By Edwin Lankester

VEGETABLE SUBSTANCES

USED FOR

THE FOOD OF MAN.

VOL. I.

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ADVERTISEMENT.

THE substance of the present Work was published in the volumes of the Library of Entertaining Knowledge, under the name of "Vegetable Substances used for the Food of Man." Since the period of their publication, the progress of organic chemistry has been so rapid, and the relations subsisting between the vegetable and animal kingdoms have become so much more fully elucidated, that it was found necessary, before republication, to submit the whole of the present work to a careful revision, and much of it has been rewritten. The Editor, in doing this, has consulted the labours of Mölder, Liebig, Playfair, Dumas, and Boussingault, and has arranged the various substances treated of according to a chemical classification. It is hoped that this plan will not only facilitate the perusal of the work, but also render the practical application of the results of recent chemical discoveries more obvious. In most cases, where the composition of the vegetable substances spoken of is given, the most recent chemical analyses have been consulted. In some cases, however, where no analysis has been made by chemists of the present day, those which appeared in the original edition of the work have been allowed to remain. Little or no alteration has been made in the general views upon the great question of the relation of the supply of food to the prosperity and happiness of man in civilised communities. The views laid down in the previous work have become gradually extended, and their soundness is now acknowledged by those who once opposed them. It is not too much to hope, that at the present moment, when a large portion of the food of the inhabitants of this country is threatened with destruction, and that the produce of other countries is about to be brought in larger quantities to our shores, this work may be the means of drawing attention to the real nature of the food of man, and the relative advantage of its various kinds for the purposes of life.

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INTRODUCTION.

The culture of the earth is a pursuit which in itself offers a sufficient distinction, not only between man and the inferior orders of animate creation, but also between man while in his merely animal state, and after he has become humanized by adopting the arts of civilization. It is this pursuit which must, in fact, precede, and be made the foundation for all other useful and ennobling occupations,—the spring whence must flow, certainly, the greater part of those reciprocal duties and affections which at once form society, and render it the source of enjoyments. That man who first, among a tribe of hunters or fishers, sows a grain or plants a root, and thus brings home the advantages of forethought to the "business and the bosoms" of his less provident fellows, becomes their benefactor, not merely by pointing out the means for avoiding the horrors of famine, and for lessening that succession of miseries which must attend upon a life of wandering, but also, by relieving their minds from the selfish exigencies that previously attended every moment, affording thereby leisure and opportunity for cultivating the social and kindly affections. It is not until men have placed themselves beyond that state of merely physical existence wherein the plenty of to-day may be followed by the destitution of to-morrow, that the higher faculties and feelings of our nature can be expanded. It must certainly, therefore, be matter of more than common interest to obtain some knowledge of those vegetable substances through the cultivation of which man has been enabled to localize himself, to reap and to store up harvests; and by thus becoming freed from an incessant call upon his physical energies for the supply of his necessities, to acquire the motives and the means for becoming something higher and better in the scale of being.

Vegetables form the primary source of sustenance to everything that lives. Were the earth without them and bare—and but for cultivation, how much of it would be in that state—the effects of heat and cold, of drought and rain, would be so violent, that, apart from all considerations as to food, the whole world would speedily become uninhabitable. Frosts and drought would break, and the returning water would wash away, the surface, until the whole would become one wide and swampy waste. The presence of vegetation prevents this desolating action, and converts what otherwise would be destructive agents into ministers of abundance. No vegetable productions tend so much to bring about this beneficial result as those which are cultivated for human food. By the shade which they afford to the ground in the hot season, they check that evaporation, and prevent that excessive hardening of the surface, which in an exposed wild render the soil impervious and inert; while, on the other hand, the humidity which they imbibe during the rainy season is again given out by continual and gradual evaporation, and they minister to the refreshment and the productiveness of all around them. In countries which are uncultivated the weather is mostly in extremes. Rain, when it comes, takes the form of an overwhelming flood, not gently entering into and moistening the soil, but rushing along the surface, tearing up one place, strewing another with the *débris*, and reducing both to a state of indiscriminate ruin; while scarcely has the flood gone by, when the returning heat evaporates the little moisture which is left behind, and burns up the coarse and scanty vegetation which the rains had fostered.

These effects of the unmitigated action of the elements are most strongly marked in those parts of the world where hitherto the seasons have defied the labour of man, and have seemed to wage war upon his agriculture. This is the case in some parts of India, in Southern Africa, and in a great part of what we yet know of Australia, where at one time the earth is parched up, and the beds of rivers become dry channels or unconnected pools, while at another they suddenly pour onward to the sea in a wide-spreading inundation, or roll their rapid floods in narrow but deepened channels. That the labours of cultivation exert the most beneficial effect upon climate may be shown by contrasting the waste and uncultivated parts of our own country with other parts in the same latitude, and at the same elevation above the level of the sea, but which are in a state of high cultivation. In these, while the immediate object of providing a certain and abundant supply of food has been accomplished by the labours of man, an indirect influence has been exerted scarcely less beneficial, by rendering the country in general more healthy and agreeable.

In the central parts of Scotland, where the introduction of agricultural improvements has been much more recent than in England, but where, owing to causes whose investigation would be misplaced in these pages, their progress has been much more rapid, the change of climate has fully kept pace with those improvements. It is within the experience of persons still living, to have noticed that the snow, which in that country formerly began to fall in November, was not wholly gone until the month of April; while in the middle of summer the heat was so excessive that agricultural labourers were obliged to suspend their toil during four or five hours in the middle of the day. At that time the autumnal rains frequently descended with so much violence that the crops, which had been retarded by the coldness of the spring, were prevented from ripening on the high grounds, were lodged and rotted on lands that were lower, and swept away by the swelling of the streams over the holms and meadows. In the same spots, at the present day, the quantity of snow which usually falls during the winter is comparatively small, appears rarely before Christmas, and is gone in February, or early in March. The summer heat is more uniformly distributed, seldom amounting to a degree oppressive to the labourer, or protracted to a term injurious to the crops; while the rain which follows is neither so violent in degree nor so long continued, and happening when the grain is far advanced towards ripeness, the injury which it does is comparatively trifling.

This mitigation of the seasons, which is wholly referable to the progress of cultivation, has had the happiest effect upon the health of the inhabitants. Diseases which formerly paid their periodical visits with distressing regularity, have either been wholly put to flight or have been deprived of the terrors in which they were clothed; the supply of food, which rested upon contingencies beyond control or calculation, has been secured with a comparative certainty; and famines, which commonly recurred at periods only a few years apart, are now happily unknown, except in some of the very wildest districts, and then only at very distant intervals.

We propose, as far as can be accomplished within narrow limits, to trace the progress of our own country towards one of the chief objects and indications of civilization—that of obtaining an abundance and a variety of wholesome and agreeable vegetable food at the cheapest rate and with unfailing regularity for increasing inhabitants. This great object is principally accomplished by the natural progress of a people in knowledge and industry. It is advanced by good commercial laws; it is retarded by bad. But if the general laws of a country have the effect of rendering industry free and property secure, it will go forward without the assistance of governments, and in spite of that assistance, too often misdirected—an embarrassment instead of a help. As we trace this advance of civilization, we first find that famines, once the unfailing scourges of a country, occur at longer and longer intervals, till at last they disappear altogether. We next perceive that seasons of scarcity, producing much severe misery, though not to be compared in their desolating effects to famines, become also fewer and fewer. Lastly, we discover that, though the great necessary of life, bread, may be dearer in one year than in another, the fluctuations in price are seldom extreme and never sudden. If we investigate the causes of these remarkable circumstances, which always attend a very advanced state of society, we shall find that they are not be ascribed to the vigilance of the soundest legislation, or to the provident foresight of the wisest ministers; but to the spirit of commerce, pursuing its natural course without interference from the cumbrous aid of a government, or the opposing prejudices of a people. When a nation has become accustomed to the best food, instead of habitually resorting to the lowest, which it can only do by its steady but certain progress in industry and a taste for comforts; when the intercourse between all parts of a country is certain and rapid; when large capitals may be safely and profitably employed in storing corn in seasons of abundance to meet the exigencies of a season of scarcity; when such vegetable productions of other lands as will endure to be naturalized can be grown in plenty at every man's door; and, lastly, when foreign commerce places the natural productions of every country within our reach in exchange for our own natural productions—then, and not till then, can a nation be said to be so advanced in civilization as to have secured, as far as possible, a constant supply of the best vegetable food that the earth can furnish, at a price accessible to the great mass of consumers.

The particular circumstances which advance or retard this desirable end will be (as far as may be done without touching upon disputable points) brought out in the following pages. The general subject will embrace a history of the vegetable food of our people, as dependent upon agriculture, gardening, commerce; and that history will be illustrated by notices of the food of other great bodies of mankind. The subject will necessarily involve a few details of vegetable physiology, and of practical agriculture and horticulture; but it must be evident that any scientific description of the structure of plants, however interesting, would be as much out of place here as any minute accounts of farming and gardening processes. Our desire is to excite attention to some of those ordinary circumstances in the condition of mankind which have such powerful effects upon the advance of the world in knowledge and happiness. In this point of view, a blade of wheat, a potato, or a peppercorn, may each be made a theme to direct the attention to some of the most important causes of the prosperity of nations; and the result of such observation and inquiry must necessarily be a conviction that all human interests are strictly allied, and that the great mutual necessities which bind mankind together are steadily going forward to break down the barriers which separate classes and nations, and to diffuse knowledge, and plenty, the fruit of knowledge, over all the earth.

In the study, then, of this subject, all who are engaged in the culture of the soil, whether the wealthy proprietor who draws from his estates a lordly revenue, the farmer who earns from his fields an independent subsistence, or the peasant whose toil obtains from the little nook which joins his cottage a wholesome meal for his family, may draw from the pursuit the means of mental improvement. Those, too, whose callings or professions shut them out from the contemplation of rural objects, may derive both pleasure and advantage from knowing by what care a grain of wheat is elaborated into the material of a loaf of bread, and how that loaf is supplied with regularity both at seed-time and at harvest. Lastly, each and all may, with equal profit, acquire some information concerning that almost countless number of foreign productions which commerce has brought to form a part of the daily food and comfort of almost the humblest of our fellow-citizens. Does it not, in fact, appear natural, it might almost be said inevitable, that every one should feel an interest in prosecuting inquiries as to things to which he is indebted for so many of his daily comforts and enjoyments — how they are produced, whence they are brought, and by what exertions their appearance at his board has been accomplished?

It is not entirely in relation to their uses that a knowledge of vegetable productions will be attempted to be conveyed in the following pages. Circumstances attend the growth of many even among the plants most familiar to us, which need only to be observed to ensure our admiration, and these will be incidentally pointed out. The seed of a globe-turnip is exceedingly minute, not larger perhaps than the twentieth part of an inch in diameter; and yet in the course of a few short months this seed will be elaborated by the soil and the atmosphere into a solid bulb of matter, containing, in some cases, twenty-seven millions of times the bulk of the seed, and this in addition to a considerable bunch of leaves. We cannot, in any case, indeed, open a page in the great volume of Nature that is not calculated to excite our highest admiration; that, if read aright, must not incite us onward to the study of her works; or which can fail to raise our grateful hearts towards the Supreme Author of every good.

CHAPTER I.

GENERAL CONSIDERATIONS ON THE NATURE OF VEGETABLE FOOD.

Before entering on the consideration of particular plants yielding the food of man, we shall endeavour to give our readers some idea of the ultimate composition of the parts of plants used as food, and of the functions they perform in the animal system. When the chemist analyses the structure of plants or animals, he finds that the elementary matters of which they are composed are nearly all identical, there being only a few elements which have been found exclusively in either the animal or vegetable kingdom. Chemists enumerate fifty-five elements, not more than a third of which have been found present in animals and plants, and four only of these are found constantly present in organic bodies. These four are carbon, hydrogen, oxygen, and nitrogen, and from their constituting so large a proportion of organised bodies, they are sometimes called *organic elements*. However varied may be the forms, colours, smell, and taste of the vegetable kingdom, or diversified the structure or functions of the animal kingdom, their great bulk is composed of these four elements. As instances, however, of the presence of other elements, we may mention that the oxides of potassium and sodium (potash and soda) are frequently present in plants, and that phosphate of lime constitutes a very important ingredient in the bones of all animals. Although the *inorganic elements*, as those bodies which do not universally enter into the structure of plants and animals are called, do not exist in large quantities, they nevertheless perform an important part in the functions of the tissues, into the composition of which they enter. It is, however, to the organic elements to which we wish now more particularly to draw attention.

Although carbon, hydrogen, oxygen, and nitrogen exist in the tissues of the animal as well as those of the plant, we have no evidence at all that would lead us to suppose that these elements are supplied to it from any other source than the vegetable kingdom. The whole material, in fact, of which an animal is composed, is derived from substances formed in the tissue of vegetables, so that wherever we have an animal, we have the expression of the fact of the previous existence of vegetable beings. The plant does not, however, supply the animal with carbon, hydrogen, oxygen, and nitrogen in a simple state, but in the form of various secretions of the vegetable tissue, which enter into the food of man and other animals. These secretions are known to chemists by the names of gluten, fibrine, albumen, casein, &c.; nor does the plant derive its food from the organic elements in a pure form, but in a state of combination the one with the other. The great sources of material for vegetable nutrition are—*carbonic acid gas*, consisting of carbon and oxygen; *water*, composed of oxygen and hydrogen; and *ammonia*, a compound of hydrogen and nitrogen. It is from these principles, which are abundantly found in nature (and formed in the various kinds of manures that man supplies the plants with which he grows for food), that the plant elaborates the various secretions that are used by the animal kingdom as aliment.

The various secretions of plants that enter into the food of man not only subserve the purpose of building up the fabric of his body, giving particle for particle of the daily waste that is going on in the body through muscular exertion and the processes of secretion, but they also supply materials for keeping up the animal heat of the body. When a thermometer is applied to the body of a man, it will indicate a temperature of 98°; and this though the external temperature be zero. This animal heat is essential to the processes of life going on in the body, and requires to be kept up at the proper temperature; and we find that this is effected in the animal system just in the same way that we artificially produce heat in our fires and lamps, *i. e.* a certain quantity of vegetable matter containing carbon and hydrogen is brought in contact with oxygen, with which it unites, and the consequence is the liberation of heat. Now it is found that the secretions of plants which contribute to the development of animal heat differ materially in their composition from those which assist in the building up of the animal machine. The former are characterised by possessing carbon, hydrogen, and oxygen, but no nitrogen; whilst the latter are distinguished by possessing this element, in addition to the other three. As carbon is the most conspicuous ingredient in the first class of secretions, they are called *carbonaceous;* they have also been called, from the function they perform in the system, *respiratory* or *combustible* secretions. The latter class, containing nitrogen, are called *nitrogenous* or *azotised*, and, in allusion to their special use in the nutrition of the body, *nutritious* secretions.

The nitrogenous secretions are found abundantly deposited in the various parts of plants which are used by man and animals as food. It is only recently that they have been detected by chemists, and their discovery has abolished a distinction which was formerly supposed to exist between plants and animals by the tissues of the latter exclusively possessing nitrogen. The various secretions containing nitrogen are all modifications to a greater or less extent of a principle called, by its discoverer Molder, *protein*, from the Greek word πρωτεύω ("I am first.") It has the following composition:—

Nitrogen . . .	5
Oxygen . . .	12
Hydrogen . . .	31
Carbon . . .	40

This substance is the basis of three other principles, called *albumen*, *fibrine*, and *casein*. These three last have long been known as the principal constituents of animal bodies, but it is only recently that their existence has been demonstrated in most of those parts of plants which are used as food by man and animals.

Albumen is found in many parts of animals; it is known familiarly as constituting the white of eggs, and is found in most of the animal fluids that assist in the nutrition of the body. It exists in many vegetables, as in the cauliflower, asparagus, mangel-wurzel, turnips, &c., the clarified juice of which, when boiled, yields a coagulum in its chemical composition and physical characters precisely similar to the white of eggs. Albumen is soluble in water, and is found in a state of solution in the serum of the blood of all animals, and in the juices of the vegetables in which it exists. When, however, it has been submitted to the action of heat, or certain chemical preparations, as acids, it coagulates, and becomes incapable of solution in water again. It differs from protein in containing two atoms of sulphur and one of phosphorus, in addition to the elements of which that compound is formed.

Fibrine enters more largely into the fabric of the animal body than albumen. It is found in the blood, the lymph, and the chyle, as well as in the juices of plants in a dissolved form. In the muscles, and in fruits, seeds, &c., it is seen in a coagulated form. It is distinguished from albumen and other substances by its spontaneous coagulation, by its not being soluble in water, alcohol, or ether, and by its being precipitated from acid solutions by ferrocyanide and ferridcyanide of potassium. Fibrine differs from albumen in possessing but one atom of sulphur. It is, however, readily convertible into albumen, as is seen in animals fed entirely on animal food (muscular tissue containing fibrine), which contain albumen in their blood. On the other hand, albumen, as during the development of the egg, passes readily into fibrine. The substance in plants formerly called *gluten*, and which abounds in the Cerealia, as in the flour of wheat, barley, oats &c., is identical with fibrine.

Casein exists in the milk of all the Mammalia, and is the substance which is separated from this fluid in the form of cheese. It is found abundantly in some vegetables, and especially in the seeds of the Leguminosæ, as beans, peas, &c. It differs in composition from the two last substances by the absence of phosphorus. It may be converted into albumen; and thus, although it is found in no other fluids of the body but the milk, and not in the solids at all, it can be used by the system for all the purposes of nutrition in the same manner as the other nitrogenous secretions. It may be distinguished from albumen by its not coagulating at the temperature of 167°, as also by its being precipitated from its solutions by all weak acids, and re-dissolved in them by an excess.

We thus see that although these three substances are yielded by different groups of plants, and differ somewhat in their chemical composition and physical characters, they perform the same function in the economy of man, and for practical purposes may be regarded as possessing the same dietetical virtues.

The second class, the *carbonaceous* secretions, have been well known to chemists for a length of time. The most important of them are—*starch*, *sugar*, and *oil*.

Starch is found abundantly in the tissues of almost all plants, existing in the form of small irregularly shaped granules, which are of different sizes and forms according to the plants in which it exists. Its composition is as follows:

Carbon . . .	12
Hydrogen . . .	10
Oxygen . . .	10

In various plants it exhibits a slightly different chemical composition, and somewhat different physical characters: and chemists have described substances having all the dietetical properties of common starch, such as is obtained from the tubers of the potato, the fruit of wheat, &c., under the name of lichen-starch and inculine. Starch is separated from some plants used as an article of diet, under the names of arrow-root, tapioca, sago, wheat-starch, potato-starch, &c.

Sugar is found in the sap of many plants, and is separated for the purposes of diet from the sugar-cane, beet-root, maple, the cocoa-nut and jaggary palms, the grape, &c. It is found also in the animal kingdom, forming a part of the milk of all the species of Mammalia. It has a composition resembling starch, and when taken into the animal system acts in the same way as starch. It is, however, more readily digestible: and it is probably on this account that it is supplied in the milk as the combustible or respirable element in this food of the young of the class Mammalia. It has been observed, that men and animals fed on sugar and starch get fat; and Liebig has drawn attention to the fact that the fat must be produced by a change in the chemical constitution of these substances, by which they are converted into oil. This conclusion of Liebig was at one time doubted by Dumas and the French chemists, but recent experiments have led to the confirmation of Liebig's conclusion. This is a fact of great practical importance, as persons may be living on food which will cause them to get fat, and yet receive no real nourishment for the tissues that contain nitrogen.

Oils are of two kinds, *fixed* and *volatile*, and both are found in the vegetable kingdom. The former only, constitute any large amount of the food of man; the latter are found extensively, giving the various scents and tastes to plants, and are only taken in the food of animals in small quantities. Various seeds yield oil, as the cocoa-nut, almond, rape-seed, and poppy-seed, from all of which it is often separated. It has, however, been observed to be very generally present in plants, and it was from this source alone that Dumas supposed animals were supplied with the oil which forms the fat of their bodies. Oil of fat, a substance which may be regarded as the basis or representative of all fixed oils, has a composition of—

Carbon . . .	11
Hydrogen . . .	10
Oxygen . . .	1

In consequence of the large quantity of hydrogen it contains in addition to its carbon, it is a more inflammable body than either sugar or starch, and is therefore more capable of keeping up animal heat. It enters into the diet of man in many of the seeds which he eats, as also in the form of butter, and in fat meat, and the various dishes prepared from it. On account of its power of maintaining combustion, it is eaten largely by persons inhabiting the colder and more northern parts of the world.

Although we have not referred to animal food, it will be seen from what we have said, that the flesh, that is, the muscles, blood-vessels, nerves, and other parts, are formed out of the nitrogenous secretions of plants, and it is by feeding on the flesh of other animals that some depend for their subsistence, as the whole of the Carnivora. Man's digestive organs, structure, and habits adapt him for feeding on animals, and we find that animal food enters more or less into his diet throughout the whole world. The nitrogenous matters which he thus obtains must, however, be first procured by some animal from the vegetable kingdom, as the animal does not possess the power of forming in its own body these substances.

Amongst the secretions of vegetables which are used by man in his food, there are some which do not appear to serve materially either in building up the fabric of his body or in maintaining heat in his frame. These have been called *medicinal secretions*,* because they seem supplied rather to protect the frame from falling into disease than to contribute to any of the great functions of life. Examples of such substances are seen in the *organic* ACIDS, which enter into the composition of the juices of most fruits; the *volatile oils*, which form the principal feature of our various spices; and the *alkaloids*, which are consumed in the form of tea, coffee, chocolate, and Paraguay tea.

In the following chapters the various substances used as food by man will be arranged according to the outline here presented to the reader. It would be quite

* See Lankester's 'Lectures on the Natural History of Plants yielding Food.'

impossible to give an accurate chemical arrangement of foods, but each plant will here be spoken of as it yields a larger quantity of one or other of the secretions which contribute to the nourishing, heating, or healing the human body.

CHAPTER II.

PLANTS YIELDING NUTRITIOUS SECRETIONS.

THE CEREALIA.

THE modifications of the chemical substances protein, albumen, fibrine or gluten, and casein, are found in all plants yielding a substantive food for man. They are, however, found in the greatest abundance in the seeds of the various forms of corn-plants, as wheat, barley, maize, &c., and particularly of the Leguminosæ. Gluten is found in the former and casein in the latter. The more digestible properties of gluten or fibrine have caused the plants which contain it to be used more extensively as a diet by mankind than any other. The seeds, however, of none of these plants yield these nutritious secretions alone. In all cases they contain starch, and also varying proportions of water. The following analyses will indicate the nature of the secretions contained in the seeds of some of the corn-plants and Leguminosæ:—

100 lbs. contain	Water and ashes.	Nitrogenous secretions.	Carbonaceous secretions.
Wheat	7	23	70
Barley	17	14	69
Oats	20	11	69
Rice	11	3	86
Maize	12	7	81
Peas	19	29	52
Beans	17	31	52
Lentils	19	33	48

The first five mentioned in this list belong to the Cerealia, to which also belong the millet and rye.

The corn-plants are all annuals, both in their stems and roots, the whole plant dying after the seed has fully formed and ripened, and sometimes even before the latter process has been perfectly accomplished. They all send up a straw or culm, which is hollow, and divided into lengths by nodes or joints; and at these joints the leaves have their insertion, one at each joint, on the alternate sides of the stem; each leaf embraces the stem for some length in the manner of a sheath. It is worthy of remark that these stems always contain a portion of silex, or earth of flint, in a state of very minute division—from which circumstance their ashes are found useful in imparting a polish to articles formed of wood, horn, ivory, or some of the softer metals; while, on the other hand, the presence of this material, and the great difficulty attending its separation from the purely vegetable matter, have always offered obstacles to the employment of straw for the manufacture of paper.

The last leaf of the season performs the office of a sheath to the newly formed flower, embracing it for a time so firmly that the sheath cannot be opened without difficulty. With the growth of the flower it bursts open its protecting spatha or sheath, rises above it, and the leaf then turns backward.

The head or ear consists of an uncertain number of flowers, followed by seeds. These are sometimes placed upon a single rib or *rachis*, as in wheat and barley, and they then form a spike. In the variety called Egyptian wheat this spike is compound, there being more than one rachis; if this consists of branches that are naked at their points of junction, and have spikelets at their extremities, they form what is called a panicle: this is the case, for example, with oats.

The chief corn-plants, or Cerealia, are wheat, rye, barley, oats, millet, rice, and maize. The tribe of cereal grasses is not restricted to these seven genera, but includes numerous others, which, if they are not equally employed as food, are neglected only on account of the smallness of their seeds. "None are unwholesome in their natural state, with the single exception of *Lolium temulentum* (darnel), a common weed in many parts of

England, the effects of which are undoubtedly deleterious, although perhaps much exaggerated. In this respect an approach seems to be naturally made to the properties of half-putrid wheat, which are known to be dangerous."*

The presence of the corn-plants in any region of the earth attests that man is there in an advanced stage of civilization. In the sepulchres of the Egyptian kings, which were opened by the naturalists and other scientific persons who accompanied the French army to Egypt, was found the common wheat, in vessels which were so perfectly closed that the grains retained both their form and their colour.† The wheat, buried there for several thousand years, was a proof of the ancient civilization of Egypt, as convincing as the ruins of temples and the inscriptions of obelisks. The corn-plants, such as they are found under cultivation, do not grow wild in any part of the earth. Wheat has been traced, indeed, in Persia, springing up in spots very remote from human habitation, and out of the line of the traffic of the natives; but this circumstance is far from proving that it is a production natural and indigenous to Persia. In Sicily there is a wild grass called *Œgilops ovata*, which is found in particular districts. It has been held that the seeds of this plant may be changed into corn by cultivation; and that the ancient worship of Ceres, which considered the fields of Enna and of Trinacria as the cradles of agriculture, had its origin in this transformation of the native grass. Professor Latapie, of Bordeaux, affirms, that having cultivated the seed of the *Œgilops*, the plant has changed its generic character, and has made approaches to that of wheat.‡ Sir Joseph Banks, in a paper addressed by him to the Horticultural Society, in the year 1805, stated that having received from a lady some packets of seeds, and among them one labelled "Hill Wheat," the grains of which were hardly larger

* Lindley's 'Introduction to the Natural System of Botany,' p. 302.

† See 'Lyell's Geology,' vol. ii. p. 81.

‡ 'Dict. Classique d'Histoire Nat.,' art. *Œgilops*.

than those of our wild grasses, but which, when viewed through a magnifying lens, were found exactly to resemble wheat, he sowed these grains in his garden, and was much surprised on obtaining, as their produce, a good crop of spring wheat, the grains of which were of the ordinary size. Every inquiry that was made to ascertain the history of these seeds proved fruitless. All that could be established, with regard to the place of their production, was, that they came from India; but as to the particular locality, or the amount of cultivation they had received, or whether the grain was indeed in that instance a spontaneous offering of nature, could not be ascertained. More recently experiments have been performed which have led Dr. Weissenborn, in Germany, and some observers in this country, to believe that plants of oats may be converted into rye, and *vice versâ*. This is the more singular, as it occurs in plants which are regarded by botanists as generically distinct.* Experiments such as those we have mentioned may naturally lead us to think that in the corn-plants, as in other vegetables, great modifications have been produced by cultivation; but they do not at all interfere with the belief that the cereal grains are spread through the earth by the agency of man alone, and that they are bequests from past ages of civilization too remote to afford any materials for the authentic history of their introduction, even into countries possessing the most ancient records. Other seeds are dispersed throughout the earth by winds and currents, in the hairy coats of quadrupeds, and in the maws of birds. But the corn-plants, in common with many other important vegetable productions, follow the course of man alone. This is a blessing, which even hostile armies are instruments in diffusing. Cortez, the conqueror of Mexico, inhuman as he was in many parts of his conduct, thus writes from Mexico to the king of Spain:—"All the plants of Spain thrive admirably in this land. We shall not proceed here as we have done in the isles, where we have neglected cultivation, and

* 'Gardener's Chronicle,' Aug. 1844.

destroyed the inhabitants. A sad experience ought to render us more prudent. I beseech your Majesty to give orders that no vessel set sail for this country without a certain quantity of plants and grain." The diffusion of plants useful to man is an accident diminishing the evils of hostile invasion ;—it is a necessary attendant of commercial intercourse. The Indians of New England called the plantain "Englishman's foot;" and in the same way, in the infancy of ancient society, wheat might have been similarly regarded as springing from the footsteps of the Persians or the Egyptians. In times approaching nearer to our own we know that wheat followed the march of the Romans, as the vine was in the train of the Greeks; and, to come still nearer, we find cotton remaining in countries which had otherwise suffered from the incursions of the Arabs. "The migration of these plants," observes Humboldt, "is evident; but their first country is as little known as that of the different races of men which, from the earliest traditions, have been found in all parts of the globe." *

The manner in which the most important gifts of Providence to mankind have been diffused by the influences of conquest or commerce, has some striking instances in the history of America. In the New World such facts are too recent to admit of any doubt. The same class of facts, too, are exhibited in several cases in the history of our empire in Hindustan. We shall give a few examples.

None of the cereal grasses, properly so called, were found in cultivation among the Mexicans when their country was first visited by Europeans. The foundation of the wheat-harvests at Mexico is said to have been three or four grains which a slave of Cortez discovered, in 1530, accidentally mixed with a quantity of rice. The careful negro who preserved and made so advantageous a use of the few grains which a happy chance had thrown in his way, and which, in the hands of a careless or thoughtless person, would, with their future

* 'Géographie des Plantes,' p. 35.

inestimable advantages, have been lost to his country, has not been thought worthy, doubtless because he was a negro, of having his name preserved. The Spanish lady Maria d'Escobar, wife of Diego de Chaves, who first imparted the same blessing to Peru, by conveying a few grains of wheat to Lima, has been more fortunate. Her name, together with the means which she took for effecting her object, by carefully distributing the produce of successive harvests as seed among the farmers, have been gratefully preserved in the records of history. The exact period when this cultivation was commenced in Peru is not, indeed, known; but it appears reasonable to believe that this event did not occur until after the date assigned for the introduction of wheat into Mexico, as in the year 1547 wheaten bread was hardly known in the important city of Cuzco. The first grains of wheat which reached Quito were conveyed thither by Father Josse Rixi, a Fleming, who sowed them near the monastery of St. Francis, where the monks still preserve and show, as a precious relic, the rude earthen pot wherein the seeds first reached their establishment. The rice of Carolina is now the principal produce of that portion of North America. Mr. Ashby, an English merchant, at the close of the seventeenth century, sent a hundredweight from China to this colony; and from this source all the subsequent rice-harvests of that division of the New World, and the large exportations of the same valuable grain to Europe, have sprung. The wheat now cultivated in Rohilcund, in India, "was propagated by seed brought from England, since the conquest, by Mr. Hawkins;"* and the potato, within a very years, has been extensively spread by us through the Indian peninsula, and there, by preventing the exclusive use of rice, is greatly ameliorating the condition of the native population. Facts such as these are highly interesting, because they exhibit the moral as well as natural causes which influence the distribution of vegetable food throughout the earth. In the following

* Heber's 'Journey,' vol ii. p. 131.

pages we shall endeavour to collect whatever is satisfactorily known as to this branch of our subject. Before we proceed, however, to a particular history of species or varieties of vegetable substances used for the sustenance of man, we shall take a rapid though necessarily imperfect view of the distribution of the corn-plants throughout the globe at the present day.

Agriculture can be pursued but very partially within the northern polar circles, where, for the most part, the intenseness of the frosts during a protracted winter binds up the soil, not otherwise sterile, and condemns it to perpetual unfruitfulness.

The utmost limit of the culture of grain in Siberia reaches only to the sixtieth degree of latitude, and in the more eastern parts of the province these important products are scarcely to be met with higher than fifty-five degrees. In the more southern parts of Siberia and in districts adjoining the Wolga the land is extraordinarily fertile, so that crops of grain are obtained with a very trifling amount of labour. Buck-wheat is very commonly cultivated in this district; and it is found that one sowing of the seed will produce five or six crops in as many successive years, each harvest yielding from twelve to fifteen times the quantity first sown. The seed which is shed during the reaping is sufficient to ensure the growth of plants for the following year, without any manuring, and with no more labour on the part of the farmer than that of harrowing the land in the spring. This system is continued without intermission until the diminished fertility of the soil compels its abandonment; but, as already mentioned, this state of things rarely occurs until six years have been thus occupied.

It might be thought that in a country thus fertile the proprietors or cultivators of the soil would speedily become enriched; this, however, is by no means the case. Facilities for transporting their surplus produce are wretchedly deficient, so that the market is extremely circumscribed; and the inhabitants of the country being generally so poor as to be unable to purchase food produced from grain, the farmers limit their cultivation in a great degree to the quantity needed for the supply of their own families. The small amount of labour called for by this cultivation is usually performed by the farmer himself, assisted by the members of his own family; the employment of any other farm-labourers is consequently rare.

All temptation to extend the breadth of culture must be wanting in a situation where the surplus produce cannot be exchanged, and its value invested in some permanent mode, whereby a larger quantum of human labour may be commanded at any future period.

Europe is indebted to Siberia for a particular description of oats, which are considered excellent; and at Yakutsk barley is sometimes seen to arrive at maturity.

In some districts of Lapland, situated to the westward, the inhabitants are, by dint of careful tillage, enabled to produce plentiful crops of rye. In some spots, nearer even than this to the pole, potatoes are made to supply the place of grain; but for the most part the inhabitants are constrained to subsist upon dried fish.

In Kamtchatka, which is considerably to the south of Siberia, extending from 62° to 51° of north latitude, but united with that province at its eastern extremity, no attempts to cultivate the cereal grasses have ever proved successful, the produce not having in any case been sufficient to repay the labour of the tillage. These failures may, however, be attributable more to the generally ungrateful nature of the soil than to the effects of an unkindly climate, since in some spots where the land is of better quality other esculent vegetables are produced in tolerable perfection; cabbages, carrots, turnips, radishes, beet-root, and even cucumbers, are raised constantly and without difficulty. Dried fish and caviaire form the principal food of the inhabitants of Kamtchatka and the islands of the Aleutian Archipelago.

Barley and oats are the kinds of grain the culture of which extends farthest to the north in Europe. The meal which they yield, and which is seldom or never used by the inhabitants of South Britain for human food, forms, on the contrary, the principal sustenance of the inhabitants of Norway and Sweden, of a part of Siberia, and even of Scotland.

Rye follows next in order, being associated with oats and barley in the more northern division of the temperate zone. In the southern parts of Norway and Sweden, in Denmark, in districts bordering on the Baltic Sea, and in the north of Germany, rye forms the principal object of cultivation; barley being raised in those countries, as with us, only for the purpose of brewing, and the use of oats being limited principally to the feeding of horses. In all these last-mentioned places wheat is also grown; but its consumption is limited, and the principal part is made an object of external trade.

The winters of Norway are intensely cold, but their summers are, on the contrary, excessively warm, particularly in the valleys, upon which the rays of the sun are reverberated during the day from the mountains, while the atmosphere has no time for becoming cool during the few hours when the sun is below the horizon. In such situations barley is generally sown and reaped within the short space of sixty days; sometimes even six weeks are found to suffice for fulfilling the hopes of the husbandman. The Norwegian agriculturist is, however, occasionally visited by seasons throughout which the sun appears to lose its genial power, and vegetation is stunted; blossoms, indeed, appear, but are unsucceeded by fruits, and the straw yields nothing but empty ears. This calamity is happily of rare occurrence; and, unless when checked by a premature frost, the harvests of Norway are for the most part abundant and excellent.

Agriculture is pursued systematically and even scientifically in Sweden, by which means the prevailing barrenness of the soil is partially remedied. The province of Gothland is made to produce barley, oats, rye, and wheat, as well as peas and beans. In these climates the transition of the seasons is always abrupt. Vegetation, when it has once commenced, proceeds with a rapidity unknown in these more temperate regions; and the interval which elapses between committing the seed to the soil and gathering the ripened harvest is scarcely greater in Sweden than is experienced in Norway.

Somewhat farther to the south, rye in a great measure disappears, and wheat becomes the principal material used for human food. France, England, the southern part of Scotland, part of Germany and Hungary, and the lands of Western and Middle Asia, fall within this description. In most of these countries the vine is also successfully cultivated; and wine forming a substitute for beer, the raising of barley is consequently much neglected.

Still farther southward wheat is found in abundance, but maize and rice are also produced, and enter largely among the constituents of human food. Portugal and Spain, that part of France which borders on the Mediterranean Sea, Italy, and Greece, are thus circumstanced.

Still farther to the east, in Persia and Northern India, Arabia, Nubia, Egypt, and Barbary, wheat is indeed found; but maize, rice, and millet form the principal materials for human sustenance. On the plains near the Caspian Sea, in the province of Georgia, rice, wheat, barley, and millet are raised abundantly, and with very little culture. In the more elevated parts of those districts rye is sometimes cultivated, but oats entirely disappear, the mules and horses being fed on barley.

The mode of culture followed at the present day in Egypt is exceedingly simple, and calls but for a small amount of labour. All that is required for raising barley and wheat is, when the inundations of the Nile have subsided, to throw the seed upon the mud: if this should be thought too hard and stiff, the grain is lightly ploughed in, and no farther care or culture is then required until the ripening of the produce, which usually happens from the beginning to the end of April.

In Nubia, and particularly above the Great Cataract, the banks of the river are so high as seldom to admit of the overflowing of the waters, and the Nubian cultivators are consequently obliged to employ *sakies*, or water-wheels, for the purpose of irrigating the fields during the summer: this practice prevails as far as Sennaar. Each of these sakies is capable of irrigating as much land as is calculated to yield from twelve to fifteen hundred English bushels of grain, and employs the alternate labour of eight or ten cows. The water thus dispensed over the land is thrown up either from the Nile, or from pits dug to the depth of fifteen or twenty feet, in which an abundant supply is soon collected. The principal vegetable productions of Nubia are barley and *dhourra* (Sorghum, or Indian millet). The use of wheat is confined to the more wealthy inhabitants.

The grains which form the principal objects of cultivation in our division of the globe are rarely seen in China and Japan, where rice greatly predominates. The reason for this is not to be sought in the influence of climate, but rather in the peculiar manners and tastes of the people; since, throughout the isles of Japan, and in a very considerable part of the Chinese empire, every one of those grains might be successfully reared. The denseness of population in China furnishes a sufficient reason why the pursuit of agriculture should be so much encouraged as it is by the government. The annals of that singular people acquaint us, that one of their emperors who enjoyed the highest reputation for wisdom was taken from the plough to sit upon the throne. Another has been celebrated for having discovered the art of draining low lands, of collecting the water in canals, and of converting it from a noxious impediment to the useful purpose of irrigation. Their emperor Ven-ti, who reigned 179 years before Christ, is said to have incited his subjects to the more zealous cultivation of their lands, by ploughing with his own hands the land surrounding his palace, which example being followed by his ministers and courtiers, influenced in turn those who moved in a less exalted sphere.*

* Du Halde, 'Nouvelle Relation de la Chine,' tome i. pp. 274-5.

Of the countries which lie between the tropics, those of Asia adopt principally the use of rice, while maize is made the common food of the Americans. There exists a natural reason for this distribution, Asia being undoubtedly the native region of rice, while maize is as certainly the production of America. In Africa, except as already particularized, and in the British settlements of that continent, the two grains are used indifferently and in nearly equal proportions.

Wheat is found in some situations within the tropics; but its high price, as compared with that of other grains, occasions its use to be confined to the more wealthy classes. In many parts of British India, and particularly in the upper provinces, the quality of the wheat is represented as being excellent, although the grain is smaller than with us. Barley is likewise grown in some of the more northern districts, but the grain does not attain to the same size or plumpness as in Europe. The variety cultivated in India is that known by us under the name of Bigg: its cheapness causes it, however, to be extensively used by the native population, who eat it in the form of cakes.

The agriculture of the Hindu Ryots is of the very rudest description: their ploughs are scarcely deserving of the name, having no contrivance for turning over the soil; the instrument employed as a harrow is nothing more than the branch of a tree, or, at best, is only a wooden frame, sixteen or eighteen feet long, in the form of a ladder, which is drawn by four oxen, and driven by two men, who add to its effectiveness by standing upon the instrument. Dr. Buchanan, in the account of his 'Journey through Mysore, Canara, and Malabar,' closes a very disparaging account of Indian husbandry with the following remarks:—

"I am afraid, however, that the reader, in perusing the foregoing accounts, will have formed an opinion of the native agriculture still more favourable than it deserves. I have been obliged to use the English words ploughings, weedings, and hoeings, to express operations somewhat similar that are performed by the natives;

and the frequent repetitions of these, mentioned in the accounts taken from the cultivators, might induce the reader to imagine that the ground was well wrought, and kept remarkably clean. Quite the reverse, however, is the truth. Owing to the extreme imperfection of their implements, and want of strength in their cattle, a field, after six or eight ploughings, has numerous small bushes remaining as upright in it as before the labour, while the plough has not penetrated above three inches deep. The plough has neither coulter nor mould-board to divide and to turn over the soil, and the handle gives the ploughman very little power to command its direction. The other instruments are equally imperfect, and are more rudely formed than it was possible for my draughtsman to represent."*

The only circumstance which is stated favourable to the agricultural skill of the Hindus, is the existence of contrivances for irrigating the lands in seasons of drought. This process is effected by means of tanks, which are maintained under the compulsory regulations of the governments, whose revenues depend upon the produce of the soil.

It remains to trace the distribution of the Cerealia throughout America. The highest limit for the cultivation of these plants on that vast continent is in the more southern portion of the Russian possessions, situated between 57° and 58° of north latitude, where barley and rye are brought to maturity. On the more eastern coast of America, the same cultivation rarely succeeds higher than 50° or 51°.

In the United States, wheat and rye grow as in the more temperate regions in Europe; and it is perhaps owing to faulty methods of tillage, occasioned by the great abundance of land and the dearness of labour, that the produce bears a small proportion when compared with that obtained from cultivating the same extent of land in Europe. Great improvements in this respect have already been introduced; and when population

* Vol. i. p. 126.

shall be found, as in older settled countries, pressing against the means of subsistence, there is no reason why the lands should not be made as productive generally, as they are in the carefully-cultivated districts of this country. Maize is very extensively raised in the United States, and in the southern parts of the Union rice is also very largely cultivated.

Canada produces wheat in sufficient abundance to supply its own population, and to make large occasional shipments to the mother-country, where this produce is received upon more advantageous terms as regards the duty payable on importation, than wheat, the produce of any part of the continent of Europe. In proportion as the lands of Canada are cleared of their timber, we may expect that a larger amount of grain will be spared by that province for consumption in Europe; unless the tide of emigration should continue to set more and more strongly towards that quarter, so as to call for a proportionately increased quantity of grain for the sustenance of the settlers.

Humboldt, in his account of New Spain, has given a very interesting view of the agriculture of South America. In the lower latitudes of the Mexican republic, the cereal grains of Europe, comprehending under this denomination wheat, barley, oats, and rye, are never cultivated at a lower elevation than from 2500 to 3000 feet above the level of the sea. It is well known that the habitation of plants is determined, in a very decided manner, by the elevation of different regions. On this subject De Candolle calculates, that in France every five hundred and forty feet of vertical elevation is equivalent to a receding of one degree from the equator; while Humboldt estimates every rise of three hundred and ninety-six feet to be equal to the same advance to the north, in tropical countries. We know that the summits of the towering Andes—some of which are placed almost directly under the equatorial line—are yet covered with perpetual snow; and that in many mountainous countries within the tropics, the seeds and fruits of temperate regions are seen to flourish.

On the declivity of the Cordilleras, between Vera Cruz and Acapulco, wheat cultivation does not in general commence at a lower level than 4000 feet. Sometimes, as in the immediate vicinity of the city of Xalapa, wheat is sown, not for the sake of the grain, which indeed it there never produces, but because the straw and succulent leaves furnish excellent fodder for cattle.

It does not appear, however, that the degree of latitude and the amount of elevation are the only circumstances that determine the fructification of wheat, since in Guatemala, which is nearer to the equator, and at a much lower level than Xalapa, that grain comes to full perfection. Humboldt offers, as reasons for this variance from the usual rule, the exposed situation of the district, and the prevalence of cool winds, which serve to modify the otherwise unfavourable influence of the climate. "I have seen," says this observant traveller, "in the province of Caraccas, the finest harvests of wheat near Victoria (latitude 10° 13′), at 500 or 600 metres (1640 or 1968 feet) of absolute elevation; and it appears that the wheaten fields which surround the *Quatro Villas*, in the island of Cuba (latitude 21° 58′), have still a smaller elevation. At the Isle of France (latitude 20° 10′) wheat is cultivated on a soil almost level with the ocean."*

Circumstances altogether unconnected with climate must be taken into account in determining the relative agricultural capabilities of Mexico, where the absolute absence of rain, throughout a large portion of the time when the plant is on the ground, must be in a high degree detrimental to wheat husbandry, unless artificial means were resorted to, as in Nubia, for supplying the natural deficiency of moisture. Throughout a great part of the temperate regions of New Spain the farmers are compelled to adopt the system of artificial irrigation. This is effected by the agency of canals and reservoirs, which are supplied from the rivers, and which are so

* Humboldt's 'New Spain,' p. 454.

constructed that the water may be dispensed at pleasure over any and every part of the farms.

In districts where the system of artificial watering is fully adopted, the fertility of the Mexican farms is extraordinary,—far beyond anything experienced in the richest soils of Europe, the wheat harvest being commonly thirty-five and forty for one, and some considerable estates yielding even fifty and sixty measures for one measure of seed. In similar localities, and with land of equal quality, but where no opportunity has been provided for watering the fields, the annual return does not exceed more than fifteen or twenty for one.

Maize is also very extensively cultivated in Mexico; and, from the genial nature of the climate, and the general fertility of the soil, the returns which it yields to the farmer are most abundant. Humboldt informs us that in the valley of Mexico the maize harvest yields two hundred for one. The Indians and Mestizoes, who form a large proportion of the inhabitants of the republic, feed on maize and manihot (cassava), the consumption of wheat being principally confined to the white inhabitants of the towns.

In the temperate and polar districts of the southern hemisphere, the order of cultivation is very similar to that pursued in similar latitudes and elevations north of the tropics. In America wheat is commonly found in the southern provinces of Brazil, in Buenos Ayres, and in Chili. The same grain predominates at the Cape of Good Hope, the flour which it yields being of beautiful quality, and accompanied by less than the usual proportion of bran. In Australia wheat also forms the principal object of cultivation on the part of the settlers; but, in the southernmost portions of that vast island—which, perhaps, it were more correct to call a continent—and in Van Diemen's Land, barley and rye are likewise to be found.

CHAPTER III.

WHEAT.

By common consent, and in every climate where it can be cultivated, Wheat is held in the highest estimation of all the cereal grains. The cost of its production, compared with that of some other substantive articles of aliment, does, indeed, occasion it to be but little consumed in countries where the bulk of the inhabitants are constrained by poverty to subsist upon the cheapest description of food that will sustain life. Where, however, the people are in a situation which enables them to indulge their choice in respect of food, wheaten bread, with scarcely an exception, constitutes the chief material for consumption.

Grain of Wheat, upper and under sides.

A full-grown and perfect grain of wheat will, on examination, be found to resemble the above figures. In form it is a compressed oval, and is inclosed firstly in certain chaffy scales, which are readily to be separated from it, and secondly in a membranous tunic, which invests the seed much more closely. Along that side of the grain which, while the plant was growing, was turned towards the rachis, a groove may be observed. At the base, on the opposite or convex side, is to be seen a small protuberant oval space, which indicates the germ or embryo of the future plant, and which is at this time covered by the tunics. The vessels whereby the grain was attached to the plant, and through which it drew nourishment until its maturity, had their point of attachment at the basal termination of this protuberance. When the seed is perfectly ripe, the umbilical vessels separate; the point of separation speedily heals in the same manner as a portion of a deciduous tree from which a matured leaf has detached itself, and the grain may then be easily threshed out from the chaff in which it had lain buried; sometimes, indeed, it sheds itself spontaneously.

Several species, and a still greater number of varieties, of wheat are to be found. Many of these differences are doubtless to be referred to influences of climate and modes of culture. The genus *Triticum*, to which wheat is referred by botanists, is known by possessing solitary spikelets with the glumes two-valved and many-flowered; the valves carinate, acute, or mucronate; the paleæ two-valved; the valves lanceolate; the external one acuminate, the internal one bifid at the extremity. The genus consists of about forty species; of these sixteen are European, and only five are natives of Great Britain. The species are divided into two groups,—the *cerealia*, yielding edible fruits, and the *agropyra*, which are merely grasses. The latter group is by some writers, as Beauvois and Lindley, made into a distinct genus. It includes all the species that are natives of Great Britain.

The cerealia are known by their spikelets being more or less ventricose and turgid, and the valves are ovate or oblong. These are again divided into the *Frumenta* or true wheats, in which the seeds fall out from the chaff, and the *Speltæ* or spelts, in which the seeds remain attached to the chaff. The most important species belonging to the former division are the following:—

T. vulgare, common wheat, has a four-cornered imbricated spike, with four-flowered spikelets, the valves ventricose, ovate, truncate, mucronate, compressed under the apex, the nerve somewhat prominent. This species includes the *T. æstivum* and *T. hybernum* of many botanists. They appear, however, to be only varieties of this species differing in their periods of growth.

The native country of this species is not well ascertained; it has been found wild in some districts of Persia, also of Siberia, apparently removed from the influence of cultivation. The great extent to which the cultivation of this species has been carried in Europe has produced many varieties. Metzger, in his 'Getreide Arten,' describes eighteen varieties which are cultivated in Germany, and many more might be added to this. The variety called *T. æstivum* is the type of all the wheats which are called summer and spring wheats. These wheats are not much cultivated in Great Britain; they are, however, in some parts of Germany. Metzger recommends the white-beard summer wheat to be grown on poor lands, as it yields the best straw for plaiting, which is used extensively in Italy for this purpose. *T. æstivum* is supposed to be a native of Siberia, in the land of the Beschkirs. It is less hardy than the winter-sown kind, and the whole plant has a weaker appearance: the stem is thin and delicate, the ear more slender and less erect, and it is provided with much longer beards or awns. This description of grain, which in our uncertain climate cannot be safely or productively cultivated throughout the kingdom, is yet domesticated in the more southerly and midland districts. As its grain is smaller than that of the commoner sort, and as its produce is less abundant, the farmer would not be led to its cultivation could he be certain of success with earlier sown seed, or if in the progress of his agricultural operations the land could always be got ready for the autumnal sowing.

The principal advantage to be derived from the adoption of summer wheat consists in the security which it offers against the injurious effects of a cold and rainy spring; so that in situations and seasons where winter-sown wheat is so far injured as to destroy all prospect of a harvest, this delicate but more rapidly growing species may be more confidently depended on for yielding its in-

Ear and Plant of Spring Wheat.

crease. Some farmers, when they perceive that the seed they have sown in the autumn fails and goes off in patches from any untoward causes, are accustomed to rake spring wheat into the vacant spaces, and wherever the plants appear weak and thin. By this means the uniformity of the crop is restored; and, if the operation has not been delayed beyond the beginning of April, the spring wheat will be matured and ready for the sickle at the same time with the earlier sown plants. This mixture of grain is of no consequence to the miller, but it would be manifestly improper to employ the produce as seed. When the spring wheat is sown by itself, the season for this operation is in April or the early part of May, from which time onward the farmer has but little to dread from any severity of weather in the above-mentioned districts. It is said that this species of wheat is not subject to blights. According to the analysis of Sir Humphry Davy, the nutritive quality of this kind is not quite equal to that of the winter wheat, the proportions being $92\frac{1}{2}$ per cent. in the latter and only 94 per cent. in the former, of the entire bulk of the grains. The gluten contained in two kinds varies in a greater degree, that of winter wheat being 24, while that of spring-sown corn is only 19, so that the winter variety is most eligible for the purpose of the baker.

T. hybernum is the Lammas or winter wheat, and embraces by far the greater number of varieties which are cultivated as the food of man. The wheats known in Great Britain and on the Continent as Fox, Kentish, Talavera, and Bohemian, or velvet, red, white, red-eared, and bearded wheats are varieties of *T. hybernum*. This species may be easily distinguished by its appearance, being much more vigorous in the stem, more erect and thick in the ear, and, in comparison with the other, destitute of beard or awn, for which reason its bloom is more conspicuous. The same cause may be cited to account for the fact that its pollen is both more easily diffused and more liable to be destroyed. This plant is sown in autumn, stands through the winter, and ripens its seed in the following summer. Slight varieties of this species are exceedingly common in different localities, and are probably attributable to some peculiarities in the mode of culture; and the common varieties of winter wheat are distinguished from each other according to the colour of the tunic enveloping the grain, and the difference observable in their chaff. The colours are usually divided into white and red, the latter of these including many different shades of brown. Red wheat is commonly said to be more hardy than white; it is therefore thought to be better suited for cultivation in bleak and upland districts. The plant is, however, not so productive as the white, and the flour which it yields is seldom of so desirable a quality.

The cultivation of another description of wheat, called from the form of the ear the duck-bill or conical wheat, *T. turgidum*, has been attempted in England, but without any profitable result, having no qualities that recommend it to the agriculturist. About ten varieties of this species are known to the agriculturist, half of which are summer and half winter wheats; of these the Russian or blue English wheat and the bread-wheat are the best.

T. durum — true beard wheat, has the prominent carinæ of the last wheat, with the valves ventricose oblong, and three times longer than broad. It is a native of Switzerland, and has several varieties, all of which produce summer wheats, and are better known in Italy, Sicily, and Spain, than in this country.

T. compositum, Egyptian or many-spiked wheat, called also the corn of abundance, is principally cultivated in the country whose name it bears, and in Italy.

Ear and Plant of Winter Wheat (*T. hybernum*).

Ear and Plant of Duck-bill Wheat (*T. turgidum*).

It is probably a native of the north of Africa, and resembles spring wheat more than any other description. The ear is bearded, and the grains are thinner than those of winter wheat. It is the distinctive character of this plant that its rachis is branched so that the ear is made up of several spikelets. Egyptian wheat will bear great degrees of heat and drought without injury, so that it is found to yield abundantly in situations where other kinds would be greatly injured if not destroyed—a circumstance which points it out as admirably adapted to the arid lands whereon it is chiefly cultivated.

T. polonicum, Polish wheat, has the spike irregularly four-cornered and compressed; the spikelets three-flowered; the valves subventricose, oblong, lanceolate, herbaceous, with many nerves; it is found native in some parts of Europe, not, however, in the country which gives it its name. In cultivation it yields summer wheats, which are adapted for warmer climates than Great Britain. It was partially cultivated in England in the latter part of the seventeenth century, but is now to be found only in botanic gardens.

The spelts include the following species:—

Triticum spelta, which is imagined to be the *Triticum* of the Romans and the *Zea* of the Greeks, although this latter name has been given to Maize, a grain unknown to the ancients. This species has a parallel compressed spike loosely imbricated, a fragile rachis, spikelets 4-flowered, the valves obliquely truncated, dentato-mucronate, the carinæ compressed, strongly prominent above, with the tooth of the apex inflexed. All the

Ear and Plant of Egyptian or many-spiked Wheat (*T. compositum*).

Ear and. Plant of Polish Wheat *(T. polonicum)*.

species of spelts are cultivated extensively in Germany, and there is so strong a prejudice in their favour in the markets of the south of Germany that other kinds of corn can with difficulty be got rid of. Their great advantage appears to be that they accommodate themselves to almost any kind of soil, yielding good crops in all degrees of moistness and dryness. They possess a firm stiff straw, which is not easily laid, and are not attacked by birds, and are less liable to smut. It is said that spelt wheat is better adapted than any of the more delicate kinds for culture in Australia, and probably it would be found the preferable sort in all the more southern wheat-growing countries.

There are two distinct varieties of spelt, distinguished as the awned and the awnless; the latter is perhaps the most naked of all the cerealia. The grains of this are large, but the ear contains only a small number of them, as a portion of the flowers prove barren. It is generally, if not always, a spring-sown crop, grows strongly, and its stalks are nearly solid. Bread made of its flour is said to be of a dry quality.

T. dicoccum, two-grained or rice-wheat, has the spike oppositely compressed, rachis fragile, the spikelets 4-flowered, the valves obliquely truncated, dentato-mucronate; the carina compressed, strongly prominent above, with the tooth of the apex inflexed. This is the *T. amyleum* of some authors, and is cultivated with the other spelts in Germany.

T. monococcum, one-grained wheat, or St. Peter's corn, has 3-flowered spikelets, the valves at the apex

Ear and Plant of Spelt Wheat (*T. spelta*).

Ear and Plant of One-seeded Wheat *(T. monococcum)*.

2-toothed, with straight acute teeth at the apex of the carina. This species is frequently cultivated in Switzerland, and containing less gluten than common sorts, it answers better for being boiled into gruel than for being baked into bread. The four-sided form of the ripe ear is so extremely regular, that it has the appearance of being carved in ivory. The straw, which is both hard and firm, is excellent for thatching.

The well-known method of propagating wheat is by sowing the grain in land previously prepared for its reception by ploughing. It has been held that this important preliminary of pulverizing the soil can hardly be carried to excess, the expense attending it forming almost the only limit to its prosecution. Cato the Censor, who, in addition to his accomplishments as a warrior and a statesman, showed an intimate acquaintance with rural economy, has recorded his opinion on the necessity of thoroughly turning up the soil. In his treatise, '*De Re rusticâ*,' he has laid it down as the first rule in husbandry to plough well, and the second rule—to plough.*

Two distinct practices are followed in committing the seed to the earth. The most ancient and most commonly used of these is that of scattering the seed from the hand of the sower over the whole surface; and this is characteristically called sowing *broad-cast*. The other method, which is comparatively of modern introduction, is that of depositing the seed in holes formed in straight furrows, and at regular intervals, which is called *drilling*, or dibbling; while the processes which accompany it, and which are impracticable with the broad-cast method, are distinguished as the horse-hoeing or drill system of husbandry.

Lord Bacon says that in his time (the beginning of the seventeenth century) attempts had been made to plant wheat, but that the plan was abandoned, although undoubtedly advantageous, as involving too much labour.† In 1669 Evelyn furnished to the Royal Society a description of a sowing machine, invented by Locatelli, an Italian, who had obtained a patent for its use in Spain, having proved its utility by public experiment.‡ The drill plough was, however, not used in England, and was perhaps quite unknown to a body of men who are proverbially slow all over the world to adopt any improvement till public attention was awakened to it in the early part of the last century, by the celebrated Jethro Tull, who, after practically following for some years his own improved plan of husbandry, and thereby proving its advantages, published a particular account of his process in the year 1733. This work, which he entitled 'An Essay on Horse-hoeing Husbandry,' became highly popular, compelling the attention of English agriculturists to the subject, and engaging no less the consideration of

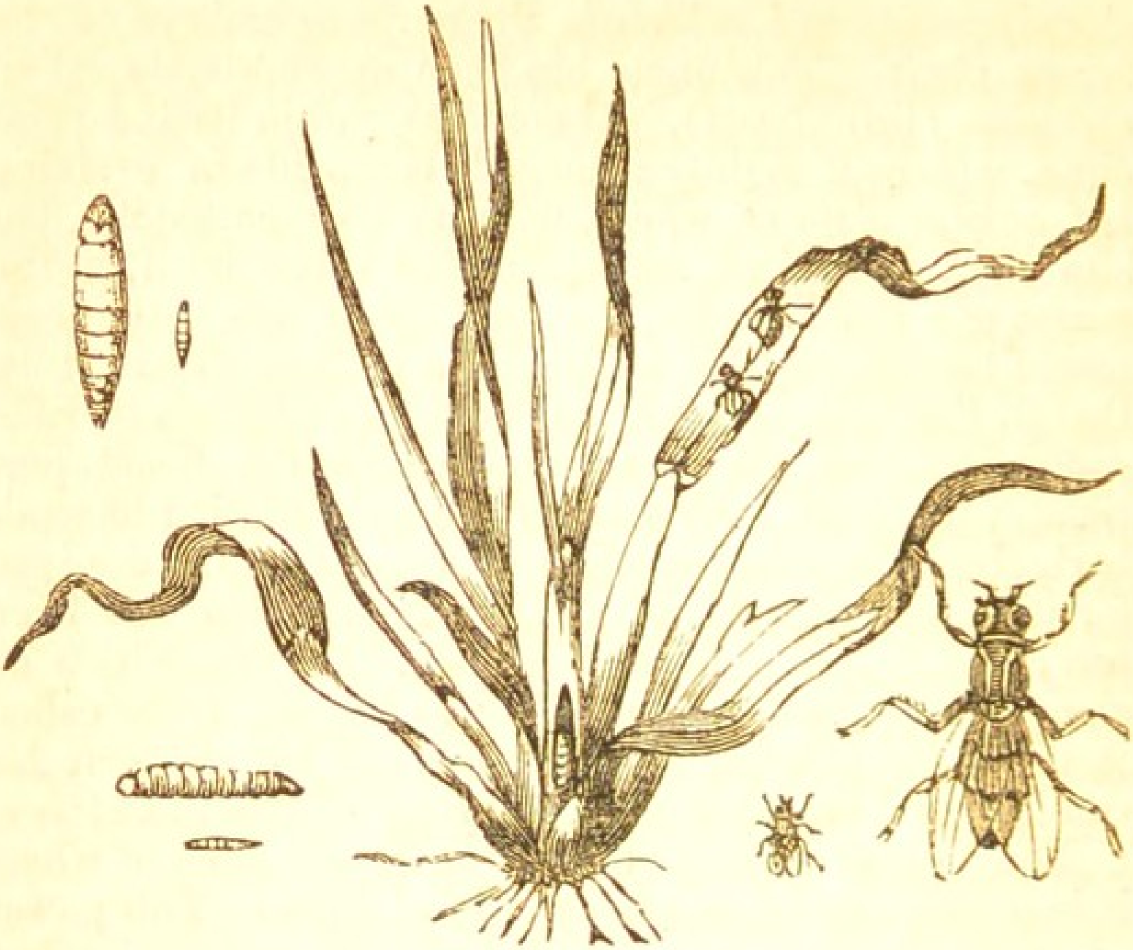
* Cap. lxi. † Sylva Sylvarum.

‡ See Beckmann's 'History of Inventions,' vol. iv. p. 45, ed. 1817.

scientific foreigners. The system of Mr. Tull consisted in discarding the old method of scattering seed upon the land broad-cast, and in substituting a mode of sowing the grain in straight rows or furrows by means of an implement more perfect than Locatelli's machine, which delivered the seed at proper interval, and in the exact quantity that was found most beneficial. Spaces of fifty inches' breadth were left between the furrows, so that the land could be ploughed or horse-hoed in these intervals at various periods during the growth of the crop, the object of these hoeings being to bring fresh portions of the soil into contact with the fibrous roots of the plants, and thus to render every part in turn available for their nutrition. One material advantage that results from the new method of husbandry is the saving which it occasions in seed-corn, and which is said to amount to five-eighths of the quantity usually expended in the old method. The comparative merits of the two plans have for so long a time been submitted to the surest of all tests, that of experience, and have been so well examined by competent persons, who have given the result of their inquiries to the world, that it cannot be necessary to do more in this place than refer the reader to those authors for farther information.

The manner in which plants are produced through the germination of seeds is so well known, that in any community where the human mind has been advanced in that degree which incites to the cultivation of the earth, it would perhaps be difficult to find a man so insensible to the workings of nature by which he is surrounded, as not to have noticed with admiration the phenomena accompanying the development of vegetable fecundity. It is true, we know not how this standing miracle is brought about; and, in all human probability, we never shall be able to pierce the veil wherein the inciting energy is shrouded to which that fecundity is owing; but is it possible for us, while conscious that it exists, not to be grateful for the benevolence whereby that energy is ceaselessly called into action? At one end of the groove, in a grain of wheat, is a small protuberance, as we have already mentioned, which is the germ or embryo of the future plant. This organ has been appropriately called *corculum* (little heart). It contains within itself a principle, which, if rightly managed, is capable of evolving not only a plant of wheat, with its abundant spike, but also plant after plant, and spike after spike, until, in the course of a few harvests, the progeny of this little germ would become capable of feeding a nation. Thus it is, that in the lapse of ages, amidst the desolations of rude conquerors, and the alternations which the finest portions of the earth have endured from civilization to semi-barbarism, the vital principle of vegetable life destined for the chief support of the human race has not been lost; and it has remained to man, like fire, which he alone of all animals has subjected to his use, to be called forth at his bidding to administer to his support, his comfort, and his advance in every art of social existence.

The number of stalks thrown up by one grain of wheat is indefinite, and depends upon local causes. This power of multiplication, as possessed by the grain-bearing plants, is called *tillering*. In its progress the stalks do not rise immediately from the germ, but are thrown out from different points of the infant sprouts while yet they remain in contact with the moist soil. An increase of the cereal plants, by this means, is sometimes produced beyond anything conceivable by those persons who have not attended to the fact. But for it, the casualties to which these important plants are liable during the earlier stages of vegetation, would in many cases operate fatally to the hopes of the farmer. One or two circumstances may be mentioned in which this power of multiplying themselves at the roots is of the highest advantage in the cultivation of the cereal grains. An insect—*musca pumilionis*—is accustomed to deposit its eggs in the very core of the *plumule* or primary shoot of wheat, so that it is completely destroyed by the larvæ. Did the plant possess within itself no means of repairing this injury, the whole previous labour of the husbandman would in this case have been in vain. But this destruction occurring in the spring of the year, when the vege-



Wheat-fly (*Musca pumilionis*), in its different stages.

tative power of the plant is in the greatest activity, an effect is produced somewhat analogous to that of heading down a fruit-tree; shoots immediately spring up from the nodes (knots), the plant becomes more firmly rooted, and produces, probably, a dozen stems and ears where, but for the temporary mischief, it might have sent forth only one.

Several extraordinary facts have been recorded in connection with the inherent power of multiplication possessed by these vegetables. Among others, Sir Kenelm Digby asserted, in 1660, that "there was in the possession of the Fathers of the Christian doctrine at Paris, a plant of barley which they at that time kept as a curiosity, and which consisted of two hundred and forty-nine stalks springing from one root or grain, and in which they counted above eighteen thousand grains or seeds of barley." In the 'Philosophical Transactions'* it is

* Vol. lxiii.

recorded, that Mr. C. Miller of Cambridge, the son of the eminent horticulturist, sowed, on the 2nd of June, a few grains of common red wheat, one of the plants from which had tillered so much that on the 8th of August he was enabled to divide it into eighteen plants, all of which were placed separately in the ground. In the course of September and October so many of these plants had again multiplied their stalks that the number of plants which were separately set out to stand the winter was sixty-seven. With the first growth of the spring the tillering again went forward, so that at the end of March and beginning of April a farther division was made, and the number of plants now amounted to five hundred. Mr. Miller expressed his opinion, that before the season had too far advanced one other division might have been effected, when the number might have been at least quadrupled. The five hundred plants proved extremely vigorous, much more so than wheat under ordinary culture, so that the number of ears submitted to the sickle was 21,109, or more than forty to each of the divided plants: in some instances there were one hundred ears upon one plant. The ears were remarkably fine, some being six or seven inches long, and containing from sixty to seventy grains. The wheat, when separated from the straw, weighed forty-seven pounds and seven ounces, and measured three pecks and three quarters, the estimated number of grains being 576,840.

Such an enormous increase is not of course attainable on any great scale, or by the common modes of culture; but the experiment is of use as showing the vast power of increase with which the most valuable of vegetables is endowed, and which, by judiciously varying the mode of tillage, may possibly in time be brought into beneficial action.

The ordinary produce of wheat varies exceedingly, depending much upon the quality of the soil, the nature of the season, and the mode of culture. The average produce of the soil of a country depends, as does every other species of production, upon the advance of its inhabitants in knowledge and in the possession of capital.

It has been conjectured, that in the thirteenth century an acre of good land in England would produce twelve bushels of wheat.* In two centuries this rate of produce appears to have greatly increased. Harrison, writing in 1574, says, "The yield of our corne-ground is much after this rate following:—Throughout the land (if you please to make an estimate thereof by the acre), in meane and indifferent years, wherein each acre of rie or wheat, well tilled and dressed, will yield commonlie sixteene or twentie bushels; an acre of barley, six-and-thirtie bushels; of otes, and such like, four or five quarters; which proportion is notwithstanding oft abated toward the north, as it is oftentimes surmounted in the south." † The mean produce in Great Britain, according to the estimate of Mr. Arthur Young, did not, at the time when he wrote (about fifty years ago), exceed twenty-two and a half bushels per acre. Other and later writers have calculated the average at from twenty-four to twenty-eight bushels; while the author of the Reports on Agriculture for Middlesex has asserted, that the medium quantity in that county is forty bushels, the highest produce he has known being sixty-eight, and the lowest twelve bushels per acre. The land in the county which was the subject of these Reports, owing to its proximity to the metropolis, may be considered as in a state of high condition, and much beyond the ordinary rate of fertility. At all times, and in every country, some situations will be found more prolific than others, and some individuals will be more successful in their agricultural labours. Pliny has related a case which occurred among the Romans, where this success was seen in so marked a degree that the able agriculturist who, by excelling his countryman, had rendered himself the object of envy, was cited before the Curule Edile and an assembly of the people to answer to a charge of sorcery, founded on his reaping much larger crops from his very small spot of ground than his neighbours did from their

* Sir J. Cullum's 'History of Hawkstead,' quoted in Eden's 'History of the Poor,' vol. i. p. 18.

† 'Description of Britain,' prefixed to Holingshed.

extensive fields. "In answer to this charge Cresinus produced his efficient implements of husbandry, his well-fed oxen, and a hale young woman his daughter, and pointing to them, exclaimed,—'These, Romans, are my instruments of witchcraft; but I cannot here show you my labours, sweats, and anxious cares.'"*

It will easily be conceived that the quantity of straw must vary considerably from year to year, according to the seasons, and that this produce will likewise be generally influenced by the nature of the soil. It is, therefore, impossible to give any certain information upon this point; but it will perhaps amount to a near approximation to the truth if we consider that for every twelve bushels of wheat one load, containing thirty-six trusses of straw, will be obtained, the weight of which is 11 cwt. 2 qrs. 8 lbs. The straw of summer wheat is more agreeable to cattle than that produced from winter sowing.

This most important vegetable is not wholly free from casualties apart from climate. The principal of these are blight, mildew, and smut. The examination and treatment of these diseases have proved fruitful topics with writers on agricultural subjects. It does not, however, appear that the public has hitherto benefited much by their speculations, and an author of considerable eminence is so far of a contrary opinion as to have asserted, that "in proportion as words have been multiplied upon the subject, the difficulties attending its elucidation have increased."†

Blight is a disorder to which the cereal grains are known to have been liable from the earliest times. Among the ancient Greeks it was regarded as a sign of wrath on the part of their offended deities; and whenever it occurred they consequently gave themselves up to the infliction, without any thought of providing a remedy. The same superstitious notion was entertained by the Romans, who believed that the evil, which they

* 'Nat. Hist.,' book xviii. chap. 6.

† Loudon's 'Encyclopædia of Gardening,' p. 236.

called *rubigo*, was under the control of a particular deity named Rubigus, to propitiate whom in favour of their crops sacrifices were continually offered.

Blight and mildew have been very much confounded together by different writers on agricultural subjects, so as to render it doubtful to which class of appearances each name should in strictness be applied, or whether indeed both are not applicable to one and the same disorder occurring at different periods of the growth of the plant. Wishing to avoid entering upon debateable ground in noticing a subject which remains intricate and obscure, notwithstanding all the laborious treatises to which it has given rise, the forms which the disorders assume, and the bad effects by which they are followed will be plainly but briefly described, leaving the question of their classification to more professional hands.

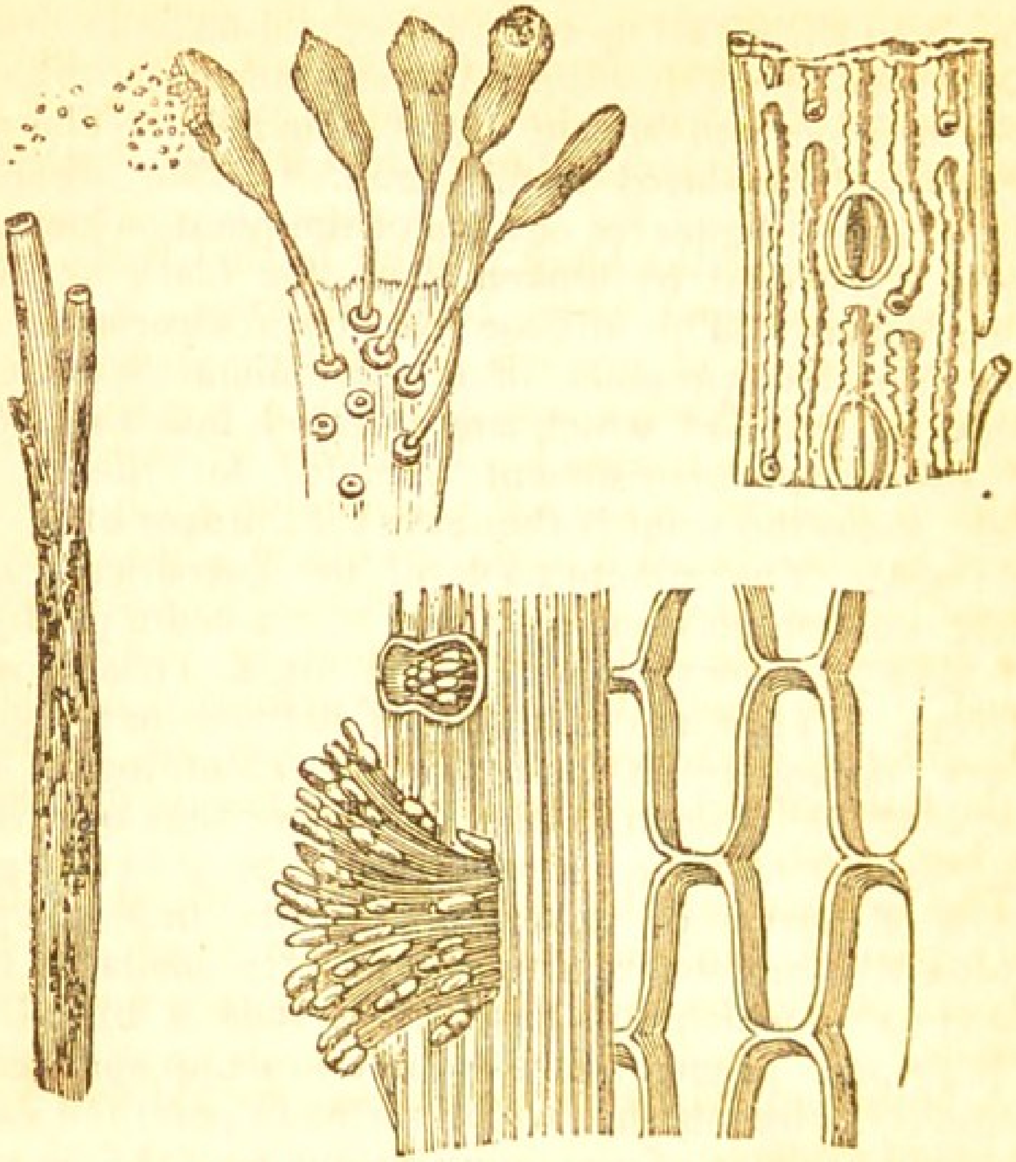
Three distinct and dissimilar causes are assigned for the production of these disorders—cold and frosty winds, sultry and pestilential vapours, and the propagation of a parasitical fungus. The first of these causes acts by stopping the current of the juices; the leaves, being then deprived of a necessary portion of nutriment, speedily wither and die, when the juices, which are impeded in their passage, swell and burst the vessels, becoming then the food of myriads of little insects. These make their appearance so suddenly as to have been considered the cause rather than one of the effects of the disease. The second cause of blight occurs after the grain has attained its full growth. It has been observed to happen mostly after heavy showers of rain, which, occurring about noontide, have been succeeded by clear sunshine. The plants are most commonly attacked thus about the middle or end of July. Mr. Loudon informs us that "in the summer of 1809 a field of wheat, on rather a light and sandy soil, came up with every appearance of health, and also into ear, with a fair prospect of ripening well. About the beginning of July it was considered as exceeding anything expected from such a soil. A week afterwards a portion of the crop on the east side of the field, to the extent of several acres, was totally destroyed, being shrunk and shrivelled up to less than one-half the size of what it had formerly been, and so withered and blasted as not to appear to belong to the same field. The rest of the field produced a fair crop."* This disorder attacks either the leaves or stem of the plant, which appear to be covered by broken lines of a black or deep brown colour. This disease has been ascertained to result from the presence of a very minute species of fungus, the roots of which are inserted into the stem, and .absorb the nourishment intended for the grain, which, when the plant is thus attacked, proves little else than husk. The minute seeds of the parasitical plant which occasion this mischief are so exceedingly light that they are borne along by the air to considerable distances. They are likewise of extraordinary quick growth, occupying in warm weather, according to the opinion of Sir Joseph Banks, not longer than one week from the time of their insertion in the plant to the production of their seed. Every pore in the straw whereon they fix will present from twenty to forty plants, so that the extent to which this mischief spreads is difficult to be imagined. Fungus thrives best in damp and shady situations, a circumstance which seems to point out naturally the propriety of providing means for the free ventilation of the fields, keeping low the hedges and fences by which they are surrounded. For the same reason it is found that thin crops, and such as are sown by drilling or dibbling, are the most likely to escape.

It has been often asserted, and was for a long time believed, that the neighbourhood of barberry bushes was hurtful by attracting the noxious fungus, but this idea is now classed among unfounded prejudices.

The grain of mildewed plants is found to be perfectly good for seed, and being smaller than sound grain, a less measure is required for the purpose.

Another formidable disease to which corn is liable is known under the characteristic name of smut. This injury consists in the conversion of the farina of the

* 'Encyclop. of Gard.,' p. 237.



Corn Mildew—*Uredo frumenti*—greatly magnified.

grain into a sooty powder, which is more or less black and offensive to the smell. Some authors have divided this evil under two different names, retaining that of *smut* for one of its modifications, while that of *burnt-grain* has been given to the other. Mills, in his 'System of Practical Husbandry,' has drawn the line of distinction between the two in the following terms:—"Smut, properly so called, occasions a total loss of the infected ears; but as the black powder which it produces is very fine, and the grains of that powder do not adhere together, wind and rain carry them away, so that the husbandman houses little more than the straw, which does not infect the sound grains, and scarcely damages their flour. The *burnt* or *carious* grains are, on the contrary, often housed with the sound grain, which they infect with a contagious distemper, at the same time that they render its flour brown and give it a bad smell." The name under which this disease was known by the Romans was *ustilago*; by the French farmers it is called *charbon*.

If a portion of the black powder be first wetted with water, and then put under the microscope, it will be found to consist of myriads of minute globules, transparent, and apparently encompassed by a thin membrane. The cause of this disease has been held by some investigators to originate in the soil wherein the grain is sown; others have attributed it to the growth of a fungus within the ear; while others again have affirmed that it is owing to a diseased state of the seed whence the plant is produced. The result of various experiments conducted with different seeds sown in the same spot, and subjected to the same culture, appears to confirm the correctness of the last hypothesis.

The average weight of a bushel of wheat is about sixty pounds. Inferior samples seldom weigh less than fifty-six pounds, and the best as seldom exceed sixty-two pounds.

A bushel of wheat of the average weight will yield, on being ground,

Of bread flour . .		47 pounds.
fine pollard . .	$4\frac{1}{4}$	
coarse pollard . .	4	
bran	$2\frac{3}{4}$	
	—	11 „
Loss of weight in the processes of grinding and dressing . .		2 „
		—
		60 „

In estimating the value of the flour of wheat as an article of diet, regard must be had to its composition. It will be seen from the table before given that the proportion of the nitrogenous or azotised secretions to the carbonaceous or non-azotised, is as one to four; and Liebig calculates that this is about the proportion which these secretions should bear to each other, however varied the diet, for people who live in temperate climates. It is undoubtedly this composition which has given to wheat its great importance as the staple article of diet in Europe, and has led to its increased consumption in this quarter of the globe. Flour is made into bread and a number of other forms of food which we need not mention here. There are one or two points, however, in the use of flour as diet to which we may call attention. It is very common to mix the flour of wheat with lard, butter, and other fatty matters for making pie-crust, pudding, cake, &c. In this form it is not so digestible as when the oleaginous matter is added to it after cooking. It appears that when exposed to heat the starch of the flour combines with oil, and forms a compound which is less easily digested than either of them separate. Although where the digestion is good and the health robust, this is a matter of little importance, yet with the valetudinarian and the dyspeptic it should always be regarded, and many would retain the integrity of their digestive powers by refraining from such food, who now forfeit it by indulgence.

Another point of importance in the preparation of flour as food, is the mode of making bread. It is ordinarily made by the addition of yeast to flour and water made into a dough ; the yeast converts the starch or sugar into alcohol by the process of vinous fermentation, and the consequence is that carbonic acid is given off; the dough being exposed to the heat of the oven during this process the carbonic acid escapes, forming bubbles in its course, which renders the bread lighter than it otherwise would be. But during this process a loss of the material of the bread takes place, and it has lately been proposed to mix with the dough carbonate of soda and hydrochloric acid. Carbonic acid is thus disengaged, and chloride of sodium, common salt is formed, and the former acts on the dough in the same manner as in the first process, and no loss of substance takes place.

CHAPTER IV.

RYE—BARLEY—OATS.

Ear and Plant of Rye.

Rye (*Secale cereale*). In former times this grain was much more extensively cultivated among us than it has been of late years. Not two centuries have passed since rye flour, either by itself or mixed with wheat, furnished nearly all the bread consumed by the labouring classes in England.

At present rye is cultivated by our farmers principally that they may draw from it a supply of green food for their flocks. For this purpose the plants, which are sown in November, are eaten early in the spring, before they begin to spindle, which they will do towards the end of March. After this stage of the growth has taken place the succulent quality of the blade is impaired; it becomes coarse and harsh, and is no longer agreeable to animals. When rye is left to ripen its seeds, these are, for the most part, applied in this country to purposes distinct from human food; the principal use to which the grain is put being the preparation of a vegetable acid, to be employed by tanners in an operation which they call *raising*, and whereby the pores of the hides are distended, so as to dispose them the more readily to imbibe the tanning principle of the oak-bark, which is afterwards applied. Rye, when parched and ground, has been recently used as a substitute for coffee. It would be difficult, however, to convince any one accustomed to the use of this grateful beverage, that the grain of home production is ever likely to take place, at least to any extent, of the fragrant Mocha bean.

Rye straw is useless as fodder, but forms an excellent material for thatching, and is so suitable for stuffing horse-collars, that saddlers will usually pay for it a very good price.

Botanists distinguish four species of this plant—

Secale villosum,
Secale orientale,
Secale creticum, and
Secale cereale;

the last only of which is cultivated in Britain. This, which is said to be a native of Candia, was introduced into England many ages ago. There are two varieties of this species, occasioned more probably by difference of culture than by any inherent variance in the plants: one is known as winter and the other as spring rye.

It was formerly usual to sow rye together with an early kind of wheat. The harvested grain, thus necessarily intermixed, was termed *meslin*, from *miscellanea*:

it also obtained the name of *mung-corn*, corruptly from *monk-corn*, because bread made with it was commonly eaten in monasteries.

With the exception of wheat, rye contains a greater proportion of gluten than any other of the cereal grains, to which fact is owing its capability of being converted into a spongy bread. It contains, likewise, nearly five parts in every hundred of ready-formed saccharine matter, and is in consequence easily convertible into malt, and thence into beer or ardent spirit; but the produce of this last is so small, in comparison with that of malted barley, as to offer no inducement for its employment to that purpose. Rye has a strong tendency to pass rapidly from the vinous to the acetous state of fermentation, and whenever that circumstance has intervened, it would be vain to attempt either to brew or to distil it. Unmalted rye meal is mixed in Holland with barley malt, in the proportion of two parts by weight of the former, with one part of the latter, and the whole being fermented together forms the wash whence is distilled all the grain spirit produced in that country, and known throughout Europe as Hollands Geneva. There must, however, be some circumstances of a peculiar nature connected with the process, as conducted by the Dutch distillers, since no attempts made elsewhere have ever been successful in obtaining a spirit having the same good qualities.

Rye is the common bread-corn in all the sandy districts to the south of the Baltic Sea and the Gulf of Finland, furnishing abundance of food for the numerous inhabitants of places which, without it, must have been little better than sandy and uninhabitable deserts. In these districts it not only forms the chief article of consumption, but furnishes a material of some consequence to the export trade of the Prussian ports.

The peasantry in Sweden subsist very generally upon rye-cakes, which they bake only twice in the course of the year, and which, during most part of the time, are consequently as hard as a board.—Linnæus observed a curious practice in Lapland. One part of rye and two parts of barley being mixed together, the seed is committed to the ground as soon as the earth is capable of tillage in the spring. The barley shoots up vigorously, ripens its ears and is reaped; while the rye merely goes into leaf without shooting up any stem, its growth being retarded by the barley, which may be said to smother it. After the barley is reaped the rye advances in growth, and, without any further care of the cultivator, yields an abundant crop in the following year.

This grain, to which so many human beings are thus indebted for aliment, is subject to a disease which, when it occurs, not only deprives it of all its useful properties as food, but renders it absolutely noxious, and it may even be said poisonous, to man. When thus diseased it is called by English farmers *horned rye*, and by the French *ergot*, from the fancied resemblance to a cock's spur of an excrescence which the grain then bears. The bodies to which this name is given are solid elongated masses growing from the inside of the ovary of rye and other grasses, rootless, of a firm mealy substance, with a concrete scaly or powdery crust. Fries says they have no proper fructification, but other authors state that the interior is composed of flocci and sporules firmly compacted into a solid homogeneous mass. The precise nature of these grains, both on account of their peculiar medicinal effects and their poisonous quality when taken as food, has excited much attention amongst botanical observers. Willdenow supposed the ergot to be merely a diseased state of the grain, and stated that he could produce it at pleasure by excessive watering. General Field made some observations which led him to suppose that it originated from the puncture of insects. De Candolle and others more recently determined that the ergot was a distinct parasitic plant, developing itself from the ovary of grasses, and referred it to the genus *Sclerotium*. Fries, in his 'Systema Mucologicum,' considered the ergot to be a diseased state of the grain, and placed it in the doubtful genus *Spermœdia*. More recently this production has been carefully investigated by Mr. Edwin Quckett, who communicated the results of his observations to the Linnæan Society, in November, 1838. From his investigations it appears that the great mass of the ergot consists of the albuminous matter of the grain in a diseased state. The interior of these grains had been described as being filled with flocci and sporules compacted together; but on examination with the microscope, after the outside was scraped off the interior was found to be composed of irregular cells filled with globules of a fatty oil. The cause of this changed state of the internal parts of the grain was found on the outside of the ergotized grain, where a number of very small oval or elliptical bodies were found about one six-thousandth of an inch in diameter, and containing within them a number of smaller granules. These were found to be the sporidia and sporules of a fungoid plant which, attached to the filaments, developed themselves early in the growth of the grain and produced its diseased state. Mr. Quekett has since succeeded in obtained ergotized rye by applying to healthy plants of rye water containing the sporule of this fungus diffused through it, thus affording additional proof that plants become diseased by imbibing the seeds or sporules of other plants from the soil in which they grow.

At the meeting of the British Association for the Advancement of Science, at Cambridge, in 1845, Dr. Robert Latham read a paper on Ergot, in which he drew attention to the fact that the attacks of this disease, on other grasses besides rye, were very frequent, and pointed out the danger of allowing animals to feed on grass so diseased. It has been stated that this disease of the grain usually appears when a wet spring is succeeded by an unusually hot summer.

Tissot, a French physician, has paid much attention to the consequences on the human system of eating the spurred rye. Bread which is made of rye thus diseased has an acrid and nauseous taste, and its use is followed by spasmodic symptoms and gangrenous disorders. These effects cannot by any means be classed among imaginary evils. In 1596 an epidemic prevailed in Hesse, which was wholly ascribed to the use of horned rye. Some of the persons who had unfortunately partaken of this food were seized with epilepsy, the attacks of which, for the most part, ended fatally; of others, who became insane, few ever fully recovered the proper use of their senses; while some, who were apparently restored, were liable through life to periodical returns of their disorder.

Similar calamities were experienced in different parts of the Continent at various times, between 1648 and 1736, and these visitations have been recorded by Burghart, Hoffman, and others. In 1709, this diseased condition of the rye occurred in a part of France to such a degree, that in consequence of it no fewer than five hundred patients were at one time under care of the surgeons at the public hospital at Orleans. The symptoms first came on with all the apparent characteristics of drunkenness, after which the toes became diseased, mortified, and fell off. The disorder thence extended itself up the leg, and frequently attacked the trunk, and this sometimes occurred even after amputation of the diseased limbs had been performed, with the vain hope of stopping the progress of the disorder.

The poisonous quality of horned rye is not exerted upon human beings alone, both insects and larger animals having been fatally affected by it; even flies, that merely settled casually upon the grain, have been killed by that means; and deer, swine, and different kinds of poultry, upon which experiments were tried, all died miserable deaths; some in strong convulsions, and others with mortified ulcers. These circumstances must have been truly appalling by their severity and the frequency of their recurrence. Few evils, however, are wholly of an unmixed character, and this one is not of the number. *Ergot of rye*, which was formerly productive of so much misery, has since found admission as a medicine into our pharmacopœias, and is now, in the hands of skilful and honest practitioners, rendered subservient to the interests of society. Horned rye is of very rare occurrence in Great Britain.

Ear and Plant of Common Spring Barley.

Barley (*Hordeum*) is, next to wheat, the most important of all the cereal grains which are now cultivated in Great Britain. Its use as bread-corn has very much diminished of late years in this country, while its employment for the production of stimulant liquids has, on the contrary, materially increased.

The Egyptians have a tradition, from which they believe that of all the grains barley is that one which was first used for the sustenance of man. Their histories assert that a knowledge of the art of cultivating this grain was imparted to their ancestors by the goddess Isis, who, having discovered the plant growing wild in the woods, instructed men how to cultivate it, so as at once to increase the quantity and improve the quality of its produce.

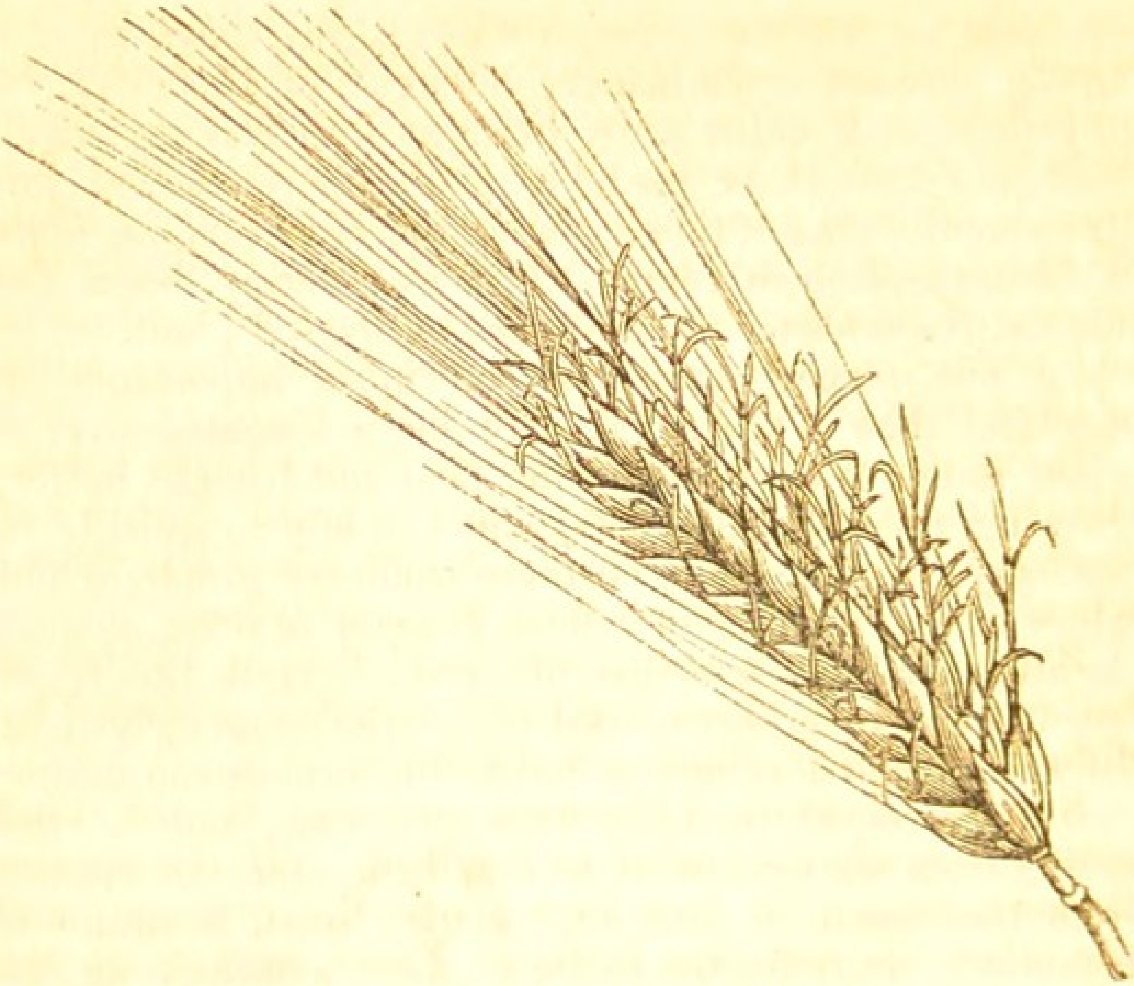
Uninstructed people are generally prone to refer to supernatural agency, the origin of all events for which they are otherwise unable to account. Dr. Franklin has related, as coming from the lips of a chief of the Susquehannah Indians, a tradition very similar to that of the Egyptians. "In the beginning," said this child of nature, "our fathers had only the flesh of animals to subsist on; and if their hunting was unsuccessful they were starving. Two of our young hunters having killed a deer, made a fire in the woods to broil some part of it. When they were about to satisfy their hunger, they beheld a beautiful young woman descend from the clouds, and seat herself on that hill which you see yonder among the blue mountains. They said to each other, It is a spirit that perhaps has smelt our broiling venison, and wishes to eat of it; let us offer some to her. They presented her with the tongue; she was pleased with the taste of it, and said, Your kindness shall be rewarded. Come to this place after thirteen moons, and you shall find something that will be of great benefit in nourishing you and your children to the latest generations. They did so, and to their great surprise found plants they had never seen before, but which from that ancient time have been constantly cultivated among us to our great advantage. Where her right-hand had touched the ground, they found maize; where her left-hand had touched it, they found kidney-beans; and where she had seated herself they found tobacco."

The native country of barley is as little known as that of wheat. Some travellers have mentioned it as being produced in a wild state in distant parts of the world; but there is reason for believing that all statements to this effect have been founded in error, since the hardiest varieties of the cultivated grain have never yet been seen to propagate themselves during two following years. The seed of cultivated barley, when chance-sown, will indeed produce plants; but the grains which these bear are rarely, if ever, seen to germinate. Some grasses which have been placed by botanists in the same genus with barley, bear to it a strong outward resemblance, yet none of them can, by any degree of culture, be brought into use as human food, nor indeed be made to exhibit any marked improvement. One of these grasses, the *Hordeum murinum* of Linnæus, known commonly as wall-barley, bears the nearest resemblance of any to the cultivated plant.

In one respect barley is of more importance to mankind than wheat. It may be propagated over a wider range of climate, bearing heat and drought better, growing upon lighter soils, and coming so quickly to maturity, that the short northern summers which do not admit of the ripening of wheat, are yet of long enough duration for the perfection of barley. It is the latest sown, and the earliest reaped of all the summer grains. In warm countries, such as Spain, the farmers can gather two harvests of barley within the year, one in the spring from winter-sown grain, and the other in autumn from that sown in summer. Barley sown in June is commonly ready for the sickle in three months from the time of the seed being committed to the ground; and in very northern climates the period necessary for its growth and perfection is said to be of still shorter duration. Linnæus relates, in his tour in Lulean Lapland, that on the 28th of July he observed the commencement of the barley harvest, and although the seed was sown only a few days before Midsummer, that the grain was perfectly ripe, the whole process having thus occupied certainly not longer than six weeks.

The property of not requiring moisture admirably fits barley for propagation in those northern countries where the duration of summer is limited to a very few months in the year, and where wet is of very rare occurrence from the time when the spring rains are over, at the end of May or the beginning of June—after which period the seed-time commences—until the autumnal equinox, previous to which the harvest is reaped.

So hurtful is excessive moisture to the plants, that even heavy dews, if of frequent occurrence, are found injurious. Wet is detrimental at all periods; but the



Premature germination of an ear of Barley.

mischief is exhibited in a very different manner, according as it occurs before or after the formation of the ear. If during the former stage, the leaves, as already mentioned, will become yellow and sickly, and the ears will probably not make their appearance; whereas if these should already have been formed and completely filled when visited by rain, the grain will sprout in the ear, and should the weather which follows be warm and genial, this growth will be so rapid that the ears will put on the appearance of tufts of grass. Barley is besides very liable to be beaten down by rain and to lodge; and should this occur after the filling of the ear, germination of the grains will take place to such a degree that the first growth will be completely rotted and destroyed by the second. Gentle showers, however, if of short continuance, and if they do not happen either very early after the plant is above the ground, or during the time of blooming, or when the ear is full, are rather beneficial than hurtful. It is worthy of remark that the very quality which renders barley so precarious a crop in unsettled climates, imparts to it likewise its chief value. The facility with which the grain is made to germinate is favourable to the operation of converting it into malt, which is, in fact, simply the process of germination induced and carried forward up to and not beyond the point when the maximum quantity of saccharine matter is developed in the grain.

In its composition barley differs from wheat: it contains more starch, less gluten, and a small quantity of saccharine matter ready formed, which latter constituent wheat does not possess previous to germination.

Botanical writers enumerate four distinct species of barley: of these there are many varieties produced by differences of soil, climate, and culture.

SPRING BARLEY (*Hordeum vulgare*) is the kind most commonly cultivated in England. Of this species farmers distinguish two sorts; one the common, and the other the *rath-pipe* barley. These, in fact, are the same plant, the latter being a variety occasioned by long culture upon warm gravelly soils. If seeds of this kind are sown in cold or strong land, the plants will ripen nearly a fortnight earlier than seeds taken from other strong land; but this holds good only during the first year. This variety is said in extraordinary seasons to have been returned to the barn within two months in this country. Siberian barley, another variety, was brought into culture in the year 1768, by Mr. Halliday, who received a very small portion out of about a pint of seed which had been presented by a foreign nobleman to the London Society for the Encouragement of Arts. This variety exhibits, on first coming up, a broader blade, and is of a deeper green than common barley. The ears are shorter, containing only from five to nine grains in length, while the common sort has from nine to thirteen grains. Siberian barley arrives at maturity about a fortnight earlier than other kinds.

WINTER OR SQUARE BARLEY, called also BEAR, or BIG (*Hordeum hexastichon*) is the second species (β).

Ear and Plant of Winter Barley.

This is rarely cultivated in the southern parts of England; but in the northern counties and in Scotland is very generally sown, being a much more hardy plant than spring barley. The grains are large and plump, and the spike is thicker and shorter than the last-described species, being seldom longer than two inches, and square. Maltsters in the southern division of the kingdom are of opinion that this barley does not answer their purpose so well as that more usually cultivated among them, while in Scotland this idea is considered to be an unfounded prejudice.

The number of grains in each ear is greater than are found on spring barley in the proportion of three to two, one ear frequently yielding forty or more grains. These are disposed in six rows, two of these being on each of two sides, and one row on each of the other sides.

Ear and Plant of Two-rowed Barley.

Long-eared Barley, sometimes called Two-rowed Barley (*Hordeum distichon*) is partially cultivated in every part of England, and is a very good sort. Some persons object to it, that the ears being long and heavy, it is more apt to lodge than other kinds. The grains are regularly disposed in a double row, lying over each other like tiles on a roof, or like the scales of fishes. The ear is somewhat flatted, being transversely greater in breadth than in thickness. The husk of the grain is thin, and its malting qualities are excellent.

Sprat or Battledore Barley (*Hordeum zeocriton*) has shorter and broader ears than either of the sorts already described; its awns or beards are longer, so that birds cannot so easily get out the grains, which also lie closer together than those of other kinds. Sprat barley seldom, if ever, grows so tall as either of the other species, and its straw is not only shorter, but coarser, so as to render it not desirable for use as fodder.

It was formerly the universal practice in this country to sow barley in the spring. The end of March or beginning of April was the more usual time, but the sowing was sometimes deferred to the beginning of May. The practice in this respect has somewhat varied of late, and a more early season has been chosen for sowing, so that it is not uncommon for the process to be performed in January, under the idea that the produce in such cases is greater. In the county of Norfolk, where the cultivation of barley is carried forward very extensively, and with the greatest skill, the farmers were formerly guided in their choice of seed time by a maxim which had long been handed down to them from father to son:—

> "When the oak puts on his gosling grey,
> 'Tis time to sow barley night and day;"

meaning, that when the oak exhibits the grey appearance which accompanies the bursting of its buds, a few days preceding the expansion of the leaves, it is then improper to lose any time in getting their seed-barley into the ground. The budding and leafing of the birch tree is, in Sweden, considered an indication of the proper time for barley-sowing. In different countries there are, of course, different natural guides in the operations of husbandry; but an intelligent and observing farmer, in every country, will not fail to regard those which have been sanctioned by experience; while the agriculturist, who is bound by a servile adherence to particular months, and even weeks for his operations, will unwisely treat as old saws such relics of the practical skill of our forefathers as the lines we have quoted. Linnæus, the great Swedish naturalist, constantly exhorted his countrymen to observe at what time each tree unfolds its buds and expands its leaves. In our own country, Mr. Stillingfleet, an eminent naturalist, made a series of very accurate observations upon this interesting appearance of the spring. A farmer who would keep a calendar of Nature in the same manner for a few years, and at the same time register his days of sowing and the issue of his harvest, would secure, no doubt, a valuable collection of rules for his guidance, peculiarly applicable to the exact circumstances of situation and soil amidst which he pursues his calling.*

The produce of barley, according to the quality of the soil, is from three to four quarters to the acre. A larger produce is not unfrequent; and even so much as seven quarters have been reaped in very favourable seasons and situations.

The average weight of a Winchester bushel of barley is between fifty and fifty-one pounds, and the same measure of bigg weighs but little more than forty-six pounds. It is very seldom that the former is found to weigh beyond fifty-two, or the latter beyond forty-eight pounds to the bushel. The average length of a grain of barley, taking the mean of many thousand measurements, is 0·345 inch, while that of a grain of bigg is 0·3245 inch. The medium length of these two species gives, therefore, as nearly as possible, one third of an inch, which agrees with the lowest denomination or basis—the barleycorn of our linear measure.†

The purposes to which barley is principally applied in this kingdom are those of brewing and distilling. Some portion is still brought more directly into consumption as human food; but this portion, for the most part, now undergoes the previous process of decortication (removal of the bark), whereby it is converted into what is called Scotch or pearl barley. This grain, in its raw state, is also used to some extent for feeding poultry and fattening swine, for which latter purpose it is commonly converted into meal. The ancients were accustomed to feed their horses upon barley, as is the case among the Spaniards to the present day; and Pliny relates (book xviii. c. 7) that the Roman gladiators were called *Hordearii*, from their use of this grain as food.

* See Howitt's 'Book of the Seasons,' p. 99.
† 'Supp. Encyc. Brit.,' *art.* 'Brewing.'

The use of barley in the preparation of a fermented liquor dates from the very remotest times. The invention of this preparation is ascribed to the Egyptians by antient Greek writers, one of whom, Dioscorides, attributes the first cultivation of barley to the same people, under the guidance of Osiris; while Herodotus informs us that the people of Egypt, being without vines, made their wine from barley.* Pliny, in his 'Natural History,' gives the Egyptian name of this liquid as Zythum.† An intoxicating liquor is still made from this grain, both in Egypt and Nubia, to which the name of *bouzah* is given. This is of very general consumption among the lower rank of people. Burckhardt observed another use to which barley is applied in the latter country. The green ears are boiled in water, and served up to be eaten with milk. Among the Greeks beer was distinguished as *barley wine*, a name which sufficiently identifies the intoxicating property of the liquid, and the material whence this was drawn. From a passage in Tacitus we learn that the German people were in his day acquainted with the process of preparing beer from malted grain; and Pliny describes a similar liquid under the name of Cerevisia, an appellation which it retained in Latin books of more recent date. It further appears that malt liquor has formed an article of manufacture and consumption in this country for a period at least coeval with the time of Tacitus; but we do not know whether any one kind of grain was exclusively employed in its preparation, or whether wheat and barley were not used for the purpose, either indiscriminately or in conjunction.

The general drinks of the Anglo-Saxons were ale and mead: wine was a luxury for the great. In the Saxon Dialogues preserved in the Cotton Library in the British Museum, a boy, who is questioned upon his habits and the uses of things, says, in answer to the inquiry what he drank—"Ale if I have it, or water if I have it not." He adds, that wine is the drink "of the elders and the wise." Ale was sold to the people, as at this day, in houses of entertainment; "for a priest was forbidden by

* Lib. ii. cap. 78. † Nat. Hist., lib. xxii. c. 25.

a law to eat or drink at *ceapealethetum*, literally, places where ale was sold."* After the Norman conquest wine became more commonly used; and the vine was extensively cultivated in England. The people, however, held to the beverage of their forefathers with great pertinacity; and neither the juice of the grape nor of the apple were ever general favourites. The wassail song of the fifteenth century, whose burden was—

"Bring us home good ale,"

was indicative of their attachment to this beverage. "The old ale knights of England," as Camden calls the sturdy yeomen of this period, knew not, however, the ale to which hops in the next century gave both flavour and preservation. Hops appear to have been used in the breweries of the Netherlands in the beginning of the fourteenth century. In England they were not used in the composition of beer till nearly two centuries afterwards. It has been affirmed that the planting of hops was forbidden in the reign of Henry VI.; and it is certain that Henry VIII. forbade brewers to put hops and sulphur into ale.† In the fifth year of Edward VI. the royal and national taste appears to have changed, for privileges were then granted to hop-grounds. Tusser, in his five hundred points of good husbandry, printed in 1557, thus sings the praises of this plant:—

> "The hop for his profit I thus do exalt,
> It strengtheneth drink and it flavoureth malt;
> And being well-brewed long kept it will last,
> And drawing abide, if ye draw not too fast."

n the reign of James I. the plant was not sufficiently ultivated in England for the consumption, as there is a tatute of 1608 against the importation of spoilt hops. n 1830 there were 46,727 acres occupied in the cultiation of hops in Great Britain.

Of barley there are above thirty million bushels an-

* Turner's 'Anglo Saxons,' vol. iii. p. 32.
† 'Archæologia,' vol. iii.

nually converted into malt in Great Britain; and more than eight million barrels of beer, of which four-fifths are strong beer, are brewed yearly. This is a consumption, by the great body of the people, of a favourite beverage which indicates a distribution of the national wealth, satisfactory by comparison with the general poverty of less advanced periods of civilization in our own country, and with that of less industrious nations in our own day.

Common bearded Oats. Common Oats.

Oats (*Avena*). This grain is held to have had its origin in a more northern climate than any other of the cereal plants, since it cannot be cultivated with advantage in the lower latitudes of the temperate zone. In the south of England, even at high elevations, the produce is inferior in quality to that which is obtained in more northern districts.

The time and mode of the introduction of oats into England are equally unknown, and some writers have expressed their opinion that this grain is indigenous with us. One thing appears sufficiently clear—the varieties cultivated here, at this time, have all been originally imported from different parts of the continent of Europe, the names of which countries they are made to bear.

This grain is extremely serviceable to man, possessing the advantage of growing upon soils and in situations where neither barley nor wheat can be raised. It is the hardiest of all the cereal grains that are cultivated in Great Britain. In its outward structure the oat-plant differs from wheat and barley in the form of the ear. This in oats is not a spike with a single rachis, but a panicle, resembling in some degree the stem and branches of a pine. While young and light, these branches arrange themselves round the centre of the stem; but as they advance towards maturity and acquire weight, they generally bend over on one side. By this arrangement the air and light are enabled to visit, and the rain to wash, each individual grain, so that any lodgment of the larvæ of insects or the seeds of parasitical plants is prevented. The grains being pendent, and having the open extremities of their chaff towards the earth, are effectually defended from the lodgment of rain within, an advantage which does not attend the growth of wheat or barley; and those grains are consequently liable to diseases from which oats are exempted. Drought and heat are unfavourable to this grain, which, under such circumstances, becomes husky and tasteless, containing but little farinaceous matter, and that little being of inferior quality.

The *Avena sativa*, which species is commonly cultivated, has several varieties. The most remarkable of these are the black or long-bearded oat; the white oat; red oat; and the naked oat, or pilcorn.

The best variety of oats produced in Great Britain is unquestionably the *potato oat*. Of this kind the first plants were discovered growing accidentally on a heap of manure in company with several potato plants, the growth of which was equally accidental, and it is to this circumstance that the distinctive name of this variety is owing. To an occurrence thus purely accidental, and which might well have passed unnoticed, we are indebted for decidedly the best and most profitable variety we possess of this useful grain. It requires to be sown on land in a good state of cultivation, when the grains on ripening will be found large, plump, and firm, often double, and of a quality which ensures for the corn a higher price in the market than is given for any other variety. It also yields an abundant produce of straw. Potato oats form almost the only kind now cultivated in the north of England and the lowland districts of Scotland.

The seed-time of oats is almost universally in March and April. The grain is scattered broad-cast in the large proportion of from four to six bushels to the acre, the medium produce of which is from forty to fifty bushels.

The nutritive quality of oats is smaller in a given weight than that of other cereal grains. The very small proportion of saccharine matter ready-formed in oats renders it very difficult and unprofitable to convert this grain into malt. Brewers at the present day do not employ oats in the preparation of any kind of beer: in former times, when the public taste was different from what it is at present, a drink called *mum* was manufactured for sale, and in the preparation of this liquid oatmeal was employed. The principal use now made of oats in the southern division of the kingdom is the feeding of horses, for which purpose the grain is admirably adapted: a large quantity of this grain is further consumed in the fattening of poultry. The deer of Henry VIII. were fed with oats. In the Privy Purse Expenses of this king (published by Mr. Nicolas) is the following entry:— "Paied to the keper of Grenewiche parke for xiiij lode of hey And for vi lode of Oots, for the relief of the dere there, And for the carriage thereof, vj*li.* ij*s.* viii*d.*" Oatmeal, prepared by various processes of cooking, composes at this day a large proportion of the food of the inhabitants of Scotland, and particularly of the better-fed portion of the labouring classes. Oaten cakes, too, are much used in Lancashire.

The wild oat, which is certainly indigenous to this country, is found to be a very troublesome weed. It is said that the seed will remain buried under the soil during a century or more without losing its vegetating power, and that ground which has been broken up after remaining in grass from time immemorial has produced the wild oat abundantly.

It is a curious fact that the vital principle of some vegetables will lie dormant, under certain circumstances, for long and indefinite periods without being extinguished. Seeds have been made to grow in this country which were brought from Herculaneum, after having been buried for more than seventeen centuries, but which, having during all that period been deprived of air, had been prevented from vegetating. The necessity that exists for the access of air in some degree, in order to promote or set in action vegetable life, has been shown by the experiments of several ingenious men, who, having placed seeds under circumstances otherwise favourable to their growth, in the exhausted receiver of an air-pump, ascertained that they were thereby prevented from exhibiting any sign of vitality.

The following notes will give an idea of the cultivation of the Cerealia in this country in past times.

The Anglo-Saxon monks of the abbey of St. Edmund, in the eighth century, ate barley bread, because the income of the establishment would not admit of their feeding twice or thrice a day on wheaten bread.* The English labourers of the southern and midland counties, in the latter part of the eighteenth century, refused to

* Dugdale's 'Monasticon,' quoted in Turner's 'History of the Anglo-Saxons,' vol. iii. p. 25.

eat bread made of one-third wheat, one-third rye, and one-third barley, saying, that "they had lost their rye-teeth."* It would be a curious and not unprofitable inquiry to trace the progress of the national taste in this particular. It would show that whatever privations the English labourer may now endure, and whatever he has endured for many generations, he has succeeded in rendering the dearest kind of vegetable food the general food of the country; this single circumstance is a security to him against those sufferings from actual famine which were familiar to his fore-elders, and which are still the objects of continual apprehension in those countries where the labourers live upon the cheapest substances. Wages cannot be depressed in such a manner as to deprive the labourer, for any length of time, of the power of maintaining himself upon the kind of food which habit has made necessary to him; and as the ordinary food of the English labourer is not the very cheapest that can be got, it is in his power to have recourse for a while to less expensive articles of subsistence should any temporary scarcity of food or want of employment deprive him of his usual fare—an advantage not possessed by his Irish fellow-subjects, to whom the failure of a rice or potato crop is a matter not of discomfort merely, but of absolute starvation. But the materials for such an inquiry are very imperfect; and although the assiduous devotion of an antiquary might collect many valuable illustrations from neglected records, it is evident that in the present instance we can do little more than put together a few scattered facts, which the diligence of previous inquirers has already collected.

In the Poem of Pierce Plowman, of the time of Edward III., it is said, that *when the new corn began to be sold*,

> "Woulde no beggar eat bread that in it beanes were,
> But of coket, and clemantyne, or else clene wheate."†

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* 'Annals of Agriculture,' quoted in Eden's 'History of the Poor,' vol. i. p. 526.

† See the 'Athenæum,' a weekly literary paper, Feb. 3, 1832.

This taste, however, was only to be indulged "when the new corn began to be sold;" for then a short season of plenty succeeded to a long period of fasting; the supply of corn was not equalised throughout the year by the provident effects of commercial speculation. The fluctuations in the price of grain, experienced during this period, and which were partly owing to insufficient agricultural skill, were sudden and excessive. On the securing of an abundant harvest in 1317, wheat, the price of which had been so high as 80*s.*, fell immediately to 6*s.* 8*d.* per quarter.* The people of those days seem always to have looked for a great abatement in the price of grain on the successful gathering of every harvest; and the inordinate joy of our ancestors at their harvest-home—a joy which is faintly reflected in our own times—proceeded, there is little doubt, from the change which the gathering of the crops produced, from want to abundance, from famine to fulness. That useful class of men who employ themselves in purchasing from the producers that they may sell again to the consumers, was then unknown in England. Immediately after the harvest, the people bought their corn directly from the farmers at a cheap rate, and, as is usual under such circumstances, were improvident in the use of it, so that the supply fell short before the arrival of the following harvest, and prices advanced out of all proportion.

In a valuation of Colchester, in 1296, almost every family was provided with a small store of barley and oats, usually about a quarter or two of each. Scarcely any wheat is noticed in the inventory, and very little rye.† The corn was usually ground at home in a hand-mill or quern; although wind and water mills were not uncommon. The general use of the latter machines was probably prevented by the compulsory laws by which the tenant was under an obligation to grind his corn at the lord's mill; and, therefore, to evade the tax, called *multure*, the labour of the handmill was endured. In Wicliff's translation of the Bible we find a passage in

* Stow.

† For some particulars of another valuation of this town, see 'Capital and Labour,' p. 68.

the 24th chapter of St. Matthew thus rendered :—" Two wymmen schulen (shall) be gryndynge in one querne." Harrison, the historian, two centuries later, says, that his wife ground her malt at home upon her quern. In the present authorised version of the Bible, published more than half a century after Harrison, the word " quern" yields to " mill." By that time, probably, the trades of a miller and a baker were freely exercised; and the lord's mill and the corporation oven had been superseded by the competition growing out of increasing capital and population.

The Reformation, and the discovery of America, were events that had a considerable influence upon the condition of the great body of the people in England. The one drove away the inmates of the monasteries, from whence the poor were accustomed to receive donations of food: the other, by pouring the precious metals into Europe, raised the price of provisions. In the latter half of the sixteenth century, wheat was three times as dear, both in England and France, as in the former half. The price of wheat, upon an average of years, varied very little for four centuries before the metallic riches of the New World were brought into Europe; upon an average of years it has varied very little since.* The people of the days of Henry VIII. felt the change in the money-value of provisions, although the real value remained the same; and they ascribed the circumstance to the dissolution of the monasteries. There is an old song of that day in the Somersetshire dialect, which indicates the nature of the popular error :—

" I'll tell thee what, good vellowe,
Before the vriars went hence,
A bushel of the best wheate
Was zold for vourteen pence;
And vorty eggs a penny
That were both good and newe;
And this, I say, myself have seen,
And yet I am no Jewe."†

* See Storch, ' Cours d'Economie Politique,' tome i. p. 477.
† Reliques of Ancient Poetry.

When wheat was fourteen-pence a bushel, it was probably consumed by the people, in seasons of plenty, and soon after harvest. During a portion of the year there is little doubt that the English labourers had better food than the French, who, in the fifteenth century, were described by Fortescue thus:—"Thay drynke water, thay eate apples, with bred right brown, made of rye." Locke, travelling in France, in 1678, says of the peasantry in his journal, "Their ordinary food, rye bread and water."* The English always disliked what they emphatically termed, "changing the white loaf for the brown." They would have paid little respect to the example of Masinissa, the African general, who is described by Polybius as eating brown bread with a relish at the door of his tent. Their dislike to brown bread in some degree prevented the change which they proverbially dreaded. In the latter part of the sixteenth century, however, this change was pretty general, whatever was the previous condition of the people. Harrison says, speaking of the agricultural population, "As for wheaten bread, they eat it when they can reach unto the price of it, contenting themselves, in the mean time, with bread made of oates or barlie, a poore estate, God wot!" In another place, he says, "The bread throughout the land is made of such graine as the soil yieldeth; nevertheless, the gentilitie commonlie provide themselves sufficiently of wheate for their own tables, whilst their household and poore neighbours, in some shires, are inforced to content themselves with rie or barlie." Harrison then goes on to describe the several sorts of bread made in England at his day, viz., manchet, cheat, or wheaten bread; another inferior sort of bread, called ravelled, and lastly, brown bread † Of the latter there were two sorts: "One baked up as it cometh from the mill, so that neither the bran nor the floure are any whit diminished. The other hath no floure left therein at all; and it is not only the worst and weakest of all the other sorts, but also appointed in *old time* for servants,

* Lord King's 'Life of Locke.'

† See Percy's 'Preface to the Northumberland Household Book,' Nicolas's edit. p. xiv.

slaves, and the inferior kind of people to feed upon. Hereunto, likewise, because it is drie and brickle in the working, some add a portion of rie-meale in *our time*, whereby the rough drinesse thereof is somewhat qualified, and then it is named mescelin, that is, bread made of mingled corne." In the household book of Sir Edward Coke, in 1596, we find constant entries of oatmeal for the use of the house, besides "otmell to make the poore folkes porage," and "rie-meall, to make breade for the poore." The household wheaten bread was partly baked in the house and partly taken of the baker. In that year it appears, from the historian Stow, that there was a great fluctuation in the price of corn; and he particularly mentions the price of oatmeal, which would indicate that it was an article of general consumption, as well in a liquid form, as in that of the oat-cakes of the north of England.

In 1626, Charles I., upon an occasion of subjecting the brewers and maltsters to a royal licence, declared that the measure was "for the relief of the poorer sort of his people, whose usual bread was barley; and for the restraining of innkeepers and victuallers, who made their ale and beer too strong and heady." The grain to be saved by the weakness of the beer was for the benefit of the consumers of barley-bread.

At the period of the Revolution (1689) wheaten bread formed, in comparison with its present consumption, a small proportion of the food of the people of England. The following estimate of the then produce of the arable land in the kingdom tends to prove this position. This estimate was made by Gregory King, whose statistical calculations have generally been considered entitled to credit:—

	Bushels.
Wheat . . .	14,000,000
Rye	10,000,000
Barley . . .	27,000,000
Oats	16,000,000
Pease	7,000,000
Beans . . .	4,000,000
Vetches . . .	1,000,000
In all . .	79,000,000

At the commencement of the last century wheaten bread became much more generally used by the labouring classes, a proof that their condition was improved. In 1725, it was even used in poor-houses, in the southern counties.* The author of 'Three Tracts on the Corn Trade,' published at the beginning of the reign of George III., says, "It is certain that bread made of wheat is become much more generally the food of the common people since 1689 than it was before that time; but it is still very far from being the food of the people in general." He then enters into a very curious calculation, the results of which are as follow:—"The whole number of people is 6,000,000, and of those who eat

Wheat, the number is .	3,750,000
Barley . . .	739,000
Rye	888,000
Oats	623,000
Total .	6,000,000

This calculation applies only to England and Wales. Of the number consuming wheat, the proportion assigned to the northern counties of York, Westmoreland, Durham, Cumberland, and Northumberland, is only 30,000. Eden, in his 'History of the Poor,' says, "About fifty years ago (this was written in 1797), so small was the quantity of wheat used in the county of Cumberland, that it was only a rich family that used a peck of wheat in the course of the year, and that was used at Christmas. The usual treat for a stranger was a thick oat-cake (called haver-bannock) and butter. An old labourer of eighty-five remarks that when he was a boy he was at Carlisle market with his father, and wishing to indulge himself with a penny loaf made of wheat-flour, he searched for it for some time, but could not procure a piece of wheaten bread at any shop in the town."

* Eden, vol. i. p. 562.

CHAPTER V.

ON RICE.

The principal cereal plants which cannot be profitably cultivated in Great Britain, but upon which the inhabitants of other countries depend for subsistence in even a greater degree than the English peasantry depend upon the supply of wheat, are rice, maize, and millet. The seeds of these plants are less palatable than wheat, and less nutritious than that or any other of the cerealia already described: the chief cause of this last mentioned inferiority arises from the smaller quantity of gluten they contain.

The three grains just mentioned will be treated of in the order wherein they are here set down, which is likewise the order of their importance, considered with reference to the number of human beings who draw from them their sustenance.

Rice (*Oryza sativa*). This is a panicled grass, bearing, when in ear, a nearer resemblance to barley than to any other of the corn-plants grown in England. The seed grows on separate pedicles springing from the main stalk; each grain is terminated with an awn or beard, and is enclosed in a rough yellow husk, the whole forming a spiked panicle. The stalk is not unlike that of wheat, but the joints are more numerous. The flour of rice is almost entirely composed of starch, having little gluten, and being without any ready-formed saccharine matter. The outer husk clings with great tenacity to the grain, and is only to be detached from it by passing the rice between a pair of mill-stones, placed at such a distance from each other as shall serve to remove the husk by friction, without crushing the grain. This is, besides, enveloped by a thin pellicle, which for the most part is rubbed off by trituration in large mortars, with pestles weighing from two to three hundred pounds.

Ear and Plant of Rice (*Oryza sativa*).

There is little reason for doubting that this grain is of Asiatic origin. From the earliest records it has formed the principal, if not the only food of the great mass of the population on the continent and islands of India and throughout the Chinese empire.

The introduction of rice as an object of cultivation in America is of very modern occurrence. The author of a work 'On the Importance of the British Plantations in America,' which was published in London during the year 1701, has recorded, as a circumstance then recent, that "a brigantine from the island of Madagascar happened to put in at Carolina, having a little seed-rice left, which the captain gave to a gentleman of the name of

Woodward. From part of this he had a very good crop, but was ignorant for some years how to clean it. It was soon dispersed over the province, and by frequent experiments and observations they found out ways of producing and manufacturing it to so great perfection that it is thought to exceed any other in value. The writer of this hath seen the said captain in Carolina, where he received a handsome gratuity from the gentlemen of that country, in acknowledgment of the service he had done the province. It is likewise reported that Mr. Dubois, then Treasurer of the East India Company, did send to that country a small bag of seed-rice some short time after, from whence it is reasonable enough to suppose might come those two sorts of that commodity; the one called red rice, in contradistinction to the white, from the redness of the inner husk or rind of this sort, although they both clean and become white alike."

There is a trifling discrepancy between the latter part of this account and the statement respecting Mr. Ashley, already mentioned in a former chapter; but the main fact, and the time of its occurrence, are the same; and it is probable that the latter gentleman may have acted in the matter under the instruction of Mr. Dubois.

The swamps of South Carolina, both those which are occasioned by the periodical visits of the tides, and those which are caused by the inland floodings of the rivers, are well suited for the production of rice; and not only is the cultivation accomplished with trifling labour, but the grain proves of a remarkably fine quality, being decidedly larger and handsomer than that of the countries whence the seed was originally derived.

It does not appear that this naturalizing of rice in Carolina and Georgia was ever productive of much effect in regard to the diet of the inhabitants of those provinces. Their consumption of rice was, doubtless, increased by it, because the abundance and cheapness of an article always influence persons to its use. But wheat and maize continued, as before, to be the bread-corn of the country, and the newly introduced grain was cultivated principally because it furnished an article in constant demand which might be transmitted to the mother-country in return for British manufactured goods.

Had a contrary effect followed upon the introduction of rice into the then British colonies of America, and this grain had become, as in India, the universal food of the inhabitants, it is not probable that their condition would have been in any way ameliorated by the change. In countries where rice forms the chief article of food, dearths are not by any means of uncommon occurrence. A failure of the usual supply of rain, which is followed by evil consequences where other descriptions of grain are raised, is productive of tenfold misery where the chief dependance is upon the crop of rice, which, without its due degree of moisture, proves wholly unproductive. In such cases there can be found few sources of relief, other objects of cultivation being pursued to only a limited extent, and the means of the people not enabling them to compass the purchase of these scarcer articles of food, even when, through the general abundance, they may be procured at their natural price. Happily for the interests of humanity, dearths are becoming less and less frequent of occurrence, through the better understanding of subjects connected with the production and distribution of commodities. In England the people are especially guarded against this calamity by the diversity of the crops which are raised, and by the opportunity they thence enjoy of falling back upon articles of consumption less costly than those to which they are ordinarily accustomed. It is this circumstance which constitutes the advantage of the general use of wheaten bread — a taste which has been slowly but steadily acquired amongst us. In no way, perhaps, is the progress of a nation in civilization more unequivocally shown than in the improvement which it realizes in the food of the community. In the infancy of societies the people are necessarily satisfied with the enjoyment of such indigenous productions as fall most naturally within their reach. But in the more advanced stages of society, when articles of food, which at one time have been introduced as luxuries are so far naturalised as to form a part, at least, of the sustenance of the common people, they, in the event of an unkindly season, have something upon which they can still fall back, so that what would otherwise be famine, is at worst changed into privation. "In those countries," it has been judiciously observed by the late David Ricardo, "where the labouring classes have the fewest wants, and are contented with the cheapest food, the people are exposed to the greatest vicissitudes and miseries. They have no place of refuge from calamity; they cannot seek refuge in a lower station; they are already so low that they can fall no lower. On any deficiency of the chief article of their subsistence, there are few substitutes of which they can avail themselves, and dearth to them is attended with almost all the evils of famine."

If a scarcity of food should be experienced in this country, the great bulk of the common people, nay even the very poorest amongst them, have, generally speaking, still some articles, that in foreign countries would be considered luxuries, which they can forego, some property which they can sacrifice, in order to satisfy the cravings of hunger. In India, on the contrary, and in most of the countries where rice forms the principal article of human food, the labouring classes are poor in the extremest sense of the word. Having few artificial wants, they are without those habitual incentives to exertion which actuate so powerfully and so beneficially people of the same rank in countries like our own. If they can acquire a meal for themselves and their families they have little thought about higher comforts; the price of labour in such countries is, in fact, equal to very little beyond the purchase of the lowest description of food: the Indian labourer is contented with the rudest hut as a place of shelter—he is without what we are accustomed to consider the most indispensable articles of household furniture, and his clothing consists of a few yards of the commonest cotton cloth. When the price of his ordinary food advances beyond the usual rate he is sunk into immediate wretchedness; he has no fund whereon he can draw for assistance, and the wages of his labour are so far from advancing under these circumstances that the contrary tendency is uniformly experienced; and the competition for employment is increased while the means of paying for labour are diminished.

Some botanical writers enumerate four varieties of rice which they consider as being originally distinct from each other; while others have been of opinion that the unimportant varieties which these present, and which do not in any way affect the chemical or alimentary properties of the grain, are simply the effects of difference of soil, culture, and climate. The four varieties are—common rice, early rice, mountain rice, and clammy rice.

Common rice is a marsh plant. If the ground on which it is sown should become dry before the plants arrive at maturity, they wither. It is this variety which grows most strongly; and on lands peculiarly adapted for it the culture is probably as advantageous as can well be pursued.

Early rice, like the other, is a marsh plant, but it does not grow to the same size. It comes much sooner to maturity; for while common rice is never ripe in less than six months from the time of ploughing, this variety, if placed in favourable situations, requires only four months for arriving at perfection.

Mountain rice thrives on the slopes of hills and in other situations where it can receive humidity only occasionally. Dr. Wallich, the able successor of Dr. Roxburgh as superintendent of the botanical garden at Calcutta, sent to London a few years ago some specimens of rice grown on the cold mountains of Nepal. These seeds were furnished to him by the resident of the East India Company in that district, and were recognised by the Doctor as mountain rice. The degree of cold which this plant is qualified to bear is very great. According to the information collected on the subject by Dr. Wallich, the cultivators consider their crops quite safe if the growth of the plants is advanced five or six inches above the surface at the time the winter snows cover the ground. It is probable that the slow melting of the snow is beneficial to the growth of the plant, which advances with great vigour on the return of spring.

A knowledge of these circumstances might have led to the opinion that this variety of rice could be naturalized in England, if the attempt had not already been fairly made by one well qualified for conducting the experiment. Samples of six different sorts of mountain rice which had been procured by Sir John Murray from the neighbourhood of Serinagur at the foot of Mount Imaus, were, on the occasion alluded to, presented by the Board of Agriculture to Sir Joseph Banks, who planted each kind in a separate bed, in a sheltered spot with a south aspect, in his garden at Spring Grove. The grains, which were sown very thin on the 21st of May, speedily sprang up, and the plants tillered so much that the beds put on the appearance of compact dense masses of vegetation; each plant having from ten to twenty off-sets. Although the blades grew vigorously, attaining in a short time to the length of two feet, there was never any symptom of a rising stem; and if the ground was not watered, either by rain or artificially every three or four days, the plants began to assume a sickly hue. In this manner vegetation proceeded, without the smallest symptom of their perfecting themselves by fructification, when the plants were suddenly destroyed by an early night-frost in September. Some of the plants, which had been transferred to pots and placed in the hot-house at an early period of their growth, soon died; while others, which were sown originally in a hot-house, produced ears and flowered, but the blossoms dropped without perfecting any seed.

The conclusion to which Sir Joseph Banks arrived from these experiments was unfavourable to the cultivation of rice in this country as a grain-bearing plant; but he was led to consider, from the great quantity of its blades, that it would afford excellent green-meat for cattle.

Clammy rice appears to be endowed with the peculiar property of growing both on wet and on dry lands: the period occupied by its growth is intermediate between those of the common and early varieties.

Rice seed is sown in Carolina in rows, in the bottom of trenches, which are about eighteen inches apart, reckoning from the centres of the trenches. The sowing is generally performed by negro women, who do not scatter the seed, but put it carefully into the ground with the hand, so as to preserve the perfect straightness of the line. The sowing is for the most part completed by the middle of March. The water, which until then has been kept back by means of flood-gates, is at this time permitted to overflow the ground to the depth of several inches, and things remain in this state for some days—generally about a week. The germination of the seed is promoted by this flooding, and the water being then drawn from the surface of the land, the plants sprout, rising in about four weeks to the height of three or four inches. At this time the flood-gates are again opened, the fields are once more overflowed, and remain in that state during about sixteen days; one good effect of this second flooding being the destruction of the grass and weeds which may have sprouted at the same time with the rice. The land is allowed after this to remain without further irrigation until the middle of July, being repeatedly hoed during the interval, as well to remove any weeds at the moment of their appearance, as to loosen the soil about the roots of the rice, adopting thus in all its principal parts the drill system of husbandry. At the time last mentioned, water is again admitted, and remains covering the surface until the grain is actually ripened.

The rice-harvest in the United States usually commences at the end of August, and extends through the entire month of September, or even somewhat later. The reaping is performed with a sickle by male negroes, and these are followed by females, who collect the rice into bundles.

This cultivation is found to be extremely unhealthy to the negroes employed in its prosecution. The alternate flooding and drying of the land in so hot a climate, where natural evaporation proceeds with great rapidity, must necessarily be prejudicial to health. To avoid exposure to this unwholesome atmosphere, the whole white population abandon the low grounds to the care of negro cultivators. The mortality thus occasioned among the labourers in rice districts is so great, that while the general increase of population in the States exceeds by far that realized in the older settled countries of Europe, fresh supplies of negro slaves must continually be brought, to repair the waste of life, from the more northern slave-states of the Union.

The cultivation of rice is very extensively and successfully carried on in the rich meadows of Lombardy, which can be irrigated by the waters of the Po. The meadows chosen for the purpose are perfectly flat. After the seed is sown, the water is turned on and allowed to cover the surface to the depth of several inches during the whole course of its growth, and until the rice is ripe. Three crops are taken successively from the ground in this manner without manuring; but the soil is then so far exhausted, that it must be manured and planted for a time with other crops, before another succession of rice-harvests can be drawn from it.

This system of agriculture proves the most profitable to the cultivator, of any that is carried on in Lombardy; but the same unwholesome effect is experienced there as in Carolina; and the government at Milan finds it expedient to restrict the cultivation within a certain limit, beyond which the production of rice is not allowed. The quantity of seed usually sown is three bushels to the acre, and the average produce, from the same measure of land, is commonly about six quarters.

In the province of Valencia in Spain, the method of rice-cultivation is very similar to that pursued in Lombardy. The water remains on the ground even during the operations of harvest, and the reapers are obliged to wade up to their knees in order to cut the grain, other persons following to receive the sheaves as they are cut, and to convey them to some dry place, where the grain is detached from the ear by the treading of mules.

The hollows between Columbo and Candy, in the island of Ceylon, are devoted to the production of rice. The fields on which it is sown are artificially formed into a regular succession of terraces, one above another, so that the water of irrigation may be made to flow from a higher to a lower level, the plants being in different stages of their growth. In some cases the water is led for a mile, or even two miles, along the side of a mountain, and is then discharged over the highest terrace, and thence downward in succession to the lowest, according as moisture may be required by each. Bishop Heber, for whom the charms of nature, whether in a wild or cultivated state, were never displayed in vain, remarks, on visiting this district, that "the verdure of the young rice is particularly fine, and the fields are really a beautiful sight, when surrounded by and contrasted with the magnificent mountain scenery."*

The cultivators of rice in America sometimes suffer severely from the depredations of the *rice-bird* of Catesby (*Emberiza oryzivora*), known familiarly in the country by the name of Bob Lincoln. This bird is about six or seven inches long; its head and the under part of its body are black, the upper part is a mixture of black, white, and yellow, and the legs are red. Immense flocks of these birds are seen in the island of Cuba, where the rice-crop precedes that of Carolina; but when from the hardening of the grain the rice in that quarter is no longer agreeable to them, they migrate towards the north, and pass over the sea in such numerous parties, as to be sometimes heard in their flights by sailors frequenting that course. These birds appear in Carolina while the rice is yet milky. Their attacks upon the grain while in this state are so destructive as to bring considerable loss upon the farmers. The birds arrive in the United States very lean, but thrive so well upon their favourite diet, that during the three weeks to which their visit is usually limited, they become excessively fat, so as to fly with difficulty, and when shot to burst with the fall. So soon as the rice begins to harden here, they retire to other parts, remaining in one place only so long as the rice con-

* Heber's 'Journey,' vol. iii. p. 169.

Rice-birds, Male and Female.

tinues green. When this food entirely fails, they have recourse for their subsistence to insects, until the maize begins to form its grains, and then the milky substance which these contain is devoured with the same avidity that marks their attacks upon the rice-plant. Extensive flocks of the oryzivora are found during the spring and summer in New York and Rhode Island; there they breed, quitting with their young for the southward, in time for the tender rice-grains of Cuba. It is remarkable that the males and females do not migrate in company, the females being always the first to perform their voyages. These birds are eaten as a great delicacy, and the song of the male is said to be melodious.

The uses to which rice is actually applied may be easily defined. In a great part of India and China it forms the subsistence of the native population, more exclusively and to a greater extent than can perhaps be said of any other vegetable substance in any known region of the globe. In the countries just mentioned, as well as those districts of Africa where it is used indiscriminately with maize, rice undergoes but little culinary preparation, being, for the most part, simply boiled with water, and eaten either by itself, or accompanied by some stimulating or oily substance. In countries, on the other hand, where it is employed only as an auxiliary article of food, rice is subjected to a greater degree of preparation for the table, and except when used to thicken broths, is seldom presented, unless after concoction with eggs, and milk, and sugar, which cover the natural insipidity of the grain.

In years when the harvest is deficient in this country, it is usual to hear a great deal about the practicability and advantage of mixing rice with wheaten or rye floor for making bread, and this may, without doubt, be done in a certain moderate proportion; such bread, however, speedily becomes harsh and dry. A writer in the *Journal des Sciences, des Lettres, et des Arts*, has, indeed, given directions, by following which, it is said, fermented bread may be made of rice without admixture with the flour of any other grain. The method is as follows:—First reduce the rice to powder in a mill, or throw the whole grains into water at nearly a boiling heat, and allow them to soak during some hours. Then drain off the water, and when the rice shall have become sufficiently dry, beat it in a mortar, and pass the powder through a fine sieve. This flour must next be placed in a kneading-trough, and moistened in the necessary degree with water rendered glutinous by boiling whole rice in it for some time; add salt, and the proper quantity of leaven or yeast, and knead the whole intimately together. The dough must then be covered with warm cloths and left to rise. During this fermentative process, the dough, which was of a pretty firm consistence, will become so soft as not to be capable of being formed into loaves. It is, therefore, placed in the requisite quantities in tin forms, and these being covered with large leaves, or with sheets of paper, are introduced into the oven, the heat of which speedily sets the dough sufficiently, so that the tins being reversed, their contents are turned out upon the leaves or paper. The bread, when perfectly baked, will be of a fine yellow colour, similar to that imparted to flour by the yolks of eggs, and when new is said to be sufficiently agreeable.

We are told that the Chinese make a kind of wine of rice, which resembles, both in colour and flavour, the white wine of Xeres; but it is not known by what process they are enabled to succeed in this manufacture. In the East, considerable quantities of ardent spirit are extracted from this grain by fermentation and distillation.

It has been declared impracticable to manufacture beer from rice, in consequence of the difficulty which attends its previous conversion into malt. M. Dubrunfaut has stated that this necessary process may be readily and completely accomplished in the mash-tub by mixing one part, by weight, of malted barley with four parts of crushed rice which has previously been mixed with its own weight of water. The ready formed saccharine matter of the barley malt appears to have the singular property of speedily converting the fecula of unmalted corn into a kind of soluble matter which has the fermentative properties of sugar. If malt and rice flour, diluted so as to have a pasty consistence, be mixed and mashed together, and then left during three or four hours, the mixture will present the appearance of a liquid which is slightly saccharine to the taste, and having a sediment at the bottom of the vessel, which is found, on examination, to be composed of only the husks of barley and rice. M. Dubrunfaut used for the purpose rice from which the husk had not been removed previous to its being crushed, and which in this state is known by the name of *paddy*, or more properly *paddee*.

The practice has obtained very much, during the last few years, of importing this paddee, in preference to shelled rice, its cost being lower in foreign markets, and the importers avoiding a very large proportion of the customs' duty chargeable on that already prepared for use. Some very effective machinery has been set up for the purpose of removing the husk and cuticle, and these operations are performed full as perfectly, and with less breaking of the grains than follows the employment of the ruder methods usually pursued in the countries of production; the loss, by waste, is also found to be less on the transport of paddee than of shelled rice.

CHAPTER VI.

MAIZE—MILLET—BUCK-WHEAT.

Maize—*Zea Mays*.

Maize, or Indian Corn (*Zea Mays*). Of this plant only one species is generally cultivated, but there are several varieties which are thought to owe their distinctive character to the accidental modifications of climate, soil, and culture, rather than to any original variance. The plant consists of a strong, reedy, jointed stalk, provided with large alternate leaves, almost like flags, springing from every joint. The top produces a bunch of male flowers, of various colours, which is called the *tassel.* Each plant bears, likewise, one or more spikes or *ears*, seldom so few as one, and rarely more than four or five, the most usual number being three: as many as seven have been seen occasionally on one stalk. These ears proceed from the stalk at various distances from the ground, and are closely enveloped by several thin leaves, forming a sheath, which is called the *husk.* The ears consist of a cylindrical substance, of the nature of pith, which is called the *cobb*, over the entire surface of which the seeds are ranged, and fixed in eight or more straight rows, each row having generally as many as thirty or more seeds. The eyes or germs of the seeds are in nearly radial lines from the centre of the cylinder; from these eyes proceed individual filaments of a silky appearance, and of a bright green colour; the aggregate of these hang out from the point of the husk, in a thick cluster, and in this state are called the *silk.* It is the office of these filaments, which are the stigmata, to receive the farina, which drops from the flowers on the top, or tassel, and without which the ears would produce no seed—a fact which has been established by cutting off the top previous to the development of its flowers, when the ears proved wholly barren. So soon as their office has been thus performed, both the tassel and the silk dry up, and put on a withered appearance.

The grains of maize are of different colours, the prevailing hue being yellow, of various shades, sometimes approaching to white, and at other times deepening to red. Some are of a deep chocolate colour, others greenish or olive-coloured, and even the same ears will sometimes contain grains of different colours.

Unlike the cereal grains which have been already described, naturalists are at no loss in determining the native region of maize, which is confidently held to be America, the Indians throughout that continent having been found engaged in its cultivation at the period when the New World was first discovered.

This grain is of scarcely less importance than rice for the sustenance of man. It forms a principal food of the rapidly increasing inhabitants of the United States of America; it constitutes almost the entire support of the Mexicans; and is consumed in Africa to an extent nearly, if not quite, equal to the consumption of rice in the same quarter.

The merits of Indian corn have been very differently estimated; and while some persons have invested it with a value equal, if not superior, to that possessed by the rest of the cerealia, other persons have, on the contrary, placed it at the lowest station among the family, scarcely, indeed, allowing it worthy to take its place in the group. Without meaning in any way to involve the reader in this controversy, it is yet necessary to set fairly before him the facts connected with the question, and he may then be enabled to form a correct judgment on the matter.

It is seen that domestic animals which are fed with maize very speedily become fat, their flesh being at the same time remarkably firm. Horses which consume this corn are enabled to perform their full portion of labour, are exceedingly hardy, and require but little care; and the common people of countries where Indian corn forms the ordinary food, are for the most part strong and hardy races. The produce of maize, on a given extent of cultivation, is greater than that of any other grain; and the proportional return for the quantity of seed committed to the ground is equally advantageous.

No argument can be founded either way upon the liking or disliking of individuals. Man is in this, as well as in most other respects, very much the creature of habit, and preferences, both national and individual, are often shown by him, in regard to articles of food, which would be wholly incomprehensible upon any other ground. We need not go beyond the bounds of Europe for abundant proofs of this fact, if indeed such are not offered by our own personal observation. It falls within the knowledge of the writer that a gentleman, who, in his boyish days, had been nurtured in a village on the coast, in a remote part of Scotland, acquired such a fondness for some weed thrown up by the sea, and which through the poverty of the inhabitants was made to form part of their sustenance, that in after-life, and when he had returned from a protracted residence abroad, he procured a supply of his favourite weed to be regularly sent to him in London, and ate as the greatest delicacy that upon which the members of his family could only look with disgust.

Of all the cerealia, maize is the least subject to disease. Blight, mildew, or rust, are unknown to it. It is never liable to be beaten down by rain, or by the most violent storms of wind; and in climates and seasons which are favourable to its growth and maturity, the only enemies which the maize farmer has to dread are insects in the early stages, and birds in the later periods of its cultivation.

American Indian Corn is the largest known variety of maize. It is found growing wild in many of the West Indian islands, as well as in the central parts of America; and there can be no doubt of its being a native of those regions. In favourable situations it has a very considerable growth, attaining to the height of from seven to ten feet; in some cases it has acquired the gigantic height of fourteen feet, without in any way impairing its productive power. Its spike, or ear, is eight or ten inches in length, and five or six inches in circumference. The plant generally sends out one, two, or more suckers from the bottom of the stalk; but these it is advisable to remove, not only as they draw away part of the nourishment which should go to support the main stalk, but because the ears which the suckers bear ripen at later periods than the others, and the harvest could not all be simultaneously secured in the properest state of maturity.

This variety will rarely come to maturity in northern climates, and could never be securely relied on for a crop in any part of Europe. In the Mexican states, where this grain is known by the name of *Tlaouili*, there are few parts of either the lower districts—*tierra caliente*—

or of the table-land, whereon it is not successfully cultivated. In the former districts its growth is naturally more luxuriant than in the latter; but even at an elevation of six or seven thousand feet above the level of the sea its productiveness is calculated to excite wonder, if not to provoke incredulity on the part of European agriculturists. Some particularly favoured spots have been known to yield an increase of eight hundred for one; and it is perfectly common in situations where artificial irrigation is practised, to gather from three hundred and fifty to four hundred measures of grain for every one measure that has been sown. In other places, where reliance is placed only on the natural supply of moisture to the soil from the periodical rains such an abundant return is not expected; but even then, and in the least fertile spots, it is rare for the cultivator to realize less than from forty to sixty bushels for each one sown.

The system of husbandry employed is closely analogous to that already referred to as Tull's Horse-hoeing Plan. The seed is sown, from three to five grains together, at regular intervals of three feet, in rows sufficiently far apart to admit of the passage of a small plough between them, for the purposes of loosening the soil around the roots and of removing the weeds. The use of manure is altogether unknown in Mexican maize husbandry.

Humboldt states that in some warm and humid regions of Mexico three harvests of maize may be annually gathered, but that it is not usual to take more than one. The seed-time is from the middle of June to near the end of August. A great part of the internal commerce of Mexico consists in the transmission of this grain, the price of which varies considerably in not very distant stations, owing to the imperfect state of the roads, and the insufficient means of transport. As an instance of this, Humboldt mentions the fact, that during his stay in the intendancy of Guanaxuato, the fanega (five bushels) of maize cost at Salamanca nine, at Queretaro twelve, and San Luiz Potosi twenty-two, livres. For want of a proper diffusion of commercial capital, the Mexican public is without the advantage of magazines for storing corn, and for preventing, by that means, great fluctuations in price. It is a fortunate circumstance, and one which should be mentioned as adding very materially to the natural value of maize in warm climates, that it will remain in store uninjured for periods varying from three to five years, according to the mean temperature of the district.

This kind of corn is generally planted in the United States of America about the middle of May, so as to avoid the mischance of its experiencing frost after it is once out of the ground. The Indians who inhabited the country previously to the formation of any settlement upon its shores by Europeans, having no calendar or other means of calculating the efflux of time, were guided by certain natural indications in their choice of periods for agricultural operations. The time for their sowing of maize was governed by the budding of some particular tree, and by the visits of a certain fish to their waters—both which events observation had proved to be such regular indicators of the season, as fully to warrant the faith which was placed on their recurrence. These simple and untaught people discovered and practised a method of preserving their grain after harvest, which afforded a certain protection against the ravages of insects, and which might be advantageously adopted in other situations, and in climates where this evil is very prevalent. Their method was to separate the corn from the cobb as soon as the harvest was finished; to dry it thoroughly by exposure to the sun, and to a current of air; and then to deposit it in holes dug out of the earth in dry situations, lining these holes with mats of dried grass, and covering them with earth, so as completely to prevent the access of air.

With the exception of artificial irrigation, to which recourse is not had in the United States, the method of sowing and managing maize is there singularly analogous to that pursued in Mexico. The proportionate produce, from a given quantity of seed or a certain breadth of land, is smaller, however, than that realized in Mexico, although the practice of manuring is universally followed.

As compared with the yielding of other kinds of grain, maize cultivation is, nevertheless, highly productive in the United States. In Pennsylvania, where the average crop of wheat does not exceed from fourteen to seventeen bushels, that of maize amounts to from twenty to thirty bushels to the acre. A writer in the 'Monthly American Journal of Geology and Natural Science' considers that maize produces the heaviest crops near the northern limits of its range. The American farmers find this advantage to attend the partial culture of maize upon their farms, that the time of harvesting is some weeks later than that of wheat, and that, consequently, the general operations of the harvest may be conducted without great bustle and temporary advance of wages, to be followed by a season of inaction, and consequently of idleness, to the labourer—evils which are commonly experienced in England.

The second variety of maize has white grains. This kind, which is cultivated in Spain, Portugal, and Lombardy, is altogether a smaller plant than the variety just described, seldom exceeding six or seven feet in height: the leaves are narrower, and the tops hang downwards. The ears or spikes are not more than six or seven inches long. The French, among whom this grain is partially cultivated, have given to it the name of Blé de Turquie, doubtless because their seed was originally obtained from that country.

Except in unusually favourable seasons, the two varieties hitherto described will not come to maturity in England, although they are sometimes sown as a curiosity in warm spots in gardens.

The third variety has both yellow and white seeds. It is even smaller than the last-mentioned, seldom rising to a greater height than four feet: the ears do not often exceed four or five inches in length. In ordinary seasons it will ripen its grains perfectly in England; and one reason why it has been presumed that its cultivation would prove advantageous to this country, is the shortness of time required for its growth, whereby the late frosts to which we are sometimes liable in spring, and the early frosts of autumn, would be alike avoided. This particular variety is cultivated in some of the middle regions of the European continent, as well as in some parts of North America, from which latter country it is understood to have its origin. It is also partially cultivated in Germany, not as a bread-corn, but that it may be malted and used in the preparation of a kind of beer, or made to yield an ardent spirit. The use chiefly made of it, however, is that of fattening swine and poultry.

In the cultivation of Indian corn in northern climates, it is proper to make choice of warm spots, and particularly to avoid shady situations. In order to admit the sun as much as possible to the plants, and probably also with the view of affording more nutriment to the grain, it is usual to remove the blades, together with the top and tassel, as soon as its office of dropping its fecundating farina upon the ears has been fully accomplished. This process is very easy of performance: when the blades and tops are perfectly dry they are stacked and thatched, and form an excellent substitute for hay and chaff in the spring, both for cattle and horses, as well as for sheep, all these animals being attracted by its sweetness.

It may generally be known when the corn is ripened by the dry and white appearance put on by the husk: a more intimate inspection is, however, accomplished without difficulty. The ears must then be plucked off, together with the husks, and conveyed at once in carts to the barn. In America the stalks are usually left standing for some time longer. Being then cut near to the ground, tied up into bundles, and stacked in a dry place, they will prove useful as food for horned cattle, which, from the saccharine quality of the plants, will thrive upon them.

The ears are preserved in bins or cages which are called corn-cribs, sometimes with the husk and at other times without it, and it is not considered good farming to shell the corn before it is required to be sent to market. This operation of shelling is very easily performed. The only implement required for the purpose is a piece of iron in shape like a sword-blade, the edge of which is

Ears of Maize in different stages.

not sharp, and this iron being fixed across the top of a tub in which the shelled grains are to be collected, the ear is taken in both hands and scraped lengthwise smartly across the edge of the iron until all the grains are removed. In this manner, it is said, an industrious man will shell from twenty to twenty-five bushels of corn in the course of the day. The cobb which remains makes a very tolerable quick-burning fuel, and thus no part of the plant proves altogether without use.

The grain forms one-half the measure of the ear, that is to say, two bushels of ears will yield one bushel of shelled corn. So correct is this estimate found to be, that in the markets of the United States, where Indian corn is sold both shelled and with the cobb, two bushels of the latter are taken without question by the purchaser, as being equal to one bushel of shelled grain.

An amusing, and in many respects an instructive, book was published a few years since upon the merits of Indian corn, by one whose sanguine wishes upon the subject of its introduction as a corn-plant into England led him farther than most people have been inclined to accompany him. There is to be seen in the work here referred to a very minute and interesting account of all the various processes which must be attended to by the maize-grower before his grain is ready for sale, as well as very minute directions for turning the produce to the best and most agreeable account in family economy.* Although the public mind seems at present to be differently impressed upon the matter, it does not appear very improbable that some hardy variety of this plant may, at no very distant day, be regularly cultivated in some parts, at least, of England and in Ireland. Sir Richard Bulkeley, who obtained some seed from Brandenburgh, sowed it in the last-mentioned island, and it is recorded that his produce was exceedingly great, fully equal, indeed, to anything asserted of Mexican fecundity. Might not this grain be gradually introduced, to the advantage of that portion of the kingdom, affording to the peasantry a more nourishing food than that upon which the bulk of them are now constrained to subsist? That Indian corn is well qualified to form the entire food—if that were necessary—of a people, is amply exemplified by the Mexicans, the great bulk of whom seldom partake of any other description.

Captain Lyon, in the narrative of his travels in Mexico, has given an amusing account of the mode of preparing *tortillas*, a species of cake made with the crushed grains of maize, which is eaten hot at the meals of all classes of people, the more wealthy using the cakes in the way we are accustomed to use wheaten bread—as an auxiliary to more nourishing aliments — and the peasants being fain

* 'A Treatise on Cobbett's Corn,' by W. Cobbett.

to enjoy them as a substantive food, seasoning them, when they have the opportunity, by the addition of chilies stewed into a kind of sauce, wherein the tortillas are dipped. Simple as the art may appear of thus making an unleavened cake with moistened flour, some persons are found to acquire a greater degree of expertness in it than others; and so great is the necessity for their preparation, and the desire of having them well concocted, that according to Captain Lyon, "in the houses of respectable people, a woman, called from her office Tortillera, is kept for the express purpose; and it sounds very oddly to the ear of a stranger during meal-times, to hear the rapid patting and clapping which goes forward in the cooking-place, until all demands are satisfied."*

The various uses to which the maize plant and grain may be applied cannot, perhaps, be better enumerated than in the words of Dr. Franklin, a man accustomed to make a sober estimate upon every subject that fell under his observation; and who, however enthusiastic he might be in the cause of virtue and rational freedom, never suffered himself to be betrayed into exaggeration, or to be carried away by a too sanguine imagination in affairs connected with the business of life.

"It is remarked in North America, that the English farmers, when they first arrive there, finding a soil and climate proper for the husbandry they have been accustomed to, and particularly suitable for raising wheat, despise and neglect the culture of maize and Indian corn; but observing the advantage it affords their neighbours, the older inhabitants, they by degrees get more and more into the practice of raising it; and the face of the country shows from time to time that the culture of that grain goes on visibly augmenting.

"The inducements are, the many different ways in which it may be prepared so as to afford a wholesome and pleasing nourishment to men and other animals. First, the family can begin to make use of it before the time of full harvest; for the tender green ears, stripped

* Lyon's 'Mexico,' vol. ii. p. 136.

of their leaves, and roasted by a quick fire till the grain is brown, and eaten with a little salt or butter, are a delicacy. Secondly, when the grain is riper and harder, the ears, boiled in their leaves and eaten with butter, are also good and agreeable food. The tender green grains dried may be kept all the year, and, mixed with green *haricots* (kidney beans), also dried, make at any time a pleasing dish, being first soaked some hours in water, and then boiled. When the grain is ripe and hard there are also several ways of using it. One is, to soak it all night in a *lessive* or lye, and then pound it in a large wooden mortar with a wooden pestle; the skin of each grain is by that means skinned off, and the farinaceous part left whole, which being boiled swells into a white soft pulp, and eaten with milk, or with butter and sugar, is delicious. The dry grain is also sometimes ground loosely, so as to be broken into pieces of the size of rice, and being winnowed to separate the bran, it is then boiled and eaten with turkies or other fowls, as rice. Ground into a finer meal, they make of it, by boiling, a hasty pudding or *bouilli*, to be eaten with milk, or with butter and sugar; this resembles what the Italians call *polenta*. They make of the same meal, with water and salt, a hasty cake, which being stuck against a hoe or other flat iron, is placed erect before the fire, and so baked to be used as bread. Broth is also agreeably thickened with the same meal. They also parch it in this manner. An iron pot is filled with sand, and set on the fire till the sand is very hot; two or three pounds of the grain are then thrown in, and well mixed with the sand by stirring; each grain bursts and throws out a white substance of twice its bigness; the sand is separated by a wire sieve, and returned into the pot to be again heated, and the operation is repeated with fresh grain; that which is parched is pounded to a powder in mortars. This, being sifted, will keep long for use. An Indian will travel far and subsist long on a small bag of it, taking only six or eight ounces of it per day mixed with water. The flour of maize, mixed with that of wheat, makes excellent bread, sweeter and more agreeable than that of wheat alone. To feed horses, it is good to soak the grain twelve hours; they mash it easier with their teeth, and it yields them more nourishment. The leaves stripped off the stalks after the grain is ripe, tied up in bundles when dry, are excellent forage for horses, cows, &c. The stalks, pressed like sugar-cane, yield a sweet juice, which being fermented and distilled, yields an excellent spirit; boiled without fermentation, it affords a pleasant syrup. In Mexico fields are sown with it thick, that multitudes of small stalks may arise, which being cut from time to time, like asparagus, are served in desserts, and thin sweet juice extracted in the mouth by chewing them. The meal wetted is excellent food for young chickens, and the old grain for grown fowls." *

In addition to the many uses enumerated by Franklin in the foregoing account, Humboldt acquaints us that the Mexican Indians, previous to the conquest of their country, were accustomed not only to express the sweet juice from maize-stalks for the purpose of fermenting it into an intoxicating liquor, but that they boiled down this juice to the consistence of syrup, giving it likewise as his opinion that they were able even to make sugar from this inspissated juice. In confirmation of this opinion he recites a letter written by Cortez, who, in describing to the emperor Charles V. the various productions in both a natural and manufactured state which he found in the new country, asserts that among these were seen "honey of bees and wax, honey from the stalks of maize, which are as sweet as sugar-cane, and honey from a shrub which the people call maguey. The natives make sugar from these plants, and this sugar they also sell." That this is truly the case there can be no doubt, as it has been recently proposed to manufacture sugar from the stalks of maize; and Professor Croft, of Toronto, in a communication made to the Linnæan Society in February, 1843, gave the result of some experiments that had been made in Indiana. The sugar is separated from the sap, which is obtained from the plants previous

* Franklin's 'Works,' vol. ii. pp. 276-8, 4to. edit. 1818.

to the development of the flowers. From the experiments made in Indiana it appears that the juice of the maize-stalks contains more than three times as much sugar as that of the beet, and five times as much as that of the maple, and frequently exceeds the quantity obtained from the ordinary sugar-cane. The preparation of the sugar from the maize is represented as an easier process than that from the sugar-cane. Another advantage is that the maize comes earlier to perfection than the sugar-cane, the juice being ready for use from the former at the end of from seventy to ninety days, whilst the latter requires eighteen months.

The sugar of the maize is capable of fermentation, and the Indians of Mexico are in the habit of preparing from the juice several fermented liquors. They are generally known by the name of *chicha*, and, according to Humboldt, some of them resemble beer, whilst others are like cyder. The spirituous liquor called *pulque de mahis*, or *tlaouili*, is prepared from the maize, and in some parts of the republic of Mexico it forms a very important article of commerce.

From the analysis of the fruit of maize, and after the above statements, there can be no doubt that it is a valuable article of diet. During the apprehended scarcity of the potato in Ireland, there can be no question that it might be made to form a valuable substitute for that tuber, although not so nutritious as wheat, barley, or oats.

MILLET—Species of *Sorghum* and *Setaria*. These are true grasses, and naturally allied to one of the most numerous tribes. In light sandy soils, under the scorching rays of the sun, and in situations where sufficient moisture cannot be obtained for the production of rice, millet is successfully cultivated. Sorghum forms a chief dependance of the people in some parts of India; through the arid districts of Arabia, in Syria, where it has been produced from the earliest periods; and in Nubia, whose inhabitants cultivate this almost to the exclusion of every other grain.

The seeds of panicled millet are by much the smallest of any of the cereal plants, but the number borne upon each stalk is so exceedingly great as to counterbalance that disadvantage, and to render this equally productive with other of the culmiferous plants: it is to this circumstance that its name, from *mille*, a thousand, has been ascribed.

Of this sort there are two modifications, distinguished by the form of their spike, one being composed of a single rachis, while the other is very much branched. The difference of form thus exhibited is of so marked a character that it can scarcely be viewed as a modification brought about by difference of culture.

Of each of these there are to be found some species which chiefly exhibit themselves as such by the varying colour of their grains, and by the circumstance of these being either naked or encrusted.

One kind of millet, the spike of which is compact, has been supposed to be a native of the north of Europe, and is commonly known, at least in this quarter of the globe, as German Millet (*Setaria Germanica*). It is thought, however, that this variety was originally imported from India and acclimatized in Germany. Nor does it afford any direct evidence against this opinion that seeds apparently of the same kind, brought from India, and subjected at once to the same culture, do not perfect their seeds; since it is well known that the habits of plants may be changed by slow degrees to an extent quite sufficient to account for this variance. The stalk of this, and indeed of all the varieties of millet, resembles a jointed reed, having at every joint a long broad leaf embracing the stalk with its base. This variety rises to the height of three or four feet, and terminates in a compact spike about eight or nine inches long, somewhat thicker at the base than at the top, beset with small round grains, which adhere but slightly to the husk, and therefore are very liable to be shaken out when ripe. The use principally made of this grain is the feeding of poultry.

Italian Millet (*Setaria Italica*) bears a considerable resemblance to the variety just described. This variety is decidedly a native of India, where it bears the

Italian Millet *(Setaria Italica)*.

name of *congue*. The plant is stronger, the spike and the seed are larger, and, to bring it to maturity, requires a warmer climate than suffices for German millet. The use to which this grain is brought in Tuscany is that of feeding domestic fowls and animals, including horses. The larger species of animals are also fed upon the leaves and culms, of which last-mentioned portion brushes are likewise made. The Italians also make from the flour a kind of bread, which is dark-coloured and coarse. Like those of maize, the seeds of both these varieties are of various colours.

Panicled Millet is the species most usually cultivated. The commonest variety, which botanists call *Sorghum vulgare*, is known by various names in the different districts where it is grown. In India it is called *jovaree;* in Egypt and Nubia, *dhourra;* while in our West Indian colonies it has received the name of *Guinea corn*, either because the seed was first conveyed thither from the western coast of Africa, or, as some persons have affirmed, because of its extensive use in feeding the African negroes throughout those colonies. The height to which this plant attains varies according to the soil and culture. In Egypt its growth seldom exceeds five or six feet, while Burckhardt* speaks of the stalks of dhourra as being sixteen or twenty feet long. The leaves are thirty inches long, and two inches wide in the broadest part. The flowers, when they first come out in large panicles at the top of the stalk, resemble the male spikes of the maize plant. These flowers are succeeded by roundish seeds, the colour of which is, in some cases, a milky white, with a black umbilical dot; in others the seeds are red, but in both cases they are wrapped round with the chaff, and are better protected from feathered depredators than other kinds of millet.

This grain was introduced into cultivation in Switzerland about the middle of the last century by M. Tschiffeli, who received about a spoonful of the seed from Dr. Schreber. M. Tschiffeli published an account of his method of cultivation in the Transactions of the Berne Society, some extracts from which paper will suffice to show the capabilities of this grain when cultivated in northern latitudes. Among the advantages which it offers are stated its adaptation to all sorts of soils, the small quantity of manure which it requires, the trifling amount of labour for which it calls, and the small degree of exhaustion which it occasions to the soil, in comparison with the largeness of the return which it yields.

M. Tschiffeli sowed his first seed in the month of May, on a gravelly soil exposed to the north wind, and which the year before had borne a very indifferent crop of bigg. The seed was spread very thin, and to this

* 'Travels in Nubia,' p. 280.

circumstance he attributed the fact that the stalks rose to the height of eight feet and upwards. The ears were above ten inches long, and but for an inopportune shower of hail which destroyed half the seed, the spoonful would probably have been multiplied into a peck of grains. In May of the following year, about a quart of seed was sown upon a piece of ground twenty paces long and half as broad, which space, it was soon apparent, was far too circumscribed for the quantity of seed. The stalks came up very close, and were interwoven with each other, reaching scarcely to the height of five feet, and the ears were much smaller than those of the preceding year. The produce, however, was seven pecks, or equivalent to fifty-six for one. In the next year thirty square rods of land were sowed with half a peck of the seed. Here again the millet came up far too thick, being almost as much crowded, from its greater tillering, as it was in the preceding year; notwithstanding which the produce was so great that twenty bushels were harvested, being a return of one hundred and sixty for one, and at the rate of more than one hundred bushels to the acre. M. Tschiffeli was of opinion that ten pounds of seed would prove an ample allowance for an acre of ground, and that greater space being thus allowed for the individual plants, the proportion between the quantities sown and harvested would be still more favourable. It does not appear that millet has ever been subjected to the system of drill husbandry, although the results here given seem to point out that system as being peculiarly applicable to its cultivation.

Sorghum is cultivated largely in some parts of China and in Cochin China. In England the autumn is rarely sufficiently dry and warm for ripening its seeds, otherwise the plant might prove useful in some poor and light soils, the produce of which is ordinarily insufficient to repay the greater expense attendant upon the cultivation of other grain. Sorghum was raised in this country as a rare plant, in the garden of John Gerarde, as early as 1596.

The golden-coloured millet-seeds seen in our grocers' shops are the produce of the *Sorghum saccharatum*, or yellow-seeded millet. Use is made of these in a similar manner with rice, for the preparation of puddings.

This variety is likewise a native of India; it is cultivated largely in China and Cochin China; and has been introduced into the island of Jamaica. Philip Miller reared it in his garden in 1759.

In warm climates millet is usually sown in May and June, and perfects it seeds within four months. The plant is not subject to blight, nor is it easily injured by either drought or rain. The only care required in its cultivation is to allow sufficient space for the tillering of the plants, and to weed and hoe the intervals during the early part of the growth; after which it will overtop and smother all weeds.

When millet is ripe, the panicles are cut off near to the top of the stalk, and collected in sacks or baskets. They are then laid up in heaps, and carefully covered during five or six days; after which they are spread on the barn floor, and the grain is threshed out in the ordinary manner with a flail. The more primitive method of treading out the grain by means of oxen is resorted to in some parts of India.

If millet is not perfectly dry when deposited in the granary it will soon be spoiled; but, on the other hand, if this precaution be properly taken, there is no grain that will keep longer or better. The weevil will not touch it, and although it is doubtless the better for being turned over occasionally, that process, so indispensable with other grain, may be omitted here without producing any serious injury. In addition to the use made of the stalks as fodder, the Nubians employ them in the construction of temporary huts.

In the barren districts of Bornou a species of millet is produced, which is called by the inhabitants *gussub*, and upon which both men and animals are almost exclusively fed. By the poorer class it is frequently eaten, simply parched, or even without any culinary preparation. Other persons crush and then steep the seeds in water previous to eating them; and some few, who are the epicures of the land, clear the grain from the husk, pound it, and make it up into a light paste with melted fat: this favourite dish is called *kaddul*.

Travellers who have visited the central parts of Africa complain much of a grievous annoyance to which they were there subjected from the prickles of a grass which grows wild and in great abundance, particularly in the neighbourhood of water. "These prickles are of the finest and most penetrating sharpness that can be imagined; they attach themselves to every part of the dress, and so small are the points that it is impossible to extract them without breaking and leaving a part behind."* The seed from this grass, which is called *kaschia*, is parched, broken, cleared from the husk, and, when boiled, is eaten in the manner of rice. When previously made into flour, kaschia is considered to be a great luxury.

The Nubians are accustomed to prepare a fermented liquor from dhourra; this, which they call *bouzah*, is considered by them as a very wholesome and nutritious beverage.

There is one plant, the name of which seems to point it out as proper for receiving some notice in this place, although it has no natural affinity with the cerealia; and the seeds, which are rarely used as human food in any country, are never so employed in England. This plant is BUCK-WHEAT (*Polygonum Fagopyrum*, Smith; *Fagopyrum esculentum*, Mœnch); also frequently called *brank*. The name given to this plant in Germany, where it is most cultivated, is *beech-wheat*, from the resemblance which the grains bear in shape to the mast or nuts of the beech-tree.

Buck-wheat is an annual plant, growing rather handsome, with branched herbaceous stems, having leaves which at first are roundish, but afterwards become arrow-shaped, resembling somewhat those of ivy, but being longer-pointed and much softer. The stalk is round and hollow; its general colour is green, but it sometimes has a reddish tinge; it commonly grows to

* Denham.

Buck-wheat *(Polygonum fagopyrum)*.

the height of about thirty inches. At almost every joint of the stalk, lateral branches shoot out, which are terminated by purplish flowers, and these are succeeded by small triangular-shaped seeds, which are of a brownish-black colour on the outside, and white within. This grain is usually sown in May or June, and is of such rapid growth that it generally ripens its seeds within about one hundred days from the time of sowing. It will thrive in any soil, even in those which contain little else than sand. The largest increase is, however, obtained from dry ground, which has been thoroughly ploughed and pulverized; and in such circumstances as much as fifty or sixty bushels have been reaped from an acre on which only one bushel of seed has been bestowed.

This plant is more generally cultivated for the sake of its green fodder, and then the seed is strewn much thicker, as much as three or four bushels being allotted to the acre. If the season is forward, and the weather continues warm, buck-wheat may be sown for this purpose in April, and will bear cutting twice during the summer ; but the slightest degree of frost will destroy it entirely. When it is thus intended to apply the plant as green meat, a sufficient quantity should be cut one day for the consumption of the next. The state most proper for cutting is when the blossoms are making their appearance.

All animals are fond of this food, and will thrive upon it. When given to cows it causes them to yield an abundance of excellent milk, which makes good butter and cheese. The stalk and leaves will continue green during the driest weather, even when all the grasses in the meadows are burnt up. The straw or haulm is sometimes given in a dry state to cattle, but is not then so useful as when green.

Buck-wheat is also sometimes sown in order that the plants may be ploughed into the ground, and serve as manure in the process of bringing lands into proper order for other crops. The time most proper for this ploughing is when the blossoms are full upon the plants, as they are then in their most succulent state. The land is then left at rest for some months, during which time the vegetable matter of the buck-wheat becomes fermented and decomposed. The plant known as Tartarian buck-wheat (*Polygonum Tartaricum*) being of more luxuriant growth than the common sort (*Fagopyrum esculentum*), has been preferably recommended for this object.

Birds are exceedingly fond of the seeds, and one of the principal uses made of them in this country is to feed pheasants during the winter, in spots set apart for the preservation of that species of game. With this object, the grain is sometimes sown in these preserves, and left standing to afford both cover and food to the birds ; at other times, the straw is taken unthreshed, and left in heaps at intervals throughout the places where the birds resort. Such an abundance of their favourite food will not only prevent pheasants from rambling, but frequently allures others from spots where an equally comfortable provision is not made.

Horses are fond of the seeds, which are sometimes given to them in conjunction with oats; it is proper, however, in such case, to subject the buck-wheat to the previous operation of crushing. Pigs are often fattened upon buck-wheat, and it is said that if this food be given to them in great quantity at first, it will occasion the animals to exhibit symptoms of intoxication, so that they run squeaking and tumbling about in a grotesque manner. As they become habituated to the use of the grain, such an effect ceases. It is necessary to crush the seeds for this purpose also.

Buck-wheat is sometimes used by distillers, it being capable of yielding a considerable quantity of good spirit. This use is made of it to a great extent at Dantzig, where an extensive manufacture of cordial waters is continually carried on.

The poor of some countries mix the meal of buck-wheat with a small proportion of wheat-flour, and make a kind of bread of the compound, which is black and bitter, and deficient in a due degree of nourishment. In Brabant it is not unusual for persons who derive a profit from keeping bees to sow this grain near to their dwellings, they being of opinion that no plant is equal to it for affording to those insects a proper supply of materials whence their sweet store is elaborated.

CHAPTER VII.

CASEIN—LEGUMINOUS PLANTS.

The various forms of legumes or pulse, next to the cerealia, may be said to form the most important kind of food. It will be found from the analysis previously given, that the seeds of these plants, as peas, beans, lentils, &c., contain even more nitrogenous matters than the cerealia, and thus are more capable of supplying nutrition to the system. The nitrogenous principle found in the seeds of the Leguminosæ differs in some of its physical and chemical characters from that found in the cerealia, and from its being identical with the substance separated from milk under the name of cheese; it is called *casein*. Although these seeds contain so much nutritive matter, they are not under all circumstances the most nutritious food. This arises from the fact that casein is much less easily digested than fibrine or albumen. With animals, however, which can digest this substance, as the horse, the ox, &c., it is well known that peas and beans are the very best diet they can have to enable them to perform their labour.

The analysis to which we have referred, and to which these remarks apply, are of the ripened seeds of the Leguminosæ, but extensive use is made both of the unripened fruits and seeds of these plants. Thus the Windsor bean and green peas are eaten before the seeds are ripe, and the fruit of the French bean is eaten whilst it is green. Of course, in this state these plants contain much less nitrogenous matter and a much larger proportion of water than the ripened seeds.

The principal legumes cultivated in Britain are the pea, the bean, and the kidney-bean.

The species of pea (*Pisum*) are climbing plants, furnished with tendrils at the terminations of the compound leaves; and none of the species, not even the dwarf kind, can sustain their stems in an upright position without either interlacing with each other, or clinging to some extraneous support.

The varieties of the species of this genus are very many. Botanists enumerate several species, which they regard as being distinct. The chief of these are the common or cultivated pea (*Pisum sativum*), the sea-pea (*Pisum maritimum*), the Cape Horn pea (*Pisum Americanum*), and the yellow flowering pea (*Pisum ochrus*). The first is the only one which is deemed eligible for cultivation in Britain. The sea-pea is a native of England, and now called by botanists *Lathyrus maritimus*.

The *Pisum Americanum* is a biennial plant which was found growing at Cape Horn by some of the people attached to Lord Anson's expedition. This fresh pulse was a most welcome addition to the ordinary sea provisions, and under such circumstances it appeared to be of more excelling flavour than the common pea. It was accordingly brought home and propagated, but was soon found not to equal even the worst sort of those which were already in cultivation, and it is now only preserved in botanical collections. The flowers are blue, each peduncle sustaining four or five flowers, the pods taper, and the seeds are very small.

The yellow flowering pea is found in a wild state in the corn-fields of Sicily, and some parts of Italy, but is here merely preserved in botanic gardens for the sake of variety. The peduncles have but one flower each, and the pods and seeds are larger than those of the sea-pea. They are sometimes eaten, but they are coarse and of little value.

The native country of the common pea (*Pisum sativum*) is not known, it having been a cultivated vegetable before the commencement of botanical history. It is probable, however, that it was introduced into Britain from the warmer parts of Europe, and may have been brought to these from Egypt and Syria. It is known in India, China, and Cochin China; but it is not very plentiful in those places, and there is no evidence of its being a native plant. It is more abundant in the Japan Isles, the climate and soil of which agree better with its habits; and therefore there is reason to conclude that it is not a native of very dry and burning regions; neither is it the offspring of very frigid climes, since it is soon affected by cold, severe weather, and the leaves become blackened by the autumnal frosts.

Historical evidence would make it appear that both the pea and the bean must not only have been introduced but extensively cultivated in some parts of Scotland, as well as in England, at a very early period. It is on record, that when the English forces were besieging a castle in Lothian, in the year 1299, their supply of provisions was exhausted, and their only resource was in the peas and beans of the surrounding fields. This circumstance would lead to a belief that the pea was then one of the staple articles of produce for human food.

The more delicate kinds, however, do not appear to have been cultivated in England until a much later period, since Fuller informs us that peas, in the time of Queen Elizabeth, were brought from Holland, and were "fit dainties for ladies, they came so far, and cost so dear." In the reign of Henry VIII., too, the pea would appear to be somewhat of a rarity, as in the Privy Purse Expenses of that king is an entry, "paied to a man in rewarde for bringing pescodds to the King's grace, iiij*s.* viii*d.*" From a song, however, called 'London Lyckpeny,' made in the time of Henry VI., peascods appear to have been commonly sold in London:

> "Then unto London I dyde me hye,
> Of all the land it bearyeth the pryse;
> 'Gode pescode,' one began to cry."

At Windsor there is a street called "Peascod," mentioned by that name in old documents.

The use of the pea as an esculent, both in its green and its dried state, is too familiar to need description. This plant is annually cultivated to a great extent in Britain; perhaps, since the more general introduction of the potato, a diminution of peas culture may have taken place in the poorer districts; but peas are always in constant requisition in this country; they are consumed in immense quantities as sea provisions; they are likewise largely supplied to hospitals, infirmaries, and workhouses, and are in familiar use in every private family.

The principal varieties of the common pea are the white or yellow, and the grey. Soil and culture have probably produced all the varieties under the two sorts; different as they now are, both in their colours and their qualities, and even in the number of flowers and pods growing from each peduncle.

Among grey peas, where much attention has not been paid to the purity of the seed, it is not unusual to find several shades of colour from a deep purple almost approaching to a black, to a very pale or nearly white hue. In even the same parcel, some seeds are grey, some mottled, and others purple.

The white and yellow peas are distinguished as garden peas and field peas. The former being the choice sorts, are raised by more careful and expensive culture for the purpose of being eaten green; the latter, inferior chiefly on account of the manner of their being raised, are allowed to come to maturity.

The sub-varieties of the common pea are never-ending. These have obtained their names, some from imaginary qualities, some from the peculiar mode of culture, others from the persons who first produced them, and some from more fanciful distinctions. Of those no less than twenty-two are enumerated as being objects of garden culture, differing in the colour of the flowers, height of the haulm or stalk, time of coming to maturity, produce of legumes, or size and flavour of the seeds. The varieties are in different degrees tender or hardy; if, then, a due regard be paid to the choice of soil and situation, and the time of sowing most favourable to the respective kinds, the success of the crop may, in a great measure, be commanded.

The varieties of the garden peas may, therefore, be divided into early and late. The former are distinguished as being more slender in the plant, and less abundant in the crop, but they are more hardy, and can better withstand the cold weather; while some kinds admit better of being forced, and thus can be produced at the earliest approach of summer, as the grand vegetable luxury of the season. The late sorts are more vigorous, and more productive both in the number of the pods, and the size of the grain; and as they come to maturity by the natural heat of the season, and in a free change and circulation of the air, they are more rich and saccharine. Thus it happens, as is the case with many other articles of human food, that green peas are really of the best quality when they are so cheap that they may be purchased by the people generally.

The pea goes through all the stages of its vegetation in a very brief period. More than one instance is on record of a crop being obtained from seed matured the same season. Some Spanish dwarf peas were sown in February, and the crop was reaped the first week in July; some of the pods were left to mature their seed, which when sufficiently ripe were again committed to the earth on the same piece of ground, and a second crop was reaped on the 27th of September.*

To obtain the very earliest crops, the seeds are sown in a dry soil, about the end of October; in favourable situations and seasons they stand through the winter, and if the spring be a forward one they may be ready for gathering about the end of May. They are a precarious crop, however, and do not pay the cultivator, unless they are produced so early as to command a very high price. In consequence of the uncertainty of the winter, in places where the demand is such as to bear the expense, the earliest peas are brought forward in hot beds.

Of peas sown in the field there are several varieties. The dark sorts are generally the longest in coming to maturity, and they have the rankest flavour. In favour-

* Fleming's 'British Farmer's Magazine,' Nov. 1826

able places, if they are sown in autumn, and cleared the instant they are ripe, they may be followed by turnips the same year; but if the sowing is delayed till after Christmas, the ground will not be free in time for any crop save winter wheat. A crop of peas is considered to improve the soil, especially for turnips. But it is not on the whole very profitable, unless upon very rich loams, in which situation they are often sown with beans, and the produce used as food for stock. The bean-stalks, from their greater strength, prevent the peas from lodging.

THE BEAN (*Vicia faba*) has been cultivated in Britain from very remote antiquity, having been in all probability introduced into this country by the Romans. It is said to have originated in Egypt; perhaps because the Greeks, from whom we have the earliest accounts of it, received it from that country as a cultivated vegetable. Some travellers affirm that the bean is found growing wild in Persia, near the shores of the Caspian; but that part of Asia has been subjected to so many fluctuations, to so many alternations of culture and destruction, that it is not easy to decide whether any plants which may be discovered vegetating spontaneously be really indigenous, or only the remains of a former cultivation. In many parts of Britain, where all other memorials of former habitations and culture have been swept away, certain plants are found growing which a traveller passing hastily over the country would very naturally describe as indigenous, since of their introduction the present inhabitants of the vicinity could most probably give him no account, but which from history and the nature of the plants themselves are known to be exotics introduced at a specific time.

Beans are cultivated over many countries, as far to the eastward as China and Japan, and they are very generally used as an esculent in many parts of Africa; from its northern coast some of the more valuable varieties were transplanted by the Moors into Spain, and by the Portuguese into their own country.

This plant is grown abundantly in Barbary, where it is usually full-podded at the latter end of February, and continues in bearing during the whole of spring. When stewed with oil and garlic, beans form, according to Shaw, the principal food of persons of all classes.

The bean in its green state is well known as a culinary vegetable; when mature and dried it is never used as human food in this country, but is then considered good, though coarse nourishment for labouring horses. Campbell, in his 'Political Survey,' published 1774, mentions that "Beans are exported for the food of the negroes in our plantations, and are employed in feeding horses at home; so that altogether they are in daily use, and most certainly turn to a very considerable amount."* Provisions for this unhappy race of human beings are in the present day somewhat better selected, and horse-beans do not any longer form an article of export to the colonies.

All the cultivated beans are annuals, having upright fibrous stems rising from two to four feet high. The flowers are usually white, with a black spot in the middle of the wing; these are succeeded by long thick legumes, woolly within, and enclosing large flat seeds. These flowers are very fragrant, and the rich perfume of a bean-field, when the plants are in full blossom, is as familiar as it is delightful to all lovers of simple rural pleasures. The popular division of the several varieties is, like that of peas, into field beans and garden beans; the same variety is, however, often cultivated in both situations. The large variety called the "Windsor Bean" is said to have been first cultivated in that neighbourhood by some of the Dutch gardeners who came over at the Revolution. There is a field near Eton still called "the Dutchman's garden."

Beans are propagated by seed sown in rows from two

* King stated the annual consumption of beans at that period to be four millions, and of peas seven millions of bushels. Campbell, indeed, considered this estimate to be excessive, but if it at all approximates to the truth, it shows that these legumes were then cultivated to a very great extent.

to three feet asunder, either by the dibble or by drilling; the early kinds in October, and from December to January inclusive. The main crop is sown in March and April, and the several varieties are continued in monthly succession until July. For late crops the seeds, previously to being used, are soaked for several hours in soft water. Some cultivators cut off the tops of the plants when in bloom, which operation is supposed to promote an earlier and more abundant production of well-filled legumes; while a very late crop may be obtained by cutting down the plants, as soon as they are in flower, to within a few inches of the base. New stalks spring from the roots, and yield pods at an advanced period of the year.

The bean, though a coarser plant than the pea, is much more liable both to disease and to the depredations of insects. When the plants become sickly from an unfavourable soil or season, small fungi are apt to form withinside the epidermis, such as the nestling spheria (*Sphæria nidula*), upon the roots, and the bean-blight (*Uredo Fabæ*) upon the stems and leaves. Though these are most probably the consequence of a diseased state of the plants, they so destroy the epidermis as to render recovery impossible, and the crop is greatly injured or altogether destroyed. The black aphis also often commits terrible havoc; it generally appears first in the young leaves of the top, and therefore may be removed by a little timely care without injuring the plants, but if once it is allowed time to establish itself, it is very difficult of eradication.

The Kidney Bean (*Phaseolus*).—Two species are cultivated in England, both natives of warm countries, and though they grow and pod well in Britain during the warm months, they will neither bear the frosts of early spring, nor those of late autumn. The dwarf kidney-bean (*Phaseolus vulgaris*), a native of India, but erroneously called the French bean, is mentioned as being in common cultivation in England in the year 1597. The species called the *runner* (*Phaseolus multiflorus*) was introduced from South America in the year 1633. It is supposed that the scarlet variety, which grows so tall and is so prolific, was first cultivated about that time by Tradescant, the celebrated gardener at Lambeth. It was then, we are told, in so great repute for its flowers, that they formed the leading ornament in the nosegays of the ladies; and it seems to have kept its place only as an ornamental plant for nearly a hundred years, as its legumes were seldom used as an edible substance until brought into notice by Miller of Chelsea in the eighteenth century.

The general characteristics of the two species are the same. The leaves are ternate, attached to long petioles; and the flowers, differing in colour according to the variety, grow on racemes or short lateral branches coming out from one common peduncle. These are succeeded by oblong pods containing smooth shining seeds of a kidney shape.

The stems are more or less voluble in all, but those of the dwarf kind are of very low growth, and require no support. The stalks of the runners ascend eight or ten feet, and, therefore, either tall sticks are provided around which they may wind, or they are planted near a building or fence from which slender cords are suspended, and the flexile stems as they rise clasp and entwine themselves with these. "It deserves notice, that in their voluble habit of growth the tendrils turn to the right or in a direction contrary to the apparent diurnal course of the sun: this aberration from the common habit of plants has been accounted for by supposing that the native climate of the scarlet runner will be found to lie south of the equator, and that the plant, although removed to the northern hemisphere, is still obedient to the course originally assigned to it, turning in a direction which in its native climate would be towards the sun." *

Both species are tender plants, and seldom thrive if they are sown very early in the season; but in favourable weather they are prolific bearers, especially the scarlet runner, which for a long continuance yields a plentiful crop from one sowing.

In England only the immature pod is used as a legume.

* Loud., 'Encyc. of Gardening,' p. 694

The ripe seeds known by the name of *haricots* are prepared in various ways as a favourite edible in France; where the dwarf white kidney-bean is extensively cultivated as a field crop, to furnish a supply of their seeds, which are in so constant demand. The seeds of the Dutch runners, which are larger than these, and of a superior quality, are made into a kind of soup, which is held in much esteem in Holland. The leaves likewise of the kidney-bean afford, when boiled, a culinary vegetable which the Nubians consider an excellent esculent.

Some varieties of the kidney-bean are found in cultivation throughout almost every civilized country of the western as well as the eastern hemisphere. The small black beans called *fricollis*, which are in general demand all over Mexico, are no doubt a kind of kidney-bean. Recent travellers in that country relate that immense fields of these are under cultivation for the supply of the large cities, where they form a part of every meal, and are not only in great favour with the inhabitants, but are considered excellent even by strangers.

Among the productions of Bornou, Major Denham enumerates four kinds of beans, which are raised in great quantities, called *mussaqua*, *marya*, *kleeny*, and *kimmay*, all known by the general name of *gafooly*. These are eaten by the slaves and the poorer people. A paste compounded from beans and fish was the only eatable the major and his companions could find in the towns near the river.*

The Lentil (*Ervum Lens*) is a small climbing plant, with weak stalks, about a foot and a half high. The leaves are winged, and each is terminated by a tendril. The flowers, of a pale purple colour, are succeeded by short flat pods containing two or three flat round seeds. Another sort, distinguished as the French lentil, is of much larger growth than the former, and altogether more worthy of cultivation. These plants are rarely raised in England, and then only as food for cattle. In most parts of the Continent they are cultivated for the use of man, and the seeds are made into soups, or become

* Denham's 'Travels,' vol. ii. p. 143.

an ingredient in other culinary preparations. They are readily softened by, and mix with, water, forming with it a pottage of a chocolate colour. In Catholic countries, where the formulary of the church enjoins a number of *meagre* days, such plants as the kidney-bean and the lentil are more cultivated than they are in countries where the religion of the people does not prescribe the same observances. In England there are no fasts scattered through the year on which the people are expected to subsist upon pulse with the addition of vegetable oils. The use of haricots and lentils is therefore but little known in this country. According to the analysis of Dr. Playfair, the lentil contains more nitrogenous matter than any of the Leguminosæ, and consequently is more nutritious where digested than any of the other forms of leguminous seeds. The lentil is consumed in the East in considerable quantities, and a curious proof of its value as a nutritious diet is afforded by the use which is made of it amongst the Hindoos, who always have recourse to lentils in addition to their rice when engaged in laborious work, such as rowing on the Ganges, &c.

The CHICK PEA (*Cicer arietinum*) is another small legume which is occasionally cultivated in the south of Europe, especially in Spain, where it is used as a dyeing ingredient as well as an article of food. It is known there, and on the opposite coast of the Mediterranean, by the name of *garavance* or *garvanzos*. These seeds do not, like most other pulse, become of a soft and pulpy consistence by boiling, and therefore they never constitute a dish by themselves, but are strewed singly as a garnish over certain savoury viands, and form part of the *olla*, a dish composed of bacon, cabbage, pumpkin, and garvanzos, with which a Spanish dinner almost invariably commences. The chick-pea, when parched, has been much esteemed among many nations from the earliest periods of history, and in that state it still continues an article of great consumption. According to Bellonius,* this pea was the parched pulse which formed the common

* Calm., 'Dict. Bibl.,' lib. ii. cap. 53.

Chick Pea (*Cicer arietinum*).

provision of the Hebrews when they took the field; and Cassianus * supposes it to have been the torrified seed mentioned by Plautus and Aristophanes. The *frictum cicer* seems also to have constituted a part of the usual food of the lower orders at Rome.†

In those warm and arid countries where travellers are constrained to carry their scanty provisions with them across vast desert tracts, they gladly supply themselves with small dried substances which require much mastication, and thus stimulate the salivary glands. Under

* Cassian., 'Collat.,' 8.

† Plautus, 'Bacch.,' act iv. 5, 7. Hor. 'Serm.,' lib. 2, Sat. 3, l. 182; De Arte Poet., l. 249.

these circumstances parched chick-peas, or *leblebby*, are in great demand, and are as common in the shops as biscuits in those of England. In Grand Cairo and Damascus there are many persons who make it their sole business to fry peas, for the supply of those who traverse the desert.

The seeds of the kerkedan, a small shrub found growing wild and sometimes cultivated in the north of Nubia, are made into a kind of bread, and form the principal food of the Kerrarish Arabs; and a decoction of the roasted grains is used as a substitute for coffee. Another shrub, called *symka*, indigenous to the same country, produces legumes resembling peas, and containing round rose-coloured seeds which afford excellent nourishment for camels, and are, when green, employed as human food. These likewise "the Arabs collect and dry, and by hard boiling obtain from them an oil which they use instead of butter to grease their hair and bodies."*

Various descriptions of pulse are cultivated in the East, but these are seldom of a large growth. The culture of smaller legumes as human food, similarly with that of the millets and other small-seeded grains, is adapted only to that state of society in which the money-price of labour is low, and yet where the climate and other concurring circumstances are obstacles to the cultivation of the more valuable kinds of vegetables. Moisture and heat, as well as a soil comparatively rich, are required for the production of rice; and the cerealia grown in more temperate climates cannot be raised unless there be either a sufficiency of manure, which cannot be procured without an abundant stock of domesticated animals, or a natural richness of soil, which is incompatible with dry land in a warm climate.

In the elevated parts of India which lie out of the direction of the periodical rains, a scanty irrigation can at best be obtained, and that only by sinking deep wells or by constructing tanks and reservoirs at a great expense; where these imperfect means are not within

* Burckhardt's 'Nubia,' p. 46.

reach, the ground is scarcely ever moistened, as probably a shower of rain does not fall during six months. Under these circumstances the cultivation of pulse is resorted to as a matter of necessity, and the smaller and the more hardy these are, the more certain is the prospect of their yielding a crop. In sultry climates there is often a portion of humidity which plays in the atmosphere, and which will form dew upon the leaves of a plant, when the evaporative power of the naked and baked earth is so great that not a condensed drop will settle upon it, or a trace of moisture be found. From this cause dew may be seen early in the morning spangling the verdant lawn when there is no humidity whatever upon the gravel walk; and upon a burnt-up heath, any plant which may have preserved its greenness, will attract moisture, when the withered grass continues perfectly dry. The pulses which are sown in the rainless parts of India not only preserve themselves, but often aid in preserving millet and other small grain with which they are mixed. When the Hindu, in his simple husbandry, sows several kinds of seeds on the same land, he does not therefore give a proof of his ignorance of the art. There is in it a little of the schooling of experience—the practical knowledge of the climate with which he has to deal. He sows his small grain in order that he may have a good crop if the season should send him rain; and he at the same time sows pulse in order that he may not only reap pulse in the event of a drought, but that he may even then perhaps obtain with it a little accompanying grain.

CHAPTER VIII.

BREAD-FRUIT.

Amongst many plants which might be mentioned as affording a sufficient quantity of nitrogenous matter to support life and enable man to maintain muscular exertion is the bread-fruit tree. It is referred to here, as at one time it was supposed to be an efficient substitute for bread made from wheaten flour, and to partake of all its dietetical value. No analysis of this fruit, however, has been made to enable us to decide this point. It was originally found in the south-eastern parts of Asia and the islands of the Pacific, though now introduced into the tropical parts of the western continent and the West-India islands.

There are two species of it: the bread-fruit, properly so called (*Artocarpus incisa*), with the leaves deeply gashed or divided at the sides, which grows chiefly in the islands; and the Jack fruit, or Jaca tree (*Artocarpus integrifolia*), with the leaves entire, which grows chiefly on the mainland of Asia. The latter has been already noticed.

The bread-fruit is a beautiful as well as a useful tree: the trunk rises to the height of about forty feet, and, in a full grown tree, is from a foot to fifteen inches in diameter: the bark is ash-coloured, full of little chinks, and covered by small knobs; the inner bark is fibrous, and used in the manufacture of a sort of cloth; and the wood is smooth, soft, and of a yellow colour. The branches come out in a horizontal manner, the lowest ones about ten or twelve feet from the ground; and they become shorter and shorter as they are nearer the top: the leaves are divided into seven or nine lobes, about eighteen inches or two feet long, and are of a lively

Fruit of the *Artocarpus incisa.*

green. The tree bears male and female flowers, the males among the upper leaves, and the females at the extremities of the twigs. When full grown the fruit is about nine inches long, heart-shaped, of a greenish colour, and marked with hexagonal warts, formed into facets. The pulp is white, partly farinaceous and partly fibrous; but, when quite ripe, it becomes yellow and juicy. The whole tree, when in a green state, abounds with a viscid milky juice, of so tenacious a nature as to be drawn out in threads.

In the island of Otaheite and other places, where the bread-fruit forms the chief support of the people, there are, as is the case with cultivated vegetables in all countries, many varieties; only two, however, are very different from each other—that which contains seeds in the fruit, and that which contains none. The variety with seeds is much inferior to the other, being more fibrous, containing less farina, and not so pleasant to the taste; it is, therefore, not cultivated, though, in cases of need, it is roasted and eaten. Whether the seedless sort has been produced wholly by cultivation it is not easy, and would not be of much importance, to ascertain: it is the one cultivated in the South Sea islands; it was originally found only there; and the tree was not in much repute till these islands were discovered.

The bread-fruit continues productive for about eight months of the year: such is its abundance, that two or three trees will suffice for a man's yearly supply, a store being made into a sour paste, called *mahe* in the islands, which is eaten during the unproductive season. The planting of the seedless variety is now saved, as the creeping roots send up suckers which soon grow to trees. When the fruit is roasted till the outside is charred, the pulp has a consistency not very unlike that of wheaten bread; and the taste is intermediate between that of bread and roasted chesnuts. It is said to be very nourishing, and is prepared in various ways.

The timber of the bread-fruit, though soft, is found useful in the construction of houses and boats; the male flowers, dried, serve for tinder; the juice answers for bird-lime and glue; the leaves for packing and for towels; and the inner bark, beaten together, makes one species of the South Sea cloth.

The earliest account of the bread-fruit is by Captain Dampier, in 1688. "The bread-fruit," says this navigator, "grows on a large tree, as big and high as our largest apple-trees; it hath a spreading head, full of branches, and dark leaves. The fruit grows on the boughs like apples; it is as big as a penny loaf, when wheat is at five shillings the bushel; it is of a round shape, and hath a thick tough rind. When the fruit is ripe, it is yellow and soft, and the taste is sweet and pleasant. The natives of Guam use it for bread. They gather it when full grown, while it is green and hard; then they bake it in an oven which scorcheth the rind, and maketh it black; but they scrape off the outside black crust, and there remains a tender thin crust; and the inside is soft, tender, and white, like the crumb of a penny loaf. There is *neither seed nor stone* in the inside, but all of a pure substance, like bread. It must be eaten new, for, if it be kept above twenty-four hours, it grows harsh and choky, but it is very pleasant before it is too stale. This fruit lasts in season *eight months* in the year, during which the natives eat no other sort of bread kind. I did never see of this fruit any where but here. The natives told us, that there is plenty of this fruit growing on the rest of the Ladrone Islands; and I did never hear of it anywhere else."

The scientific men who accompanied Captain Cook in his voyages, came home with the most enthusiastic ideas of the bread-fruit. Dr. Solander calls it "the most useful vegetable in the world," and urges that no expense should be spared in its cultivation. The mere idea of bread, the most valuable food of man, growing spontaneously, was doubtless calculated to excite attention—almost, perhaps, as strongly as the subsequent description of the poet:—

> "The bread-tree, which, without the ploughshare, yields
> The unreap'd harvest of unfurrow'd fields,
> And bakes its unadulterated loaves
> Without a furnace in unpurchased groves,
> And flings off famine from its fertile breast
> A priceless market for the gathering guest."*

A tree, of the value and easy culture of which so very encouraging accounts were given, could not but attract the notice of the public generally, and more especially of those colonists of Great Britain who lived in a climate warm enough for its cultivation. An application to be furnished with plants of the bread-fruit tree was accordingly made by the planters and others interested in the West Indies, and it met with a favourable reception. The Bounty, a vessel of about two hundred and fifteen tons burthen, was fitted up for a voyage to Otaheite. Lieutenant (afterwards Admiral) Bligh, who had accompanied Cook on his last voyage, and shown himself an officer of great talents, enterprise, and bravery, was appointed to the command. In addition to the crew of the vessel, two men were appointed, at the recommendation of Sir Joseph Banks, to take im-

* Byron.

mediate charge of the procuring, shipping, and tending of the plants.

The Bounty was skilfully fitted up for her intended purpose. A large cabin between decks, in midships, was prepared for the reception of the plants. This had two large skylights on the top for light; three scuttles on each side for ventilation of air, and a double bottom; an upper one of timber on which to place the pots and tubs containing the plants, which was drilled full of holes to allow escape to the superfluous water which might have injured them by stagnation—and a leaden one upon the lower deck, in which the water that ran through the other was collected, and from which it was conducted by a leaden pipe at each corner, into casks below for future use.

Thus prepared, the vessel put to sea about the middle of November, 1787, but was beat about and baffled by contrary winds, so that the voyage was not commenced till the 23rd of December. The instructions given to Lieutenant Bligh were full and explicit. He was to resort to those places in the Society Isles where Captain Cook had stated that the bread-fruit tree was to be found in the greatest luxuriance, and there procure as many plants as the vessel could carry; after which he was to proceed with them to the West Indies with all possible expedition.

The commander sailed first for Teneriffe, and thence for the south of America, intending to enter the Pacific by the passage of Cape Horn. But the storms of that inhospitable region beat him back; and he was forced to bear away for the Cape of Good Hope, and reach the Society Islands on the side of New Holland. This voyage, which had occupied ten months, terminated on the 25th of October, by the arrival of the Bounty at Otaheite.

No time was lost in putting the instructions into execution. The young shoots that sprung from the lateral roots of the bread-fruit trees were taken up, with balls of earth, where the soil was moist; and this operation was continued till they were in possession of one thousand and fifteen live plants, secured in seven hundred and seventy-four pots, thirty-nine tubs, and twenty-four boxes. To complete this cargo took them till the 3rd of April, 1789; and Bligh sailed on the 4th, passing from Otaheite through the group of islands, and bidding adieu to the natives, with whom he and his crew had been on the most friendly terms during their stay.

Hitherto there had been no perils to contend with but those of the sea; but when four-and-twenty days had elapsed, and they were, of course, far from any land, a new scene took place, which frustrated for a time the bounty of the government and the skill of the commander. Under the cloak of fidelity, a mutiny had been forming of a very determined and extensive nature; and so well had the mutineers disguised their intentions, that not one but those who were in the plot had the slightest suspicion of it.

The known bravery of Lieutenant Bligh made the mutineers afraid to attack him awake; and so, on the morning of the 28th of April, he was seized, while asleep in his bed, by a band of armed traitors, and hurried upon deck in his shirt; and, on coming there, he found the master, the gunner, one of the master's mates, and Nelson the botanist, who had been with him under Cook, confined in the fore hatchway, and guarded by sentinels. The launch was hoisted; and such individuals as the mutineers did not like were ordered to quit the ship, and forced if they refused or hesitated. Eighteen individuals out of the forty-six remained true to the commander; and one of them, Mr. Samuel, the clerk, contrived to save Mr. Bligh's commission and journals; but he failed in attempting to procure Bligh's surveys, drawings, and remarks during fifteen years, which were exceedingly valuable, and the time-keeper. Four of the men, who kept their allegiance, were detained by the mutineers contrary to their wishes. The cause of this singular mutiny, for which none of the usual motives could very well account, could not with certainty be known; but it was generally supposed that the instigator was Mr. Christian, one of the master's mates. Bligh himself says, in his most interesting account of this voyage and mutiny, "It will naturally be asked what could be the cause of this revolt? In answer, I can only conjecture that the mutineers had flattered themselves with the hope of a happier life among the Otaheitans than they could possibly enjoy in England."

Thus, after they had made certain of the successful termination of an enterprise which was looked upon with a great deal of interest, both in a scientific and an economical point of view, Bligh was disappointed—and he and his faithful associates were sent adrift upon the wide ocean, in an open boat, with only an hundred and fifty pounds of bread, a few pieces of pork, a little wine and rum, a quadrant and compass, and a few other implements of navigation. But they were undaunted, and they were skilful; and though they had hard weather to contend with, they reached Tofoa, one of the Friendly Islands. But as the people there were treacherous, though not quite so successful in their treachery as their former shipmates, they again put to sea, and stood for New Holland, which they reached in safety; rested for a little, and got a supply of provisions. From New Holland they again sailed in the direction of the Eastern Archipelago; and, after suffering the greatest fatigue, being exposed to the full action and vicissitudes of the elements, and forced for some time to bear famine, they reached the Dutch settlement of Coupang, in the island of Timor, without the loss of one individual by disease; though they had traversed at least five thousand miles of sea. Nay, so ardent was Bligh as a seaman, that, amid all those perils, he was occupied in making some very valuable observations.

The Dutch governor of Coupang showed them every attention; and, from the care that was taken of them, twelve were enabled to return to England. Though the adventure had failed, everybody was disposed to bestow all praise on the adventurer; and he was promoted to the rank of captain, and appointed to the command of his Majesty's ship Providence, in order to repeat the voyage.

The Providence, with the Assistant, a small ship, in company, sailed on the 3rd of August, 1791. His instructions were to procure the bread-fruit trees for the West Indies, and, on his return, to examine the passage between the north of New Holland and New Guinea—which, in his former voyage in the Bounty, he had been the first to navigate.

On the 9th of April, 1792, they reached Otaheite; and, by the 17th of July, they were ready to leave the island, having on board twelve hundred and eighty-one tubs and pots of plants, all in the finest condition. There was no mutiny on this voyage; but the passage between New Holland and New Guinea was dangerous; and it was the 2nd of October before the captain reached his old friends at Coupang. He remained there for a week, replacing with plants from that island those that had died on the voyage; and then he came to the Atlantic by the Cape of Good Hope, which he contrived to pass so closely as never to have a lower temperature than sixty-one degrees of Fahrenheit.

On the 17th of September, he anchored at St. Helena, collected there a number of trees, and among others the akee; and, leaving twenty-three bread-fruits, and some other valuable plants, he sailed, and reached St. Vincent on the 23rd of January, 1793—where he left with Dr. Anderson, the superintendent of the Botanical Garden, three hundred and thirty-three bread-fruit trees, and two hundred and eleven fruit trees of other kinds, receiving at the same time nearly five hundred tropical plants for the Botanical Garden at Kew. From St. Vincent, Captain Bligh sailed for Jamaica, where he left three hundred and forty-seven bread-fruits, and two hundred and seventy-six others, which were a selection of all the finest fruits of the East. Some of the plants were also left on the island of Grand Cayman; and the ships finally came to the Downs on the 2nd of August, 1793.

But, after all the peril, hardship, and expense thus incurred the bread-fruit tree has not, hitherto at least, answered the expectations that were entertained. The banana is more easily and cheaply cultivated, comes into bearing much sooner after being planted, bears more abundantly, and is better relished by the negroes. The mode of propagating the bread-fruit is not, indeed, difficult; for the planter has only to lay bare one of the roots, and mound it with a spade, and in a short space a shoot comes up, which is soon fit for removal.

Europeans are much fonder of the bread-fruit than negroes. They consider it as a sort of dainty, and use it either as bread or in puddings. When roasted in the oven, the taste of it resembles that of a potato, but it is not so mealy as a good one.

CHAPTER IX.

CARBONACEOUS SECRETIONS—STARCH—THE POTATO.

THE plants mentioned in the preceding chapters all of them yield in the food which they supply one or other of the carbonaceous secretions. The flour of wheat contains starch, barley contains sugar, and the fruit of maize oil; but these plants are more indebted for their use amongst mankind to the nitrogenous matters they contain than to any other secretion. The plants now to be mentioned yield only or chiefly the carbonaceous secretions. There, it will be recollected, are starch, sugar, and oil.

Of the plants yielding starch, none are more important than the potato; but its importance at the present day is not so much given to it by the starch it contains as by the small quantity of nitrogenous matter which is found in it. In estimating the potato as an article of diet, its composition should always be taken into consideration; and this will point out the fact, that although potatoes have been used as a substantive article of diet by man, they stand very low in their nutritionary power, and that starch is their distinguishing alimentary secretion. Although eaten by the poorer classes for the sake of its fibrine, it is never employed thus in a state of society which it is desirable to maintain. The potato is consequently placed here amongst plants yielding carbonaceous secretions, lest the ordinary impression that it is a food comparable to the European cerealia should be countenanced.

The composition of the tuber of the potato is as follows:—

Water	72
Starch	26
Fibrine . . .	2
	100

With the exception of turnips, it contains less fibrine than any of the substances ordinarily used as food by man. This will account for the fact, that persons who subsist entirely on potatoes are obliged to eat very large quantities, in order to obtain from them a due supply of nutriment. Drs. Lindley and Playfair found that, upon the average, an adult Irish peasant ate not less than fourteen pounds of potatoes every day. It thus becomes a question as to whether this tuber is the economical food it has been so often represented. Whether, however, it be a desirable article, as a principal diet or not, there can be no question of its advantage as an adjunct to a food containing the flesh of animals.

The common and very general culture of the potato in this kingdom at the present day renders it difficult of belief, that so comparatively short a period should have elapsed since its introduction, and that the time when this vegetable was served up in small quantities as a rarity should be in the present recollection of aged persons.

There is strong evidence for believing that this plant was first introduced into England by the colonists adventuring to North America under the auspices of Sir Walter Raleigh, who had obtained a patent in 1584 from Queen Elizabeth " for discovering and planting new countries not possessed by Christians." Thomas Heriot, afterwards known as a mathematician, was among these voluntary exiles; who, however, all returned within two years after they had first gone forth for the purpose of founding a colony. These voyagers most probably brought home the potato, since in Heriot's report of the country, which is printed in De Bry's collection of voyages, he describes (vol. i. p. 17), under the article Roots, a plant called *openawk*, which there is little doubt is identical with the potato. " The roots of this plant," says he, " are round, some as large as a walnut, others much larger; they grow in damp soils, many hanging together as if fixed on ropes. They are good food either boiled or roasted." The introduction of this plant into Ireland by Sir Walter Raleigh, on his return from Virginia, is indeed well authenticated by corroborative testimony. In the manuscript minutes of the Royal Society, we find that Sir R. Southwell distinctly stated to the fellows, that his grandfather was the first who cultivated the potato in Ireland, and that for this valuable root he was indebted to Sir Walter Raleigh. Among the anecdotes told of this enterprising voyager, it is said that when his gardener at Youghal, in the county of Cork, had reared to the full maturity of "apples" the potatoes which he had received from the knight, as a fine fruit from America, the man brought to his master one of the apples, and asked if *that* were the fine fruit. Sir Walter, having examined it, was, or feigned to be, so dissatisfied, that he ordered the "weed" to be rooted out. The gardener obeyed, and in rooting out the weeds found a bushel of potatoes.

In contradiction to the above account, Dr. Campbell, in his 'Political Survey,' states that this plant was not introduced into Ireland until the year 1610; while some writers affirm that the people of that country were in possession of the potato at a period prior to the one just assigned. One supposition is, that this root was brought from Santa Fe into Ireland in the year 1565; and another, that it is of so very ancient a date in that island as to make it equally probable that it is a native vegetable of the country. It is found, however, that the plant carried to Ireland by Captain Hawkins, in 1565, was the Spanish batata, or sweet potato. The claim to its greater antiquity in that country was made by Sir Lucius O'Brien, who stated to Mr. Arthur Young that the venerable Bede mentioned this plant as being in Ireland about the year 700. Sir Lucius did not, however, point out the passage containing any proof of his assertion; and the potato, largely as it is cultivated in that country, has not yet made out its title to a place in the indigenous flora of Ireland.

Gerarde mentions in his 'Herbal,' published 1597, that he cultivated this plant in his garden, where it succeeded as well as in its native country. He gives a drawing, which he distinguishes by the name of Virginian potato, having, as he states, received the roots from Virginia, otherwise called Nozembega. It was, however, considered by him as a rarity, for he recommends that the root should be eaten as a delicate dish, and not as common food.

From the authority of more than one writer, it would appear that the potato was brought into southern Europe through a different channel, and at an earlier period than the introduction of the root from Virginia into this country. Clusius relates that he obtained this root at Vienna in 1598, from the governor of Mons in Hainault, who had procured it in the preceding year from Italy, where, in common with the truffle, it had received the name of *taratouffli.* Peter Cieca, in his 'Chronicle,' printed in 1563, chap. xl. p. 49, relates that the inhabitants of Quito and its vicinity, besides producing maize, cultivated a tuberous root which was used as food under the name of *papas:* this, it is affirmed, is the same plant which had been transplanted to the south of Europe, and which Clusius received from Hainault.

Humboldt rather doubts if sufficient proof can be produced of this root having been indigenous to South America. Upon the interesting subject of the native country of the potato, we gladly quote the following account by Mr. Cruickshanks:*

"Mr. Lambert, in the tenth volume of 'Brande's Journal,' and in the appendix to his splendid work on the genus *Pinus*, has collected many valuable facts which prove that the potato is found wild in several parts of America, and among others in Chili and Peru. Don José Pavon, in a letter to Mr. Lambert, says, 'The *Solanum tuberosum* grows wild in the environs of Lima, and fourteen leagues from Lima on the coast; and I myself have found it in the kingdom of Chili:' and Mr. Lambert adds, 'I have lately received from Mr. Pavon very fine wild specimens of *Solanum tuberosum*, collected by himself in Peru.' There is also a note from

* Originally published in Dr. Hooker's 'Botanical Miscellany,' and quoted in the 'Journal of the Royal Institution,' for December, 1831.

Mr. Lambert on the same subject, in the third volume of the 'New Edin. Phil. Journ.,' with an extract from a letter of Mr. Caldcleugh, who sent tubers of the wild plant some years ago from Chili to the Horticultural Society. But it is frequently objected, that in some of those countries where the *potato* is found wild, it may, like many other species met with in that state in America, be an *introduced*, not an *indigenous* plant. There are, however, many reasons for believing that it is really indigenous in Chili, and that wild specimens found there have not been accidentally propagated from any cultivated variety. In that country it is generally found in steep, rocky places, where it could never have been cultivated, and where its accidental introduction is almost impossible. It is very common about Valparaiso, and I have noticed it along the coast for fifteen leagues to the northward of that port; how much farther it may extend north or south, I know not. It chiefly inhabits the cliffs and hills near the sea, and I do not recollect to have seen it at more than two or three leagues from the coast. But there is one peculiarity in the wild plant that I have never seen noticed in print, that its flowers are always *pure white*, free from the purple tint so common in the cultivated varieties; and this, I think, is a strong evidence of its native origin. Another proof may be drawn from the fact, that while it is often met with in mountainous places, remote from cultivated ground, it is not seen in the immediate neighbourhood of the fields and gardens where it is planted, *unless a stream of water run through the ground, which may carry tubers to uncultivated spots.* Having observed the distribution of this and other plants through the agency of the streams employed for irrigating the land, I am led to think that the wild specimens found near Lima may have had similar origin. If they occurred in the valley, this is more than probable, as almost the whole of the land is either cultivated by irrigation, or the uncultivated spots are overflowed when the river is swelled by the rains in the interior. Upon the whole, it may be safely concluded that this important vegetable is really indigenous to

Chili; but with respect to Peru, some further evidence appears necessary to remove all doubt on the subject. The question can only be decided by ascertaining the exact situations in which the plants present themselves at Lima and Chancay, especially with respect to land that is or has been cultivated. It would be interesting, too, to know the colour of the flowers."

Though now so extensively used, the value of this root as an esculent was not perfectly appreciated for a great length of time in this country, during which period it was indeed only cultivated in gardens, and that as a curious exotic. The potato was considered as a great delicacy in the reign of James the First. At that period, though it formed one of the articles provided for the household of the queen, the quantity used was extremely small and exorbitantly dear, being at the price of two shillings per pound.* This esculent remained equally scarce throughout the turbulent times of the succeeding reign, and during the Commonwealth. Its cultivation very gradually spread in different parts of Ireland, and also into Lancashire, but not till nearly a hundred years after the discovery of Virginia by Raleigh. Mr. Buckland, of Somersetshire, in the year 1663, drew the attention of the Royal Society to its value, earnestly recommending the general cultivation of the potato throughout the kingdom to guard against a famine. This appeal was not made in vain. A committee was appointed to inquire into its merits, and all those Fellows of the Society who had lands adapted for the growth of the potato were entreated to plant them with that vegetable: while Mr. Evelyn was requested to notice the subject at the close of his 'Sylva.' This celebrated man appears, however, not to have been aware of the importance of the potato as an article of food, for he did not mention it until more than thirty years after that period, and then in rather slighting terms. In his 'Kalendarium Plantarum,' the first gardener's calendar published in Britain, he thus writes:—" Plant potatoes in your worst

* Eden on the 'State of the Poor.'

ground. Take them up in November for winter spending, there will enough remain for a stock, though ever so exactly gathered." In another of his works, 'Acetarius,' he remarks that the small green fruit or apples of the potato make an excellent salad. This assertion has not, however, been verified by experience.

The zeal of the Royal Society to promote the growth of this vegetable failed for a long time to exercise much influence upon the habits of the nation; and, if we may judge from the opinions which were published respecting the plant, we must conclude that the necessities of the poor of Ireland, who have ever been left too entirely to their own resources, did more to promote the culture of potatoes than all the labours of the learned, and the philanthropy of the patriotic. At the end of the seventeenth century one writer on gardening, indeed, admits that "potatoes are much used in Ireland and America as bread, and may be propagated with advantage to poor people." Woolridge, who wrote in 1687, twenty-four years after the appeal of Mr. Buckland, describes potatoes as being very useful in "forcing fruits," stating that they are planted in several places in this country to good advantage; he adds, "I do not hear that it has been yet essayed whether they may not be propagated in great quantities for the use of swine and other cattle." The celebrated Ray, who began to publish his 'Historia Plantarum' in 1686, takes no further notice of this vegetable than by saying that it is dressed in the same manner as Spanish batatas. Merrett, who wrote in the following year, records that potatoes were then cultivated in many fields in Wales, but in what part of the principality he does not mention.

On the other hand, Lisle, who made observations on husbandry from the year 1694 to 1722, is wholly silent about the potato. In Mortimer's 'Gardener's Kalendar' for 1708, this plant is directed to be sown in February; and, as if its character had not been generally known, it is added—that "the root is very near the nature of the Jerusalem artichoke, although not so good and wholesome, but that it may prove good for swine." In the

'Complete Gardener,' by the eminent nurserymen Loudon and Wise, the seventh edition of which was published in 1719, no mention is made of this root; and Bradley, who wrote about the same time, and whose very extensive works on horticultural subjects treated expressly on new improvements in the art, notices it as if by compulsion. "They (potatoes) are," says he, "of less note than horse-radish, radish, scorzonera, beets, and skirret; but as they are not without their admirers, I will not pass them by in silence."

These facts and extracts are curious, as they serve to show that this most valuable article of food was not brought into general use by the skill and labour of professional men, but in defiance of their prejudices and the bad methods of culture which they promulgated. There can indeed be little doubt that the imperfect modes of both cultivating and preparing the potato as an esculent were in a great measure the causes which prevented its more speedy adoption as a wholesome and substantive article of food; while this very ignorance of its nature and management produced the low estimation in which it was held by writers about the beginning of the eighteenth century.

To those who know anything practically of the cultivation of this plant, it must be evident how much the early sowing, the late taking up, and the leaving in the ground during winter of the roots intended for propagation, tended to deteriorate the quality of the potatoes. These circumstances, together with the little culinary skill exercised in its preparation, caused it to appear under no very tempting form. A person who had been invited to taste the first potatoes which were planted in the county of Forfar, in or about the year 1730, related that the roots had been merely heated, and that they adhered to the teeth like glue, while their flavour was far from agreeable. The food was about to be condemned through the ignorance of the cook, when the accidental arrival of a gentleman who had tasted a potato in Lancashire, caused the rejected roots to be remanded back to the hot turf-ashes, till they became as dainty as they had before been nauseous.

We have no records of the early practice and progress of potato-husbandry in Ireland. The more tardy progress and the less favourable results attendant on this culture in England, might induce a belief that it had been better conducted in the former country; though no doubt the more genial climate of Ireland, its humidity, and the absence of those chilling winds from the east, which are so often fatal to the tender spring crops of England, gave to it a natural advantage, and might perhaps sufficiently account for the superiority of this branch of husbandry in Ireland over England.

The early practice in this country of planting potatoes in February was, in itself, an effectual bar to their goodness as field culture, since the young plants betray their origin to have been from a warmer climate, by their inability to bear the slightest degree of frost with impunity; so that if they put forth their tender heads to the nipping frosts of spring, a great part of the crop is certain to fall a sacrifice. The better quality of the potato grown in Ireland, and its excellence as a substantive article of food among a population sunk to the lowest state of poverty, caused it to be brought into general use in that country, finding its way even to the tables of the rich, at a period when it was scarcely known in the sister island.

The introduction of this plant into Scotland was probably earlier than into any part of England, with the exception, perhaps, of Lancashire. The people living in that county were then distinguished by a marked difference of habits, manners, and character from their neighbours. A remnant of these peculiarities is even still to be found, notwithstanding the singularities of the inhabitants and local circumstances combined to render this a favourable situation for the introduction and improvement of the potato.

The land in Lancashire is rather poor, and the climate rainy, so that wheat, with even the present improved system of husbandry, cannot be raised to very great advantage. Oats were consequently there, as in Ireland and the Lowlands of Scotland, the staple production. The mechanics, who worked chiefly in iron and brass, were all cottagers, who followed their respective employments in the winter, and raised food for themselves upon their little patches of land in the summer. The population of Lancashire then bore a great resemblance to the cotters of Ireland. They were, however, more ingenious in handicraft works, and still more resembled the manufacturing peasantry in the centre and south of Scotland, who grow the whole or the greater part of their food upon their cottage lands. Even the education of their children was formerly often obtained out of the produce of their little field; the schoolmaster went "thigging," that is, collecting a portion of produce from every cottager, in proportion to the wealth of the individual, and to the number of pupils he might have contributed to the school-room. The poor likewise were relieved by a voluntary contribution of produce, and it is probable that this system worked as well as that of a compulsory rate. Even in the smaller burghs of Scotland, and in the villages where the lands are held on *feu* or perpetual lease, the same system was, and in many places still is, followed. The portioners, as they are called, are allowed a house in the village, and land for their subsistence, in the surrounding fields.

In such a state of the peasantry the cultivation of the potato would offer peculiar advantages, as no other substantive article of food could be raised by the inexperienced rustic in equal quantities, with so little risk and trouble, and without any but his own and his family's labour being required for its culture and after-preparation. Accordingly, when once this plant was introduced into cottage cultivation in Scotland, its importance was quickly recognised.

It is understood, however, that this valuable root was not, until the year 1728, made the object of useful culture among the Scotch, and they were then indebted to a cottager for first attempting its culture. This man's name was Thomas Prentice; he was a day-labourer living near Kilsyth, in Stirlingshire, and drawing his subsistence partly from the produce of his little plot of ground. This crop proved extremely valuable, and was almost instantly in demand for propagating other crops, first among the cottagers, and then among the farmers. Prentice continued to cultivate this root very carefully, and to supply his neighbours with the produce of his crop. He was, moreover, frugal and industrious, so that in a few years he found himself in possession of two hundred pounds, no small fortune at that time and in that place. When he had "made his fortune," he sank his capital in an annuity, at a good interest, upon which he lived independently to an old age. The last years of his life were spent in Edinburgh, where he died in the year 1792, at the advanced age of eighty-six, having thus been, for sixty-four years, a witness to the happy effects of the blessing which he had been instrumental in conferring on his country.

But notwithstanding the success that attended the culture of the potato among the cottagers, its progress among the higher classes in Scotland was retarded by the opinions of the writers formerly alluded to; while, what is not a little singular, a mistaken zeal in religious matters made some of the Scotch folks hostile to the innovation. "Potatoes," said they, "are not mentioned in the Bible," and thus the same anathema was pronounced against them as against the "spinning-wheel" and the "corn farmers."

The name of this plant was indeed inserted in the 'Hortus Medicus Edinburgensis,' published by Sutherland in 1683. It is therefore probable that the potato had been introduced as a curiosity into some of the gardens about Edinburgh some time before it was brought into full culture by Prentice. But if its management was the same as that recommended by so great an authority as Evelyn, the produce was most probably of little value.

The year 1742, which was long remembered in Scotland as "the dear year," gave an impulse to the cultivation of the potato. Old people who were still living at the beginning of the present century represented the state of things in the summer of 1743 as being dreadful. Many of the destitute wandered in the fields seeking to prolong the misery of existence by devouring the leaves of peas and beans, of sorrel and other wild plants; while not a few perished from absolute want, and still more were carried off by those diseases which always follow and aggravate the devastations of famine. This state of distress naturally called the general attention to the cultivation of the potato, and indeed to the whole agriculture of the country. So that, during the latter half of the eighteenth century, the practice and science of husbandry made much more rapid progress in Scotland than in England. Previously to this general scarcity in 1743, some potatoes which were growing in the county of Roxburgh were so uncommon as to have been considered objects of curiosity. But the state of things soon altered, and immediately after "the dear year" the farmers of Lothian began to make this a branch of field husbandry.

In England, with the exception of Lancashire, the progress of the cultivation of the potato continued at an extremely slow pace. It was known in Yorkshire only as garden produce down to 1760; and in Somersetshire it was rare indeed to meet with a whole acre under this culture so late as 1770.

So little attention had been bestowed on this subject even by the most intelligent landowners, that Miller, in the quarto edition of his 'Gardener's Dictionary,' published in 1771, names only two varieties, and founds the distinction of these not upon quality, or time of coming to maturity, but on the trifling accident of a red and of a white colour, which is found to be productive of no other difference. At present, however, the varieties are so numerous, without any reference to colour, that it would be equally vain to attempt their description within any limited compass, as it is unnecessary to point out their uses or enumerate their properties.

Not many years after the appearance of Miller's valuable work, the potato began to form an important article of English husbandry; and in the year 1796 it was found that in the county of Essex alone seventeen hundred acres were planted with this root for the supply of the London market.*

The culture of the potato is now so extensive in this country, that an abundant supply can be obtained in all places throughout the year; and such have been the improvements in the culture, and the varieties to which these improvements have led, that a succession is furnished fresh out of the earth for nearly six months in the year. The early sorts have been the reward of horticultural skill now so successfully exerted in this country; under the shelter of frames, with careful management, the tender young plants are made to struggle through ungenial weather, and to produce tubers at the earliest approach of summer.

The culture of the potato in the rest of Europe appears to have attained to no great extent until during the last century. In the latter half of this period it was made in more than one country a subject of interest and inquiry. Several works published about that time, treating on its culture, are to be found in the French and German languages. From one of these† we learn that the potato was introduced from England into the Netherlands; and was thence transplanted into some parts of Germany. It was first cultivated in Sweden in 1720, but, notwithstanding the exertions and recommendations of Linnæus, it did not come into general cultivation until 1764, when a royal edict was published for the encouragement of this branch of husbandry.

The potato was still unknown to the agriculturists of Saxony so late as 1740; but so rapidly did its culture increase, that less than thirty years after the above date, a small detachment of the French army, while in that country, having its supplies wholly cut off, the soldiers subsisted for eight or ten days entirely on potatoes ob-

* Loudon's 'Encyc. of Gardening.'

† 'Traité de la Nature de la Culture et de l'Utilité des Pommes de Terre, par Un Ami des Hommes,' 1771.

tained from the fields; nor was this manner of living considered among them as by any means a hardship.

The Swiss discovered the value of this cultivation about the same period in which it was introduced into Sweden, and in a few years they not only grew potatoes among their mountains in abundance, but had likewise learnt the art of drying them, grinding them into flour, and making them into bread. A traveller in 1730 relates that the miller of Untersen had scarcely anything to grind but potatoes; and in 1734 a peasant was so well aware of the profit arising from this culture, that he bought a small field situated near the Swiss mountains, and in only two years after paid the purchase-money by the produce of his potato crops.*

It is said by another writer,† about the same period (1770), that during the twenty-five or thirty years preceding, the culture of this root in some parts of Switzerland had so much increased, that it constituted the food of two-thirds of the people. In the present day it still forms a principal article of food among the peasantry of that country.

It likewise makes a very prominent figure in the husbandry of Poland, where it is cultivated to an extraordinary extent. In 1827 as much as 4,288,185 korzecs‡ of potatoes were produced in that country, while 4,439,399 korzecs of rye were reaped, 3,183,023 of oats, 4,506,062 of barley, and 751,076 of wheat.§

The cultivation of the potato has been of late years introduced into some parts of India with every prospect of success. In Bengal, especially, it has been attended with the most satisfactory results. Bishop Heber, in his interesting Journal, notices in several places the progress of this culture, the crops becoming by degrees more and more extended. These roots were at first very unpopular, but they have gradually gained favour, and are now spoken of as being the best gift which the

* 'Traité de la Nature,' &c.

† 'Dictionnaire de Bomare,' Art. Pommes de Terre.

‡ One korzec is nearly equal to two hundredweight.

§ 'Foreign Quarterly Review,' No. xiv. p. 531.

natives ever received from their European masters. They are, we are told, held in much esteem, " particularly by the Mussulmans, who find them very useful as absorbents in their greasy messes."* The following observations are gathered from the same volumes. In the neighbourhood of Patna many descriptions of European vegetables are brought to market in abundance; they are, however, reared for the consumption of the European inhabitants alone, the natives rejecting all but the potato, which, though known only since the last few years, may perhaps soon take its rank with rice and plantains, as a substantive article of food with the frugal Hindu. It is already largely cultivated in that district, but can never become an exclusive crop, inasmuch as those humid stiff soils which are peculiarly favourable to the growth of rice are wholly unsuited to the potato, the cultivation of which must therefore be confined to those sandy and drier soils which are inimical to the culture of the rice plant. In such situations this vegetable of English production may be raised with unmixed utility, while the result of so important a supplementary crop may, in seasons of the failure of the rice harvest, avert the evils of famine, and diminish, in one strong point of view, the resemblance between the Indian and Irish peasantry—their reliance on a single article of food. The almost infinite division and subdivision of their farms is in India, as in Ireland, a fertile source of poverty and wretchedness.

The observations of another intelligent writer† on the same subject likewise tend to show the advantages which may result from this cultivation in Hindustan. He remarks that a dry season is prejudicial to the rice crop, while it is favourable, or rather not so hurtful, to that of the potato, and " therefore nature points out the one crop as a substitute when the other fails." It is certainly a fortunate circumstance that the superstition by which the Hindu is enslaved does not shut up every

* Heber's 'Journey,' vol. i. p. 13.
† Tennant, 'Indian Researches.'

avenue to innovation and improvement. No religious prejudice forbids the culture of this vegetable, and therefore the natives evince a readiness to adopt it in all situations where it can be as easily obtained as other food.* The soil of Bengal, and the long continuance of dry weather, may, perhaps, be obstacles sufficient to prevent this root from becoming the principal nourishment of the lower orders; but it is supposed that if it could be raised cheaper than rice, the potato would be generally preferred by Hindus. At present it is almost universally served up at European tables in Bengal in the same manner as in England; and though the crop is less abundant, and the roots are smaller in size, they are scarcely inferior in quality to those of this country.

Wherever the Englishman seeks a home, he always strives to naturalize this root, which was so long struggling into notice in his own country. Now, amid all the luxuriant and delicious vegetation of tropical climes, he still retains his preference for that simple vegetable, which he considers almost a necessary of life. At Ceylon all his attempts to cultivate this plant have been nearly vain, as it will not thrive in that island at any place except at Candy, a town almost seventy miles in the interior, and the only spot in the country where European vegetables come to any degree of perfection. A basket of these roots is sent every morning thence for the supply of the governor's table, as all the indigenous vegetables are considered an inferior substitute for this necessary auxiliary to the Englishman's more substantial fare.†

* The Southern Africans in this respect prove themselves more obstinately adverse to innovation than the Hindu. "The Matchappees, though very fond of potatoes, have never been prevailed upon to plant any, because they resemble nothing which has been handed down to them from their forefathers, to whose manners and customs they seem as strongly attached as the Hindu or the Mussulman."—Campbell's 'Travels in South Africa,' vol. i. p. 101.

† Heber's 'Journey,' vol. iii.

It would be superfluous to give any but a slight description of a plant so well known, as annually forming new subterranean tubers, and rising with weak, slender, and branching stems, from two to three feet in height. The leaves are composed of leaflets of unequal size, the flowers are white or of a purple tinge, producing large berries, which are green at first, but which change nearly to black when at maturity, and contain numerous small white seeds. The supposed root, but which is really an underground stem, consists of many tubers connected to the base of the stems by cords or fibres, and having minute branchy rootlets which issue from different parts of each tuber, and which serve to convey nourishment to the plant. The several points whence these are produced are usually called the eyes of the potato, and each of them contains the germ of a future plant.

The uplands and the lighter soils are found to be much better adapted than rich and strong lands to the cultivation of the potato. This root has one great advantage over all grain and leguminous crops, in being perfectly secure against the late rains, which often completely destroy the hopes of the farmer. Rains which have no bad effects upon the potato, injure the bloom upon the cerealia, or cause them and the legumes to run so much to straw as not only to be less productive of seed, but actually to lodge and rot. The quality of the roots is no doubt a little deteriorated by excess of moisture, but when they are sufficiently matured rain has little or no injurious influence over them.

This plant seems alone to have been wanted to make the agriculture of the British Isles complete. Upon the western side, and among the mountains, a grain crop is always precarious, and seldom or never good. Scanty and bad as it is, its culture is also expensive, as, after it has been reaped, it cannot be left in the field to dry, but must be taken wet into barns constructed of wicker-work for the purpose of obtaining a current of air, and there suspended upon ropes. Such a process is not merely tedious and costly, but absolutely incompatible with the culture of any considerable quantity of grain.

A new soil produces better potatoes than worked land in the highest condition; and ground which is light and spongy, provided that it has the advantage of plenty of moisture, which does not stagnate, is better than the strongest lands. The reasons are obvious—the tubers will form with the greater ease according as the resistance is less which the ground offers to their expansion, while so large a quantity of vegetable matter elaborated in so brief a space demands no little supply of humidity. Now the little patches among mountains are composed of the very best soil for this purpose, being generally a mixture of sand and vegetable matter. Such a soil is readily penetrated throughout by every shower, and yet the water does not stagnate; as a mountainous country near the sea is, in high latitudes, always one in which there are frequent showers, the watering of these mountain patches is precisely that which is most beneficial, and therefore it would be difficult to imagine a soil and climate better fitted for the growth or for producing excellence in the quality of these tuberous roots.

When cultivated in tenacious argillaceous soils, if the summer be dry, the swelling of the tubers is prevented by the mechanical pressure of the earth; and on the other hand, such soils, if kept constantly in a state of moisture, produce immature tubers, which are sodden, waxy, and otherwise of bad quality. But in ground which to all appearance is little else than loose sand, if there be humidity enough, potatoes will grow and be of excellent quality, and, even should there be any failure in the sufficiency of moisture, the quality of roots yielded by the first planting will be good, but they will be small, and too hard for propagating. In the mountain districts of Scotland the frequent rains in all seasons are of so constant recurrence, that a whole week of dry weather is considered worthy of record. This circumstance, so unfavourable to the maturity of other crops, operating in union with the peculiar nature of the soil, causes the situation to be well adapted to this cultivation:

while there are still other advantages on the west coast of the Scottish Highlands, and which apply in a great measure to Ireland. In the first place, there is very little frost—never any except in high and comparatively inland places—until the potatoes are come to their proper growth. Again, spade husbandry is best adapted for potatoes, and it is also the best for those places where the acclivities are generally too abrupt, and the spots of land really worth culture too small to admit of the use of the plough with any advantage. Persons who are acquainted with only flat countries, where there is little inequality of soil in a field, and no absolute sterility in a parish, but that which is consequent on neglect, can form but an imperfect idea of the variations witnessed in a little portion of mountain land. In a section of thirty yards there may be ten yards of useless gravel in which moisture can find no resting-place till it be fathoms deep in the ground, ten where there is not above three inches of soil on the bare rock, and ten of soil of the very best quality. The first and second portions would not of course produce a crop of any description, and yet in the use of the plough it would be necessary to pass over them, or to lose about the same time in turning; so that the expense of ploughing such a piece of land would be triple that of ploughing the same extent of a champaign country. On the other hand, when the spade is employed, the culture of the fertile spots is not more expensive than if they were continuous, and situated on the flattest surface in the island; while the nature of the soil renders the labour of turning it and taking up the crop comparatively easy.

Thus the potato has this great and peculiar advantage over all other substantive esculent vegetables, that it can not only be cultivated in places where no others can be profitably grown, but that it can be cultivated there at small expense; while it is less subject to disease and more secure against degenerating in those situations than on richer lands. Consequently, in a soil so diversified as that of Britain, and where the communication between any two places is so easy, an almost unlimited supply of potatoes may be grown without any diminution of the breadth of profitable crop of the cerealia, the legumes, or indeed of any other useful plant; while this crop is recommended as causing an amelioration rather than an exhaustion of the soil.

The most usual and profitable manner of propagating this vegetable is by putting into the ground the tubers, either whole or divided into as many parts or *sets* as they contain eyes. The quality of soil best adapted for this culture has already been sufficiently indicated. The sets are planted in lines from twenty to twenty-four inches apart, either in drills or by the dibble, at intervals of from twelve to fifteen inches. The proper season for planting the main crop is from the middle to the end of March, and a peck of seed potatoes is usually required to plant a bed of twelve feet by thirty-two. In field culture eighteen bushels are planted in one acre. The young plants are kept free from weeds, and when they are about half a foot or a foot high, some earth is drawn around the lower part of the stem; little or no further care is required till the taking up of the crop. The plants are suffered to remain until the roots attain to their full growth. This state is indicated by the stalks beginning to decay, which usually takes place at the commencement or latter end of October, when the roots should be dug up for the winter store. Some careful cultivators pinch off the blossoms as they appear on the plant: the good effects of this practice have been very often proved, it being supposed that the weight of the tubers of each plant is increased an ounce in consequence, or considerably above a ton per acre.* The cause of this result has been thus explained:—the fluid or sap gives sustenance alike to the tuber and blossom, and therefore, if a portion be diverted from the formation of the blossom, it will be exerted for the enlargement of the root.

This plant may be propagated also from cuttings or layers of the green shoots, and from seeds. The first is

* 'Hort. Trans.' vol. i.

not at all advantageous for any culture, except in some instances, when it is required to multiply as quickly as possible a rare sort.

The tubers obtained from seeds are at first very few and very small, and therefore seed cultivation is by no means advisable to "the grower" of potatoes; but it is of great service to "the breeder," who seeks to improve its quality. No vegetable is more yielding to the hand of the cultivator than this plant. Raising it from seed enables him to obtain varieties without end, and attention to the qualities of those between which the crossings take place, admits of obtaining any particular quality that may be wanted.

On the other hand, by cultivation from the tubers a good variety may be extended and preserved after it has been once obtained; as the plant from the tuber is not a new plant, like that which is procured by the operations of flowering and seeding, but an identical part of the old one. Though the planting tubers will not lead to any new variety, it may have effects every way as advantageous; for no plant profits more by changes from one district to another.

Besides improvement in quality which a judicious change produces, it likewise often prevents a disease to which the potato is liable. This disease is known by the technical name of the *curl* or the *curl-top*, a name by no means inexpressive of the appearance of the plant when under its influence. The top leaves begin to shrink just about the time that the tubers should form, the young shoots cease to expand, and the whole plant assumes very much the appearance of the tip of a cherry twig, when the under leaves are assailed by aphides. From the moment in which this disease appears, all further growth in the plant ceases, and though it may linger in a yellow and sickly state until autumn, the produce, if any, is little, and that little is of a bad quality. If, as soon as the disease shows itself, the tuber which has been planted be taken up, it will be found much firmer and less exhausted than those of the plants of the same age that are in a healthy state. This at the same time points out the cause of the disease and suggests its remedy. The old tuber has been too compact for yielding to the vegetative powers of the plant.

The curl first made its appearance in this country in the year 1764, in Lancashire, where potatoes had been first introduced into British field culture, and had been propagated without any change of seed. From Lancashire this disease spread over all the potato districts of Britain, and as the cause and cure were equally unknown, there was a general apprehension that the plant would be exterminated. Premiums were offered by different agricultural societies to those who should point out a remedy for a disease so destructive; in consequence of which many speculations and theories were raised, which, however, led to very little practical utility.

The discovery of at least a temporary preventive, and therefore of the probable cause, was made, as is believed, more from accident than design, in the neighbourhood of Edinburgh. Some of the growers in that situation were in the habit of procuring seed potatoes from the cold moorland districts, and fields planted with these were free from the curl. Upon inquiry it was found that in those bleak and humid situations the potato crop was so late that the frost came on and blackened the leaves, while they and the stems were still green, and the tubers of course not ripe. The change of climate was therefore not the sole cause of prevention, if indeed it was the cause at all, for when the full ripened potatoes were planted in the moors, the curl appeared in them, in situations where there was none in the native potatoes.

It was thus found that the curl could be prevented by using tubers that were not quite ripe.

A writer in the 'Gardener's Magazine' for May, 1827, thus ingeniously accounts for this fact:—"The potato tuber is a perfect organized system, in which the circulation regularly proceeds, and if suffered to ripen will then tend to decay; but if separated before ripe from the stem or stalk which furnishes it with blood or fruit sap, descending from the leaves, the circulation of the blood-sap is suddenly arrested. The ripe potato, having performed all its operations, becomes more inert; but the circulation of the sap in the unripe tuber having been stopped, it starts more readily, and with greater vigour, when planted: the one appears to die, worn out with age; the other seems accidentally to have fallen asleep, and when awakened, possesses an unspent vigour and energy."—p. 317.

That over-ripeness is the principal cause of the disease, has been found by experience to be so much the case, that out of the same potato it is possible to make some sets that will, and others that will not, produce the curl. The portion of the tuber that is nearest to the cord by which it is fastened to the plant, ripens first, as any one may observe, especially in an elongated potato, where the root end is often so mealy as to fall to powder, when the top or thick end is soft and waxy. If such a potato be taken when only the small end is ripe enough to boil mealy, the eyes upon another of the same parcel that are upon the waxy part will all produce sound plants, while curl may appear in those which are taken from the mealy end. The soil and mode of culture may have likewise some effect in producing this evil. Experience has shown that high culture and stimulating manure tend more to produce curl than poorer treatment, —that this disease is less frequent in new lands than in those which have been long under culture,—and that it seldom appears in cold and upland places.

The potato is subject to another disease, which, although it has been observed for some years past on the continent of Europe and in the United States, did not excite much attention till the year 1845, when Great Britain became alarmed by the appearance of this disease in the potato crops of Ireland. One of the earliest writers on the diseases of potatoes is Von Martius, who, in a work* published at Munich in 1842, described several diseases which had been observed in the potato

* 'Die Kartoffeln-Epidemie.

in various parts of Germany, and one closely resembling that which appeared in Great Britain in 1845. For several years, more especially during 1842, 1843, and 1844, a disease of the potato was observed in the United States of America; and during the latter year it was so prevalent as to induce the American government to appoint a commission to inquire into the nature, causes, extent, and remedies of this disease. Although little attention had been paid to any failure in particular crops of potatoes in England, yet the writer of this possesses satisfactory evidence that potatoes were affected with the disease which prevailed in 1845, during the year 1844.

One of the earliest public notices of this extraordinary distemper appeared in the 'Gardener's Chronicle' of the 16th of August, 1845, from Dr. Bell Salter, of Ryde, in the Isle of Wight. He thus describes its character: "The first appearance is a dark spot on the margin of the leaf, which withers the leaf and spreads rapidly to the stem. The discoloration soon extends along the stem in the course of the vessels, and the whole plant rapidly becomes black, so that within three days after a plant is attacked it has become totally destroyed. With this appearance in the upper part there co-exists a fatal change in the tubers; they become likewise spotted, at first near the eyes on the upper surface; the cuticle separates; the substance becomes friable, and the change soon spreads throughout the whole potato." Such was the first account of the disease. It was soon found that it had appeared in various parts of England at the same time, and what was worse than all, that it had made its appearance in Ireland. Such was the alarm felt on this subject, that the Government thought it necessary to appoint a commission, consisting of Professors Kane, Lindley, and Playfair, to investigate the nature and extent of the disease, and the amount of probable failure in the crops from its effects, in Ireland. Such an inquiry was not necessary in England, but in Ireland, where upwards of four millions live chiefly on potatoes, it became a matter of the utmost importance to ascertain the real condition of the crops. The commissioners from Ireland presented a report that has led the Prime Minister, Sir Robert Peel, to adopt measures for a more free supply of food to this country. Not only did the disease prevail in Great Britain during the year 1845, but almost throughout the whole continent of Europe, pointing to a common cause for its origin.

In most instances the disease is easily detected, from the dry and shrivelled external appearance of the tuber, but in many cases it cannot be discovered till the potato is cut into with a knife, when one or more black spots may be seen in the very centre of the tuber. On placing the diseased tissue of the potato under the microscope, the cells are found to contain a brown amorphous matter, which give the colour to the diseased tissue. Granules of starch are also seen in the cells which appear to have been unaffected by the disease. In addition to this, crystals of oxalate of lime are frequently observed present in the interior of the cells.

On submitting the diseased potato to chemical analysis it is found that the quantity of water in the tissues has increased. Dr. Playfair made several analyses, and found that it contained 80 per cent. of water. He also found that sound potatoes contained in the same year (1845) a larger quantity of water than usual.* The consequence of this would of course be a diminution in the amount of starch. The fibrine does not appear to undergo any change in quantity, but Professor Liebig observed a curious change in the quality of the nitrogenous constituent, having observed that it was converted into vegetable casein (cheese). This substance has a much greater tendency to enter into decomposition than fibrine, and in this way Liebig accounts for the production of the disease. It is worthy of observation that none of the constituents of the affected tubers seem to have undergone any injurious change, so that however disagreeable they might be to the taste, they did not act as a poison on the system. A French experimenter, M.

* Scottish Guardian, Nov. 1845

Bonjean, put this to the test, and lived for several days on the diseased potatoes, and drank the water in which they were boiled, and yet suffered no other inconvenience than would have occurred from having recourse to a diet of healthy potatoes.

Under the microscope the granules of starch appear to have suffered no change; and when separated, they are as available for all the purposes of diet as those procured from healthy potatoes. The starch is easily separated from the potato by scraping it on a grater and throwing the softened pulp into water, when the cellular and fibrous matter will fall to the bottom of the water insoluble, and the starch will be held in suspension in the supernatant fluid. The liquid, on being decanted off and set aside, will deposit the starch, which may be re-washed, and may then be used for all the purposes of arrow-root, sago, or tapioca.

The cause of this disorder has been the occasion of difference amongst those who have written on the subject. During the progress of the disease, and especially during the latter stages in the tissues of the tuber, several species of the lower order of fungi have been observed to be present; and from a knowledge of the fact that the spores of some of these fungi are capable of engendering other forms of disease in plants, it has been concluded that they are the cause of the disease in this instance. Of those who defend this theory of the origin of the potato murrain, there is no one whose opinion is entitled to more respect than that of the Rev. M. J. Berkeley, author of a volume on the fungi of Smith's 'English Botany.' In a paper in the first volume of the 'Journal of the Horticultural Society' he says, "The decay is the consequence of the presence of the mould, and not the mould of the decay. It is not the habit of the allied species to prey on decayed or decaying matter, but to produce decay, a fact which is of the first importance. Though so many other species have this habit, these have not. The plant then becomes unhealthy in consequence of the presence of the mould, which feeds upon its juices and prevents the elaboration of nutritive sap in the leaves, while it obstructs the admission of air and the emission of perspiration. The stem is thus overcharged with moisture and eventually rots, while every source of nutriment is cut off from the half-ripe tubers." On the other hand, Professor Lindley, Dr. Playfair, Mr. E. Solly, and others, attribute the disease to atmospheric causes alone. Dr. Lindley, in the 'Gardener's Chronicle' of August 23, 1845, says: "The cause of this calamity is, we think, clearly traceable to the season. During all the first weeks of August the temperature has been cold, from two to three degrees below the average; we have had incessant rain and no sunshine. It is hardly possible to conceive that such a continuation of circumstances should have produced any other result, all things considered. The potato absorbs a very large quantity of water; its whole constitution is framed with a view to its doing so; and its broad succulent leaves are provided in order to enable it to part with this water. But a low temperature is unfavourable to the motion of the fluids, or to the action of the cells of the plant; and, moreover, sunlight is required in order to enable the water sent into the leaves to be perspired. In feeble light the amount of perspiration from a plant is comparatively small; in bright sunshine it is copious; in fact, the amount of perspiration is in exact proportion to the quantity of light that falls upon a leaf. At night or in darkness there is no appreciable action of this kind. During the present season all this important class of functions has been deranged. The potatoes have been compelled to absorb an unusual quantity of water; the lowness of temperature has prevented their digesting it; and the absence of sunlight has rendered it impossible for them to get rid of it by perspiration. Under these circumstances it necessarily stagnated in their interior, and the inevitable result of that was rot."

According to Dr. Playfair, in his lectures delivered before the Royal Agricultural Society of Great Britain, in Dec., 1845, this rot consists in a simple union of the tissues of the tuber with the oxygen of the atmosphere, a tendency to such a union being given by the imperfect manner in which the cellular tissue of the plant is developed. It is not perhaps a matter of importance which part of the plant is attacked first; but Dr. Lindley says, that "although we first see the symptoms of the disease in the leaves, and then in the haulm, yet we believe that it commences underground, in that part of the haulm which is just above the old set."

During the prevalence of the disease it was found that sound potatoes were capable of contracting the same state from unsound ones, and this points to the necessity of keeping the potatoes, when dug up, as far from each other as possible. They should be placed in some dry material, as sand, turf, dry mould, &c., and be kept in a cool place, as a high temperature favours decomposition. In the next place they should be well ventilated, as the same air remaining constantly in contact with the potato serves to increase the disease.

In planting potatoes for seed it seems desirable to avoid using those which have been in any manner diseased, and those should be chosen which have grown on lands where none of the potato crop has suffered. It is however to be hoped that it will be long before such a concurrence of untoward events takes place as produced the potato murrain of 1845. Should the visitation of this disease lead to the more general cultivation of the better kinds of food in the sister country, it may still have to be regarded as a great blessing, although its immediate effects are of so painful a nature.

In concluding this notice of the potato, we would call attention to the following table given by Dr. Lyon Playfair at the lectures above alluded to, to illustrate the relative value and cost of the potato as an article of food. In all food the most important constituent for the working man is the nitrogenous matter called protein :—

lbs.				Cost. s.	d.
25	of milk contain	1 lb. of protein	. .	3	1
100	of turnips	,,	,, . .	2	9
50	potatoes	,,	,, . .	2	1

lbs.			Cost. s.	d.
50	carrots contain 1 lb. of protein	. .	2	1
4	flesh ,, ,,	. .	2	2
9	oatmeal ,, ,,	. .	1	1
7½	barley-meal ,, ,,	. .	1	2
7½	bread ,, ,,	. .	1	2
7½	flour ,, ,,	. .	1	2
3½	peas ,, ,,	. .	0	7
3½	beans ,, ,,	. .	0	6½

The most obvious preventive of actual famine in Ireland from the effects of the potato disease is the importation of MAIZE. This course has not been neglected by the Government as a temporary measure; it is recommended to the legislature that it should be rendered always available by the importation of maize free of duty. We have given a short account of this valuable plant in a preceding chapter of this volume.

Since the above was in type, the forced crops of potatoes are making their appearance. From a large amount of evidence collected in the 'Gardener's Chronicle' of March 7, there can be no doubt that the disease has again made its appearance, and that the crop for 1846 cannot be relied on. *Under these circumstances, it is hazardous to plant potatoes, and we recommend in the most decided manner that* OATS, PARSNIPS, *and* CARROTS *be planted in their stead.*

CHAPTER X.

STARCH (*continued*)—CASSAVA—ARROW-ROOT, SAGO, ETC.

The Cassava (*Jatropha Manihot*) is known also as the edible-rooted physic-nut, and in Brazil it bears the name of *Mandioc*. It springs from a tough, branched, woody root, the slender collateral fibres of which swell into those farinaceous masses for which alone the plant is cultivated.

The height to which the cassava attains varies from four to six feet; it rises by a slender, woody, knotted stalk, furnished with alternate palmated leaves, which are smooth, and increase in breadth till within an inch and a half from the top, when they diminish to an acute point. The middle lobes are six inches long, and two inches broad in the broadest part; the two next are an inch shorter, and the outer lobes are only three inches long.

South America is held to be the native region of this plant, which formerly afforded the greatest part of their sustenance to the entire Indian population of that vast region. In the Mexican States cassava is more used on the western than on the eastern coast.

When the climate is favourable, the plant is of a hardy nature and of easy culture. It however requires the land to be of good quality, and the same spot cannot well be employed to yield two crops of it in succession. It needs a dry situation for its most successful cultivation, and when spots of a different nature are applied to the purpose, precautions must be taken, by raising hillocks whereon to set the cuttings, against the effects of excessive moisture, which would rot the plants: some mois-

Cassava (*Jatropha Manihot*).

ture is, notwithstanding this, needed by the plant at its earliest stages.

There are nine different species of Jatropha enumerated by botanists, only two of which are cultivated for human food. These two are—

The *Jatropha Manihot*, or bitter cassava ; and

The *Jatropha Janipha*, or sweet cassava.

The first of these varieties, when in its natural state, is highly poisonous; while the other, although equally agreeable and wholly innocuous, is yet not cultivated to anything like an equal extent. The two roots are very similar in appearance, their only perceptible difference being a tough, ligneous fibre or cord running through the heart of the sweet cassava root, which the bitter variety is wholly without. Bread is made of both kinds, which is palatable and wholesome; and although its taste may be thought somewhat harsh by persons accustomed to soft fermented bread made from wheaten flour, cassava bread is not without its admirers, and is in such high repute with those who have been accustomed to its use, as to be frequently procured at some expense and trouble by Creole families who have transferred their residence to Europe.

The tubers are spindle-shaped, much resembling parsnips in appearance: they are generally about fourteen or fifteen inches long, and four or five inches thick at the middle. When first dug out of the ground they are washed clean; the rind, which is of a dark colour, is then peeled off, and the root is ground or grated. In Brazil, where the preparation of mandioc is carried on to a larger extent than in any other place, many persons are employed together in peeling the roots, which are then applied to and pressed against the face of a wheel, which is made to revolve with great velocity, and in this manner they are ground, a trough being placed beneath the wheel to receive the pulp. The next process is that of expressing the poisonous juice, which is effected by placing the pulp in bags, and subjecting it to the action of a press. The only further operation required to fit it for consumption is that of baking, which is then performed on a hot iron hearth. The pulp being placed on this, forms itself into a very thin cake, similar in form to a pancake, and fifteen inches or more in diameter. During the period occupied in this baking, the cake is kept constantly in motion to prevent its being partially burnt, and as soon as it is crisp is removed from the fire: when sufficiently cool, it is then quite fit for use. If kept in a dry situation, these cakes will remain good for a very long period.

To whatever cause the poisonous quality of the juice of bitter cassava may be owing, it is so highly volatile as to be entirely dissipated by exposure to heat. Even a comparatively low temperature suffices for correcting its deleterious nature; for when the root has been cut into small pieces and exposed during some hours to the direct rays of the sun, cattle may be fed on it with perfect safety.

If the recently extracted juice be drunk by cattle or poultry, these will speedily become much swollen and die in convulsions; but if this same liquid is boiled with meat and seasoned, it forms a favourite soup, called by the Brazilians *casserepo*, and which is found to be wholesome and nutritious. Dr. Pinckard mentions having partaken of this soup in Demerara.*

Stedman acquaints us that the Indians of Guiana, among whom cassava forms the chief bread, first grind the root on a rough stone, and then, for the purpose of separating the juice, prepare a curious kind of press out of reeds, which being disposed in the form of a long tube and secured at bottom, the ground pulp is introduced, and the press being suspended to a tree, a heavy stone or log of wood is fixed to the bottom, the weight of which draws the tube gradually together, by which means the juice is squeezed through the interstices. Occasionally the juice is collected into a receptacle, and is then used for the poisoning of arrows. The baking process of these inhabitants of the woods is similar to that described above, with this only difference, that, being without iron plates, their cooking is performed upon heated stones.†

The roots of sweet cassava are eaten by the Indians after roasting them in hot ashes, and without submitting them to the previous processes of grinding and expressing the juice.

Both plants are propagated by cuttings, which very quickly take root, and in about eight months from the time of their being planted the tubers will generally be in a fit state to be collected; they may, however, be left in the ground for many months longer without sustaining any injury.

The juice of mandioc is sometimes fermented with the addition of molasses, and converted into an intoxicating liquor in great favour with the Indians and negroes. The former of these possessed a knowledge of the means

* 'Notes on the West Indies,' vol. ii. p. 257.

† 'Narrative of an Expedition to Surinam,' vol. i. p. 405.

Indians preparing Cassava.

of preparing inebriating fluids when first they were visited by Europeans, who in this instance are therefore free from the reproach which in too many cases attaches to them of introducing the practice of drunkenness among those whom they were bound to have enlightened by communicating knowledge, rather than to have brutalized by imparting vices.

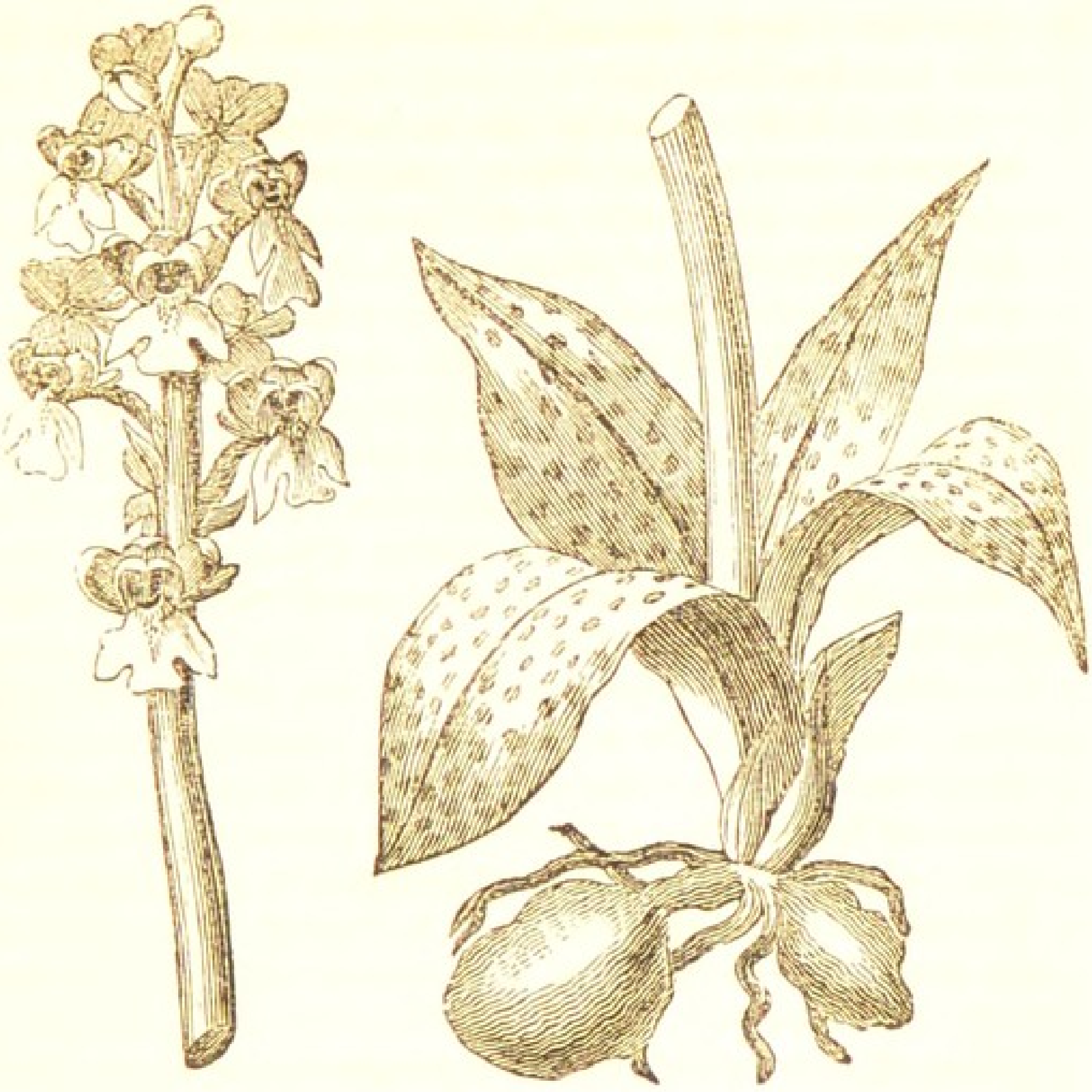
TAPIOCA, which is capable of being made into excellent puddings, and which is a very wholesome food for children, and for persons whose digestive powers are feeble, is a kind of starch prepared from the farina of cassava roots. A considerable quantity of this preparation is exported annually from Brazil to Europe.

A new species of Phaseolus was accidentally discovered some time since in the island of St. Domingo. A gentleman who was collecting plants in that island for the king of France, taking shelter in a cave, observed near it, upon some trees, a climbing plant, bearing clusters of dry pods. These seeds he gathered and sowed. The plants grew quickly and luxuriantly, and produced many roots, closely resembling that of cassava, and these, upon being treated in the manner already described, yielded very good cassava bread. In consequence of this discovery, the plant, which was found growing commonly in the woods of St. Domingo, was for some time after used in this manner; no part of the plant, with the exception of the tuberous root, was found to be edible.

Salep (*Orchis mascula*). This plant is assiduously cultivated in the East, for the sake of its root, which forms a considerable part of the diet of the inhabitants of Turkey, Syria, and Persia. Botanists have enumerated many species of this genus of plants, which are fleshy-rooted, and from several of which salep may be prepared. That which is generally preferred, however, is the one above named, the *Orchis mascula*, or male orchis, and it is from the root of this that the starchy substance brought from the Levant is supposed to be prepared.

This article of commerce comes to us in pieces of an oval form, very hard, approaching to transparency, and of a yellowish white colour. Although this substance has been for so long a time imported from a distant market, the plant from which it is prepared is furnished spontaneously, and in great abundance, in many parts of our own country. The Turkey roots are, however, much finer than ours, which may account for the greater esteem in which they are held.

The plant consists of a root composed of two fleshy lobes, crowned with oblong, broad, spotted leaves, and



Salep (*Orchis mascula*).

having upright stalks growing to the height of twelve inches, furnished with one or two narrow leaves, and terminated by a long spike of reddish purple flowers, which exhale a very slight agreeable odour; these commonly appear in the months of May, June, and July. The soil best adapted to its growth is that which is dry and not very fertile. It is worthy of remark that in rich lands, and those which have been highly manured, the Orchideæ do not come to maturity; where the experiment has been tried, the roots of the few plants that did appear proved black, and were half rotted in the ground. The stem is sent up by the lobe of a former year, and the new lobe, which is therefore easily distinguishable from the old one, is formed in the course of the summer as the tubers of potatoes. The root is known to be fully matured when the leaves and stalk begin to decay; the plants may then be dug up, and the new lobes—from which alone salep is made—separated from the others.

Many methods have been proposed for preparing salep. In the performance of the one among those methods which appears to be the simplest and best, the new root is first washed in warm water, when the fine brown skin with which it is covered may easily be rubbed away by means of a coarse cloth or a brush. The roots being thus cleaned and peeled, are to be arranged on a tin plate, and then placed within an oven heated to the same degree as is necessary for the baking of bread; here they are to remain from seven to ten minutes, in which time they will exchange their opaque and milky whiteness for a semi-transparent horn-like appearance, and a yellowish colour, retaining their original bulk. Being then withdrawn from the oven, they are exposed during some days to dry and harden in the air; or by the employment of a very gentle heat they may be brought to the same state in the course of a few hours: all that is then required to adapt the salep for food, is to boil it in water to the required consistency.

It is said that salep contains a greater quantity of nutriment in the same bulk than any other vegetable body; and for this reason it has been proposed that it should be made to form a part of the provisions of every ship that undertakes a distant voyage. So high a nutritive power has been assigned to salep, that, it is asserted, if one ounce of the powdered root, mixed with an equal weight of the stiff animal jelly or glue known as portable soup, be boiled in two quarts of water, it will suffice for the daily nourishment of an able-bodied man. This, however, is a mistake, as it consists principally of starch, which is not a nutritious aliment.

A small quantity of salep added to milk has been found to retard the commencement of the acetous fermentation in that fluid; and there is reason to believe that if it were used in a moderate proportion, it would prove a very useful and economical addition to wheaten flour in the preparation of bread. Dr. Percival, in his

'Medical and Experimental Essays,' mentions the results of some experiments of this kind. "I directed," says he, "one ounce of the powder to be dissolved in a quart of water, and the mucilage to be mixed with a sufficient quantity of flour, salt, and yeast. The flour amounted to two pounds, the yeast to two ounces, and the salt to eighty grains. The loaf, when baked, was remarkably well fermented, and weighed three pounds two ounces. Half a pound of flour and an ounce of salep were mixed together, and the water added according to the usual method of preparing bread. The loaf, when baked, weighed thirteen ounces and a half, but it should be remarked that the quantity of flour used in this trial was not sufficient to conceal the peculiar taste of the salep."

It is to be presumed that the last-mentioned circumstance did not occur where the proportion of wheat flour was greater, and the result is certainly such as should at least encourage the prosecution of further experiments. This vegetable preparation is held to be exceedingly wholesome, and was formerly in considerable favour with medical practitioners.

Indian Arrow-root (*Maranta arundinacea*). Arrow-root, when prepared for use, bears a considerable resemblance to the substance last described, consisting, equally with that, of little else than starch. It forms, therefore, a pleasant and useful aliment for children and invalids.

The plant from which it is prepared is a native of South America. It is an herbaceous perennial, and is propagated by parting the roots. It rises to the height of two or three feet, has broad pointed leaves, and is crowned by a spike of small white flowers. It is much cultivated both for domestic use and for exportation in our West India islands, and in some parts of Hindustan.

There are several species of Maranta, as the *M. arundinacea*, or starch plant, the *M. ramosissima* of India, the *M. Indica*, &c., which are thus cultivated. The name by which it is commonly known it owes to the use which was formerly made of another plant which was once con-

Indian Arrow-root (*Maranta arundinacea*).

founded with it, but is now distinguished by the name of *Alpinia Galanga*. The Indians employed that root for extracting the virus communicated by their poisoned arrows.

The starchy matter, for the obtaining of which the plant is cultivated, is prepared by the following process: When the roots are a year old they are dug up, and having first been well washed in clear water, are either grated or beaten to a pulp in large wooden mortars. This pulpy substance is next thrown into a large proportion of clean water, and after the whole has been agitated for some time the fibrous parts are collected in the hand, squeezed, and rejected. The milky liquor which remains is a mixture of the starch with water, and this, after being strained through a hair sieve to separate such fibrous particles as have escaped before, is left for some time to settle, when the water is drained off. The white pasty mass remaining at the bottom is then again washed in a further portion of water, and allowed to subside as

Wake-Robin (*Arum maculatum*).

before; and this process is sometimes repeated a third time, and oftener even, by persons who wish to be exceedingly nice in preparing the powder. When this is considered to be sufficiently cleansed, it is dried on clean white cloths in the sun, and is then fit for consumption: it will keep for a very considerable length of time.

Other plants have been proposed as substitutes for the exotic above described. Among these the *Arum maculatum*, or common wake-robin, has been mentioned. This plant grows wild in woods and on shady banks in many parts of Great Britain.

In its natural state the *Arum maculatum* is exceedingly acrid, so that if a small piece of the leaf be chewed it produces a painful stinging sensation in the mouth, and by applying the juice of the raw tuber to the skin, this will be considerably blistered. The noxious quality here mentioned is, however, like that inherent in the cassava root, extremely volatile; and if the root be either roasted or boiled, and afterwards dried and pounded, it affords a starchy substance which is perfectly insipid, and may be used for the same purposes as the powder of the true arrow-root.

Many roots, some the peculiar growth of America, as well as the potato and mandioc, yield substantive food to the inhabitants of both the northern and southern divisions; they contain principally starch, but enough nitrogenous matter to serve the purposes of the system. Among these the SPANISH or SWEET POTATO (*Convolvulus Batatas*) is commonly cultivated for its root in the tropical climates, both of the eastern and western hemispheres. It was known in this country before the common potato, which, as we have before observed, received its name from the similarity which it bears to the batata.

This plant was introduced into England by Sir Francis Drake and Sir John Hawkins, in the middle of the fifteenth century. Attempts were made to naturalize it in this country, but it was found too tender to thrive in the open air through an English winter. Gerarde cultivated it in his garden in 1597, where it flourished

Sweet Potato (*Convolvulus Batatas*).

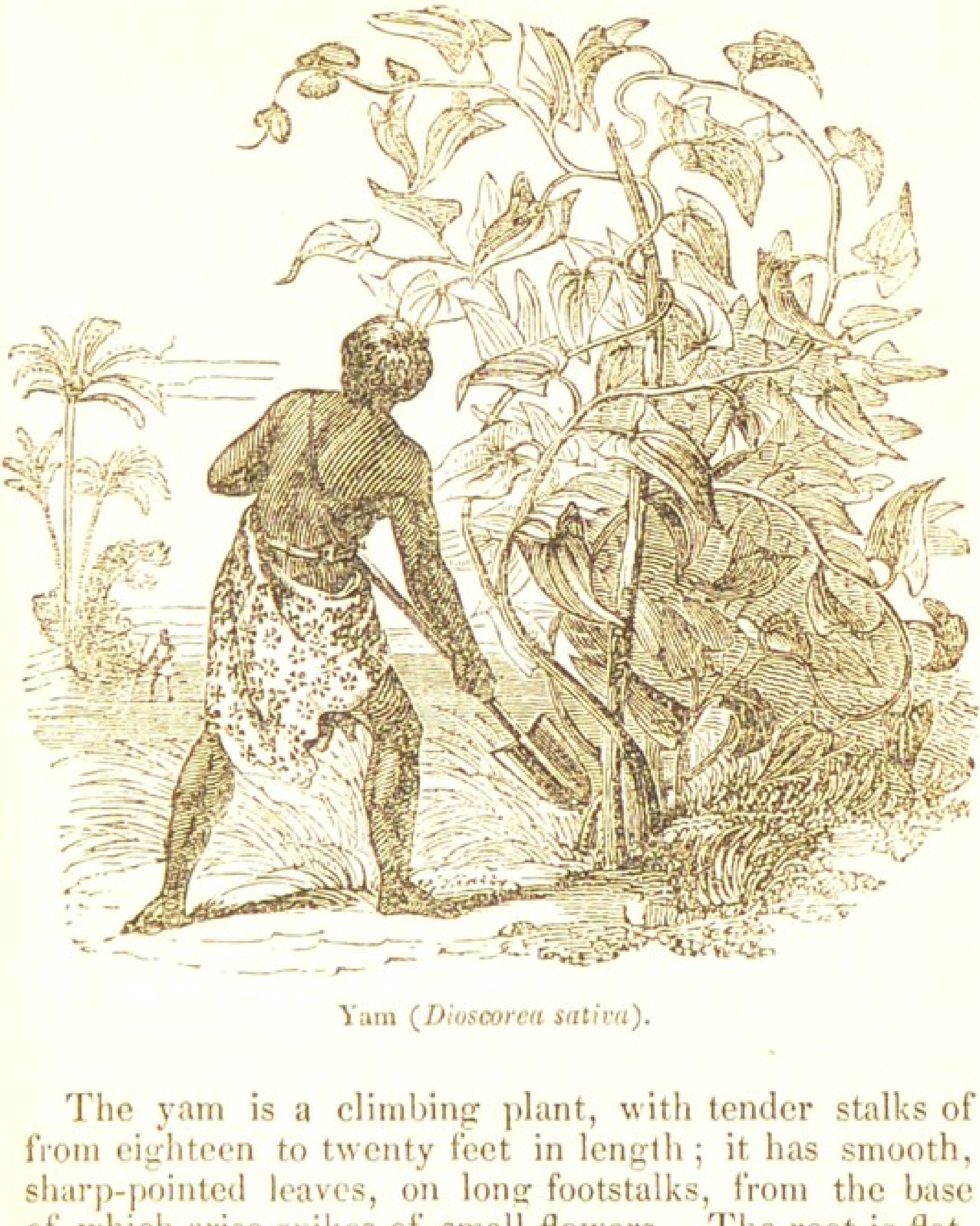
during the warm season; but as soon as it was assailed by the cold weather, it drooped, and perished in the ground. The roots were at that time imported into England in considerable quantities from Spain and the Canaries; and were used as a confection rather than as a nourishing vegetable. A more abundant supply of fruit of home growth has caused the batata gradually to decline in favour, and for many years it has ceased to be an article of importation into this country.

This plant is an herbaceous perennial, which sends out many trailing stalks, extending six or eight feet every way; these are round, and of a pale green colour; at each joint roots are put forth, which, in a genial climate, grow to be very large tubers, so that from a single plant forty or fifty large roots are produced. The leaves are angular, and stand on long petioles. The flowers are purple. Several varieties of this plant are to be found in the different countries where it is cultivated, and which differ from each other in size, shape, and the flavour of the roots. The batata is propagated by laying down the young shoots in the spring; indeed, in its native climate it multiplies itself almost spontaneously; for if the branches of roots that have been pulled up are suffered to remain on the ground and a shower of rain falls soon after they have been broken off, their vegetation will recommence. The roots are sweet, nourishing, and though rather insipid, of no unpleasant flavour. In warm climates the batata is of very abundant growth, and easy of propagation; and therefore it is matter of surprise that, in Brazil, the mandioc should be cultivated in preference as food for the negroes, the batata being raised more as a luxury for the planter's table.

In the national garden at Paris this plant is raised in a hotbed, whence it is transplanted at the latter end of the spring into the open ground, and treated like the common potato. In favourable seasons a tolerable crop is produced; and hopes are entertained that in the course of some years the batata will be so far acclimatized as to be the object of successful field-culture in the south of France.

The Yam (*Dioscorea sativa*) is a native of the East; and is supposed to have been transplanted thence to the West Indies, as it has never been found growing wild in any part of America; while in the island of Ceylon and on the coast of Malabar it flourishes in the woods with spontaneous and luxuriant growth. It is very extensively cultivated in Africa, Asia, and America, for its root, which is nutritious and of good flavour, and is used either roasted or boiled as a substitute for bread. This root is farinaceous, and resembles the potato, but is of a closer texture.

Some yams were first brought into this country from the West Indies in 1733; and they are now occasionally imported, more, however, as an article of curiosity than of commerce.



Yam (*Dioscorea sativa*).

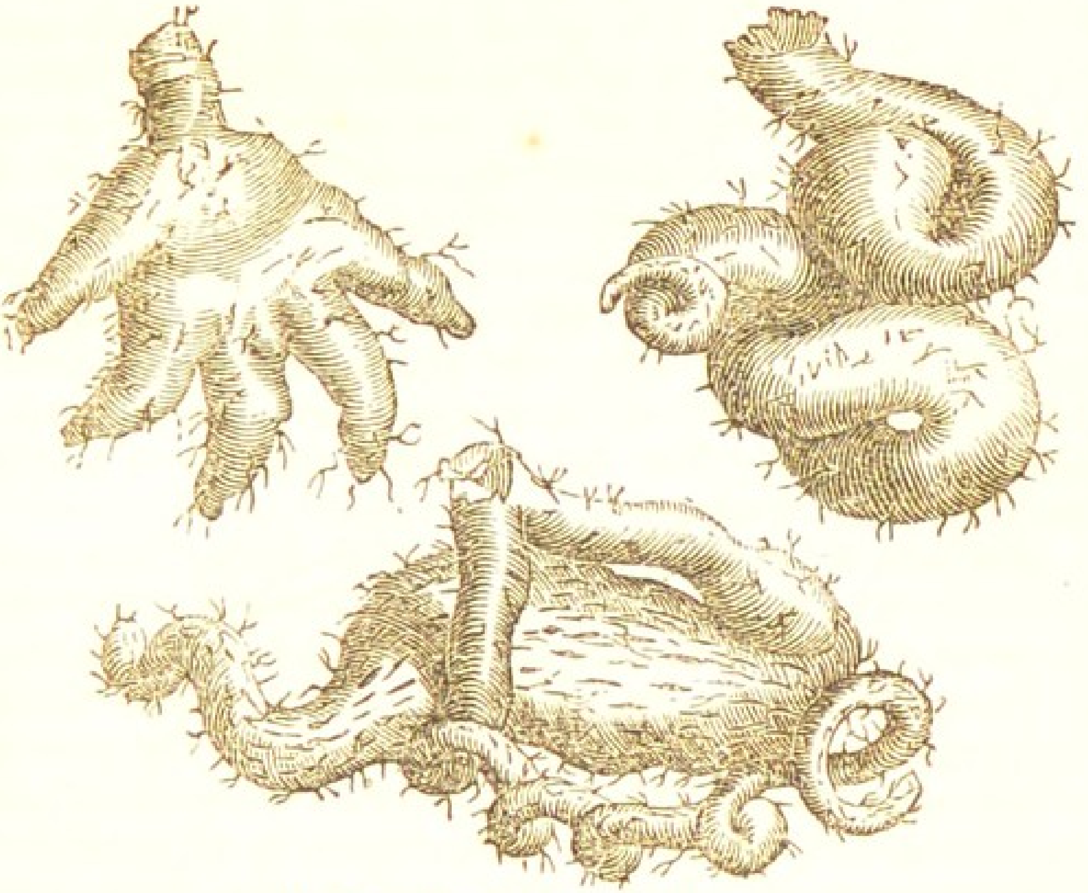
The yam is a climbing plant, with tender stalks of from eighteen to twenty feet in length; it has smooth, sharp-pointed leaves, on long footstalks, from the base of which arise spikes of small flowers. The root is flat, and palmated about a foot in breadth, white within, and externally of a dark-brown colour, almost approaching to black.

The winged yam (*Dioscorea alata*) is another species very generally cultivated; its roots attain to a larger size, being frequently about three feet long, and weighing about thirty pounds. Both these kinds are cultivated like the common potato. They are usually planted in August, and are fit for use in the November and December following. Brown* directs that the roots for planting should be cut so as to leave a small portion of skin to each piece; "for by that alone," he affirms, "they germinate, the roots having no apparent buds or eyes, but casting out their weakly stems from every part of the surface alike."

When dug out of the earth, the roots are placed in the sun to dry, and are then put into sand or casks, where, if guarded from moisture, they may be preserved a considerable length of time without being in any way injured in their quality.

ARRACACHA (*Arracacia esculenta*), an umbelliferous plant, is cultivated in some parts of South America for its root, which is farinaceous, and easy of digestion. The main roots branch into four or five parts, which attain to the size of cows' horns. Sanguine hopes were entertained by English horticulturists that this root might in the course of time become nearly as important to Europe as the potato, and that it may, like that, be acclimatized in England. It grows on the plains of Bogota, on an elevation of 8700 feet above the level of the sea. The temperature of these lofty plains is found not greatly to vary from that of the south-west of England. The mean temperature of Santa Fe de Bogota is fifty-eight degrees; the mean temperature of the warmest month sixty-two degrees; of the coldest month fifty-seven degrees. If any spot in the south of England or Ireland can be found of a similar temperature, it is probable that the arracacha will survive throughout the year in the open air. The mean temperature of Plymouth is about fifty-three degrees; mean of hottest month sixty-three degrees; mean of coldest month forty-two degrees. It is therefore supposed that this climate may be favourable to the growth of the arracacha. In 1821 plants were sent to the Horticultural Society, but they unfortunately died. Since that time, however, the introduction of this plant has been effected; and it is thriving in the garden of Dr. Hamilton, of Plymouth, who writes, in July, 1828, "My

* 'History of Jamaica.'



Different sorts of Yam Roots.

arracacha plant is flourishing beyond my most sanguine expectations in the open air; indeed, it grows much more luxuriantly in the open air than in the house."*

One of the substances of spontaneous growth, which is largely used as an article of food, is Sago (*Sagus farinifera* and *Rumphii*, and other species). The substance known in commerce under the name of sago is a form of starch extracted from the trunk of a tree.

This tree is a native of the south-east of Asia, and of the islands of the Indian Ocean, where it grows spontaneously, and is perfected without any culture. This circumstance occurring with regard to a substance slightly nutritive, in a climate which disposes the human frame to inaction, occasions the adoption of sago in many places as the general food of the population, to the neglect of other plants, the cultivation of which would call for some amount of exertion.

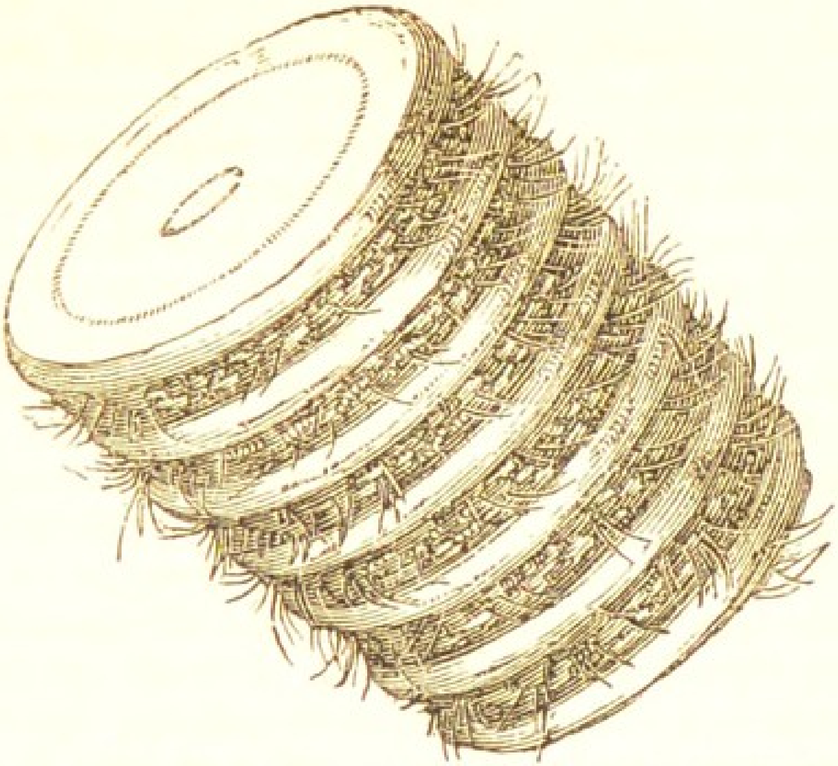
* 'Gard. Mag.,' vol. iv. p. 402.

The sago, or, as it is called in the Molucca Islands, the libley tree, is of peculiar growth. The trunk, which is formed of the bases of the leaves, grows at first very slowly, and is covered with thorns; so soon, however, as the stem is once formed, the growth of the tree proceeds with very great rapidity, so that it speedily attains its full height of thirty feet, with a girth of five or six feet, losing in this stage its thorny accompaniments. Like the cocoa-nut tree, the sago has no distinct bark that can be peeled off, but the trunk consists of a long, hard, ligneous tube, about two inches thick, the internal area of which is filled with a kind of farinaceous pith, intermixed with numerous longitudinal fibres. The maturity of the tree is known by the transpiration of a kind of whitish dust through the pores of the leaves; and when this appears the trunk is felled near to the ground.

The best account of this tree, and of the mode of preparing its pith for use as human food, is to be seen in Forrest's account of the Molucca Islands: it is to the following effect:—

"The tree, being felled, is cut into lengths of five or six feet. A part of the hard wood is then sliced off, and the workman, coming to the pith, cuts across the longitudinal fibres and the pith together, leaving a part at each end uncut, so that when it is excavated there remains a trough, into which the pulp is again put, mixed with water, and beaten with a piece of wood. Then the fibres, separated from the pulp, float at top, and the flour subsides. After being cleared in this manner by several waters, the pulp is put into cylindrical baskets made of the leaves of the tree; and if it is to be kept some time, those baskets are generally sunk in fresh water to keep it moist. One tree will produce from two to four hundredweight of flour.

"We seldom or never see sago in Europe but in a granulated state. To bring it into this state from the flour, it must be first moistened and passed through a sieve into an iron pot (very shallow) held over a fire, which enables it to assume a globular form. Thus all our grained sago is half baked, and will keep long. The



Stem of the Sago Tree, showing the pith from which the Sago is extracted.

pulp or powder of which this is made will also keep long if preserved from the air, but if exposed, it presently turns sour."*

We learn also from the same authority, that loaves of bread are sometimes made in the Molucca Islands of the pith of the sago, and that these loaves are baked in small ovens, "the floors of which are divided by means of partitions into cells about the size of an octavo volume."

The leaf of the sago is used in the same quarter for covering houses, and in that climate will not need to be renewed oftener than once in seven years.

When the sago tree is cut down, its vegetative power still remains in the root, which again puts forth its leaves and forms the trunk, and this proceeds again through its different stages until it is again subjected to the axe, and made to yield its alimentary contents for the service of man.

Sago is also produced from many varieties of palms, but the tree here described is that which furnishes the best. The produce of the *Cycas circinalis*, so often er-

* Forrest's 'Voyage to the Moluccas,' p. 39, second edition.

roneously mentioned as yielding the sago of commerce, is very inferior.

If the native of the Molucca Islands has his sago-bread without the labour of cultivating the plant which produces it, the Indian of the Cordilleras of South America has his supply of milk from a tree growing at a vast height amidst arid mountains, where no cattle can pasture. The *Cow-Tree* has been described by Humboldt with his characteristic spirit and accuracy; and it was much earlier noticed by Laet, a Dutch traveller, as growing in the province of Cumana. "On the side of a thirsty rock," says Humboldt, "grows a tree whose leaves are dry and husky. Its large roots penetrate with difficulty through the stony soil. During many months of the year not a shower waters its foliage; the branches appear withered and dead; but when its trunk is pierced, a sweet and nourishing milk flows from the wound. It is at the rising of the sun that this vegetable aliment is most plentiful. The natives and the black slaves then gather together from all parts with large wooden vessels to catch the milk, which as it flows becomes yellow, and thickens on the surface. Some make their abundant meal at the foot of the tree which supplies it; others carry their full vessels home to their children."*

In tropical countries the force of vegetation is so great, and the wants of society are so few, that magnificent trees are destroyed for the sake of a small portion of food, such as a few square feet of an English garden would produce.

The CABBAGE-PALM (*Areca oleracea*) is a most gigantic tree; its stem, which, near to its base, is about seven feet in circumference, ascends straight and tapering to a vast height. It is of a brown colour, hard, ligneous, divided into short joints, and pithy within like elder. Several feet from the summit the tree assumes a fluted form, and a green colour; which change is occasioned by the husky tegument that forms the petioles, which thence diverge far in a horizontal direction, like the

* 'Voyage aux Régions Equinoxiales,' tome v. p. 264.

crown of a pine-apple. These are decorated with numerous leaflets, some of which are about three feet long, and an inch and a half broad, tapering into a sharp point; the leaflets gradually decrease in size as they approach the extremities of the branches. This regular, lofty group of foliage, impelled by the most gentle gale, and constantly waving in feathery elegance, is an object of beauty which cannot be imagined by an inhabitant of temperate climes, unused to the magnificent vegetation of a tropical sun. The seed is inclosed in a brown spatha or sheath, which arises from the centre of the branches, and, hanging downwards, consists of small oval nuts, not unlike a bunch of dried grapes, but much longer in proportion to their circumference.

Within the leaves which surround the top of the trunk the *cabbage* lies concealed. It is white, about two or three feet long, as thick as a man's arm, and perfectly cylindrical. This substance is composed of longitudinal flakes like ribands, but so compact as to form a crisp, solid body. When eaten raw it resembles the almond in flavour, but is more tender and delicious. It is usually cut into pieces, boiled, and served as an auxiliary vegetable with meat.

To obtain this small portion, borne on the pinnacle of the tree, and hidden from the eye of man, the axe is applied to the stately trunk, and this majestic lord of the mountain-top is laid low, to furnish a small quantity of vegetable matter, which is "eaten like cauliflower," and which receives its distinctive name from our lowly cabbage. Surely this rivals the tales handed down to us of Roman epicurism!

In the cavity made in the trunk by the removal of the cabbage, a kind of black beetle deposits its spawn, from which grubs, which are called the palm-tree worms, are produced, and these, strange to say, are eaten as a great delicacy. Stedman gives the following account of this choice luxury of Guiana:—"Another negro also brought me a regale of *groe-groe*, or cabbage-tree worms, as they are called in Surinam. This reptile grows to the size and thickness of a man's thumb, and is extremely fat.

However disgusting to appearance, these worms are a delicious treat to many people, and they are regularly sold at Paramaribo. The manner of dressing them is by frying them in a pan with a very little butter and salt, or spitting them on a wooden skewer. In taste they partake of all the spices of India, as mace, cinnamon, cloves, nutmegs, &c. Several species of these worms are produced in all the palm-trees, when beginning to rot, but some are larger than others. They are all of a pale yellow colour, with black heads."*

Cabbage Palm (*Areca oleracea*).

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* Stedman's 'Surinam,' vol. ii. p. 23.

CHAPTER XI.

TURNIP, CARROT, PARSNIP, ETC.

Amongst the parts of plants which are eaten by man and many of the lower animals, are the roots of several plants. Most of the edible roots contain starch as a distinguishing ingredient; to this however is frequently added sugar. They contain also a large quantity of water, and only a small quantity of protein, so that they are not at all adapted for the entire subsistence of either man or animals. Of some of those which will be mentioned in this chapter, Dr. Lyon Playfair has given the following chemical analysis :—

100 lbs.	Water, &c.	Protein.	Carbonaceous matter.
Turnips contain .	90	1	9
Carrots ,,	88	2	10
Beet-root ,,	70	$1\frac{1}{2}$	$8\frac{1}{2}$

From this analysis it will be seen how large a quantity of water these roots contain, and how little they are adapted for nutrition, and the properties of the whole class may be judged of by these examples.

The Turnip (*Brassica rapa*). A species of turnip is to be occasionally found growing in a wild state in some parts of Britain ; but the root of this plant is of no value, and experiments have proved that cultivation cannot, under an English sky at least, convert this wild variety into that of which the root is used as an edible substance.

The turnip was well known to the Romans, and all that can be gathered on this subject from the writings of the ancients renders it probable that it occupied nearly the same place in Roman culture as it does in

British husbandry in the present day. Columella* recommended that the growth of turnips should be abundant, because those which were not required for human food could be given with much advantage to cattle; and both Pliny and he concur in their testimony, that this produce was esteemed next to corn in utility and value. The best grew in the country of the Sabines, and were worth at Rome a sestertius (or two-pence) each.†

Flowers and Pods of the Turnip.

It is averred that the Roman method of cultivation must have been superior to that of the moderns, since Pliny relates that some single roots weighed as much as forty pounds, a weight far surpassing any which has been obtained by the most skilful modern agriculturists. Indeed, the large size of the Roman turnip is supposed

* 'De Re Rustica,' lib. ii. cap. 10.
† 'Hist. Nat.,' lib. 18, c. 13; lib. 19, c. 5.

by some authors to furnish a collateral proof of the colder temperature of Italy in ancient than in modern times. Speculations, however, raised upon what might perhaps have been an exaggerated statement of the Roman naturalist must be purely hypothetical. It is certainly found by experience that a warm climate is not so favourable to the growth of the turnip as cold moist regions. Though receiving equally careful culture, it does not attain to the same size in the south as in the north of England and in Scotland, while it thrives best in the west of the latter country, and in those parts of Ireland where the climate is the most humid. Though the colder parts of the temperate regions are found most favourable for this cultivation, the countries of still higher latitudes are not congenial to the growth of the turnip. Those arctic climes where the summer, though brief, is dry and warm, are decidedly adverse to its successful cultivation.

It is very probable that the garden culture of the turnip was introduced by the Romans into this country, and that, like some of the fruit-trees which they had transplanted here, though neglected, it was never altogether lost: and, if appearing to be so for a time, was restored by the monks, those constant guardians and fosterers of horticulture.

There is no doubt that this root was in cultivation in the sixteenth century. Whether revived by native industry, or introduced at that period by the Flemings, is a question differently answered by different writers; nor does the inquiry possess much interest. Turnips were partially grown for many years in this country before they came into extensive notice. Horticultural pursuits were at that time so little understood and practised here, that even the most successful issue which attended the cultivation of the turnip in Norfolk, a county peculiarly adapted to its growth, failed for a time to be followed by its more extended adoption; and a considerable period elapsed before it travelled out of Norfolk into Suffolk, and thence into Essex.

Towards the latter end of the sixteenth century it is mentioned by more than one writer. Cogan, in his 'Haven of Health,' published in 1597, says, that "although many men love to eat turnips, yet do swine abhor them." Gerarde, who published in the same year, and who had rather more rational views on the subject of plants, leads us to conclude that more than one variety was cultivated in the environs of London at that time. "The small turnip," says he, "grown by a village near London, called Hackney, in a sandie ground, and brought to the Crosse in Cheapside by the women of that village to be solde, are the best that I ever tasted." Gerarde is silent concerning the field culture of turnips; neither is this mentioned by Parkinson, who wrote in 1629. It is not until the close of the seventeenth century that we can find any account of this root being thus cultivated in any part of the country.

The turnip, in some of its varieties, is of very universal culture throughout Europe. In Sweden it is a very favourite vegetable. We also learn from the interesting journal of Linnæus, that even so far north as Lapmark the colonists sow annually a considerable quantity of turnip-seed, which frequently succeeds very well, and produces a plentiful crop. The native Laplanders are so fond of this root that they are often induced to part with a whole cheese in exchange for one single turnip, "than which nothing," our author adds, "can be more foolish."*

In Russia turnips are used as fruit, and eaten with avidity by all classes. In the houses of the nobility, the raw turnip cut in slices is handed about on a silver salver, with brandy, as a provocative to the more substantial meal. "The first nobleman of the empire," says Dr. Clarke, "when dismissed by his sovereign from attendance upon his person, may be found throughout the day with his neck bare, his beard lengthened, his body wrapped in a sheep's-skin, eating raw turnips, and drinking quass."†

It is said that the root of the turnip cultivated in the

* Vol. i. p. 174.

† Clarke's 'Travels in Russia,' vol. i. p. 46.

plains of Germany seldom exceeds half a pound in weight; and that in France, and countries still farther to the south, they are yet more diminutive. These are, however, no doubt a variety, perhaps a species, naturally of a small growth, and it must not thence be inferred that hot countries are wholly inimical to this production. At Benares, in Hindustan, a latitude of about 26°, turnips, radishes, asparagus, cauliflowers, and other garden vegetables are raised in considerable plenty by the natives, and exposed to sale in the bazaars, principally for European purchasers,* to whom these plants of home association are welcome even among the rich display of tropical productions, and even though they cannot be obtained in their native excellence, being comparatively tasteless when raised under the fervid sun of India.

The turnip is a biennial plant; the appearance of its large radical leaves is familiar to everybody. In the second season after sowing, a flowering stem shoots up, which bears flowers having the four petals arranged in the form of a cross, and therefore called cruciform. The varieties both under garden and field culture are very numerous; while these again differ with soil and climate, and manner of cultivation. When destined for human food, of course the quality more than the size is considered; but in raising them as an economic aliment for cattle the greatest possible quantity of nourishment which can be produced in a given space is the object most to be desired. Various sorts, differing in size, shape, and colour, but all assuming, in a greater or less degree, the globular or spheroidal form, are the objects of either garden or field culture. Of these there are ten varieties in common cultivation, distinguished by colour, size, time of coming to maturity, productiveness, or flavour. Among this number, the Maltese golden turnip is a very fine variety, of one uniform orange tinge. It is perfectly spherical, and the crown and tap-root are both so very small, that if dexterously removed the exact parts of the root whence they were divided are not easily dis-

* Tennant's 'Indian Recreations.'

cernible. When quite fresh, and just before it has acquired its full consistence, it makes its appearance in the northern parts of the country with the dessert, and it is considered to be superior both in form and flavour to many fruits. The Swedish turnip is another variety of a much larger growth, and of a more hardy nature than any of the other kinds under cultivation; this is very seldom raised among garden vegetables, as it is too strong and harsh to be acceptable for human food. It has, however, the advantage of surviving through seasons when even the hardiest of the others would be destroyed. This turnip is largely cultivated in fields and employed as food for cattle.

The root of the French turnip, or *naveu*, differs from the other varieties, having more the appearance, in shape and size, of the carrot. It is of a very fine flavour, and in high repute on the Continent. When used, the outer rind is not peeled off as in the common turnip, but merely scraped, since the peculiar taste chiefly resides in that part. In France, as well as in Germany, few great dinners are set on the table without this vegetable appearing under some form, either enriching the gravies and stews, or prepared as a viand by itself.* The naveu was more cultivated in this country a century ago than it is at present, being now but rarely found in our gardens.

In Barbary a small parsnip-like turnip with fibrous roots, called in that country *el bashoure*, is held in much esteem for its agreeable pungency.†

A light gravelly soil, broken fine by tillage, is most favourable to the production of turnips of the best quality; but they will succeed in almost any land. Any poor, light, sandy ground suits the naveu, which has the great advantage of never requiring any manure in its cultivation.

Turnips may be obtained in this country in succession almost throughout the year by sowing seed every month in spring and summer. This is distributed broad-cast, or sometimes sown in drills in the proportion of about

* 'Hort. Trans.' † Shaw's 'Travels.'

half an ounce of seed to one hundred square feet. As soon as the plants are sufficiently advanced, having rough leaves of about an inch broad, they are hoed and thinned to six or eight inches apart from each other. In the early stages of their growth turnips are rather a delicate crop. When they first put forth their tender and succulent seed-leaves they are liable to be preyed upon by a peculiar species of beetle called thence the turnip-fly; this is extremely destructive, and various preventives against the evil have been suggested. Several preparations of the seeds previously to sowing have by turns been recommended, such as steeping them in sulphur-water or sprinkling them with soot at the time of sowing; these, however, have not been considered efficacious, and even when they have apparently been successful, perhaps it has been under circumstances in which the plants would have equally escaped without any precautionary measure. No insect can very well deposit its eggs in the seed of the turnip before it is in the ground, at least there is no known species which perforates the pods for that purpose. The sulphur or soot, or any other application, is of course thrown off with the tunic or outer coat, and does not in any way protect the cotyledon or side lobes of the seed, which come up in the form of leaves, and in which the eggs of the fly are then deposited. By some cultivators these leaves are powdered with quick-lime as soon as they show themselves above ground; a plan which appears the most rational for preventing the mischief. One of the easiest remedies against it, however, is recommended by Neill, to sow thick, and thus ensure a sufficiency of plants both for the fly and the crop. As soon as the rough leaves are a little developed the danger from the insect depredator ceases.

Turnips, if carefully cultivated, attain to a very great size in this country, though appearing insignificant when compared with the gigantic root of the Roman naturalist. Tull * speaks of some weighing as much as nineteen pounds, and of often meeting with others of sixteen

* Tull's 'Horse-Hoeing Husbandry.'

pounds. In Surrey, a Swedish turnip, the seed of which had been sown in July, was dug up in October, 1828, which weighed twenty-one pounds, and was one yard in circumference.* But these are far surpassed by one which was pulled up in 1758 at Tudenham, in Norfolk, and which weighed twenty-nine pounds.† In No. 360 of the 'Philosophical Transactions' we find a curious calculation made by Dr. Desaguliers, on the rapid increase of a turnip root. One ounce of turnip-seed was found by him to contain between fourteen and fifteen thousand single seeds; therefore, one seed would weigh one-fourteen or one fifteen-thousandth part of an ounce; and assuming its growth to be always uniform, a turnip-seed may increase fifteen times its own weight in a minute! By an actual experiment made on moss or peat ground, turnips have been found to increase by growth 15,990 times the weight of their seeds each day they stood upon it. It is not, however, only the size and weight of the root which renders this crop so productive; the number contained in a given space, with reference to their size, is very great. Some writers speak rather marvellously on this subject, but it is generally thought a good crop to obtain a turnip from each square foot of ground. Mill considers an average crop to be 11,664 roots per acre, which at six pounds each will be 69,984 pounds.

The uses of the turnip as a culinary vegetable are too familiarly known to require that they should be here enumerated. Though in very extensive favour among the moderns, the different modes of preparing it appear poor and insipid compared with those efforts of gastronomic skill by which the ancients made it assume so many inviting forms. It is related that "the king of Bithynia, in some expedition against the Scythians, in the winter, and at a great distance from the sea, had a violent longing for a small fish called *aphy*—a pilchard, a herring, or an anchovy. His cook cut a turnip to the perfect imitation of its shape; then, fried in oil, salted, and well powdered with the grains of a dozen black

* 'Gard. Mag.' † Campbell's 'Pol. Survey,' vol. ii.

poppies, his majesty's taste was so exquisitely deceived, that he praised the root to his guest as an excellent fish. This transmutation of vegetables into meat or fish is a province of the culinary art which we appear to have lost; yet these are *cibi innocentes* (harmless food) compared with the things themselves."*

Our more immediate ancestors appear to have applied the turnip to more extensive uses as an esculent than is done in the present day. It is recorded † that in the years 1629 and 1630, when there was a dearth in England, very good, white, lasting, and wholesome bread was made of boiled turnips, deprived of their moisture by pressure, and then kneaded with an equal quantity of wheaten flour, the whole forming what was called turnip-bread. The scarcity of corn in 1693 obliged the poor people of Essex again to have recourse to this species of food. This bread could not, it is said, be distinguished by the eye from a wheaten loaf; neither did the smell much betray it, especially when cold.

The earliest spring-produced leaves of the turnip are sometimes boiled or stewed, and appear on the table under the name of turnip-tops. The Romans likewise applied these tender leaves to the same purpose.

Turnips, in all their varieties, do not contain so much nourishment as either carrots or parsnips.

The CARROT (*Daucus carota*). It was a subject of much interest among the botanists of the sixteenth and seventeenth centuries to ascertain what plants of the ancients could be identified with those at present known. Accordingly we find in the works of those writers many curious and learned disquisitions in support of their respective opinions. Among the plants which have given rise to so much laborious, and perhaps unprofitable research, the carrot makes a prominent figure. This discussion would have little interest in the present day; the result, however, shows that the carrot was certainly known and used by the ancients as an edible root. A

* 'Curiosities of Literature,' vol. v. p. 88.

† 'Phil. Trans.,' Nos. 90 and 205.

plant under the name of *staphylinos* is minutely described by Dioscorides,* and this description applies in every respect to that of the carrot. Though growing wild, the plant is noticed by the Greek physician as being likewise reared in gardens on account of its esculent root. It is difficult to trace the progress of the carrot since that period, but it appears to have been always an object of cultivation among various nations.

Umbel of the Carrot.

Miller and other horticulturists have made various attempts to change by culture the wild carrot into the esculent one; these attempts have, however, always proved unsuccessful—it is therefore probable that the two plants are not identical, or that the cultivated one was first fostered into its present value under a warmer temperature than that of Britain. Whatever may be its origin, it was not, however, immediately transplanted into this country from a milder climate than our own.

We are indebted for its introduction to the Flemings,

* Dioscorides ,lib. iii. cap. 52; Theophrastus, 'Hist. Plant.,' ib. ix. cap. 15.

who, in the reign of Queen Elizabeth, sought refuge in England from the insupportable tyranny of their Spanish master Philip the Second. Finding the soil about Sandwich in Kent very favourable for the culture of the carrot, the emigrants soon engaged in its production on that spot. The English, whose knowledge of horticulture was at that time extremely circumscribed, were in this case well pleased to add another edible vegetable to the scanty list which were then under general cultivation. The carrot, therefore, unlike the turnip, grew quickly into esteem, and being made an object of careful culture, was very shortly naturalized throughout the island. We are told by Parkinson, the celebrated botanist to James the First, that in his time the ladies adorned their head-dresses with carrot-leaves, the light feathery verdure of which caused them to be no contemptible substitute for the plumage of birds. Although the taste of the fair sex in the present day has discarded this simple and perishable ornament, the leaves of the carrot are even now sometimes used as house decorations. If in the winter a section be cut from the end or thick part of the root, and this be placed in a shallow vessel containing water, young and delicate leaves are developed, forming a "radiated tuft," the graceful and verdant appearance of which makes it a pleasing ornament for the mantel-piece in that season when any semblance of vegetation is a welcome relief to the eye.

The carrot is a biennial plant, attaining to the height of two feet; its white flowers grow in umbels, that is, having the common peduncle divided into rays springing from one point, each ray or pedicle being terminated by a floret; they appear in June and July, and are succeeded by rough hairy grains.

Of cultivated carrots there are many varieties, which have in all probability been produced by climate and culture. The kinds which are commonly grown are distinguished into two, the long and the horn carrot. The first is again subdivided into others which differ in size as well as in colour. The red or large field carrot attains to a considerable growth; it is chiefly cultivated in fields as food for cattle, and in farmers' gardens as a material for colouring butter. The orange carrot, though not so productive, is generally the main crop in garden culture —the flavour of this is more delicate, and therefore it is in higher estimation as a culinary vegetable. There are, likewise, white, yellow, and purple varieties--these are not, however, in common cultivation. The horn-carrot has a shorter and smaller root than the long varieties; it is, therefore, a good crop for a shallow soil, and in such a situation is preferable to the larger kind; it has likewise the advantage of coming to maturity in a shorter period than the long, and is consequently found well adapted for the early and late crops.

When a carrot is cut transversely it is found to consist of two parts of different colour and texture. These are the bark and the wood; the bark is of the darkest colour, and of the most pulpy consistence, and it is also the sweetest to the taste; the heart or wood, especially when the root has attained its full size, is more fibrous or stringy, and, if it be separated, it is bristled over with hard points or fibres that extend to the rootlets outside. Almost the whole crown of the root, or the part which sends up the leaves, is connected with the wood, and only the epidermis of the leaves and stem with the external portion of the root.

The skin or bark is found to be more nutritious than the central part, and consequently the value of the carrot as an esculent will depend on the relative proportion of these two parts of the root. The object of the skilful cultivator is, therefore, to obtain the root with the smallest possible proportionate quantity of wood. In endeavouring to secure this result much must of course depend upon the nature of the plants from which the seeds are obtained; but adaptation of soil is likewise a very important consideration.

The carrot is most successfully cultivated in a light mellow soil mixed with sand: the ground should be well dug to some depth, and made extremely friable and porous, that the roots may meet with no obstruction in running down, which would cause them to grow forked and to shoot out lateral branches. This accident will happen, especially when the ground has been too highly manured previously to the seed being sown. It may perhaps be taken as a general rule that strong soils are not well adapted for any plants which form esculent roots deep under the surface, as the mechanical resistance which is thereby opposed to the swelling of the root forces much of the strength of the plant up into leaves; and in the carrot especially, that part of the root which is the most valuable is diminished in the greatest proportion.

The best mode of cultivating these roots has been made by many agriculturists a subject of inquiry. So early as the year 1765, this branch of husbandry engaged the attention of the Society for the Encouragement of Arts, &c.; and, in consequence, an account of the culture of carrots and the uses to which they may be applied was published by Robert Billing, a farmer of Norfolk, in whose work much useful matter on the subject is contained.

The seeds of carrots are surrounded by numerous forked hairs, by which they adhere to each other so tenaciously, that there is some difficulty in causing their separation; this is performed either by rubbing them through the hands or by passing them through a fine chaff-sieve; but the best and most effectual method, as recommended by an intelligent cultivator,* is to mix them with fine sand in the proportion of one bushel to every four or five pounds of seeds—this mixture is then laid in heaps, being occasionally watered and turned during two or three weeks previous to sowing. The above preliminary process not only occasions the more equal diffusion of the seeds, but likewise promotes their quicker germination; besides this, when they are sown alone their extreme levity causes great inconvenience, and prevents this operation from being successfully performed except in the calmest weather. The ground being duly manured, and reduced to the required degree of fineness,

* 'Communications to the Agricultural Society,' vol. ii.

the seed mixed with the sand is sown about the middle of March or beginning of April: the seeds thus prepared germinate and send up young plants before the appearance of the annual weeds, which are always abundant in a soil so worked and manured. In about five or six weeks the plants are in a fit state for hoeing, and that operation two or three times repeated, according to the increase of the weeds, is all the after-culture which is requisite.

From this manner of sowing, more than eight hundred bushels per acre of carrots of very large growth have been obtained. According to Mr. Arthur Young, the produce of these roots on indifferent land is about two hundred bushels, and on a more congenial soil six hundred and forty bushels per acre. The garden culture of carrots is somewhat different. In that case they are sown in a succession of crops from the latter end of February to the beginning of August, and the plants when hoed are thinned at regular distances, of from five to eight inches apart, the particular interval being regulated by the size of the variety under cultivation, and by the period of their growth at which they are to be drawn.

In order to preserve carrots for winter use, they are dug up in the beginning of November, and placed in a dry place in sand, by which means they may be kept without spoiling until March or April of the ensuing year.

To obtain carrot seed, some roots which have been taken up in November are replanted in February about two feet apart, and with the crown or head a few inches below the surface. Leaves and flower-stalks will spring up from these, and seeds will be produced which ripen in autumn. A considerable quantity of carrot-seed is raised at Weathersfield in Essex, but this is insufficient for a home supply, and it is said much is imported from Holland into this country.* It would appear that the production of carrot-seed may occasionally be made a source of considerable profit to the cultivator. We find it recorded that in the latter half of the last century a

* Loudon's 'Encyc. of Gardening.'

farmer in Essex obtained from an acre of land sown with carrots ten hundredweight of seed, which he sold in London for 10*l.* per hundredweight.* This is a very rare case. If it were general, the price would soon be reduced.

The size of carrots differs, of course, very much according to soil, culture, and variety. Some have been known to measure two feet in length and from twelve to fourteen inches in circumference at the thickest part. In the autumn of 1826 several were taken up in the neighbourhood of Lancaster having an average weight of four pounds each; these were fine firm roots, and in every respect good for the table.

Besides their use as human food, carrots are in some places grown largely for the consumption of stock, especially for horses. It is affirmed that cattle which have once tasted these, usually prefer them so much to turnips as with difficulty to be made to return to the latter. The milk of cows fed on carrots never acquires any unpleasant flavour, while at the same time the quantity produced is increased. Calves thrive admirably, and bullocks are quickly fattened on this food. Carrots are equally beneficial as nourishment for sheep, and are devoured with avidity by swine. In the short space of ten days a lean hog was fattened by these roots, having consumed during that period one hundred and ninety-six pounds. Its fat proved very fine, white, and firm, and did not waste in the dressing. Horses receiving no other sustenance perform their work as usual without any diminution of their sleekness. The efficacy of these roots in preserving and restoring the wind of horses had, it is said, been partially known in Suffolk, where carrots were administered as a secret specific for the complaint, long previously to their being commonly applied as food for horses. These roots may also with advantage be given to poultry. In severe winters they have been found of great utility in the preservation of deer; and they have been strongly recommended as wholesome and cheap nourishment for dogs.

* Campbell's 'Political Survey.'

Various opinions exist among agriculturists as to the relative advantages arising from the culture of the carrot or the turnip as food for cattle. The latter root may perhaps be more productive, and succeed better in a variety of soils, but the amount of nourishment it contains is much less than that of the carrot. This assertion rests not alone on chemical evidence, but also on the testimony of Mr. Billing, who obtained from twenty and a half acres of land, varying in soil and degree of preparation, five hundred and ten loads of carrots. Experience led him to conclude that these were equal in use and effect to one thousand loads of turnips, and to three hundred loads of hay. At Parlington in Yorkshire, the stock of a farm, consisting of twenty working horses, four bullocks, and six milch cows, were fed from the end of September to the beginning of May on the carrots produced from three acres of land. The animals, during the whole of that period, lived on these roots with the addition of only a very small quantity of hay, and thirty hogs were fattened on the refuse left by the cattle.

The greater part of the alimentary portion of the carrot consists, according to Sir Humphry Davy's analysis, of saccharine matter. The quantity of protein is two per cent. in the whole weight of carrot, and ten per cent. of starch and saccharine matter. The quantity of ready formed saccharine matter in carrots is much greater than in any of the cerealia, being two and a half per cent. more than in barley, and about six times more than the quantity contained in potatoes. It is presumed, therefore, that carrots are much better adapted than the latter for the distillery. Dr. Hunter, in the 'Georgical Essays,' details experiments made to prepare from carrots a beverage resembling beer, and subsequently a spirituous liquor; the former proved unsuccessful; but the result of the latter was, according to the Doctor's opinion, very encouraging. "From a gross calculation," he concludes, "I am induced to think that a good acre of carrots manufactured in this manner will leave a profit of forty pounds, after deducting the landlord's rent, the cost of cultivation, distillation, and other incidental expenses. In this calculation I presume that the spirit is worth six shillings per gallon, and not excised." This is perhaps rather an exaggerated statement: it has, however, been found by other experiments that eighteen tons, the produce of one acre, will yield one hundred gallons of proof spirit, a larger product than that obtained from an acre of barley;* while the refuse supplies a greater quantity of food for hogs.

Attempts have been made to prepare sugar from carrots, but without success; a thick syrupy matter which refuses to crystallize can alone be obtained.

The PARSNIP (*Pastinaca sativa*) is, like the carrot, a biennial, and is also a native of Britain. It belongs to the same tribe of plants (*Umbelliferæ*) as the carrot, and resembles it in its general characteristics. The leaves are, however, larger, the parts not being so delicately formed, and the whole plant is more strong and hardy. The flowers are yellow, while those of the carrot are white, with a tinge of purple in the middle.

One variety only of the parsnip is cultivated in England, though that runs into many sub-varieties, according to the soil upon which it is grown. In other countries the varieties are more numerous. In France, as well as in Guernsey and Jersey, where the soil is peculiarly adapted to this cultivation, three varieties are distinguished by the names of *Coquaine*, *Lisbonaise*, and *Siam*. The first runs very long, to the depth of three and even four feet in the ground, and attaining to from three to four inches in diameter; while its leaves grow proportionally high, and proceed from the whole crown of the root. The *Lisbonaise* is shorter, but considerably thicker,

* The average product assigned to twelve stone or one hundred and sixty-eight lbs. of malt, is about six gallons and three-quarters, imperial measure, of spirit twenty-four per cent. over proof; thus giving about two gallons as the product of a bushel. According to this calculation, an acre of barley should produce sixty gallons of spirit of the strength above mentioned, which is equal to seventy-four gallons of proof spirit, imperial measure, or eighty-nine gallons of the old wine-measure.

and of an equally good quality: the leaves of this variety are small and short, and proceed only from the centre of the crown. The *Siam* has not so large a root, and is of a slightly yellow tinge; it is more tender, and of a richer flavour than the other varieties.

A light deep soil, free from stones, is requisite for the favourable growth of the parsnip. The seed is usually sown at the latter end of February or March, in the proportion of nearly three and a half pounds of seed to one rood of land. It is sown broad-cast, and raked into the ground. The only after-culture required is to keep the plants free from weeds, and to thin them to about a foot distance from each other. The roots come to maturity at the latter end of October: this state is indicated by the decay of the leaf; they are then fit for use. Parsnips are not so susceptible to injury from frost as carrots, and they may therefore remain throughout the winter in the ground without being in any way deteriorated.

A few roots should, however, be preserved in sand for use during those months when the ground is too hard to allow of their being dug up. The seed is obtained in the same manner as that of the carrot.

When the parsnip is grown upon poor land it loses much of the rank taste which it acquires if cultivated in richer soils, and though not nearly so abundant, is far more sweet and agreeable. Thus produced, when slowly roasted in the ashes of peat or turf, it becomes nearly as farinaceous as the best potatoes, and in some of the poorer districts of the country is used with the same additions as an article of substantive food. "In the north of Scotland," Neill observes, "parsnips are often beat up with potatoes and a little butter: of this excellent mess the children of the peasantry are very fond, and they do not fail to thrive upon it." From the same authority we learn that in the north of Ireland an agreeable beverage is prepared from the roots brewed with hops. In some places a species of wine is also made from them, and a very pure spirit is obtained when parsnips are distilled after a similar preparatory process to that used with the carrot. In Catholic countries the parsnip is more abundantly employed for human food than in Britain. It was, however, formerly held in much greater estimation here than it is at present. This root is wholesome as well as hardy, but as the soil which is most favourable to its production as human food is also best adapted for the growth of the potato, which is both more productive and more nutritious than the parsnip, the culture of this plant as a culinary esculent has declined; and the use of it with salt-fish in Lent may perhaps be regarded more as the relic of an old custom than as a choice arising from any partiality for the peculiar flavour of the parsnip in combination with this particular kind of viand.

The alimentary matter in parsnips is found by analysis to be ninety-nine parts in a thousand, of which nine parts are mucilage, and the remaining ninety are saccharine matter. The quantity of protein has not hitherto been estimated, but it is probably of the same amount as in carrots.

The Skirret (*Sium Sisarum*) differs from the roots already mentioned in being a perennial. This plant is not a native of England, or of any part of Europe. It is indigenous to China, but was introduced into this part of the world some centuries back, being known in British horticulture so early as about the middle of the sixteenth century. It was formerly much more prized than it is at present. Worlidge, a writer in the latter end of the seventeenth century, described it as the "sweetest, whitest, and most wholesome of roots." The skirret is one of those plants which are now neglected, because we are become acquainted with others more pleasant to the taste and more profitable in their culture. Its peculiar sweetness, so delightful to the palates of our less-refined forefathers, to us appears nauseous lusciousness; and that root which the Emperor Tiberius esteemed so much as to cause it to be brought from the banks of the Rhine for the use of his table, is little relished in the present day. Beckmann ingeniously accounts for this change of taste in the use of vegetable productions.

"In the oldest times mankind were so fond of sweet things, that the goodness and agreeable taste of every kind of food was determined according to the degree of its sweetness; and such is the manner of judging, even at present, throughout all the East, in Africa, and in America. This is the case also among us with the greater part of the lower classes, who are not able to follow the mode of richer tables. In the northern countries this taste is almost everywhere prevalent. Thus the Swedes spoil, by the addition of sugar, costly Rhenish wines, sauer-kraut, and other articles, the agreeable tartness of which is gratifying to other nations. In proportion to their population and luxury the Swedes seem to use more sugar than the Germans, and the Germans more than the English or French; and one might almost suspect that a taste for sweet things was in the inverse ratio of culture. At any rate, one can thus explain why many vegetable productions which some centuries ago were reckoned among the most agreeable dishes appear to us to be nauseously sweet."*

For some time after the cultivation of skirrets had become neglected in the gardens of the rich, they still continued to be an object of culture among the poor in a few remote parts of the country. But even in those situations they have now very generally given way to the potato, and are seldom grown, and even then rather from the love of variety than for any particular merit which they may possess. The skirret is thus occasionally cultivated in the north of Scotland, under the name of *crummack*.

This plant is small compared with the carrot and parsnip, and belongs to the same natural order (*Umbelliferæ*). It has pinnated leaves, consisting of two or three pair of long dentated leaflets, and terminated by an odd one. The flower-stalk rises to the height of about two feet, breaking out at top into branches, each terminating in an umbel of small white flowers. The root consists of a cluster of fleshy fibres, which are connected

* 'History of Inventions,' vol. iv. p. 358.

Flowers and Roots of the Skirret.

together at the crown or head, and in the course of a few years augment to a considerable bunch. Each separate tuber is about the thickness of the little finger. They grow very uneven, and are covered with a whitish rough bark, while a hard core or pith runs through the centre.

This plant is propagated either by seeds or by offsets from the parent root; the first method is considered the preferable one for obtaining good and tender roots.

The skirret abounds in saccharine matter. Mr. Margraaf extracted from half a pound of this root one ounce and a half of pure sugar.

The Beet (*Beta*) was known as an esculent root in the time of Pliny, who has given an accurate description of it in his work. The period when this plant was first introduced into Britain as a garden vegetable is not ascertained. It was cultivated at Lambeth by Tradescant the younger in 1656; but there is no reason for supposing that he was the first cultivator; on the contrary, it is more than probable that the beet was brought into this country by the Romans, and that it has continued since that period to be an object of partial cultivation.

The cultivated beets, in all their varieties, are plants of the same duration, and nearly of the same habits, as turnips. They are sown in the early part of the summer, bulb towards the close of the season, and, if allowed to stand, send up their flowering stems, and ripen their seeds in the following year.

The variety which has its root red throughout its whole substance is most used in England for culinary purposes. This plant is said to be a native of the warmer countries of Europe, but it is sufficiently hardy to bear the climate of most parts of Britain. The root is in the form of a carrot, but thicker in proportion to its length, those of a foot long often being three or four inches in diameter. It is very juicy, and, when wounded, bleeds freely a limpid fluid of a beautiful purple colour. The leaves are large, long, and succulent, and generally have a red or purple tinge. When eaten warm, beet-root has rather a mawkish flavour; it is, therefore, usually eaten cold, cut in slices, after having been previously boiled, and, with the addition of vinegar, is by some persons found agreeable to the palate. Its culture, as an esculent, has not, however, increased of late years, and it is not generally a favourite vegetable for the table. Nearly twelve per cent. of the whole weight of the beet is saccharine matter, which is a much greater proportion than is contained in any other European esculent. The quantity contained in the red and the white beet is nearly the same; the proportion of mucilage in each is likewise almost equal, the red having rather the advantage, while it has nearly three times as much gluten (protein) as the white.

In a country like Britain, where with the bulk of the people vegetables are esteemed for their agreeable flavour, rather than for their nutritive qualities, the superiority of the beet, in the latter respect, is disregarded, and those roots which are considered more savoury obtain the preference.

From one variety of this root, which has a red skin, but is internally white, sugar is extensively prepared in France. We shall notice this manufacture in a subsequent chapter.

The white beet is seldom, if ever, used as human food, but is largely cultivated for the nourishment of domestic animals, and is preferred for this purpose to the turnip or carrot, especially in the vicinity of populous towns. The field-turnip is esculent when young; the carrot is so in all stages of its growth; and therefore when grown amid a thick population, they form a great temptation to petty depredators, by whom the farmer finds this provender for his cattle much diminished. The field-beet, however, affords no allurement to the hungry plunderer, as starvation itself could scarcely induce him to make a meal of this harsh, coarse root, previously to its being subjected to culinary preparation, and even then it would prove a most unpalatable repast. When cows are fed with the beet, it is said that they yield a greater quantity of milk in consequence; and this food does not impart any of that rank flavour which is communicated by turnips.

There are several varieties of the field-beet: some with the stem, branches, and veins of the leaves red; others with leaves wholly red; and some, again, with the epidermis of the root in different shades of red, brown, and yellow. Those coloured varieties are considered more hardy than the white; and one, having a reddish skin, the *mangold* or *mangol wurtzel* of the Germans, is said to produce the largest roots and the most weighty crop in a given space of land. In Guernsey crops have been raised of one hundred tons per acre.*

* 'Gard. Mag.,' vol. iv.

Some varieties of white beet are cultivated in the gardens for their leaves alone; these are larger than the leaves of the red beet, and are more thick and succulent; they are boiled as spinach, and put into soups. One kind, called the great white or sweet beet, is esteemed for the footstalks and midribs of the leaves, which are stewed and eaten under the name of Swiss *chard*, or *poitée aux carotes*.

The JERUSALEM ARTICHOKE (*Helianthus tuberosus*) belongs to the natural order *Compositæ*. It is a native of Brazil, and was first introduced in 1667 into this country, where it was much esteemed before potatoes were brought into general adoption. It is of the same genus, and has the same appearance, as the common sunflower, except that it attains to a greater height, often being ten or twelve feet high. Its name is derived from the similarity of flavour observable between these roots and the bottom of the artichoke. Its distinctive epithet is a corruption of the Italian word for sunflower, *girasole*, from *girare*, "to turn," and *sol*, the "sun;" and bears no reference, as many have imagined, to the city of Jerusalem.

The period of its flowering is autumn; but though the roots bear unhurt our severest winters, the plant rarely blooms in this country, and, even then, its seeds never come to maturity. The root is composed of many tubers, growing in a cluster; and so prolific is this plant, that there are often from thirty to fifty of these tubers attached to one stem. No care is required in its culture. If, when digging up the roots, the smallest piece of a tuber be left, a plant will spring from it, thus propagating itself almost in the manner of a weed; so that after it has once found entrance in a garden, there is no little difficulty in extirpating it thence. This plant, however, repays cultivation, and much better roots are obtained from regular setting than from its spontaneous growth. Cuttings of the tubers are planted in the same manner as potatoes in any of the spring months: the crop can be used in September, and taken up in November for winter supply. This root seems to meet with

Flower and Root of Scorzonera.

undue neglect in our gardens; for it is an excellent winter vegetable, which may be grown abundantly at very little cost; it is wholesome, nutritious, and savoury; and, either boiled or stewed, affords a very agreeable variety for the table. These tubers resemble potatoes in being of one homogeneous substance; and are likewise eaten in their matured state.

SCORZONERA (*Scorzonera hispanica*) also belongs to the natural order *Compositæ.* It is indigenous to Spain, and was introduced into this country some years after the skirret, and, like it, was formerly more cultivated than it is at present. Its root has not, however, the peculiar sweetness of the latter, but is extremely delicate, and when properly prepared makes so pleasant an addition to the list of culinary vegetables, that it appears to be unjustly excluded from our gardens. It has shared the fate of those vegetables which, according to Beckmann, have been banished by fashion; "for this tyrant, which rules with universal sway, commands the taste, as well as the smell, to consider as intolerable, articles to which our ancestors had a peculiar attachment."

Scorzonera was first known on account of its supposed medicinal properties, but was afterwards cultivated as food in consequence of its agreeable flavour. It was applied to this first purpose in the middle of the sixteenth century in Spain, where it was esteemed as an antidote to the poison of a snake, called there *scurzo*. A Moor, it is said, who had learnt in Africa that this plant possessed so valuable a property, availed himself of the knowledge in effecting many cures with the juices of the leaves and roots upon peasants who had while mowing been bitten by these venomous reptiles; but he carefully concealed the plant, that he might retain to himself all the honour and the profit attendant on the discovery. He was, however, clandestinely followed to the mountains, where he was observed to collect this plant, to which the name of scurzonera or scorzonera was then given, from the name of the snake, the venom of which it was believed to render innocuous. The knowledge was quickly disseminated. Petrus Cannizer transmitted the plant, together with a drawing of it, to John Oderick Melchion, physician to the Queen of Bohemia; and he, in his turn, lost no time in sending it to Matthioli, who had not any previous knowledge of the plant.* Soon after this Nicholas Monardes published a tract, in which the particular virtue of these roots was panegyrized. It is probable that in Spain their adaptation as an edible substance was likewise first discovered; and thence, about the beginning of the seventeenth century, it was introduced into France. The author of 'Le Jardinier

* 'Matthioli Epistol. Medicinal.'

François,' who was a practical as well as theoretical gardener, assigns to his own exertions its first cultivation in the French gardens.*

Scorzonera is at present much more used on the Continent than in this country; its medicinal virtues are now, however, but little regarded.

This plant is a hardy perennial, with a stem from two to three feet long, and having yellow flowers, which continue to bloom from June to August. The lower leaves, which are linear and pointed, are about eight or nine inches in length. The root is thin and spindle-shaped, covered with a dark brown skin, but white within, and containing a milky juice.

Though the plants are perennial, producing offsets from the crown of the root, it is better to propagate from seeds, in the same manner in which carrots are cultivated, since the offsets degenerate from year to year, both in size and quality. The roots, like those of parsnips, remain uninjured in the ground throughout the winter, and till they begin to put out fresh leaves in the spring. The whole plant is somewhat bitter. To divest the roots of that quality, they are scraped, and then steeped in water previously to their being made to undergo any culinary process.

* "The first edition of his book, which greatly contributed to improve gardening in France, was printed in 1616."—*Beckmann.*

CHAPTER XII.

CABBAGE, SPINACH, ASPARAGUS, SEA-KALE, ARTICHOKE, ETC.

Many other parts of plants besides the roots and root-stocks contain starch and other alimentary matters, which cause them to be eaten by man. The parts of the plants which we shall now mention, which are eaten, are the leaves, flowers, and young shoots. Some of these are previously cooked, whilst others are eaten uncooked, or as salads. These plants have not been submitted to a rigorous chemical analysis, but they are all known to contain starch; and this is probably the constituent which recommends them in the diet of man. In addition to starch, they possess small quantities of protein; and in the Cruciferæ, as the cabbage, &c., and the asparagus, this principle is found in the form of albumen. The albumen, however, does not exist in sufficient quantities to render any of them an efficient nutritious diet for man.

The Cabbage (*Brassica oleracea*).

Some varieties of the cabbage have been cultivated from the very earliest times of which we have any record. But the migrations and changes of the best sorts have not been traced: neither is it at all probable that the varieties which the ancients enjoyed have descended to us unaltered. This particular genus of plants is peculiarly liable "to sport or run into varieties and monstrosities." They belong to the numerous family *Cruciferæ.* The cruciferous esculents form a much longer list than those bearing umbels; they are applied to a greater number of purposes, and afford an addition to food in a greater number of forms, ages, and parts of the plant. The roots, the leaves, the stems, the buds, are eaten raw, or dressed in various ways; and the seed of many species are valuable on account of the oil which they afford. None of the family are poisonous. The *Cruciferæ* being found as weeds in almost every field, constant changes are produced, even in those plants under cultivation by crosses with the pollen of wild plants; while soil, culture, and climate exert a powerful influence over the different species, altogether causing varieties and sub-varieties, of which it would be a hopeless task to attempt the enumeration.

It is probable that some species of Brassica was first introduced into this country by the Romans, since *kale* is mentioned among the oldest English records. It is well known that "Brassica" was in very common cultivation at Rome, where, according to Columella, it was a favourite edible with freemen, and in sufficient plenty to be an article of food for slaves. The ancient Germans likewise cultivated the species of Brassica from very remote times; whether they, too, were indebted to their Roman conquerors for its introduction it is impossible to decide. The Saxon name for February is sprout-kale,* and that is the season when the sprouts from the old stalks begin to be fit for use; the Saxons must therefore, of course, have been familiar with the culture of cabbage or kale, as it is not at all probable that they invented the name after their settlement in this country.

The variety of brassica which was first cultivated in England cannot be ascertained, since our ancestors had no distinctive name for the different kinds. Many improvements have been made in the cultivation of this vegetable, and many new varieties introduced by different individuals at comparatively recent dates.

The close-hearted variety, which is now more peculiarly called cabbage, was for many years imported into England from Holland. Sir Anthony Ashley first introduced its cultivation into this country, and made the

* White's 'History of Selborne.'

English independent of their neighbours for a supply. This planter of cabbages likewise rendered his name known by other deeds, less creditable to his character. It is related that he had a command at Cales (Cadiz), where he got much by rapine, especially from a lady who intrusted her jewels to his honour; whence the jest on him, that he got more by *Cales* than by *cale* and cabbage. There is said to be a cabbage at his feet, sculptured on his monument at Wimborne St. Giles, in Dorsetshire.* Although Sir Anthony Ashley introduced the cabbage, it does not appear to have become generally cultivated, for we continued to import the vegetable for many years. Ben Jonson, who wrote more than half a century afterwards, says, "He hath news from the Low Countries in cabbages."

It is recorded that cabbages were first introduced into the north of Scotland by the soldiers of Cromwell.† A country embroiled in internal hostilities might be supposed not to be in a very favourable state for the more extended cultivation of plants, the passions of the contending parties being too keenly roused to pay attention to improvements in those arts the progress of which more peculiarly belongs to a period of peace. But in the present case the fact is opposed to this conclusion; we learn that "Cromwell was a great promoter of agriculture and the useful branches of gardening, and that his soldiers introduced all the best improvements wherever they went."‡

The colonies of German fishermen from Cuxhaven and the adjacent places, which peopled the coasts of the central parts of the east of Scotland, are, however, supposed by some writers to have brought with them their national love of brassica, and to have introduced some species of those plants, at a period much anterior to that of the Commonwealth, to this part of Scotland, which is more peculiarly "the land of kale." There the cabbage and the open colewort are in equal favour, giving the

* Gough's 'British Topography,' vol. i. p. 133.

† 'Edin. Encyc.,' Art. Horticulture.

‡ Loud., 'Encyc. Gard.,' p. 87.

name of kale to a soup of which they form the principal ingredients, the outside leaves and the stalks of the plants falling to the share of the cattle. The father of Burns was from Kincardineshire; and the poet alludes to the customs of that county in his humorous comparison of Kilmarnock to a cow.

> "Now auld Kilmarnock cock thy tail
> An' toss thy horns fu' cantie:
> Nae mair thou'lt route o'er moor and dale,
> Because thy fare is scanty;
> For lapfu's large o' gospel kail
> Shall fill thy crib in plenty;
> An' *runts* o' grace the feck and wale,
> No gi'en by way o' dainty,—
> But ilka day."

The lapfu's allude to the outside leaves, and the *runts* to the portion of the stalk and centre from which the parts fit for culinary purposes have been removed; the latter especially were given as a dainty to the favourite milch-cows.

Many allusions in the old Scotch songs point to the fact of the country about Aberdeen abounding with this vegetable. In recommending the good fare of the country, the poet says,

> "There's cauld *kail* in Aberdeen,
> An' *castocks** in Stra'bogie."

The "kale brose o' auld Scotland" is celebrated to the same tune as the "roast beef of old England;" and though, with many of the ancient peculiarities of the people, it has fallen much into disuse, it is still considered a national dish.

All those kinds of cultivated *Brassica*, the leaves and flowers of which are eaten, belong to the species *B. olera-*

* Cabbage stems having the fibrous part peeled off, and the remainder softened by boiling. Before the introduction of the turnip into general use in Scotland, this medullary substance of the stalks of the brassica was very commonly eaten by the peasantry.

cea. This resolves itself into many varieties and endless sub-varieties, which, however, may be reduced to three classes, having their distinctive characters sufficiently marked for all practical purposes.

1*st class*.—Cabbages, in which the leaves gather into what is called a head, and are blanched by their own compression. The green colour is always much more completely destroyed by this blanching than the red; and the smaller the tendency which the expanded leaves have to blue or purple, the more sweet and crisp will the head become.

Cabbages are propagated by seed, which is sown at the three seasons, spring, summer, and autumn, to obtain a supply in succession. The soil for the seed-beds should be light, and not very rich.

The plants, from seed sown in autumn, are finally transplanted in spring. Most generally the seedlings are pricked out from the seed-beds as soon as they have one or two leaves of an inch or two broad, into beds of good earth; thence they are transplanted into a rich soil, which should be well manured.

2*nd class*.—Kale or Colewort.—In these the leaves are expanded and coloured, with the exception of a small portion in the centre, which encloses the rudiments of the flowering stem. The plain-leaved colewort is now seldom found in English cultivation. Borecole, or curly-leaved colewort, *Brassica oleracea*, var. δ *sabellica*, very generally, however, finds a place in our gardens. The green borecole, or Scotch kale, and the purple or brown borecole, are the most hardy of the race, and are therefore best adapted for cold situations and late seasons. The plants, when vegetating in a rich soil, grow vigorously, and attain to large dimensions; but, in common with most of the genus, moderate-sized plants are best for culinary purposes, the very large being harsh, and those which are so small as to be stunted are bitter.

Sauerkraut, "that excellent preparation" of the Germans, and of which they are so immoderately fond, is

Colewort (*Brassica oleracea*).

merely fermented cabbage. To prepare this, closely-headed white cabbages are cut in shreds, and placed in a four-inch layer in a cask; this is strewed with salt, unground pepper, and a small quantity of salad oil; a man with clean wooden shoes then gets into the cask, and treads the whole together till it is well mixed and compact. Another layer is then added, which is again trod down, and so on until the cask is entirely filled. The whole is then subjected to heavy pressure and allowed to ferment; when the fermentation has subsided, the barrels in which it is prepared are closed up, and it is preserved for use. The preparing of sauerkraut is considered of so much importance as to form a separate profession, which is principally engrossed by the Tyrolese. The operation of shredding the cabbage is now performed by a machine, which the men carry on their backs from house to house; this means for the abridgment of labour has not been invented more than ten or twelve years. Every German family stores up, according to its size, one or more large casks of this vegetable preparation. October and November are the busy months for the work, and huge white pyramids of cabbage are seen crowding the markets; while in every court and yard into which an accidental peep is obtained, all is bustle and activity in the concocting of this national food, and the baskets piled with shredded cabbage resemble "mountains of green-tinged froth or syllabub."

Sauerkraut has been found of sovereign efficacy as a preservative from scurvy during long voyages; it was for many years used in our navy for this purpose, until displaced by lemon-juice, which is equally a specific, while it is not so bulky an article for store.

The larger and grosser kinds of cabbage are used as food for cattle. But this nutriment has a great tendency to impart a disagreeable flavour to the milk of cows fed on it, and even to the flesh of other cattle. This unpleasant effect may, we are told, be prevented by removing the withered leaves; but cabbage is more disposed to fermentation and putrefaction than almost any other vegetable. When cultivated as food for stock, it is of course a matter of importance with agriculturists to produce the greatest weight in a given space. The average crop, as stated by Mr. Arthur Young, is thirty-six tons per acre, when the plants are grown on a dry soil, which is very similar to that quoted from other and more modern writers; but on a sandy soil only eighteen tons have been obtained. Some cabbages are occasionally produced of an astonishing size and weight. A cabbage-seed accidentally sown among onions came up in the onion bed, and, without any care being taken of it, grew to very large dimensions, and weighed, when taken up, twenty-five pounds. A cabbage was also produced in Devonshire, two or three years back, which, when growing, occupied a space of fifteen feet of ground, measured five feet in circumference, and weighed sixty pounds.*

A variety of brassica under the name of cow-cabbage (*Brassica oleracea*, var. *arborescens*) has been recently introduced into this country from La Vendée by the Comte de Puysage. The proximity of this department to the ancient province of Anjou, and the description of the plant, leave no doubt of its identity with the Anjou cabbage, a very large variety described by Mill.† In 1827 thirty-six seeds‡ were divided among six agriculturists, for the purpose of raising this useful vegetable in England. The perfect success resulting from some of these seeds, which have produced plants of a luxuriant growth, is already known; and horticulture is now so much more disseminated and understood in this country, that there is every reason to hope that the cow-cabbage will at length become naturalised in England. It is said that sixty plants afford provender sufficient for one cow during three or four years, without fresh planting. A square of sixty feet will contain two hundred and fifty-six plants four feet apart from each other, sixteen plants more than four cows require for a year's provender without the aid of other food. This plant is now successfully

* 'Gard. Mag.,' vol. iii. p. 351.
† Mill's 'Husbandry,' vol. iii.
‡ 'Gard. Mag.,' vols. iii. and v.

cultivated in Jersey, whence seeds have been sent to a nurseryman in London.

3rd class.—This division consists of cauliflowers and brocoli, which have the flowering stem short and succulent, the rudiments of the flowers forming into a curd-like head, which is not higher than the leaves, and becomes a mass of matter before the corolla or any other part of the flower is developed. This is the part of the plant used in this state as an esculent, but at the commencement of the development of the flowers it becomes bitter, and is no longer considered edible.

The CAULIFLOWER (*Brassica oleracea*, var. ε *botrytis*) is the most delicate variety of the genus brassica. It was first brought into England from the island of Cyprus, where it is said to attain to a high perfection, although it is not supposed to be indigenous to that country. The exact period of the introduction of this plant into English horticulture is not known; but it was certainly cultivated in this country at the beginning of the seventeenth century, although as a rarity which could only be produced at the tables of the most opulent. In the year 1619 two cauliflowers cost three shillings, the price of wheat being at that time 35*s.* 4*d.* per quarter.* It was not, however, until the latter end of the same century that this vegetable was brought to any degree of perfection; at least it was not raised in sufficient abundance to appear in our English markets until that period. The importation then of Dutch gardeners and Dutch gardening gave an impulse to English horticulture, which had been in rather a languishing state during the intestine troubles to which the Revolution of 1688 put a termination. But although the Dutch gardening no doubt produced an improvement in the cultivation of the cauliflower, as well as in vegetables generally, this plant became more naturalised in England than in Holland, or any of the adjacent countries of the Continent. Up to the period of the French revolution, cauliflowers were regularly exported from England into

* Eden's 'History of the Poor,' vol. i. p. 152.

Holland, some parts of Germany, and even France; and while the seed of very many cultivated plants is in this country preferred when it is of Dutch, rather than of English produce, cauliflower seed obtained from England is the most esteemed in Holland, and indeed throughout the Continent. The superiority of the English cauliflower is to be attributed solely to culture, and to culture carried on in the vicinity of London, not by experimentalists or amateurs, but by those who rear the plants for sale in the way of ordinary business. This vegetable is now cultivated very generally throughout the island; but since the portion of the plant which is used as food is not nearly as large as that of the cabbage, occupying an equal space, while it requires a richer soil and a warmer situation, it evidently can never become so cheap an esculent. Its delicate flavour is, however, in general much preferred to that of the cabbage, and it takes a higher rank in the list of culinary vegetables. Dr. Johnson, whose most trivial and perhaps sometimes absurd remarks have been considered worthy of record, used to say, "Of all flowers I like the *cauliflower* the best."

This plant, like the common cabbage, is first raised in a seed-bed of light earth, and finally transplanted into soil which can scarcely be either naturally or artificially too rich. The seed is generally sown at the latter end of the months of February, May, and August, for three succeeding crops. The plants raised from seed sown in the latter month stand through the winter, during which season and the first part of spring they are usually protected under hand-glasses. In the neighbourhood of London it is not uncommon to see whole acres overspread with such glasses, fostering an early supply of this vegetable for the inhabitants of the metropolis, and conveying to the mind of the beholder a forcible idea of the riches and luxury of this vast city.

The head of the cauliflower is not nearly so liable to putrescency, after being cut, as its leaves, which in this respect are similar to those of the cabbage. For a considerable time after the leaves have become flaccid and in a state of decay, the head remains unchanged, and with care may be preserved without putrefaction for some months. By merely drawing up the plants entire, and hanging them in a cellar, they will continue in a sound state for a considerable time. The method most successfully adopted in Scotland, is to place the plants in layers in a pit, with their heads inclining downwards. The pit is then covered up closely with earth, beaten down, and smoothed in a sloping direction, so as to exclude both the rain and the atmosphere.

Brocoli is usually considered as merely a sub-variety of cauliflower, and that this is the case is rendered very probable from the great tendency of the plant to run into new varieties, which are constantly making their appearance, and as rapidly vanishing and giving place to others. It is a matter of common observation, that the more any plant has been changed by culture, the more readily does it admit of other changes.

But a few years back, only two sorts of brocoli were recognised—the red and the purple, both of which originally came to us from Italy. Thirteen varieties are now enumerated as raised in the English garden, and each in turn is recommended to the notice of the cultivator by some characteristic quality. In the culture of no vegetable has so marked and rapid an improvement taken place as in that of brocoli; horticulturists have recently succeeded in producing a hardy white variety, which has a handsomer appearance than either the green or the purple, while it is more delicate in flavour. White as well as purple are now obtained throughout the winter, some attaining to the size and equalling the cauliflower in appearance, though not in taste. The earliest spring crop follows without an interval the late winter crop, and no cessation need take place in the supply of brocoli, although, perhaps, it is not commonly raised during a month or two in the middle of the summer, when many other vegetables are produced in abundance.

Brocoli succeeds best in a fresh loamy soil; the seed-beds should be of rich mould, on which the seeds are thinly scattered, and covered with mats or litter till the plants appear.

The species of SPINACEOUS PLANTS, as they are called after the common spinach, are most generally of a softer texture and more insipid flavour than those of the brassica. As their excellence consists in the succulence of the leaves, a rich soil is required for their cultivation. They generally belong to the family *Chenopodeæ*,* having very small flowers of a greenish tinge, formed into heads of various shapes, as a ball, a bunch, or a spike.

Spinach (*Spinacia oleracea*).

SPINACH (*Spinacia oleracea*). The native country of the common spinach, and the time of its introduction into Britain, are not precisely known.

The west of Asia is assigned as its native country, but on what grounds is not very clearly shown, except that the earliest notice we find of it is in the works of the Arabian physicians, who of course only treat of its sup-

* De Candolle.

posed medicinal properties, which might probably have originally led to its adoption as an edible vegetable. Spain is supposed to have been the first European country into which it was introduced, for many of the old botanists call it *olus hispanicum;* while some writers, among whom is Ruellius, distinguish it as *Atriplex hispaniensis*, and the latter adds that the Moors call it *hispanach* or *Spanish plant.* According to Beckmann, the first notice of its being used as an edible substance in Europe occurs in the year 1351, in a list of the different vegetables consumed by the monks on fast days: at that time it was written *spinargium* or *spinachium.* This plant found a place among culinary vegetables at rather an early period in England, for Turner, who wrote in 1568, mentions it as being at that time in common cultivation, and prepared for the table precisely in the same manner as it is at present.

Spinach is an annual plant, having large and succulent leaves: the flowering stems, which are hollow and branched, rise to the height of two or three feet. The male flowers grow on different plants to those of the female, which yield the seed. The former are produced in long terminal spikes, and the latter in close branches at the joints of the stem, or in the axillæ of the leaves and branches. This plant is remarkable as being one of the plants which are *diœcious*, that is, having the different parts of fructification upon separate plants. Some trees which are cultivated for their fruit, such as the date-palms, have the same peculiarity.

Two varieties of spinach are cultivated. The leaves of the one are arrow-shaped and rough, and of the other round and smooth. July and August are the months in which the seeds of both kinds would naturally come to maturity; but as they slightly differ in their qualities, it is found more advantageous to sow them at different seasons. The round-leaved grows the fastest, is the largest and most succulent, and therefore is sown for succession crops in spring and summer; the other, being much more hardy, is preferred for winter supply. The former is usually sown in January, from which time until the end of July frequent sowings are made for a regular succession, from the beginning of April to continue throughout the summer. The rough-leaved is usually sown in August for a winter crop. The seed is sown broad-cast, and in subsequent culture the plants are thinned first to three inches apart, and as they increase in size that distance is doubled.

From the circumstance of the male and female flowers growing on different plants, when they are left to bring their seed to maturity care is taken that a due proportion of each is suffered to remain. As soon as the seed capsules are set, the male plants are pulled up, thus allowing a freer space for the female plants wherein to perfect their seeds.

Wild Spinach, or English Mercury, or Good King Harry (*Chenopodium bonus Henricus*). This plant, which has obtained so many names, grows wild on a loamy soil, and may be found on way-sides and among ruins in many parts of England. The stalks rise to the height of a foot and a half; they are upright, thick, and striated, and covered with a whitish powder, which is likewise found on the under side of the leaves. These are arrow-shaped, and rather large for the size of the plant. The flowers, of a yellowish green colour, grow upon close spikes; they appear in June and July, and in August the seeds come to maturity. This plant is a perennial, and may be propagated by seeds or by offsets from the root. When young, both the stem and the leaves are succulent, the former being used as asparagus, and the latter as spinach.

Lincolnshire is the part of England where it is most in request, and where it is cultivated and preferred to the common spinach. It is, however, more nearly in a state of nature than the latter plant, and therefore cannot accommodate itself to differences of soil and situation.

The superior docility of a plant which has been long under cultivation, and which has travelled or borne changes of soil and climate in a growing state, is very apparent to those who attempt to rear wild plants in situations where they are not indigenous. This fact is so important a feature in the natural history of plants, that it is not perhaps sufficiently pointed out or explained in books treating on these subjects. It is a very natural result, which on consideration should not excite surprise, that a wild plant, which has been from time immemorial produced on the same spot, and has there accommodated itself solely to the circumstances of that spot, should refuse to grow in any other situation where the circumstances are not precisely similar. It is upon this principle that the mountain berry will not flourish upon the champaign country, and that the sweetest flowers of the woodlands refuse their odour to the parterre. In like manner, "Good King Harry," which makes a very estimable spinach or asparagus in its native country, might make but a very sorry one if removed to a place where it is not indigenous.

NEW ZEALAND SPINACH (*Tetragonia expansa*), so called because it was found growing wild on the shores of New Zealand when Captain Cook first touched at that island. Although the natives made no use of this plant as an esculent, the naturalists who accompanied the expedition were induced to recommend it as a vegetable which might be safely eaten, since its appearance and general characteristics were so similar to the *Chenopodium*. On trial, it was found to be both agreeable and wholesome. Sir Joseph Banks brought it into culture in England in 1772, and it has subsequently been found to be a much more hardy and valuable plant than was at first supposed. It was at first treated as a greenhouse plant; but now grows freely in the open garden, and indeed seems already to have naturalized itself in the south-west of England. A writer, from Exmouth, observes, in the 'Gardener's Magazine' for February, 1829, "The New Zealand spinach is quite a weed with us, as, wherever it has once grown, plants rise spontaneously, even when the seeds have been wheeled out with the dung in the winter, and again brought in as manure in the spring. I have now a full supply of it in my old pink bed." This spinach has an advantage over the common sort under cultivation, in producing an abundance of large and succulent leaves during the hot weather, when the latter plant runs almost immediately to seed, and produces little or nothing. It is likewise milder in flavour, and of so rapid growth, that a bed with about twenty plants is sufficient for the daily supply of a large family.

New Zealand Spinach (*Tetragonia expansa*).

Though by some called a biennial, this spinach is an annual in our climate. The stem has numerous thick and strong branches, somewhat procumbent for the greater part of their length, but raised at the points. The leaves are fleshy and succulent, three or four inches long, of a dark green on the under part, but of a paler colour on the surface, on which the mid-ribs and nerves are strongly marked. They are triangular, or rather of an elongated heart-shape, having the angles at the base rounded, and the apex sharp and extended. The flowers are small, and of a yellowish green colour; they appear in August and September. The whole plant is thickly studded with minute aqueous tubercles; a peculiarity likewise to be found in some species of *Atriplex* and *Chenopodium*.

In six weeks after sowing, some of the leaves of the plants are fit for gathering. These are pinched off, and not torn from the branches.

This plant has been likewise found growing on the Tonga Islands; and Thunberg discovered it of spontaneous growth in Japan.*

New Zealand spinach is remarkable as being almost the only native of the isles of Australasia which has been found worthy of a place in the kitchen-gardens of Europe.

ASPARAGINOUS PLANTS.—The ancients were accustomed to class all young sprouts of vegetables under the general name of asparagus. In agreement with this arrangement, all those pulpy shoots, stems, buds, and bottoms of compound flowers, which undergo culinary preparation before they become auxiliary articles of food, will be here designated as asparaginous plants.

The nature of this class of vegetables causes them to be always of more expensive cultivation than other plants the leaves or roots of which are used as esculents. For it is only a comparatively small portion of the whole plant which is here appropriated; and that too, most generally, when in a young and undeveloped state. Asparaginous plants must, therefore, always belong to luxurious, rather than to economic management.

ASPARAGUS (*Asparagus officinalis*), a plant belonging to the natural order *Liliaceæ*, stands foremost in this list, as having been of most ancient cultivation, and as being most esteemed in every age. It was held in much favour by the Grecians, and is handed down to us by its present name in the writings of Dioscorides.† The Romans must have been particularly skilful in its cultivation, since, according to Pliny, three shoots of that grown in Ravenna weighed a pound, which is considerably more than the weight of the largest English asparagus.

* 'Hort. Trans.,' vol. iv. † Lib. ii. cap. 151.

Asparagus has a perennial root and annual stalks. The root is fleshy and succulent, composed of round knobs, which are united together into a kind of tuber. This is seated deep in the ground, and is not liable to be much affected by the winter frosts. From this root, which contains turions or eyes somewhat analogous to those on the tuber of the potato, the stems rise up in the early part of the spring, and are cut for use when only a few inches above the ground. There are few subjects in vegetable anatomy which display more beauty in their structure than may be disclosed in a transverse section of a head of asparagus. The shoot of an asparagus grows only from the extremity, and works or vegetates from the centre, and not from the surface, as in trees. Thus it pushes up through the soil *en masse*, if it may be so expressed. The branches, which lie so thick together, safe and well protected under their scaly leaves, soon begin to be developed, and are drawn out until the whole plant, with its numerous thread-like leaves, assumes very much the character of a larch tree, having its miniature parts more light and elegant, and the colour of a more lively green. The flowers, which wave in graceful panicles, are of a yellow hue, and of a fragrant smell. They are followed by round berries of a bright orange red.

The head of the young shoot of asparagus is edible just as far as the part which is to flower extends; and thus one who eats a head of asparagus eats in that little space the rudiments of many hundreds of branches and many thousands of leaves.

Asparagus is distinguished into two varieties, the red and the green: the first is a larger kind, growing fuller and closer; though handsomer in appearance, it is not considered of so good a flavour as the green. In consequence of its being more showy, it is, however, held in great esteem with market-gardeners. This kind has been cultivated with great success in soils consisting of little else than sea-sand, dressed annually with sea-weed; and by attending to this mode of culture it is probable that asparagus might be reared on many spots on the coast, that will hardly produce any other vegetable.

A large quantity of asparagus is raised for the London market. Battersea, Mortlake, and Deptford, at each of which places the soil is light and friable, are the chief localities for its cultivation. The breadth of land in asparagus-beds in the parish of Mortlake alone, is estimated to be nearly a hundred acres; one of the principal growers having sometimes forty acres under this crop. The largest cultivator in Deptford has eighty acres entirely laid out in asparagus beds.

Although the natural soil of this plant is poor and light, beds for asparagus can never be too highly manured, since its good quality depends on the quickness of its growth, which is accelerated by richness of soil. It is propagated by seed, which is sown broad-cast in spring; and at the same period of the ensuing year the young plants are transplanted to beds prepared for their reception, and where they are allowed to remain three or four years, before the tender shoots are cut for use. When these are from two to four inches above the ground, they are cut two or three inches below the surface. In cutting, care is taken to leave to each plantule or stool one or two shoots, to grow up into flower and seed, or otherwise the roots would perish. Under good culture, the same plants will continue to furnish annual crops during twelve or fourteen years. It is estimated by a practical gardener that five square poles of ground, planted with sixteen hundred plants, will yield, during the season, from six to eight score heads daily.*

Asparagus contains but little nutriment, but it is a mild vegetable, and pleasant to the taste. Though this plant is much cultivated in places where the luxuries of horticulture are abundant, its use is little known in situations remote from populous towns; of this the following anecdote will serve as an illustration:—About the close of the last century the proprietor of a considerable estate in one of the midland counties of Scotland, who prided himself upon his general knowledge and uniform

* Abercrombie.

consistency, had passed the meridian of life without ever having seen asparagus. When he did at length meet with some at a dinner in a neighbouring town, he selected the white end, and having with some difficulty cut off a piece, he subjected it to rather a laborious process of mastication. A gentle hint was given that he had taken the wrong end; but disliking to confess ignorance in the matter, he assured the company that he always ate asparagus in that fashion, and for the sake of consistency he continued to gnaw the hard end as long as he lived.

Asparagus contains a peculiar vegetable principle to which the name of *asparagin* has been given, and to which, in part in least, the plant owes its qualities.

Sea-Kale (*Crambe maritima*), like the cabbage, belongs to the natural order *Cruciferæ*. In the first volume of the Transactions of the Horticultural Society, it is stated by Maher, that sea-kale was sent from England to the Continent by L'Obel and Turner, before the middle of the sixteenth century. No professional account of it, however, appeared for nearly a century after that period; the earliest notice being that taken of it by Miller, in 1731; and it was not until the year 1767 that it was first brought by Dr. Lettsom into fashionable repute as a garden vegetable. Since that time it has gradually come into very general culture in Britain, though, for the same reason as has been assigned in the case of asparagus, it can never become a cheap vegetable.

The cultivation of this plant is but little attended to, and apparently not very well understood on the Continent. In the 'Manuel du Jardinier,' for 1807, a French horticulturist described the *chou marin d'Angleterre*, but he was not aware of its proper application as an esculent, since he used the broad green leaves instead of the blanched shoots. This of course proved no very tempting preparation, and caused the plant to be condemned as only fit for the coarser tastes of the inhabitants of colder climates.

Sea-kale is a hardy perennial, and when allowed to attain its full growth is a very beautiful plant. It is of a delicate sea-green colour, with a tinge of purple, and is powdered over with a very fine meal or bloom. The radical leaves are large, of a rounded form, waved, and deeply notched at the edges, and having very thick foot-stalks and mid-ribs. The flowering head is much branched ; the single flowers are of a beautiful white, and have a rich odour of honey. They are followed by roundish pods, having two cells, one of which generally contains a seed, and the other is abortive. Notwithstanding which, however, the number of flowers upon one plant is so great as always to produce an abundance of seed. The shoots proceed from eyes on the roots, or from buds in the axillæ of the radical leaves ; if these leaves are removed, and the flowering stems, as soon as they begin to appear, are cut, the number of the shoots and the rapidity of their growth are increased. This is an effect very desirable to be attained, since these shoots when young and tender, and the stalks of the unfolding leaves when blanched either by natural or artificial culture, are the parts used as an edible substance in the manner of asparagus. The peeled mid-rib of the large leaves which have been allowed to expand, after the plants have ceased to send up young shoots, is sometimes applied to the same purpose.

As the roots of sea-kale are perennial, and contain eyes or buds, the plant may be propagated either by sowing the seeds or parting the roots. Either of these methods may be advantageously pursued in the middle of the spring.

A deep light soil is so essential to this culture, that if the earth do not naturally contain sand, as much of this must be mixed with it as will ensure a drainage to the depth of at least two feet and a half. Water stagnating in any part of the soil to which the roots may reach, is found injurious to the plants.

The well-known nature and peculiarity of the soil and situation in which sea-kale is found point out the mode of its artificial culture much more clearly than is the case with plants of which the natural habits and localities are not so well ascertained. This culture, therefore, is similar in its circumstances, except in that of time, to those which attend the growth of the plant when in a state of nature. The soil is made light and porous, and as the young plants advance they are artificially, if not naturally, watered. When the leaves of the first year die down, the beds are covered with a thin layer of very light and sandy mould, and over that with a layer of about six inches of light litter, to protect the plants from frost, and to preserve about the same temperature which the soil has during winter upon a light sandy beach. In the second season nearly the same treatment is pursued, the object being not to force the upward production, but to make the roots as full of germs and as strong as possible. The earthing up in those two seasons changes the bud in the axillæ of the radical leaves into germs, which will produce shoots in the ensuing year; and, as the process continues, the buds of one season become the stems of the next.

When the shoots of the third year are coming into action, preparations are made for obtaining the first crop. For this purpose a layer of about an inch thick of fine sand or gravel is laid on the sea-kale bed, that it may have a still nearer resemblance to the sea-beach. If the plants were left to their natural action in that soil, freely exposed to the air and the heat of the sun, they would come into flower in May or June, and the progress of the flowering stems, and the expanding and colouring of the radical leaves, would be so rapid, that the plants would be esculent only when very small, and would in consequence be of little value; they would not, in fact, differ much from the wild plants which the peasants gather upon the beach, being perhaps inferior, if the temperature were warmer than it is in those situations which are refreshed by the immediate presence of the sea.

This, therefore, is the point at which the skill of the cultivator changes the season of the plant, not by forcing it forward into productiveness, as is the case with fruits that are forced, but by checking its upward growth, and causing the nourishment which would be thus expended to be directed to the enlargement of the shoots previous to their expansion. To produce this effect, as well as to blanch and prevent them from becoming bitter, the plants are covered with pots, so pressed down into the soil as to preclude the admission of light and the circulation of air, as both are detrimental to the colour and flavour of the produce.

Pursuing this method shoots are produced fit for use generally in April or May, and a succession may be obtained during six weeks. No plant is more easily and cheaply forced than sea-kale, and therefore a supply of this vegetable may be usually obtained for the tables of the affluent during mid-winter, and throughout those months when fresh vegetables are most difficult to be procured.*

The ARTICHOKE (*Cynara Scolymus*) belongs to the natural order *Compositæ*, and is a native of some of the warmer parts of the temperate zone, and is supposed to be indigenous to the countries which bound the Mediterranean, as well as to the islands which are situated in that sea.

Like sea-kale, it is naturally a maritime plant, or at least one which thrives best on soils where there is a mixture of saline or alkaline matter. It does not, however, flourish on the same sandy shore with the former plant, its most genial soil being that in which there is a mixture of peat or other decayed marshy vegetable matter. Nowhere does the artichoke arrive at greater perfection than in the Orkney Islands, and this successful culture is said to be consequent on the plentiful supply of sea-weed, with which the ground is annually dressed.

Beckmann made very laborious researches to ascertain the positive antiquity of the artichoke. These discussions are, however, more curious than interesting. A commentator of Dioscorides, Hermolaus Barbarus, who died in 1494, relates that this vegetable was first seen in

* Loudon's 'Encyc. of Gard.,' p. 731.—*Abercrombie.*

the Venice garden in 1473, at which time it was very scarce. A few years previous to that time it was, however, an object of cultivation in other parts of Italy. It was introduced into France at the beginning of the sixteenth century, and not many years afterwards, during the reign of Henry VIII., was first transplanted into our gardens. In the Privy-Purse expenses of this king we find several entries regarding artichokes. Thus :—"Paied to a servant of maister Tresorer in rewarde for bringing Archecokks to the king's grace to Yorke place, iiij*s.* iiij*d.*"—A treatise, written in the reign of Mary, on "the best settynge and keepynge of artichokes," is still preserved in the Harleian library, of which it forms the 645th number. Though in very common culture in this country, this plant is not held in so much estimation here as on the Continent.

The artichoke has large thick perennial roots and annual stems, rising to three feet or more in height. The leaves are large and pinnatifid, or cut in deep, horizontal, convex segments; these are covered with an ash-coloured down. In the midst of them rise the upright stalks, which are surmounted by large, scaly heads, composed of an involucrum, having numerous oval leaves or scales, enclosing the florets, and placed on a broad, fleshy receptacle; this, and the lower part or *talus* of the scales, are the only edible portions of the plant used in the early stage of their growth, before the central leaves of the calyx are separated, or the flowers in any way exposed. A large portion of the centre is occupied by what is vulgarly called the choke, which consists of the young flowers and seed-down, having the appearance of bristles or prickly filaments, and from which the receptacle, or bottom, must be entirely freed before it can be eaten.

Artichokes are most readily propagated by offsets from the roots of the old plants, from which they may be separated, and planted out anew in March or April, when they have attained a height of about five inches. They will produce a crop the same year, but not an abundant one, commencing in August, and continuing till November; the second year they will be in full bearing, and produce two months earlier. Thus by planting fresh offsets every year, a succession of artichokes may be obtained from June to November. The old plants, however, will continue productive for many years, provided the ground be annually manured at the winter dressing. But although the heads may be obtained from roots twenty years old, they degenerate in size and abundance with the age of the plant, and therefore it is advisable often to renew the plantation.

The CARDOON (*Cynara carduncului*) is also a compositous plant, and is a native of Candia, whence it was not introduced into England until more than a century after the artichoke. Its cultivation has never, however, been an object of much attention in Britain, where it is considered of little value. On the Continent this vegetable takes a higher rank, and is much more extensively used.

The stems of the young leaves, rendered mild and crisp by blanching, are the only edible part of the plant; these are stewed or used as an ingredient in soups and in salads.

The cardoon very much resembles the artichoke in appearance; but it is of a larger and more regular growth.

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CONTENTS.

THE FOOD OF MAN.

CHAPTER XIII.

CARBONACEOUS SECRETIONS *continued*:—SUGAR.

SUGAR is one of the carbonaceous principles of plants, and is found sparingly in the animal kingdom, more especially in the milk of the Mammalia. It varies slightly in its composition, according to the sources from which it is obtained. The great proportion of the sugar used by man as an article of diet is obtained from the sugar-cane, the *Saccharum officinarum* of botanists. The properties of cane-sugar are more or less partaken of by that obtained from other sources. When sugar is pure, it is colourless, inodorous, of a purely sweet taste, and moderately hard and brittle. It assumes a crystalline form, and when the crystals are rapidly formed, as in common refined sugar, they are small; but when they are obtained by the rapid evaporation of a strong solution of sugar, as in the making sugar-candy, they may be procured of a very large size. Sugar has a specific gravity of about 1·065: it undergoes no change when exposed to the air, and when moderately heated loses only a little hygrometric moisture. It is soluble in one-third of its weight of cold water; but with hot water it combines in all proportions. It melts at a temperature of 365°, and when cooled suddenly, becomes a transparent mass, which is sold in the shops under the name of barley-sugar. When exposed to a very high temperature, sugar undergoes decomposition, yielding various gaseous compounds, leaving behind carbon in the form of charcoal. In chemical combination it acts in the same way as an acid, and has the power of uniting with the alkalis and oxides of metals, forming salts, which have been called saccharates.

According to the analysis of Berzelius, cane-sugar consists of—

12 equivalents of carbon .	. 72	or	6·4
11 equivalents of hydrogen	. 11	or	42·1
11 equivalents of oxygen .	. 88	or	51·5
Equivalent .	. 171		100·

When this is exposed to heat, two equivalents of hydrogen and two of oxygen, or two of water, are given off, and a substance containing twelve atoms of carbon and nine of water is left, which is sometimes called caramel. The sugar obtained from the maple and from beet-root has the same composition as cane-sugar.

The sugar of the grape differs somewhat from the preceding. It has the following composition:—

12 equivalents of carbon	. 72	or	36·36
14 equivalents of hydrogen	. 14	or	7·07
14 equivalents of oxygen	. 112	or	56·57
Equivalent	. 198		100·

The sugar formed in the human system, in the disease called diabetes, has the same composition as grape-sugar, so also has the sugar of honey, and the sugar of all fruits. A sugar of the same composition is obtained by the action of diastase and sulphuric acid on starch. This sugar is however uncrystallizable, a property possessed by the sugar that is developed during the decomposition of many plants.

Manna and liquorice, although they are sweet, are not forms of sugar, for all sugars are susceptible of being converted into alcohol by fermentation. Molder suggests that these substances are produced in plants by the decomposition of cane or grape sugar. Thus mannite is produced from beet-sap when it is fermented at a high temperature, and during the change of starch into grape-sugar by the action of sulphuric acid. Manna, or mannite, as it is called, when free from impurities, has the following composition:—

6 equivalents of carbon	36	or	39·6
7 equivalents of hydrogen	7	or	7·6
6 equivalents of oxygen	48	or	52·8
Equivalent	91		100·

Glycyrrhizine, or pure liquorice, is composed as follows:—

16 equivalents of carbon	96
12 equivalents of hydrogen	12
6 equivalents of oxygen	48
Equivalent	156

The sugar of the milk of the human being and of the Mammalia has also a peculiar composition, but is a true sugar. It has—

24 equivalents of carbon	144	or	40·46
24 equivalents of hydrogen	24	or	6·61
24 equivalents of oxygen	192	or	52·93
Equivalent	360		100· 1

Sugar is not so widely distributed in the vegetable kingdom as starch, but it appears constantly to exist as the result of the decomposition of starch. It presents itself especially during the germination of plants; and a knowledge of this fact has led to the process of malting for the purpose of obtaining sugar for the fermentation of beer. Sugar is found in the sap of many trees, as the maple, birch, and others; and is found in the stems of most of the Cerealia and other Gramineæ. It is also present in many fleshy roots, as the carrot, turnip, parsnep, and beet-root, and in the fruits of a great number of plants. Although in all cases starch seems to be deposited before sugar in the cells of plants, yet at certain periods in their growth the sugar is either again transformed into starch, or removed by decomposition, as we find many parts of plants sweet when they are young, which are not so when they become old; the sweetness of the seeds of the pea when green, and that of the stems of many grasses when young, are examples.

Sugar when taken into the system appears to act in the same way as starch. It is taken into the circulation, and there becoming converted into tannine, it is burned in contact with oxygen, and assists in maintaining animal heat. Like starch also, when not entirely burned in the system, it is converted into oil, and is deposited in the tissues in the form of fat. It is on this account that sugar has been regarded as "nutritious." It is not, however, nutritious in the sense of adding to the living tissues of the body; no one can live on pure sugar, and experiments were performed by Majendie on dogs, which, when fed entirely on sugar, died. At the same time it is well known that the negroes, during the time they are getting in the sugar-plants in the West Indies, live almost entirely on the sugar-cane. That they can do so arises from the fact, that the sugar-cane, in addition to the sugar, contains large quantities of protein, in the form of albumen. This substance then supplies nutrition, whilst the sugar acts on the system as the other carbonaceous secretions.

Sugar is more easily digestible than starch, and is on this account supplied to the young animals of the various species of Mammalia. It is the carbonaceous secretion which of all others is most adapted for children, and their instinctive love of it seems to point out the value of it to them as a diet. Sugar should not, however, be administered alone as an article of diet, but where properly mixed with from 70 to 90 per cent. of other kinds of food, children will scarcely take too much of it. The coarser the sugar the better it is as a diet, as it contains more of the proteinaceous impurities of the cane. Thus brown sugar, in this point of view, is better than white, and treacle or molasses is better than either.

Although sugar may be eaten with impunity by the young, caution ought to be exercised in feeding upon it by the adult, especially where there is any tendency to indigestion. If sugar is not properly digested in the stomach, it quickly decomposes, sometimes forming oxalic acid, but more frequently lactic acid, and by this means lays the foundation of dangerous diseases.

The principal supply of sugar for consumption in Great Britain is obtained from the sugar-cane, although small quantities are obtained from other sources. The quantity of sugar obtained from various parts of the world was, in 1839, estimated as follows :—

	Cwt.
British sugar colonies	3,571,378
British India	519,126
Danish West Indies	450,000
Dutch West Indies	260,060
French sugar colonies	2,160,000
United States of America . . .	900,000
Brazil	2,400,000
Spanish West Indies	4,481,342
Java	892,475
For internal consumption, exclusive of China, India, Siam, Java, and the United States	2,446,337
Total	18,080,658

The consumption of the United Kingdom is about one-fifth of the above quantity. There is a remarkable fact connected with the sugar-trade of this country, and that is, that although the population of the country has nearly doubled in that time, the consumption of sugar has not increased in anything like the same proportion. In 1820 the consumption of sugar in this country was about 3,000,000 of cwts.; in 1840 it was not more than 3,500,000. There can be no doubt that this limited supply depends on the restriction which exists with regard to the admission of sugar from other colonies than our own. Sugar is not only thus kept up at an enormous price, but the whole junior population of the country is kept upon a limited supply of an article of food which seems especially created for their use. The philanthropy which would urge as an objection to the free trade in sugar, that some of it is produced by means of slaves, forgets that there may be suffering at home for the want of it, setting aside the probability there is that a free trade in sugar would be a death-blow to slavery thoughout the sugar colonies of the world.

CHAPTER XIV.

SUGAR-CANE.

THE Sugar-cane (*Saccharum officinarum*) must be considered as a native of China, since it has been pretty accurately shown that its cultivation was prosecuted in that empire for two thousand years before sugar was even known in Europe, and for a very long period before other eastern nations became acquainted with its use. For some time after this substance, in its crystalline form, had found its way to the westward, through India and Arabia, a singular degree of ignorance prevailed in regard to its nature and the mode of its production; and there is reason for believing that the Chinese, who have always evinced an unconquerable repugnance to foreign intercourse, purposely threw a veil of mystery over the subject. Persons have not been wanting, even in modern times, who have approved of this anti-social spirit, as being the perfection of political wisdom;—but is it not a complete answer to their opinion, that every nation which has cultivated commercial relations has been steadily advancing in civilization, and adding most importantly to the sum of its comforts and conveniences; while the inhabitants of China, although possessed of the greatest natural advantages, arising from variety of soil and climate, and whereby they had so long ago placed themselves in advance of other people, have remained altogether stationary? The case of this extraordinary people forms altogether, and in many ways, a standing enigma in the history of our species, the solving of which could not fail to prove highly instructive and interesting.

A knowledge of the origin of cane-sugar was correctly revealed in the middle of the thirteenth century, by the

Sugar-canes.

celebrated traveller Marco Polo; though it was partially known much earlier. The plant was soon conveyed to Arabia, Nubia, Egypt, and Ethiopia, where it became extensively cultivated. Early in the fifteenth century the sugar-cane first appeared in Europe. Sicily took the lead in its cultivation; thence it passed to Spain, Madeira, and the Canary Islands; and shortly after the discovery of the New World by Columbus, this plant was conveyed to Hayti and Brazil, from which latter country it gradually spread through the islands of the West Indies.

The canes of the sugar-cane have knotty stalks, and at each joint or knot a leaf is produced. The number of joints varies in different specimens, some having as many as eighty, and others not half that number. There are now several varieties cultivated in the American colonies, which were conveyed to that quarter, about the end of the last century, from the islands of Bourbon, Java, and Otaheite. These are so far superior to the old plant, that its cultivation has nearly ceased. The new varieties are larger in diameter, have a much greater distance between the joints, and come sooner to maturity than the old Brazil cane. This occupies, from the time of its being planted until it is fit for being cut, a period of from twelve to twenty months; while the larger varieties, by which it has been superseded, are fully ripe in ten months.

The sugar-cane varies exceedingly in its growth, depending upon the nature of the soil. In new and moist land it sometimes attains the height of twenty feet; while in ground that is arid and calcareous, its length does not exceed from six to ten feet. It is always propagated from cuttings. When sown in the colonies of America, the seeds have never been known to vegetate; and although there must, doubtless, be some country where the course of nature could be followed in this respect, we are not acquainted with any place in which the cultivators resort to the sowing of seed, in order to the propagation of the plant. The top joints are always taken for planting, because they are less rich in saccharine juice than the lower parts of the cane, while their power of vegetation is equally strong. The cane-plant is possessed of the power of tillering, in a manner similar to that shown by wheat, although not to an equal extent.

In preparing a field for planting with the cuttings of cane, the ground is marked out in rows three or four feet apart, and in these lines holes are dug from eight to twelve inches deep, and with an interval of two feet between the holes. Where the ground is level, larger spaces are left at certain intervals, for the facility of carting; but there are many situations at the sides of steep hills where no cart can be taken, and in such cases these spaces are not required. The ripe canes are then conveyed to the mill in bundles on the backs of mules, or are passed down to the bottom of the hill through wooden spouts.

The hoeing of a cane-field is a most laborious operation when performed, as it must be, under the rays of a tropical sun. Formerly this task was always effected by hand labour, but, of late years, where the nature of the ground will admit of the employment of a plough, that instrument has been substituted, to the mutual advantage of the planter and his labourers. The planting of canes does not require to be renewed annually; in such a case the utmost number of labourers now employed on a sugar-plantation would be wholly inadequate to its performance. The most general plan is for a certain portion of the land in cultivation to be planted annually and in succession, the roots and stoles of the canes of the former year being left through the remaining parts of the plantation. From these, fresh canes, which are called rattoons, spring up, and are nearly as large the first year as plant-canes. Rattoon canes have a tendency to deteriorate—at least in size—every year they are continued, for which reason the progressive renewal of the plants is adopted. This plan may, however, be continued with very good effect for several years, provided the roots are furnished every year with a liberal supply of manure, that the ground about them is well loosened, and that all weeds are carefully removed. In this way it is said the same roots have been made to send up canes during twenty years. In some few cases the planters adopt a different course, and never wholly renew any individual field of canes, but content themselves with supplying new cuttings in such particular spots as from time to time appear to be thin.

The mode of cultivation varies in some particulars in different countries. In India, where the price paid for daily labour is exceedingly small, great pains are taken in preparing the ground for the reception of the plants, which are carefully weeded and watered, and freed from insects, at all periods of their growth, when such operations are called for. Unfortunately for the Indian sugar-cultivator, something more than mere labour is required for the proper manufacture of his produce—an acquaintance with chemical science, and the possession of adequate apparatus—in both which particulars he is lamentably deficient. The Indian agriculturist would suffer martyrdom rather than be guilty of the crime of innovation; the discoveries of scientific men are to him as though they never had been made, and in conducting processes he is contented with apparatus, the total cost of which does not exceed many shillings, where manufacturers of other countries think it necessary to expend many hundred pounds. If their inveterate prejudices could be overcome, and the Indian sugar-planters were furnished with adequate utensils, there is every reason to believe that the markets of Europe could be supplied thence with sugar of a quality quite equal to that of West-India manufacture, and at a considerably lower cost.

The manufacture of sugar is a somewhat complicated process, requiring for its successful performance not only some degree of chemical knowledge, but likewise a considerable amount of practical experience. We must content ourselves here with giving the merest outline of the operations, referring the reader who is curious in such matters to books wherein the whole details are given.

When the canes are fully ripe they are cut close to the stole, and being then divided into convenient lengths, are tied up in bundles, and conveyed to the mill. This always consists of three iron cylinders, sometimes standing perpendicularly in a line with each other, and at other times placed horizontally, and disposed in the form of a triangle, and so adjusted that the canes, on being passed twice between the cylinders of either kind of mill, shall have all their juice expressed. This is collected in a cistern, and must be immediately placed under process by heat to prevent its becoming acid, an effect which has sometimes commenced as early as twenty minutes from the time of its being expressed. A certain quantity of lime in powder, or of lime-water, is added at this time to promote the separation of the feculent matters contained in the juice; and these being as far as possible removed at a heat just sufficient to cause the impurities to collect together on the surface, the cane-liquor is then subjected to a very rapid boiling, in order to evaporate the watery particles, and bring the syrup to such a consistency that it will granulate on cooling. The quantity of sugar obtainable from a given measure of cane-juice varies according to the season, the soil, the period of the year, and the quality of the canes; but it may be calculated, that taking one state of circumstances with another in these respects, every five gallons, imperial measure, of cane-juice, will yield six pounds of crystallized sugar, and will be obtained from about one hundred and ten well-grown canes.

The fuel used for thus concentrating the juice is furnished by the cane itself, which, after the expressing of that juice, is dried for the purpose by exposure to the sun.

When the sugar is sufficiently cooled in shallow trays, it is put into the hogsheads wherein it is shipped to Europe. These casks have their bottoms pierced with holes, and are placed upright over a large cistern into which the molasses—which is the portion of saccharine matter that will not crystallize—drains away, leaving the raw sugar in the state wherein we see it in our grocers' shops: the casks are then filled up, headed down, and shipped.

With the planters in our own colonies, the process of sugar-making mostly ends with the draining away of the molasses in the manner just mentioned; but in the French, Spanish, and Portuguese settlements it is usual to submit this raw sugar to the further process of claying. For this purpose the sugar, as soon as it is cool, is placed in forms or moulds, similar to those used in the sugar-refineries in England, but much larger; and these being placed with their small ends downwards, the top of the sugar is covered with clay moistened to the consistence of thin paste, the water contained in which gradually soaks through the sugar and washes out a further quantity of molasses, with which it escapes through a hole purposely made at the point of the earthen mould. It is then called clayed sugar: the loaves when removed from the forms are frequently divided into three portions, which, being of different colours and qualities, arising from the greater effect of the water in cleansing the upper portion, are pulverized and packed separately for exportation.

The molasses which have drained from the sugar, together with all the scummings of the coppers, are collected, and, being first fermented, are distilled for the production of rum. The proportionate quantity of this spirit, as compared with the weight of sugar produced, varies considerably with the seasons and management. In favourable years, when the canes are fully ripened and the quality of the sugar is good, the proportion of molasses and scummings is comparatively small, and the manufacture of rum is consequently lessened. A hundredweight of sugar yields five or six gallons of proof spirit.

In the cultivation of the sugar-cane, the principles on which it should be based have almost entirely been overlooked, so that in many districts of the world the sugar-canes are failing on their old grounds. It must, however, be obvious that the same principles which apply to the ordinary produce of the farm and garden must be applicable to them. With this object in view Dr. Stenhouse has lately analyzed the stalks of the sugar-cane for the purpose of ascertaining their composition. From his experiments he came to the conclusion that for the successful cultivation of the sugar-cane it requires to be furnished with a very large quantity of silicate of potash, and also with a considerable amount of the phosphate. "In fact," says Dr. Stenhouse, "there are few of our cultivated plants, except perhaps wheat, barley, and other Cerealia, which require so large an amount of these substances. It is not wonderful, therefore, that the cultivation of the sugar-cane, from the inconsiderate way in which it has hitherto been too often conducted, should have been found rapidly to deteriorate, and in the course of time to exhaust most ordinary soils. I apprehend, however, that this exhaustion of the soil by the cultivation of the sugar-cane is by no means an unavoidable result; and that by means of suitable arrangements successive crops of sugar might be raised without the soils being materially injured. Wheat or any other kind of grain necessarily causes the removal of a portion of the valuable inorganic constituents of the soil, such as the alkalis, phosphates, &c., which can only be returned to it indirectly; but with sugar the case is quite otherwise. Sugar is a purely organic substance, consisting of carbon and the elements of water, all of which can be derived from the atmosphere, and contains neither alkalis nor phosphates; so that if the ashes of the canes were carefully collected, and returned to the soil in an available state, I do not see why cane-crops might not be grown upon the same land almost indefinitely." Dr. Stenhouse proposes to do this by burning the canes in an open fire at a much lower temperature than the fires used for evaporating the syrup in the manufacture of sugar, and for which purpose the canes are generally used, and to employ the ashes as a manure. He recommends also a small quantity of guano to be employed, but not mixed with the cane-ashes. The slag from the furnaces also may be powdered, and mixed with carbonate of soda, and exposed to a great heat in a reverberatory furnace.

CHAPTER XV.

SUGAR FROM BEET-ROOT, MAPLE, AND BIRCH.

Sugar may be properly reckoned a necessary of life. It is of almost universal use throughout the world. The scattered tribes of North American Indians spend the months of spring in their rude encampments, manufacturing sugar out of the juice of the maple; the five-and-twenty million inhabitants of the United Kingdom employ, throughout the year, two hundred thousand tons of shipping to export five hundred million pounds of sugar from their colonies. This enormous supply affords, upon an average, twenty pounds of sugar to each individual of our twenty-five millions of population. Through the natural operation of our commercial power this important article of comfort is placed within the reach of the humblest in the land, although the revenue received by the state from the consumers amounts to 5,000,000*l.* annually. In France, on the contrary, where the Government has chosen to force the manufacture of sugar at home, the article is consumed only by the wealthy in large towns, and is quite beyond the reach of the labouring population, although it is entirely freed from all duty. The history of beet-root sugar forms one of the most instructive chapters in the history of the evils resulting to a nation from what is called "the protection" of particular interests by a Government.

The celebrated Prussian chemist Margraff, about the year 1747, discovered the existence of a certain portion of sugar in the beet. This discovery was communicated to the Scientific Society of Berlin; but no attempt was made to carry the principle of the discovery into practice. Forty years after this, Achard, another Prussian chemist, resumed the experiments which Margraff had commenced. This man was somewhat of a visionary; and he was so enraptured by the prospects which his labours opened to him, that he announced the beet-root as "one of the most bountiful gifts which the Divine munificence has awarded to man upon the earth;" affirming that not only sugar could be produced from beet-root, but also tobacco, molasses, coffee, rum, arrack, vinegar, and beer. Here, then, was clearly nothing for Europe to do but to apply itself to the cultivation of beet, and leave the West Indies to be covered once more with jungle. The Institute of Paris, however, did not sympathise with the enthusiasm of Achard; for in 1800 a committee of that body, having gone through a series of the most careful experiments, reported that the results were so unsatisfactory, that it would be unwise to establish any manufacture of sugar from beet.

Here, probably, the matter would have rested, and Europe would have continued wholly to receive its sugar from countries adapted to the growth of the sugar-cane, had not the decrees of Bonaparte, in 1809, excluded France from purchasing the produce of the West Indies. To a large number of the French, sugar was an article of the first necessity; and the public dissatisfaction at the Milan decrees was therefore excessive. The emperor directed his active mind to the best method of obviating the inconvenience which his political schemes had imposed upon his people. Manufactories of syrups from raisins and honey were established; but sugar, or a crystallized saccharine substance, could not be procured. M. Deyeux, a member of the committee appointed by Napoleon to consider how the wants of the people could be supplied without foreign commerce, once more turned his attention to the beet-root. His experiments were more satisfactory than those of the committee of 1800; probably because the necessity of producing sugar at home was more pressing. An imperial manufactory of sugar was forthwith established at Rambouillet; imperial schools were instituted for instructing pupils in the process; premiums were given for the best samples of sugar; and thus, by 1812, the manufacture of beet-root sugar might be considered prosperously set on foot. The profits of the manufacturers were so large, that in one year they were reckoned sufficient to cover all the expenses of the original establishment. There was no competition. Of course there enormous profits were paid by the consumer. The French obtained some sugar, but they paid an extravagant price for the luxury. In 1814 Europe was at peace; the ports of France were again open to the produce of the West Indies; and in a moment the foreign sugar swept the beet-root manufacture entirely away. The consumers once more had cheap sugar; and the Government had not then made the discovery that it would be a good thing to compel them to eat dear sugar, that the manufacturers of beet-root sugar might be kept in activity.

This cheapness was a natural and healthy state of things, which would be sure to provoke the meddling propensities of that class of rulers who can never believe that the interests of trade can take care of themselves. Immediately after the peace, sugar from the French, English, and American colonies was permitted to enter France at the same rate of duty. In a few months, however, it was found that the sugars from the English colonies were driving the sugars of Martinique, Guadaloupe, and Bourbon out of the market. The colonies *must* be protected; so a protecting duty of twenty francs the 100 kilogrammes* was imposed upon all sugars of foreign origin. In 1816 the duty on foreign raw sugar was increased to forty-five francs; in 1820 to seventy-five francs; and in 1822 to ninety-five francs, the 100 kilogrammes. The law of 1816 was the first bounty to the beet-root sugar manufacturers, and they accordingly once more began to be active. But when the duty of 1822 upon foreign sugar amounted to a prohibition, their prosperity was certain. They were enabled to tax the consumer to the amount of the prohibition. The beet-root

* A kilogramme is equivalent to 2 lbs. 2 oz. 4 dr. 16 gr. English avoirdupois.

sugar pays no duty whatever. In 1829 there were 101 manufactories of this sugar in employment, which produced five millions of kilogrammes in the year, or about one-sixteenth part of the whole consumption of sugar in France. That the people of France are the sufferers by this miserable policy is sufficiently evident, from the fact that their average yearly consumption does not exceed four pounds of sugar per head: in the United Kingdom it is twenty pounds per head.

Upon the national advantage of that commercial policy which has given rise to the manufacture of beet-root sugar in France, and which may probably extend the system to Germany and Russia, we have much pleasure in extracting the following sensible observations from a valuable periodical work:—

"The history of this manufacture in France is an illustration, we apprehend, not of the natural progress of industry and of the arts, but of the effects of a system which counteracts the natural progress of both. Whatever may be the ultimate state of this singular manufacture, in consequence of mechanical and chemical improvements yet unknown to us, it is now only supported by a system of commercial and financial policy, which it is for the interest of all countries to see proscribed in Europe. The people of France were the first to be taught by their own philosophers those principles of mutual intercourse which form the basis of trade. Nearly a hundred years have elapsed since Quesnay and his followers taught his countrymen that freedom of intercourse is the soul of commerce. But his countrymen have yet to learn that liberty is as necessary to the health of commerce as to the well-being of the citizen; that trade is but an interchange of things produced, and that if France will not take the productions of other countries, other countries will not and cannot take the productions of France. The cultivation of the beet is but one ramification of that system of repulsion and exclusion which has been adopted in France, to the oppression of her domestic industry, the ruin of her foreign commerce, and the maintenance of false principles in the commercial policy of surrounding countries."*

Sugar-Maple (*Acer saccharinum*).

The SUGAR-MAPLE grows plentifully in the United States; and from the sap of it the inhabitants make sugar, which, though inferior both in the grain and in strength to that which is produced by the cane, granulates better than that of the beet-root, or any other vegetable, the cane excepted. The sugar-maple is a smaller tree than the maple of this country; and it is not much in repute as timber, although from its abundance it is a good deal used in America,—the wood for domestic purposes, and the bark as a blue dye, and as an ingredient in the manufacture of ink.

February, March, or April, according to the state of the season, is the time when the maple is tapped for the preparation of sugar. A perforation is made by an auger, about two inches into the tree, slanting upwards; into this a cane or wooden pipe is inserted, and a vessel placed to receive the sap. The quantity afforded by a

* 'Quarterly Journal of Agriculture,' No. xii. Edinburgh, 1831.

tree varies both with the tree and the season; the most favourable season being when there is the greatest difference between the heat of the day and that of the night. From two to three gallons may be about the daily average afforded by a single tree; but some trees have yielded more than twenty gallons in a day, and others not above a pint. The process by which maple-juice is boiled and clarified into sugar does not differ materially from that used for cane-juice in the West Indies. The juice should be as recently drawn as possible; for if it stand more than twenty-four hours, it is apt to undergo the vinous and the acetous fermentation; by which processes, the saccharine quality of the juice being destroyed, sugar can no longer be extracted. From the quantity of saccharine matter in the juice of this maple, there is no doubt that it could be fermented into wine, and that a spirit could be distilled from it. There is saccharine matter in the sap of the common maple, but it does not granulate well, and would not repay the expense of extraction.

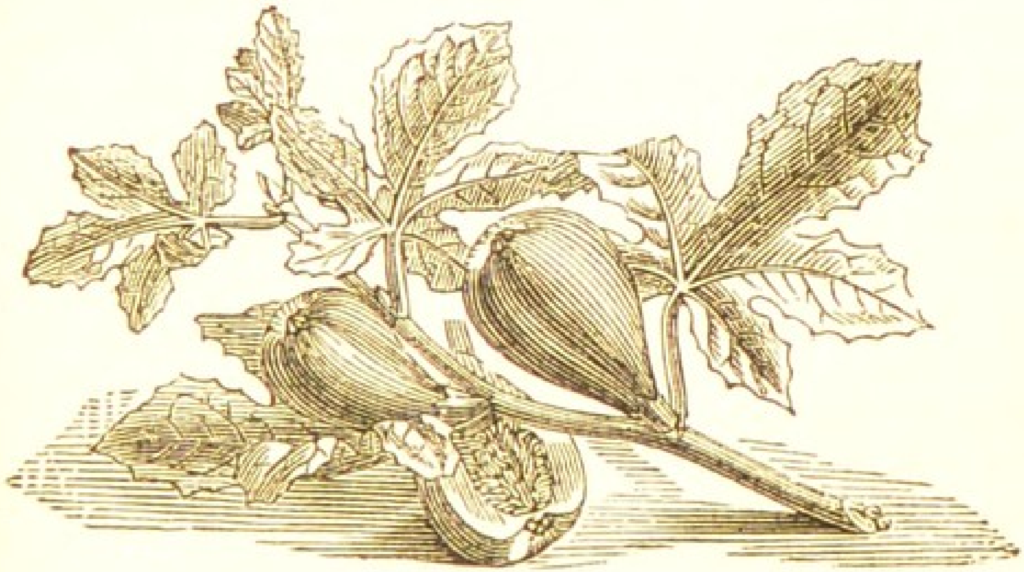
BIRCH (*Betula alba*). The sap of this tree in the earlier spring months contains sugar. By tapping the tree, or breaking off one of the branches, the sap drops out, and may be easily collected. It does not contain a sufficient quantity of sugar to repay the trouble of concentration; there is, however, enough to allow of the vinous fermentation, which when properly conducted forms an agreeable effervescing beverage known by the name of birch-wine.

Sugar may be manufactured from the stalks of many of the Cerealia, and in America this is actually carried on to a great extent with the maize. (See vol. i. of this work, p. 112.)

CHAPTER XVI.

FRUITS CONTAINING SUGAR :—FIG AND VINE.

WE shall here refer to those fruits which contain sugar as a distinguishing ingredient. Almost all fruits brought to table in a mature state contain more or less sugar, but this is combined with acids and other peculiar secretions, for which they are consumed rather than for the sugar they contain.



The Fig (*Ficus carica*).

The FIG (*Ficus carica*). — The traditions of the Greeks carried the origin of the fig back to the remotest antiquity. It was probably known to the people of the East before the *Cerealia* (wheat, barley, &c.), and stood in the same relation to men living in the primitive condition of society as the banana does to the Indian tribes of South America at the present day. With little trouble of cultivation it supplied their principal necessities, and offered, not an article of occasional luxury, but of constant food, whether in a fresh or a dried state. As we proceed to a more advanced period of the history of the species, we still find the fig an object of general attention. The want of blossom on the fig-tree was considered as one of the most grievous calamities by the Jews. Cakes of figs were included in the presents of provisions by which the widow of Nabal appeased the wrath of David.* In Greece, when Lycurgus decreed that the Spartan men should dine in a common hall, flour, wine, cheese, and figs were the principal contributions of each individual to the general stock. The Athenians considered figs an article of such necessity that their exportation from Attica was prohibited. Either the temptation to evade this law must have been great, or it must have been disliked; for the name which distinguished those who informed against the violators of the law, συκοφανται (from συκον, a fig, and φαίνω, to show), became a name of reproach, from which we obtain our word sycophant. As used by our older writers, sycophant means a *tale-bearer;* and the French employ the word to designate a liar and impostor generally—not a flatterer merely. At Rome the fig was carried next to the vine in the processions in honour of Bacchus, as the patron of plenty and joy; and Bacchus was supposed to have derived his corpulency and vigour, not from the vine, but from the fig. All these circumstances indicate that the fig contributed very largely to the support of man; and we may reasonably account for this from the facility with which it is cultivated in climates of moderate temperature. Like the Cerealia, it appears to flourish in a very considerable range of latitude; and even in our own country frequently produces fine fruit, without much difficulty, in the open air. Yet the tree is not generally cultivated except in very favourable situations; and it must belong to more genial climates to realize the ancient description of peace and security, which assigns the possession of these best blessings of Heaven to "every man under his own fig-tree."

The fig consists of a pulp, containing a number of

* 1 Samuel, chap. xxv., ver. 18.

seed-like pericarps, inclosed in a rind. There is something very singular in the fructification of the *Ficus carica.* It has no visible flower; for the receptacles which afterwards become the fruit arise immediately from the joints of the tree, in the form of little buds, with a perforation at the end, but not opening or showing any thing like petals, or the ordinary parts of fructification. As the fig enlarges, the little flower inside the receptacle comes to maturity in its concealment; and in the eastern countries the fruit is improved by a singular operation known by the name of *caprification.* This is performed by suspending by threads, above the cultivated figs, branches of the wild fig, which are full of a species of cynips. When the insect has become winged, it quits the wild figs and penetrates the cultivated ones, for the purpose of laying its eggs; and by this process it ensures the fructification by dispersing the *pollen*, and afterwards hastens the ripening by puncturing the pulp, and causing a dispersion or circulation of the nutritious juices. In France this operation is imitated by inserting straws dipped in olive oil.

The double, and in some climates the triple, crop of the fig-tree, is one of the most curious circumstances belonging to its natural history, and further illustrates the value attached to it in the countries of the East. It offers the people fruit through a considerable portion of the year. The first ripe figs, according to Dr. Shaw, are called boccôre, and come to maturity about the latter end of June; though, like other trees, they yield a few ripe before the full season. These few are probably of inferior value; for the prophet Hosea says, "I found Israel like grapes in the wilderness; I saw your fathers as the first-ripe in the fig-tree at her first time." When the boccôre draws near to perfection, the karmouse, or summer fig, begins to be formed. This is the crop which is dried. When the karmouse ripens, in Syria and Barbary, there appears a third crop, which often hangs and ripens upon the tree after the leaves are shed.

The time of gathering the summer fig in the Levant, with its corresponding process of drying and packing for the European market, is one of considerable bustle and activity. The principal seat of this commerce is Smyrna.

The import of figs to Great Britain alone, which is principally from Turkey, amounts to nine hundred tons annually, subject to a duty of 1*l.* 1*s.* per cwt. Dry figs form also a very considerable article of commerce in Provence, Italy, and Spain; besides affording, as in the East, a chief article of sustenance to the native population. In Spain the principal exports of dried figs are from the provinces of Andalusia and Valencia; though the fruit grows, more or less, in every province.* In the northern parts of France there are many fig-gardens, particularly at Argenteuil.

It is probable that if the fresh fig were much esteemed by the people of this country, the tree would be more extensively cultivated here in favourable situations, such as our southern coast. But it would seem, from our old writers, and indeed from a common expression even of the present day, that, from some association of ideas, the fig was an object of contempt. "*Figo* for thy friendship," says Pistol.† We have, however, old trees still remaining in some gardens, which bear good crops. These are generally trained against walls; but fig-trees have also been planted as standards here with success. We shall mention a few instances of each case.

The fig-tree is said to have been first brought into England in 1525, by Cardinal Pole; though probably it was introduced before, both by the Romans and the monks. The specimens came from Italy, and are still in the archbishop's gardens at Lambeth: they are of the white Marseilles kind, and bear excellent fruit. In the course of their long existence, they have attained a size far exceeding the standard fig-tree in its native situation. They cover a space of fifty feet in height, and forty in breadth: the trunk of the one is twenty-eight, and the other twenty-one inches in circumference. In the severe winter of 1813-14 those venerable trees were

* Laborde's 'View of Spain,' vol. iv. † 'Henry V.'

greatly injured; and, in consequence of the injury, it was found necessary to cut the principal stems down nearly to the ground; but the vegetative powers of the roots remained unimpaired, and they are shooting up with great vigour.

In the garden of the manor-house at Mitcham, which was formerly the private estate of Archbishop Cranmer, there was another fig-tree of the same sort, which is generally understood to have been planted by that prelate. It was low, compared with the trees at Lambeth, but had a thicker stem: it was destroyed some time before the close of the last century.

Another celebrated fig-tree was in the Dean's garden at Winchester: it bore a small red fig, and was in a healthy state in the year 1757. It was inclosed in a wooden frame, which had a glass door, with two windows on each side, by which the sun and air were admitted, while the frame protected it from the wind and rain. On the stone wall to which the tree was nailed there were several inscriptions; and, among the rest, one which mentioned that, in the year 1623, King James I. "tasted the fruit of this tree with great pleasure." That tree also has been destroyed.

A few years since there was a fine old fig-tree at the back of a house in King Street, Covent Garden. The trunk has now been cut down to build a wall where it grew: but shoots are springing up from the root. This tree was doubtless one of the *Convent Garden*, which, in the reign of Elizabeth, bounded the Strand on the north, extending from St. Martin's Lane to Drury-Lane, these two lanes being the only approaches to the neighbouring village of St. Giles.

The *Pocock Fig-tree* is one of the most celebrated in this country, and was once supposed to have been the first of the white Marseilles figs introduced into England. The tradition is, that it was brought from Aleppo by Dr. Pococke, the celebrated traveller, and planted in the garden of the Regius Professor of Hebrew at Christ Church, Oxford, in the year 1648. An extract from a communication by Mr. William Baxter, curator of the

Botanical Garden at Oxford, read before the Horticultural Society in 1819, contains the latest history of this tree. It received considerable damage from the fire that happened at Christ Church on the 3rd of March, 1809; till that time the large trunk mentioned by Dr. John Sibthorpe, in Martyn's edition of Miller's 'Gardener's Dictionary,' remained. In order to preserve it from the injuries of the weather, this trunk had been covered with lead; but at the time of the fire the lead was stolen, and soon after the trunk itself decayed, and was removed. The tree in 1819 was in a very flourishing state. There are some remains of the old trunk to be seen a few inches above the surface of the ground. The branches then growing were not more than eight or ten years old; but those in the middle of the tree were twenty-one feet high.

It is probable that standard fig-trees were formerly much more common in this country than at present. Bradley, an old writer on agriculture, mentions an ancient fig-tree at Windsor, which grew in a gravel-pit, and bore many bushels every year, without any pains being bestowed upon it.

In the fourth volume of the 'Horticultural Transactions' there is a very interesting account, by Mr. Sabine, of some standard fig-trees in the garden of a cottage at Compton, near Worthing, in Sussex. The garden in which they stand slopes gently to the south, is protected on the north by a thick grove of apple and plum trees, and the climate is very mild. "The number of the fig-trees," says Mr. Sabine, "is fourteen; they occupy the principal part of the garden, which is very small, and are in perfect health; their average height is about ten feet; and, if any of the larger ones were detached, they would cover a space of twelve feet in diameter. Their stems are not large: the plants are bushes rather than trees, for the branches spread in all directions from the root. These are propped up by stakes, but many of them are suffered to hang near the ground." Mr. Kennard, to whom they belonged, informed Mr. Sabine that though the quantity varied, there always was a crop; that the figs began to ripen in the end of August, or beginning of September, and continued during October; that the crop was generally from the spring figs, though occasionally a few of the autumn ones ripened; that he manured the ground every autumn, and that he pruned as little as possible.

In the neighbourhood of Worthing, and indeed along nearly all the south-east coast of Sussex, fig-trees are very common in the gardens. At Tarring (about two miles from Worthing) there is a remarkable plantation of figs, called by the inhabitants of that village "The Fig-garden." The trees, which are about eighty in number, grow luxuriantly at intervals of about twelve feet, on the sides of the paths. They are about fifteen feet high, and the stems are from six to eleven inches in diameter. We saw them on the 1st of September, 1829, bearing a most abundant crop. The people to whom the garden belonged knew nothing of the history of these trees, but an old inhabitant of the village told us that he thought they had been planted about forty years.

With the requisite degree of care figs may be readily obtained in this country in a hothouse; but they require a mode of cultivation so peculiar, that if it is wished to procure them in perfection they ought to be cultivated along with no other fruit, and then two or three crops may be gathered.

The Vine (*Vitis vinifera*). The berries of the grape, in addition to sugar, contain tartaric acid, and might be enumerated amongst acid foods, but the principal use of this fruit, the making of wine, entirely depends on the property which the sugar possesses of entering into the vinous fermentation.

Of all the berries, the grape has in every age been held the most in esteem. As is the case with the cerealia, the early history of the vine is involved in obscurity. The cultivation of the grape was, probably, amongst the earliest efforts of husbandry. "And Noah began to be an husbandman, and he planted a vineyard."*

* Genesis ix. 20.

According to the tradition of the Egyptians, Osiris first paid attention to the vine, and instructed other men in the manner of planting and using it. The inhabitants of Africa ascribe the same gift to the ancient Bacchus. We find mention of the fermented juice of the grape as early as that of its cultivation. Wine was among the first oblations to the Divinity. "Melchizedek, King of Salem, brought forth bread and wine, and he was the priest of the Most High God."* We may trace, through all the most ancient records of the human race, a conformity between the chief articles of subsistence and the sacrifices to heaven.

"The vine," says Humboldt, "which we now cultivate, does not belong to Europe; it grows wild on the coasts of the Caspian Sea, in Armenia, and in Caramania. From Asia it passed into Greece, and thence into Sicily. The Phocæans carried it into the south of France; the Romans planted it on the banks of the Rhine. The species of Vitis, which are found wild in North America, and which gave the name of the Land of the Vine (*Weinenland*) to the first part of the New Continent which was discovered by Europeans, are very

* Genesis xiv. 18.

different from our *Vitis vinifera*."* It is a popular error that the grape-vine was common to both continents.

It has been said that the vine was introduced into England by the Romans; but if so, it could not have been till near the close of their influence, for Tacitus mentions that it was not known when Agricola commanded in the island. At the invasion of the Anglo-Saxons, however, when the country had been under the Roman dominion four hundred years, and had received, during that long period, all the encouragement which that people gave to the agriculture of their provinces, the vine, without doubt, was extensively cultivated. Vineyards are mentioned in the earliest Saxon charters, as well as gardens and orchards, "and this was before the combating invaders had time or ability to make them, if they had not found them in the island."† In the Cottonian Manuscripts, in the British Museum, there are some rude delineations in a Saxon calendar, which, in the month of February, represent men cutting or pruning trees, some of which resemble vines. King Edgar, in an old grant, gives the vineyard situate at Wecet, together with the vine-dressers. In 'Domesday-Book' vineyards are noticed in several counties. According to William of Malmesbury, who flourished in the first half of the twelfth century, the culture of the vine had in his time arrived at such perfection within the vale of Gloucester, that a sweet and palatable wine, "little inferior to that of France," was made there in abundance. In the thirteenth and fourteenth centuries, almost every large castle and monastery in England had its vineyard. The land on the south side of Windsor Castle, now a pleasant green lawn, running from the town under the castle-wall, was a vineyard, of which a particular account may be seen in the 'Archæologia.' At this period wine was made in England in considerable quantities; and yet the importation of foreign wines was very large. In the year 1272, London imported 3799 tuns;

* Géographie des Plantes, 4to., p. 26.

† Turner's Anglo-Saxons, Appendix to vol. ii. 8vo.

Southampton and Portsmouth, 3147; and Sandwich, 1900.* In the time of Edward III., a trade in Rhenish wine was carried on between Hull and the ports of the Baltic.† The vineyards were, probably, continued till the time of the Reformation, when the ecclesiastical gardens were either neglected or destroyed; and about this period, ale, which had been known in England for many centuries, seems to have superseded the use of wine as a general beverage. This arose from the better cultivation of the country. Under the feudal tenures, when the serfs were often suddenly compelled to follow their lords to battle, husbandry, particularly the growth of grain, was fearfully neglected; and sometimes the most dreadful famines were the result. The prices of wheat occasionally fluctuated from ten shillings to twenty pounds per quarter of modern money. But when just principles of tenancy were established, so that the occupier of the land could be sure of appropriating to himself a fair proportion of the fruit of his labour, agriculture began to flourish. The cultivation of hops was revived or introduced about the end of the fifteenth century. All these circumstances—the decay of the vineyards, the encouragement to the growth of grain, and the culture of hops—gradually tended to supersede the demand for wine, by offering a beverage to the people which was cheaper, and perhaps as exhilarating. Ritson, a celebrated antiquary, has preserved a rude ballad of this period, in praise of that beverage which was becoming the national favourite:—

"Bryng us home no sydyr, nor no palde wyne;
For an that thou do shalt have Cryst's curse and mine:
But bryng us home good ale, and bryng us home good ale,
And for our der lady's love bryng us home good ale."

We understand that on the southern coast of Devonshire, possessing the mildest temperature of the English counties, there are still two or three vineyards, from

* Anderson's History of Commerce.
† Rymer's Fœdera.

which wine is commonly made. A vineyard at the castle of Arundel, on the south coast of Sussex, was planted about the early part of the last century, and of the produce there are reported to have been sixty pipes of wine in the cellars of the Duke of Norfolk, in 1763. This wine is said to have resembled Burgundy; but the kind of grape and the mode of culture have not been particularly recorded. Whatever may have been the condition and qualities of the early English grapes employed in making wine, we know that they must have been ripened by the natural temperature of the climate, as artificial heat was not resorted to for the ripening of grapes till the early part of the last century; and then the heat was applied merely to the other side of the wall on which the vines were trained: nor is it till about the middle of the same century that we have any account of vines being covered with glass. Professor Martyn is an advocate for the renewal of grape culture in this country for wine. For that purpose he recommends that the vines should be trained very near the ground, he having found that, by this method of training, the berries were much increased in size, and also ripened earlier. The same method is pursued in the northern part of France, where it is found to be successful.

The culture of the grape, as an article of husbandry, extends over a zone about two thousand miles in breadth, that is, from about the twenty-first to the fiftieth degree of north latitude; and reaching in length from the western shores of Portugal, at least to the centre of Persia, and probably to near the sources of the Oxus and the Indus. Farther north than that, it does not ripen so as to be fit for the making of wine; and farther south, it seems to be as much injured by the excessive heat. The best wines are made about the centre of the zone; the wines towards the north being harsh and austere, and the grapes towards the south being better adapted for drying and preserving as raisins. Thus, in Spain, while the wine of Xeres, in the Sierra Morena (the real Sherry), is an excellent wine, and while that of the ridge of Apulxarras, in Granada, is very tolerable, the grapes of the warm shores about Malaga, and in Valencia, are chiefly fit only for raisins. So, also, while the slopes of Etna, and those of the mountains in Greece, furnish some choice vines, the grapes upon the low shores in those countries have also to be dried. It should seem, that the grapes are always the higher flavoured and the more vinous, the greater the natural temperature under which they are ripened, but that an extreme heat throws the juice into the acetous fermentation before the vinous one has time to be matured. We have an analogous case in the fermentation of malt liquors in this country, which cannot be properly performed in the warm months.

About eight thousand tons of raisins, or dried grapes, are annually imported into England, at a duty of about £160,000. A considerable quantity of undried grapes are also imported, principally from Portugal, in jars, among sawdust. The annual value of those so imported is about £10,000. The *currants* of commerce, which are so extensively used in England, and of which about six thousand tons are annually imported into this country, are small dried grapes, principally grown in the Ionian Islands.

Laborde, in his account of Spain, gives the following description of the mode of drying raisins:—" In the kingdom of Valencia they make a kind of ley with the ashes of rosemary and vine branches, to which they add a quart of slaked lime. This ley is heated, and a vessel, full of holes, containing the grapes, is put into it. When the bunches are in the state desired, they are generally carried to naked rocks, where they are spread on beds of the field artemisia, and are turned every two or three days till they are dry. In the kingdom of Granada, particularly towards Malaga, they are simply dried in the sun, without any other preparation. The former have a more pleasing rind, but a less mellow substance; the skins of the latter are not so sugary, but their substance has a much greater relish; therefore, the raisins of Malaga are preferred by foreigners, and are sold at a higher price: to this their quality may likewise contribute; they are naturally larger and more delicate than those of the kingdom of Valencia."

A vineyard, associated as it is with all our ideas of beauty and plenty, is, in general, a disappointing object. The hop-plantations of our own country are far more picturesque. In France, the vines are trained upon poles, seldom more than three or four feet in height; and "the pole-clipt vineyard" of poetry is not the most inviting of real objects. In Spain, poles for supporting vines are not used; but cuttings are planted, which are not permitted to grow very high, but gradually form thick and stout stocks. In Switzerland, and in the German provinces, the vineyards are as formal as those of France. But in Italy is found the true vine of poetry, "surrounding the stone cottage with its girdle, flinging its pliant and luxuriant branches over the rustic veranda, or twining its long garland from tree to tree."* It was the luxuriance and the beauty of her vines and her olives that tempted the rude people of the North to pour down upon her fertile fields:—

> "The prostrate South to the destroyer yields
> Her boasted titles and her golden fields;
> With grim delight the brood of winter view
> A brighter day, and heavens of azure hue,
> Scent the new fragrance of the breathing rose,
> And quaff the pendant vintage as it grows."†

In Greece, too, as well as Italy, the shoots of the vines are either trained upon trees, or supported, so as to display all their luxuriance, upon a series of props. This was the custom of the ancient vine-growers; and their descendants have preserved it in all its picturesque originality.‡ The vine-dressers of Persia train their vines to run up a wall, and curl over on the top. But the most luxurious cultivation of the vine in hot countries is where it covers the trellis-work which surrounds a

* The Alpenstock, by C. J. Latrobe, 1829.
† Gray's Alliance of Education and Government.
‡ See the second Georgic of Virgil.

well, inviting the owner and his family to gather beneath its shade. "The fruitful bough by a well" is of the highest antiquity.

The vine lasts to a considerable age; it spreads also to a large extent, or, when supported, rises to a great height. Although it bears at three or four years plentifully, it is said that vineyards improve in quality till they are fifty years old.* Pliny mentions a vine which had attained the age of six hundred years. In France and Italy there are entire vineyards still in existence, and in full bearing, which were in the same condition at least three centuries ago, and have so continued ever since. The slender stems of ordinary vines, when they have attained a considerable age, are remarkably tough and compact; and the timber of the very old ones in foreign countries, which is occasionally of size enough for being sawn into planks, and being made into furniture and utensils, is almost indestructible. Strabo mentions an old vine which two men could not embrace. A single vine-plant, which was trained against a row of houses at Northallerton, covered, in 1785, one hundred and thirty-seven square yards. It was then about a hundred years old, and it increased in size afterwards; but it is now dead. In 1785 the principal stem of this vine was about fifteen inches in diameter.

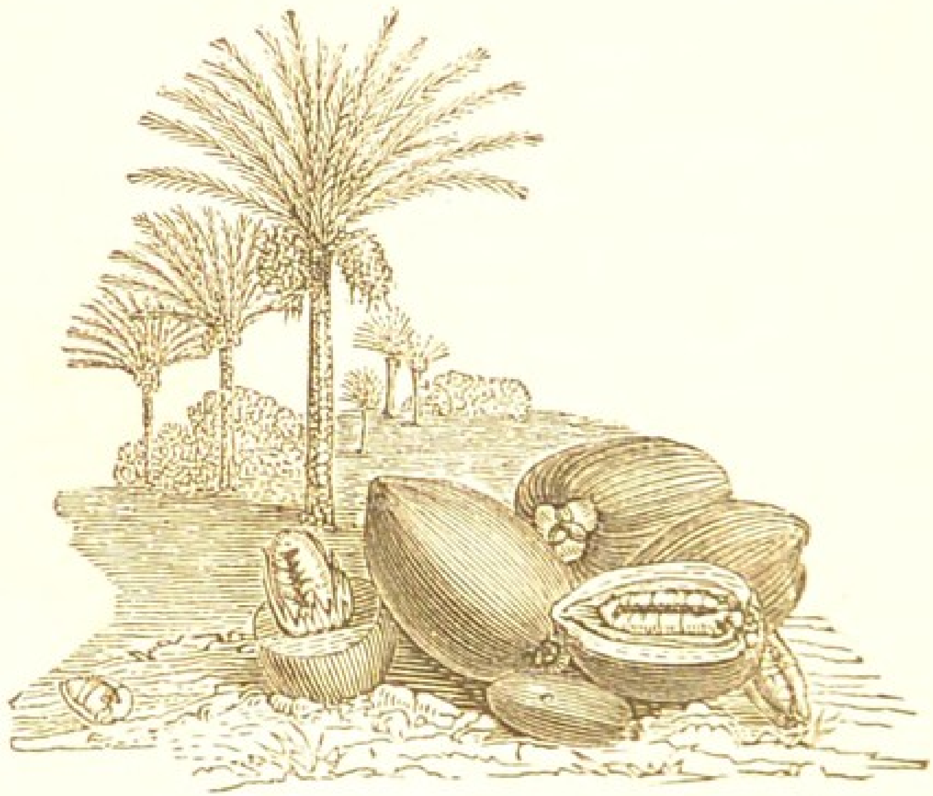
Of the variety of the vine called the black Hamburg there are several remarkable trees in England, covering a great extent of surface, and bearing (under glass) a profusion of the finest fruit. Of these, among the most celebrated are the Hampton Court vine, and the vine at Valentines, in Essex. The Hampton Court vine is in a grape-house on the north side of the palace: it covers a surface of twenty-two feet by seventy-two, or 1694 square feet. It is a most productive bearer, having seldom fewer than two thousand clusters upon it every season. In the year 1816 there were at least 2240, weighing each, on the average, a pound; so that the whole crop weighed a ton, and merely as an article of

* Miller.

commerce was worth upwards of £400. The Valentines vine extends over a greater surface and has a larger trunk than that at Hampton Court; but it is not on the average of seasons so productive. It has, however, been known to produce two thousand bunches of a pound each.

CHAPTER XVII.

THE DATE—PLANTAIN—BANANA, &c.



THE DATE (*Phœnix dactylifera*). The date is one of those plants which, in the countries that are congenial to their growth, form the principal subsistence of man; and its locality is so peculiar that it cannot, strictly speaking, be classed either with the fruits of temperate or with those of tropical climates. It holds a certain intermediate place; and is most abundant in regions where there are few other esculent vegetables to be found.

There is one district where, in consequence of the extreme aridity of the soil, and the want of moisture in the air, none of the Cerealia will grow: that district is the margin of the mighty desert which extends, with but few interruptions, from the shores of the Atlantic to the confines of Persia, an extent of nearly four thousand miles. The shores, the banks of the rivers, and every part of this region in which there is humidity, are exceedingly fertile; and with but unskilful culture produce the most abundant crops and the choicest fruits. But along the verge of the desert, and in the smaller oases or isles which here and there spot that wilderness of sand, the date-palm is the only vegetable upon which man can subsist. The lofty summits of the mountains of Atlas form an effectual barrier to the humid winds from the sea. Accordingly, the richer vegetation extends only as far to the south of them as the courses of the streams that are fed by the mountain snows; and these streams are soon evaporated by the air, or absorbed by the thirsty soil. The more lowly vegetables on that soil are chiefly of a saline and succulent description, such as euphorbias, salsolas, and cactuses, which retain their own humidity in consequence of their smooth and close rinds, without much aid from external moisture; but their juices are in general too acrid, or too much impregnated with soda, for being of any use as food. Over these the date-palm raises its trunk and spreads its leaves, and is the sole vegetable monarch of the thirsty land. It is so abundant, and so unmixed with anything else that can be considered as a tree in the country between the states of Barbary and the desert, that this region is designated as the Land of Dates (Biledulgerid); and upon the last plain, as the desert is approached, the only objects that break the dull outline of the landscape are the date-palm and the tent of the Arab. The same tree accompanies the margin of the desert in all its sinuosities; in Tripoli, in Barca, along the valley of the Nile, in the north of Arabia, and in the south-east of Turkey.

This region of the date has perhaps remained for a longer period unchanged in its inhabitants and its productions than any other portion of the world. The Ishmaelites, as described in Scripture history, were but little different from the Bedouins of the present time; and the palm-tree (which in ancient history invariably means the date) was of the same use, and held in the same esteem, as it is now. When the sacred writers wished to describe the majesty and the beauty of rectitude, they appealed to the palm as the fittest emblem which they could select. "He shall grow up and flourish like the palm-tree," is the promise which the Royal Poet of Israel makes for the just.

Even among the followers of other faiths, the palm has always been the symbol held in the greatest veneration. It is recorded of Mahomet that, like the Psalmist, he was accustomed to compare the virtuous and generous man to the date-tree: "He stands erect before his Lord; in every action he follows the impulse received from above; and his whole life is devoted to the welfare of his fellow-creatures." The inhabitants of Medina, who possess the most extensive plantations of date-trees, say that their prophet caused a tree at once to spring from the kernel at his command, and to stand before his admiring followers in mature fruitfulness and beauty.* The Tamanaquas of South America have a tradition that the human race sprung again from the fruits of the palm, after the Mexican *age of water*. The usefulness of the tree has thus caused it to be the subject of universal veneration. In ancient times, and in modern, the palm has been the symbol of triumph. The Jews carry it on a solemn festival in commemoration of their fathers having gained possession of the Promised Land;† and the Christians in remembrance of that more glorious victory, when the Saviour rode into Jerusalem amid the jubilations and hosannahs of the people.

And the tree is not unworthy of those honours which mankind have in all ages bestowed upon it. Indeed,

* Burckhardt's Arabia.

† Judæa was typified by the palm-tree upon coins of Vespasian and Titus.

the worthiness of the tree must have been the cause of those honours. Rearing its stem, and expanding its broad and beautiful shade where there is nothing else to shelter man from the burning rays of the sun, the palm-tree is hailed by the wanderer in the desert with more pleasure than he hails any other tree in any other situation. Nor is it for its shade alone, or even for its fruit, that the palm is so desirable in that country; for, wherever a little clump of palms contrast their bright green with the red wilderness around, the traveller may in general be sure that he shall find a fountain ready to afford him its cooling water.

Nor is it only when standing alone in the desert that the palm is a majestic tree. Palms form the shade and the beauty of many of the tropical forests. Some of them are among the tallest of trees; and when the margin of a river is spoken of as more than usually delightful, we allude to its "palmy side."

The *Cucurito*, a palm of South America, throws out its magnificent leaves over a trunk a hundred feet high. This family of plants diminish in grandeur and beauty as they advance towards the temperate zone; and Humboldt says that those who have only travelled in the north of Africa, in Sicily, and in Murcia, cannot conceive how the palms should be the most imposing in their forms of all the trees of the forest. The palms of South America furnish food in a variety of ways to the people; so that in those wild districts, the assertion of Linnæus forces itself upon the mind,—that the region of palms was the first country of the human race, and that man is essentially *palmivorous*.

The date-palm, though some of the family are more majestic, is still a beautiful tree. Its stem shoots up, in one cylindrical column, to the height of fifty or sixty feet, without branch or division, and of the same thickness throughout its whole length. When it attains this height, its diameter is from a foot to eighteen inches. From the summit of this majestic trunk it throws out a magnificent crown of leaves, which are equally graceful in their formation and their arrangement.

"Those groups of lovely date-trees bending
Languidly their leaf-crowned heads,
Like youthful maids, when sleep descending
Warns them to their silken beds."*

The main stems of the leaves are from eight to twelve feet long, firm, shining and tapering; and each embraces, at its insertion, a considerable part of the trunk. The trunk of the palm is, in fact, made up of the remains of leaves, the ends of which are prominent just under the crown, but more obliterated towards the root of the tree. The bottoms of the leaves are enveloped in membranous sheaths, or fringed with very tough fibrous matter. These leaves are pinnated, or in the form of feathers, each leaf being composed of a great number of long, narrow leaflets, which are alternate, and of a bright lively green. Near the base of the leaf, these leaflets are often three feet long; but even then they are not one inch in breadth; neither do they open flat, but remain with a ridge in the middle, something like the keel of a boat. When the leaves are young they are twisted together, and matted up with loose fibres, which open and disperse as the leaf expands. The young leaflet is also armed at the extremity with a hard black spine, or thorn. They are more stiff and firm than the leaves of any other tree.

The trunk of the palm, though it is in some parts remarkably hard and durable, can hardly be considered as timber. It consists of longitudinal fibres, which are not so much interwoven as those of the branching trees; but have their interstices filled with a sort of pith, or medullary substance, when young, that is near the top, where the young leaves are in the progress of formation. This medullary substance contains sap; but in the older portions of the tree it consolidates, though it always remains granular, and, as is the case with the pith of trees, is as easily divided across as longitudinally. Generally speaking, the medullary part of the palm is much lighter in the colour than the fibrous part; and thus

* Moore.

well-consolidated palm-trunks have a beautifully mottled appearance when cut across. The wood of the areca palm, or cabbage-palm of South America, is sometimes used in ornamental furniture, under the name of cabbage-wood; but it does not answer very well, as the ends of the fibres are too hard, and the medullary matter too soft, for holding glue. For the same reason, the surface is very difficult to polish, and cannot be preserved without varnish.

The flowers come out in large bunches, or spikes, from between the leaves; they are at first inclosed in a spatha, or sheath, which opens to let them expand, and then shrivels and withers.

The date-palm is a diœcious tree, having the male flowers in one plant, and the female, or fruiting ones, in another. The male flowers are considerably larger than the female; and the latter have in their centre the ovaries, which are the rudiments of the dates, about the size of small peas.

The two distinct sexes of the date-tree appear to have been known from the remotest antiquity, as they are noticed by all the ancients who describe the tree. It is not a little remarkable that there is a difference in the fructification of the wild date and the cultivated, though both are precisely the same species. Wild dates impregnate themselves; but the cultivated ones do not, without the assistance of art. Theophrastus and Pliny mention this fact; and in every plantation of cultivated dates, one part of the labour of the cultivator consists in collecting the flowers of the male date, climbing to the top of the female with them, and dispersing the *pollen* on the germs of the dates. So essential is this operation, that though the male and female trees are growing in the same plantation, the crop fails if it be not performed. A very remarkable instance of this is related by Delile, in his Egyptian Flora. The date-trees in the neighbourhood of Cairo did not yield a crop in the year 1800. The French and Turkish troops having been fighting all over the country in the spring, field labour of every kind was suspended, and amongst the rest, the fecundation of the date. The female date-trees put forth their bunches of flowers as usual, but not one of them ripened into edible fruit. The pollen of the male trees appears to have been scattered over the country by the winds; and, as it had not been sufficiently abundant for reaching the germs so as to ensure fructification, an almost universal failure was the consequence. The Persians, according to the elder Michaux, who travelled in the country, were more provident than the Egyptians. In a civil war, which was attended with all the ruinous effects of anarchy, the male date-trees of a whole province were cut down by the invading troops, that the fructification of this necessary of life might be stopped. But the inhabitants, apprehending such a result, had been careful previously to gather the pollen, which they preserved in close vessels; and thus they were enabled to impregnate their trees when the country was freed from the destroying army. It is said that the pollen had thus preserved its powers during nineteen years.*

Pontanus, an Italian poet of the fifteenth century, gives a glowing description of a female date-tree, which had stood lonely and barren, near Otranto, in Italy, until a favouring wind wafted toward it the pollen of a male that grew at a distance of fifteen leagues. Father Labat, in his account of America, relates a story of a date-tree in the island of Martinico. There were palm-trees of various other kinds in the island, but there was only one date-tree, which grew near a convent. That tree produced fruit which was grateful enough to the taste; but when an increase of the number of the date-trees was wanted, not a single one would grow from the seed; and thus, after a number of unsuccessful trials, they were obliged to send to Africa for dates, the stones of which grew readily, and produced abundantly.

Four or five months after the operation of fecundation has been performed, the dates begin to swell; and when they have attained nearly their full size, they are carefully tied to the base of the leaves, to prevent them

* Annales du Muséum.

from being beaten and bruised by the wind. If meant to be preserved, they are gathered a little before they are ripe; but when they are intended to be eaten fresh, they are allowed to ripen perfectly, in which state they are a very refreshing and agreeable fruit. Ripe dates cannot, however, be kept any length of time, or conveyed to any very great distance, without fermenting and becoming acid; and therefore those which are intended for storing up, or for being carried to a distant market, are dried in the sun upon mats. The dates which come to the European market from the Levant and Barbary are in this state; and the travellers in the desert often carry with them a little bag of dried dates, as their only or their chief subsistence during journeys of many hundred miles. In parts of the East, the dates that fall from the cultivated trees are left on the ground for the refreshment of the wayfaring man.

In the Hedjaz, the new fruit, called *ruteb*, comes in at the end of June, and lasts two months. The harvest of dates is expected with as much anxiety, and attended with as general rejoicing, as the vintage of the south of Europe. The crop sometimes fails, or is destroyed by locusts, and then a universal gloom overspreads the population. The people do not depend upon the new fruit alone; but during the ten months of the year when no ripe dates can be procured, their principal subsistence is the date-paste, called *adjoue*, which is prepared by pressing the fruit, when fully matured, into large baskets. "What is the price of dates at Mekka or Medina?" is always the first question asked by a Bedouin who meets a passenger on the road.*

There is, indeed, hardly any part of the tree which is not serviceable to man, either as a necessary or a luxury. When the fruit is completely ripened, it will, by strong pressure, yield a delicious syrup, which serves for preserving dates and other fruits; or the fruit may be made into jellies and tarts. The stalks of the bunches of dates, hard as they are in their natural state, as well

Burckhardt's Arabia.

as the kernels, are softened by boiling, and in that condition are used for feeding cattle. Dates, with the addition of water, afford by distillation a very good ardent spirit, which, as it does not come within the prohibition of the Koran against wine, is much used in some of the Mohammedan countries, and answers the same purpose of false excitement as the brandy or the malt spirits of other nations. Palm-wine is also made from the date: this is also without the statute of the Prophet. It is known in Egypt by the name of *lakhlsy*. It is the sap or juice of the tree, and can only be obtained by its destruction; so that such trees only as are unproductive are selected for obtaining it. The time chosen for this purpose is when the tree is in the most active state of vegetation. The crown is then cut off, and a cavity scooped in the top of the trunk. As the sap rises, it exudes into this cavity, at the rate of nearly a gallon a day, for the first two weeks; after which it gradually diminishes; and at the end of six weeks or two months it stops entirely, and the tree, which has become by the operation completely dry, is cut down for fire-wood, or for any other of the purposes to which the trunk of the palm is applied. When the juice first exudes from the tree, it is remarkably sweet, but it soon ferments and becomes vinous, with a certain degree of acidity. This juice may also be distilled into an ardent spirit; in fact, the genuine arrack, or rack, of the East is obtained from the juice of palms. In Egypt and Arabia the date-trees that have become unproductive, through age or any other circumstance, are commonly disposed of in this manner. What is called the *cabbage* of the palm is esculent in many of the species, and in the date among others. The cabbage is a conical tuft in the centre of the crown of leaves, and is formed of the future leaves in their undeveloped state. When the outside is removed, this part of the date-tree tastes very much like a fresh chesnut; but, like the palm-juice, it is costly, being obtained only by the destruction of the tree; and therefore it is not used except in those trees which are cut for the sake of the sap or juice.

The fibrous parts of the date-tree are made into ropes, baskets, mats, and various other articles of domestic use; and so are the strings or stalks that bear the dates. The cordage of the ships navigating the Red Sea is made almost exclusively of the inner fibrous bark of the date-tree. The trunk answers very well for posts, railings, and other coarse purposes; but it is not fit for being worked into planks, as the fibrous nature of it makes it easily split lengthwise into threads. The medullary part is much more abundant and soft towards the centre of the tree than towards the circumference; and, therefore, when it is to be used as timber, the trunk is generally cleft in two down the middle, for the purpose of allowing the heart to dry and harden.

The medullary part of the date-tree is partly farinaceous, and soluble in water; and a nutritious substance may be obtained from it, resembling in consistency the *sago* which is obtained from another kind of palm. In the proper date-tree, however, it is small in quantity, and by no means good in quality. From another, and a much smaller species (*Phœnix farinifera*), which is a native of the East Indies, the supply is much more abundant. This farinaceous date-tree grows upon the dry and sandy parts of the east or Coromandel coast of the peninsula of Hindostan. It is a very low tree, or rather a great leafy bush; for the trunk is never above a foot and a half or two feet in height, and the leaves completely conceal it. This palm is of a much deeper green, and has the leaves much narrower, than those of the date. It fruits and flowers nearly in the same manner. The berries are about the size of kidney-beans, and of a shining black; they have not much pulp, but what they have is sweet and mealy. In times of scarcity the natives of Hindostan have recourse to the wood of this palm for food. When the stem is divested of the leaves, and of the brown fibrous matter with which their roots are enveloped, it is about eighteen inches long, and six in diameter where thickest. The outside of it consists of woody fibres of a white colour, and very much matted together, and within these the farinaceous matter is contained. To obtain that, the natives split the trunk into longitudinal pieces, dry them, beat them in mortars, and then sift the mass to separate the fibres. After this, the farina is ready for being boiled into gruel, or *congee*, as it is called in India; but it is bitter, and far inferior to sago. It has, however, occasionally been of much use, and saved the lives of the people at times when famine has threatened them with destruction.

The true sago-palm of Asia (*Sagus*) offers a greater quantity of alimentary matter than is furnished by any other plant, except the banana. The single trunk of a tree of this species, in its fifteenth year, sometimes furnishes six hundred pounds of sago. In the dialect of Amboyna the word sago signifies farina (meal). Mr. Crawford, in his 'History of the Indian Archipelago,' has calculated that a single acre of land will support four hundred and thirty-five sago-palms, which will annually produce 120,500 lbs. of sago.

The northern bank of the Orinoco, the great river of South America, is covered with palms of the Mauritia, which also produce farinaceous matter, or sago. The whole country in which they abound is subject to inundations; and the fan-like branches of these trees look like a forest which rises out of the bosom of the waters. The navigator who passes along the *delta* of the Orinoco is surprised to see the tops of these trees lighted with fires. They are kindled by a people (the Guanacas) who have remained for ages in these marshy districts,—secured from the floods by living in the palms. In the branches they suspend mats, which they fill with clay, and on this damp earth kindle the fires which are necessary for their comfort. Sir Walter Raleigh saw and described these people. The palm offers to this rude race, as well as to other tribes who inhabit the Gulf of Darien and the watery lands between the Guarapitha and the mouths of the Amazon, a safe habitation amidst the great inundations to which those countries are subject. But it affords them also, in its fruit, its farinaceous bark, its sap abounding with sugar, and its fibrous stalks,—pleasant food to eat, wine to drink, and thread to make cordage and hammocks. "It is curious to behold," says Humboldt, "in the lowest stage of human civilization, the existence of a whole race depending upon a single species of palm, in a similar degree with those insects which subsist but upon one species of flower."*

Even the leaves of the date-palm have their uses: their great length and comparatively small breadth, and their toughness, render them very good materials for the construction of coarse ropes, baskets, panniers, and mats. On the continent of Europe, palm-branches are a regular article of trade; and [the religious processions, both of Christians and Jews, in the greater part of Europe, are supplied from some palm-forests near the shores of the Gulf of Genoa.

The cultivation of the date-tree is an object of high importance in the countries of the East. In the interior of Barbary, in great part of Egypt, in the more dry districts of Syria, and in Arabia, it is almost the sole subject of agriculture. In the valleys of the Hedjaz there are more than a hundred kinds of dates, each of which is peculiar to a district, and has its own peculiar virtues. Date-trees pass from one person to another in the course of trade, and are sold by the single tree; and the price paid to a girl's father, on marrying her, often consists of date-trees.†

The palm is not wholly confined to the warmer latitudes, though in those only it matures its fruit. There are greenhouse specimens in many parts of England. Some of the more luxuriant parts of the province of Valencia, in the south-east of Spain, have very fine forests of date-palms, from which, as well as from the neighbourhood of Genoa, palm-branches are exported. There are date-palms upon the coast of Gallicia, near Ferrol and Corunna; but the fruit on them does not come to maturity. There is abundance of palms in the gardens of Naples; and they are still finer and more numerous in that part of Sicily in the neighbourhood of Palermo,

* Voyages, liv. viii. chap. xxiv. † Burckhardt's Arabia.

which, from the fertility of its soil, and the variety and beauty of its productions, has the name of "the golden shell." They are also to be met with in some parts of the south of France, though they rarely, if ever, ripen their fruit in that country. There are, in particular, two very majestic specimens growing in the open air in the Botanical Garden at Toulon; but these, so far as we have heard, have not yet flowered. As greenhouse plants, with heat in the colder season, they have been introduced into England for about a century; and the celebrated Miller, of the Botanical Garden at Chelsea, is reported to have been the first cultivator. The Messrs. Loddiges, of Hackney, have palms of considerable height growing under glass; there are also some fine palms in the Botanical Garden at Kew.

The date-palm is a very slow-growing tree; and even in the soil and climate that are most congenial, old trees do not gain above a foot in height in five years, so that, supposing the increase uniform, the age of a tree sixty feet high cannot be less than three hundred years. Dr. Shaw says that the palm of Barbary usually falls about the latter end of its second century.

The PLANTAIN (*Musa paradisiaca*) is a tree of considerable size: it rises with an herbaceous stalk, about five or six inches in diameter at the surface of the ground, but tapering upwards to the height of fifteen or twenty feet. The leaves are in a cluster at the top; they are very large, being about six feet long and two feet broad: the middle rib is strong, but the rest of the leaf is tender, and apt to be torn by the wind. The leaves grow with great rapidity after the stalk has attained its proper height. The spike of flowers rises from the centre of the leaves to the height of about four feet. At first the flowers are inclosed in a sheath, but, as they come to maturity, that drops off. The fruit is about an inch in diameter, eight or nine inches long, and bent a little on one side. As it ripens it turns yellow; and when ripe, it is filled with a pulp of a luscious sweet taste.

The Plantain (*Musa paradisiaca*).

The BANANA (*Musa sapientum*) is a shorter and rounder fruit than the plantain: the stem is also different —that of the plantain being wholly green, while the banana is spotted with purple. The banana is not so luscious as the plantain, but it is more agreeable.

The uses of these plants are much the same, and in our general remarks we shall use the word Banana.

The banana, as we have indicated by the heading of this chapter, is not the property of any particular country of the torrid zone, but offers its produce indifferently to the inhabitants of equinoctial Asia and America, of tropical Africa, and of the islands of the Atlantic and Pacific Oceans. Wherever the mean heat of the year exceeds 75° of Fahrenheit, the banana is one of the most important and interesting objects for the cultivation of man. All hot countries appear equally to favour the growth of its fruit; and it has even been cultivated in Cuba, in situations where the thermometer descends to 45° of Fahrenheit. Its produce, as already mentioned, is enormous. The banana, therefore, for an immense portion of mankind, is what wheat, barley, and rye are for the inhabitants of Western Asia and Europe, and what the numerous varieties of rice are for those of the countries beyond the Indus.*

The banana is not known in an uncultivated state. The wildest tribes of South America, who depend upon this fruit for their subsistence, propagate the plant by suckers. Yet an all-bountiful Nature is, in this case, ready to diminish the labours of man—perhaps too ready for the proper development of his energies, both physical and moral. Eight or nine months after the sucker

The Banana (*Musa sapientum*).

* Humboldt's Political Essay on New Spain—Black's Translation, vol. ii.

has been planted, the banana begins to form its clusters; and the fruit may be collected in the tenth and eleventh months. When the stalk is cut, the fruit of which has ripened, a sprout is put forth, which again bears fruit in three months. The whole labour of cultivation which is required for a plantation of bananas is to cut the stalks laden with ripe fruit, and to give the plants a slight nourishment, once or twice a year, by digging round the roots. A spot of a little more than a thousand square feet will contain from thirty to forty banana plants. A cluster of bananas, produced on a single plant, often contains from one hundred and sixty to one hundred and eighty fruits, and weighs from seventy to eighty pounds. But reckoning the weight of a cluster only at forty pounds, such a plantation would produce more than four thousand pounds of nutritive substance. M. Humboldt calculates that as thirty-three pounds of wheat and ninety-nine pounds of potatoes require the same space as that in which four thousand pounds of bananas are grown, the produce of bananas is consequently to that of wheat as 133 : 1, and to that of potatoes as 44 : 1.

The banana ripened in the hothouses of Europe has an insipid taste; but yet the natives of both Indies, to many millions of whom it supplies their principal food, eat it with avidity, and are satisfied with the nourishment it affords. This fruit is a very sugary substance; and in warm countries the natives find such food not only satisfying for the moment, but permanently nutritive. Yet, weight for weight, the nutritive matter of the banana cannot at all be compared to that of wheat, or even of potatoes. At the same time, a much greater number of individuals may be supported upon the produce of a piece of ground planted with bananas, compared with a piece of the same size in Europe growing wheat. Humboldt estimates the proportion as twenty-five to one; and he illustrates the fact by remarking that a European, newly arrived in the torrid zone, is struck with nothing so much as the extreme smallness of the spots under cultivation round a cabin which contains a numerous family of Indians.

The ripe fruit of the banana is preserved, like the fig, by being dried in the sun. These dried bananas are an agreeable and healthy aliment. Meal is extracted from the fruit, by cutting it in slices, drying it in the sun, and then pounding it.

The facility with which the banana can be cultivated has doubtless contributed to arrest the progress of improvement in tropical regions. In the new continent civilization first commenced on the mountains, in a soil of inferior fertility. Necessity awakens industry, and industry calls forth the intellectual powers of the human race. When these are developed, man does not sit in a cabin, gathering the fruits of his little patch of bananas, asking no greater luxuries, and proposing no higher ends of life than to eat and to sleep. He subdues to his use all the treasures of the earth by his labour and his skill ;—and he carries his industry forward to its utmost limits, by the consideration that he has active duties to perform. The idleness of the poor Indian keeps him, where he has been for ages, little elevated above the inferior animal ;—the industry of the European, under his colder skies, and with a less fertile soil, has surrounded him with all the blessings of society—its comforts, its affections, its virtues, and its intellectual riches.

In a very interesting and instructive paper by Professor Lindley, 'On the Tropical Fruits likely to be worth cultivating in England,'* it is stated, upon the authority of Mr. Crawford, that some of the varieties of the banana possess an exquisite flavour, surpassing the finest pear; and that others in the East Indies have been compared to an excellent reinette apple, after its sweetness has been condensed by keeping through the winter. Of these varieties there are so many, that they would be as difficult to describe as the sorts of apples and pears of Europe. The banana has frequently pro-

* Hort. Trans., vol. v.

duced its bunches of yellow fruit in hothouses in this kingdom; particularly at Wynnstay, the seat of Sir W. W. Wynn; and at Messrs. Loddiges', at Hackney, and at Kew, and other places, and is now a regular article of sale in the fruit-markets of London.

Longan.

LITCHI (*Dimocarpus litchi*).—LONGAN (*Dimocarpus longan*). These fruits are natives of the south of China, where they are held in the highest estimation. They have thence been introduced into many parts of the East Indies, and to the gardens of the curious in some places of Europe. John Knight, Esq., of Lee Castle, near Kidderminster, presented the Horticultural Society with some of the fruit that had ripened in his hothouse in 1816, and it was found to be as good as that which is produced in China. The litchi was introduced into this country by the celebrated Warren Hastings, Esq., in 1786: the longan had been introduced before.

The trees on which these fruits are produced have a considerable resemblance to each other,—are, in fact, so much alike, that they are distinguished only by the flowers of the litchi being without petals, while those of the longan have eight; and the fruit of the litchi being larger, and generally of a red colour, while that of the longan is always brown. They are moderately sized trees, with brown bark, which is very bright in the twigs. The leaves are large, have some resemblance to those of the laurel, are placed alternate, and hang very gracefully. The fruit is produced in bunches, which are pendent from the extremities of the twigs; and there is a considerable number of fruit in the bunches, not close together, like grapes, but on stalks, the principal ones from six inches to a foot in length; while those of the individual fruit are from one inch to two.

Of both species there are many varieties in China, which differ in the time of ripening, and the form and qualities of the fruit. In general, the litchi is about an inch and a half, or from that to two inches, in diameter, and the longan about an inch and a quarter; and both are covered with small scaly processes, which are most prominent in the longan. Both fruits are covered by tough, thin, leathery coats, within which is the pulp, and in the inside of that a single brown seed. The pulp is colourless, semi-transparent, slightly sweet, and very grateful to the taste. The Chinese prefer the longan, to which they ascribe medicinal qualities; but Europeans give the preference to the litchi, probably on account of its larger size and the greater beauty of its colour. The litchi is often brought to this country in a dried state, in which, though the pulp be much diminished in size, it retains a very considerable portion of its original flavour. From the beauty and flavour of these fruits, and the perfection to which they have been brought in this country, in all cases where they have had a fair trial, it is by no means unlikely that they may become common as hothouse fruit.

CHAPTER XVIII.

CARBONACEOUS SECRETIONS (*continued*) :—OIL—THE OLIVE.

OIL differs from starch and sugar in the possession of a larger quantity of hydrogen than either of these substances. In them the hydrogen exists in combination with oxygen in the proportions to form water, but in oil the quantity of oxygen is so small, that it is believed that both the carbon and hydrogen of oil, when taken into the system as food, unite with oxygen, and assist in keeping up the animal heat of the body. That its agency is more active in this respect than either sugar or starch, may be inferred from the fact, that just in proportion to the diminished temperature on the surface of the earth, is the quantity of oily matter eaten by the inhabitants. Thus the natives of Norway, Sweden, and Siberia eat with avidity train oil, whilst the inhabitants of Greenland were found by Franklin to esteem his tallow candles as a luxury.

Although oil for the food of man is obtained principally from the animal kingdom, yet the animals from which it is procured have obtained it either directly or indirectly from the vegetable kingdom. Animals that are fed on oily foods, when not able to consume them, for the purpose of keeping up animal heat, deposit the oil in the form of fat. Thus oxen fed on oil-cake become fat. On the other hand, animals possess the power of converting starch and sugar into oil in their systems, so that there can be no doubt that a large proportion of the oil yielded by animals has been produced in this way.

Oil is the least digestible of the carbonaceous secretions, and is only taken sparingly by the inhabitants of temperate and tropical climates. It is commonly used in this country in the formation of what is called pastry, in which a combination of the oil takes place with the starch of wheat flour, and an indigestible compound is produced. Whether an analogous combination with this exists or not in the seeds of plants which contain oil, there can be no doubt that they are less digestible than their separate constituents. This is especially the case with those unaccustomed to the various seeds containing oil, as the walnut, chesnut, almond, &c.

Most plants which possess oil in sufficient abundance to render them useful as the diet of man, contain this substance in their seeds.

The olive (*Olea Europea*) is, however, a remarkable exception, and secretes its oil in the pericarp or external covering of the seed.

The Olive is a stone-fruit, or rather a double-celled nut, covered by a fleshy pericarpium.

There is something peculiarly mild and graceful in the appearance of the olive-tree, even apart from its associations. The leaves bear some resemblance to those of the willow, only they are more soft and delicate. The flowers are as delicate as the leaves; they come in little spikes from buds between the leaf-stalks and the spikes. At first they are of a pale yellow, but when they expand their four petals, their inside is white, and only the centre of the flower yellow. The matured wood of the olive is hard and compact, though rather brittle, and has the pith nearly obliterated, as is the case with box. Its colour is reddish, and it takes a fine gloss; on which account the ancients carved it into statues of the gods; the moderns make it into snuff-boxes and other trinkets.

The wild olive is found indigenous in Syria, Greece, and Africa, on the lower slopes of the Atlas. The cultivated one grows spontaneously in many parts of Syria, and is easily reared in all parts of the shores of the Levant that are not apt to be visited by frosty winds. Where olives abound they give much beauty to the landscape. "The beautiful plain of Athens, as seen toward the north-west from Mount Hymettus, appears entirely covered with olive-trees."* Tuscany, the south of France, and the plains of Spain, are the places of Europe in which the olive was first cultivated. The Tuscans were the first who exported olive-oil largely, and thus it has obtained the name of Florence-oil; but the purest is said to be obtained from about Aix, in France.

The particular departments of France in which the olive is most successfully cultivated are those of the Mouths of the Rhone, of the Var, of the Gard, and some others; but it does not ripen its fruit to the north-west of a line drawn from the Pyrenees, near Narbonne, to the foot of the little St. Bernard in the Alps; or in that part of France which may be considered as forming

* Olivier.

a portion of the basin of the Mediterranean, and which is inclosed between that sea and the mountains of Cevennes and the Alps.

The proper time for gathering olives for the press* is the eve of maturity. If delayed too long, the next crop is prevented, and the tree is productive only in the alternate years. At Aix, where the olive-harvest takes place early in November, it is annual: in Languedoc, Spain, and Italy, where it is delayed till December or January, it is in alternate years. The quality of the oil also depends upon the gathering of the fruit in the first stage of its maturity. It should be carefully plucked by the hand, and the whole harvest completed, if possible, in a day. To concoct the mucilage, and allow the water to evaporate, it is spread out, during two or three days, in beds three inches deep. The oil-mill is simple: the fruit is reduced to a pulp, put into sacks of coarse linen or feather-grass, and subjected to pressure. The oil first expressed is the purest: the oil of the kernel is said to injure that of the fruit, and cause it to become sooner rancid. The growth of olives and the manufacture of the oil offer a considerable employment to many of the inhabitants of France and Italy. The importation of olive-oil into Great Britain amounted, in 1827, to about four thousand five hundred tons, paying a duty of eight guineas per tun.

The olive grows in England, though, in the severity of our winters, it changes its character. In the south it is an evergreen; but in England it loses its leaves. Indeed it needs protection even in the mildest winters, and it is only in the very warmest summers that it will produce fruit a little, which does not ripen, and is of very slight flavour.

In ancient times, especially, the olive was a tree held in the greatest veneration, for then the oil was employed in pouring out libations to the gods, while the branches formed the wreaths of the victors at the Olympic Games. It was also used in lubricating the human body. Some

* Hillhouse on the Olive Tree.

of the traditions say that it was brought out of Egypt to Athens by Cecrops; while others affirm that Hercules introduced it to Greece on his return from his expeditions; that he planted it upon Mount Olympus, and set the first example of its use in the Games. The Greeks had a pretty and instructive fable in their mythology, on the origin of the olive. They said that Neptune, having a dispute with Minerva, as to the name of the city of Athens, it was decided by the gods that the deity who gave the best present to mankind should have the privilege in dispute. Neptune struck the shore, out of which sprung a horse: but Minerva produced an olive-tree. The goddess had the triumph; for it was adjudged that Peace, of which the olive is the symbol, was infinitely better than War, to which the horse was considered as belonging, and typifying. Even in the sacred history, the olive is invested with more honour than any other tree. The patriarch Noah had sent out a dove from the ark, but she returned without any token of hope. Then "He stayed yet other seven days; and again he sent forth the dove out of the ark; and the dove came to him in the evening: and lo, in her mouth was an olive-branch plucked off: so Noah knew that the waters were abated from the earth."

The veneration for the olive, and also the great duration of the tree, appear from the history of one in the Acropolis at Athens. Dr. Clarke has this passage in his Travels,* in speaking of the temple of Pandrosus:— "Within this building, so late as the second century, was preserved the *olive-tree* mentioned by Apollodorus, which was said to be as old as the foundation of the citadel. Stuart supposed it to have stood in the portico of the temple of Pandrosus (called by him the Pandroseum), from the circumstance of the air necessary for its support, which could here be admitted between the caryatides; but instances of trees that have been preserved to a very great age within the interior of an edifice inclosed by walls, may be adduced."

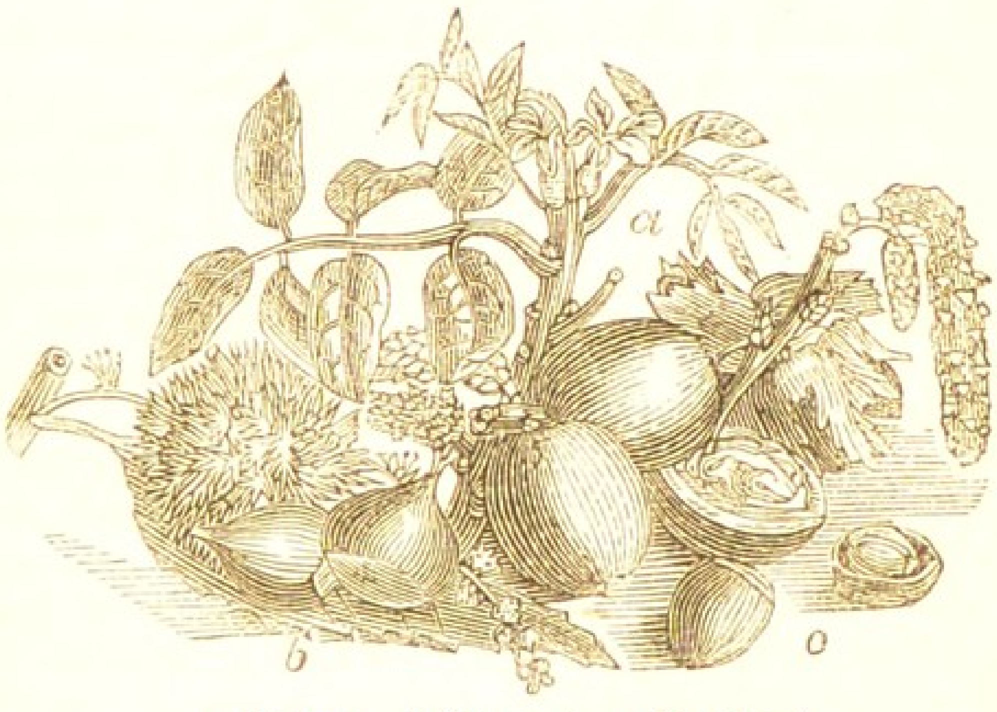
The province of Suse, in Morocco, produces great abundance of olive-oil, which is stated to be equal in

* Vol. vi. p. 246.

quality to the best Florence oil, when it is expressed from the fruit before it becomes quite ripe. Mr. Jackson, in his ‘Account of the Empire of Morocco,’ mentions a curious circumstance regarding an extensive plantation of olive-trees in the neighbourhood of Messa, which indicates the great facility with which this tree may be propagated. Being struck with the whimsical arrangement of this large plantation, he inquired the cause of their being so arranged, which was thus explained:—“I learnt from the viceroy’s aide-de-camp, who attended me, that one of the kings of the dynasty of Saddia, being on his journey to Soudan, encamped here with his army; that the pegs with which the cavalry picketed their horses were cut from the olive-trees in the neighbourhood; and that these pegs being left in the ground on account of some sudden cause of the departure of the army, the olive-trees in question sprung from them. I confess, while I acknowledged the ingenuity of the idea (for the disposition of the trees exactly resembled the arrangement of cavalry in an encampment), I treated it as fabulous; some time afterwards, however, the following circumstance occurred, which induced me to think the story was not only plausible, but very credible. Having occasion to send for some plants for a garden which I had at Agadeer, or Santa Cruz, the foulah (gardener) brought, amongst other things, a few bits of wood, without any roots or leaf, about eighteen inches long and three in circumference, which he with a large stone knocked into the ground. Seeing the fellow thus employed, I asked him what he meant by trifling in that way? ‘I am not trifling,’ said he, ‘but planting your pomegranate-trees.’ I began to take them out of the ground; but some persons who were near assuring me that it was the mode in which they were always planted, and that they would (with the blessing of God) take root and shoot forth leaves the next year, I was at length prevailed on to leave a few in the ground, merely for experiment;—and they certainly did take root, and were in a fair way of becoming good trees when I left Santa Cruz.”

CHAPTER XIX.

NUTS—WALNUT; CHESNUT; HAZEL-NUT; ALMOND COCOA-NUT; BRAZIL-NUT, ETC.



a. Walnut. b. Chesnut. c. Hazel-nut.

Nuts, properly so called, are hard dry fruits, containing one or two seeds, and not in any degree fleshy or pulpy. They are often surrounded by a leafy or woody husk, which is called the involucre, enlarged as a covering to the fruit. The kernels of all the esculent nuts are eaten on account of the quantity of oil they contain; but are less digestible than any other vegetable matters.

The Walnut (*Juglans regia*).—The nuts of this tree have, when perfectly ripe, a very agreeable flavour; and the tree being besides exceedingly valuable as timber, and highly ornamental, it is well worthy of cultivation. The walnuts of commerce are many of them obtained from warmer countries; but were sufficient attention paid to walnut-plantations, an abundant supply might be obtained in all the southern parts of England. In some parts of Scotland walnuts come to muturity, but they are by no means general. In the unripe state walnuts make an agreeable pickle; and an indelible olive dye is obtained from the pericarp of the ripe fruit. The nut of the hickery (*Juglans alba*) is small, and of little value; and though the nut of the black walnut of Virginia (*Juglans nigra*) is large, the kernel is very small; it is, however, sweet.

Walnuts or chesnuts may be preserved through the winter by pitting them in the earth, as is done with potatoes.

The CHESNUT (*Castanea vesca*).—The chesnut has a prickly involucre, and the nuts grow in a lengthened cluster, upon twigs. The kernel is large, and enveloped in a tough coat of a tint so peculiar as to give its name to a particular kind of colour. When raw the chesnut has a slight trace of walnut taste, but it is much inferior. Roasted, it becomes farinaceous, and resembles a mealy potato. The chesnut is, indeed, the most farinaceous, and the least oily, of all the nuts, and therefore it is more easy of digestion.

In the southern parts of the Continent chesnuts grow so abundantly as to form a very large portion of the food of the common people, who, besides eating them both raw and roasted, form them into puddings and cakes, and even bread. The chesnut produces abundantly in the warmer parts of England; but though the tree grows in Scotland, the fruit seldom comes to maturity there.

The best kinds of chesnuts are grafted. The late Sir Joseph Banks had some brought from Devonshire to his house at Spring Grove, which bore most plentifully; the fruit was smaller than the Spanish chesnut, but much sweeter.

The HAZEL-NUT (*Corylus*).—Of this nut there are several species and varieties.

The common hazel (*Corylus avellana*) has the nut small and short, but the tree grows more easily than the filbert, being found wild not only in forests and commons in England, and especially upon the banks of dingles and ravines, but occurring in extensive tracts in the more northern and mountainous parts of the country. Several places, whose soil suits its growth, are called after the hazel, such as Haselmere, Haselbur, &c. The common hazel is seldom cultivated as a fruit-tree, though perhaps its nuts are superior in flavour to the others, which are more inviting in size.

The filberts, both the red and the white, and the cob-nut, are merely varieties of the common hazel, and have been produced partly by the superiority of soil and climate where they grow, and partly by culture. The filbert is not thicker than the common nut, but it is at least double the length, and has the kernel large in proportion. The cob-nut is the largest of the species, and it is round: the cluster-nut differs from the others only in the fruit being produced in large clusters at the ends of the branches. A particular form of tree receives in some parts of the country (especially in Kent, where the culture of the filbert is carried on with advantage) the name of the dwarf productive nut, though that name indicates rather the mode in which the tree is trained than the variety to which it belongs. Generally speaking, the filbert is but a low grower, but still considerable ingenuity is exerted in keeping it down, it having been found by general experience that the dwarfing of fruit-trees is the most effectual means of ensuring a large and uniform crop, and fruit of superior quality. The trees that are dwarfed are not allowed to exceed seven feet in height, and they are trimmed in the form of a goblet, with an open centre, as is generally done with well-managed gooseberry-trees. When the tree comes into proper bearing, this goblet has attained a diameter of about six feet, which is every season covered with filberts both outside and inside. The nuts are of excellent quality, and it is found, by comparison, that a tree treated in this manner, with the ground regularly hoed and cleaned, will produce more than three which are planted in a hedge-row or coppice, and allowed to run wild in the usual manner.

There is something singular in the flowering of the hazel: the male catkin makes its appearance in autumn, and continues to increase till spring, at which time the female ovaries, that are to produce the nuts, make their appearance: this takes place as early as February, and before there is yet a leaf upon the deciduous trees; so that, besides its advantages as a fruit, the filbert may be regarded as an ornamental tree at that season when groves and coppices have the least beauty.

The word filbert is a corruption of the original English name for this nut, *full-beard*—which was applied to the large and fringed husk, to distinguish it from the closer covering of the common hazel. Our old poet Gower assigns a more classical origin to the name—

> "Phillis
> Was shape into a nutte-tree,
> That all men it might see;
> And after Phillis, *Philberd*
> This tree was cleped." *

The Constantinople nut (*Corylus colurna*) is a superior ut to even the best variety of the hazel. Its flavour is equal, and its size is more than double. It is a round nut, invested with a deep calyx, or involucre, which covers it almost entirely, and is very much lobed and fringed at its extremity.

L'Ecluse, a distinguished gardener, brought the nuts of the *Corylus colurna* from Constantinople in 1582; and Linnæus states, that in the Botanical Garden at Leyden there was growing, in 1736, a fine tree of this species, planted by L'Ecluse. It was cultivated in England by Ray, in 1666. This tree grows naturally in the neighbourhood of Constantinople.

The American nut (*Corylus americana*) is a beautiful species, extensively spread over North America, and which has been cultivated in the neighbourhood of Paris.

The involucra and bottoms of the nuts of all the species

* Confessio Amantis.

and varieties of *Corylus* are extremely austere and astringent when in their green state ; and it is doubtful whether they might not then be profitably employed either in the tanning of leather, or perhaps for the same purposes as galls.

The Spanish nuts of the shops are fresh nuts from Spain ; the Barcelona nuts are another variety, kiln-dried before exportation.

The Carob-Tree (*Ceratonia siliqua*), which grows extensively in the south of Europe, particularly in some provinces of Spain, of which Valencia is the principal, bears a fruit called the *carob bean*, which is an important article of commerce. It is chiefly used for the feeding of cattle, but furnishes a nutritive aliment to the poor in times when there is a scarcity of bread-corn.

The Almond-tree (*Amygdalus vulgaris*) has a considerable resemblance to the peach-tree in the form of its leaves, and of its blossoms, only the latter are more variable in colour. It is probable that the almond is a native of the western parts of Asia. The almond is mentioned in the Scriptures as amongst the best fruits of the land of Canaan. It is very plentiful in China, in most of the Eastern countries, and also in Barbary. In that country it is the most early bearer of all the fruit-trees. It flowers in January, and gives its fruit in April.* It does not appear that the almond-tree (which is now abundantly cultivated for its fruit in Italy, Spain, and the south of France) was so early introduced into the first of these countries as the peach, or that its native region was so well known, "Greek nuts" being the name given to almonds at Rome in the time of Cato.

The fruit of the almond is not so attractive as that of the peach ; because, instead of presenting the same delicious pulp as that, the pericarp of the almond shrivels as the fruit ripens ; and when the ripening is completed, has become a horny kind of husk, which opens of its own accord. The kernel of some varieties of the almond is not defended by so tough a shell as that of the peach

* Shaw's Travels.

and nectarine; for it is often so tender that the nuts break when shaken together.

In the south of Europe, where the almond is cultivated with as much care as the peach is in this country, its varieties are carefully distinguished. The bitter and the sweet are permanently distinct varieties; and after this leading character is observed, the variety is further distinguished by the form and degree of hardness of the shell. For instance, the French have "amandier à coque dure"—"amandier à coque demi-dure"—"amandier à coque tendre."

In England almond-trees are chiefly cultivated for the beauty of their early flowers; and for this reason, the common kind, and the double-flowering dwarfs, are preferred. There is something very charming in the peculiarity which belongs to this tree, of blossoming on the bare branches:

> "The hope, in dreams, of a happier hour,
> That alights on misery's brow,
> Springs out of the silvery almond-flower,
> That blooms on a leafless bough."*

One of the most beautiful tales of the Greek mythology (that of the Loves of Phyllis and Demophoon) is founded on this property of the almond-tree.

Almond-trees ripen their fruit in England, though the produce is very inferior to that which is imported. The flowers of the productive almond, both the sweet and the bitter, are much less showy than those of the unproductive. Like most of the other nut-bearing trees, the almond yields an oil. Between the expressed oil of bitter and that of sweet almonds there is little difference; but the bitter almond contains an essential oil, while the sweet almond has none. Owing to the prussic acid which it contains, this essential oil is found, by experiment, to be exceedingly poisonous; and therefore the use of bitter almonds should be carefully avoided in every instance where there is a chance that the essential oil may

* Moore.

be separated in the stomach. So very violent is the poison of this oil, that instances are recorded of persons dying in consequence of drinking even a very small portion of spirits flavoured by it; and, in its concentrated state, it is probably not exceeded, in its hurtful effects, even by the essential oil of tobacco itself, or by any of the narcotic vegetable poisons.

According to Haller (*Hist. Plant.*), bitter almonds are a poison to birds and quadrupeds.

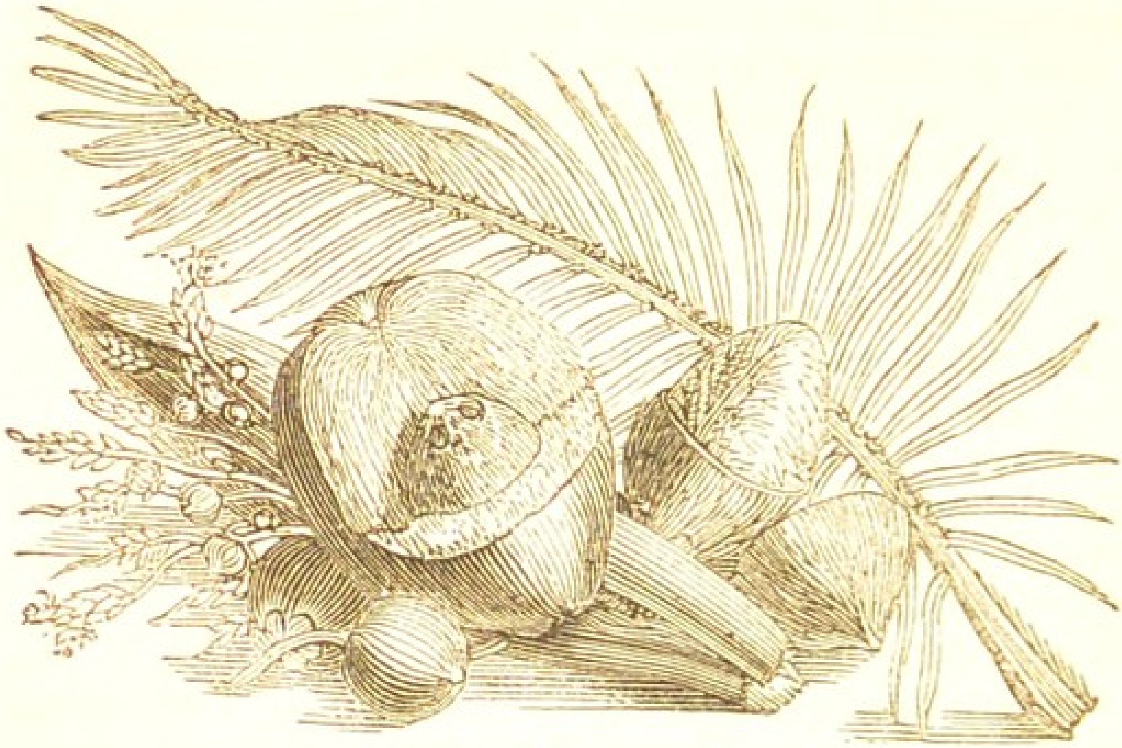
Almond-oil (the expressed oil) is principally obtained from the almonds of Valentia and Barbary; the Syrian almonds, usually called Jordan almonds, being preferred for the table.

The *large-fruited Almond* (*var. macrocarpa*) is one of the most beautiful varieties of the almond. The flowers are twice as large as those of the common sort, and remain longer in perfection: the fruit also is larger. There is a specimen in the garden of the Horticultural Society, which has been figured and described by Professor Lindley in the 'Botanical Register;' who remarks, that this almond is "increased by budding upon plums and other drupaceous plants."

About four hundred and fifty tons of almonds are annually imported into Great Britain, paying a duty of 18,000*l.*

Cocoa-nut (*Cocos*). The cocoa-palm is supposed to be a native of the south-east of Asia, and is found wild in some of the small islands off the shores; but it has been introduced into almost every part of the tropical regions. Its quality of bearing in the neighbourhood of sea-water is very favourable to its migrations. There are five species enumerated and described by the botanists; but the most valuable is the *Cocos nucifera*, or cocoa-tree, properly so called.

The *C. nucifera* is a very tall tree, the trunk of which is composed of hard and strong fibres, which cross each other like network. There are, strictly speaking, no branches; but the leaves are from twelve to fourteen feet long, with a very strong middle rib, to each side of which the sword-shaped leaflets are attached. The



Cocoa-nut *(Cocos nucifera)*.

flowers come out round the top of the trunk, each cluster inclosed in a long spatha or sheath. When these have arrived at maturity, the sheath opens, and the male flowers gradually fall off, leaving the embryo fruit. In a moist and fertile soil the cocoa-palm bears in four years; in a dry region fruit is not produced till it has been planted ten years. The fruit consists externally of a thin but tough rind, of a brownish-red colour; beneath which there is a quantity of very tough fibrous matter, of which cordage and coarse cloth, matting, and a variety of other articles are manufactured at the present day. Burckhardt says that ships coming from the East Indies to Djidda have cordage made of the cocoa-nut tree. Inclosed within this fibrous mass is the shell, of great firmness, and used for many domestic purposes. While the nut is green, the whole hollow of the shell is filled with an agreeable, sweetish, refreshing liquor. When the nut is gathered, a formation of albumen takes place upon the inside of the shell, producing that white, firm, pleasant-tasted, but rather indigestible substance, which is called the kernel of the nut. Like the kernels of most nuts, that of the cocoa is nutritious, and contains a great quantity of fixed oil, which is also the ingredient to which its indigestible quality is owing. A tree generally furnishes about a hundred cocoas. The stem of the cocoa-nut tree is very tough and durable, and used for constructing the abodes of the people in the warm countries where it grows, and the leaves are employed as thatch; while the ribs answer the same purpose as osiers in the making of baskets and other wicker-work. The tender shoots at the top of the cocoa-nut tree may be used as esculents, and are very tender and delicate; but they are costly, as they cannot be obtained except at the expense of the tree.

The finest arrack in the East Indies is made from the juice of the cocoa-nut tree. This juice, before it is distilled, is called *toddy;* and those trees from which it is to be obtained are not suffered to bear fruit. There are two ways of obtaining the toddy: they either cut off the monthly shoot from which the fruit would be produced, and collect the sap in jars from the wound; or they make a perforation in the trunk of the tree, which they keep plugged up, unless when they are about to collect the sap. When put in vessels, and kept out of the sun, the toddy undergoes the vinous fermentation, and is fit for distilling; but if it be exposed to the sun, it undergoes the acetous fermentation, and is changed into vinegar.

The cocoa-palm generally reaches the age of from eighty to a hundred years; and its average height is about eighty feet. Its growth is thus more rapid than the other palms.

The other species of cocoa are not so valuable. The seeds of *Cocos butyracea* are very mucilaginous, and also very oily. The pulp of the nuts is used for fatting hogs; and the natives of South America make a sort of butter from it. The Guinea cocoa-nut (*Cocos guineensis*) is much smaller than the others, the trunk not being above one inch in diameter, and twelve feet high. It is tough and hard, and covered with prickles; when cleared of the bark it is made into walking-sticks, which are black, strong, light, and take a fine polish. It grows abundantly in the island of Tobago, after which island the sticks used to be named in France. The fruit is about the size of a cherry: it may be eaten, but it is very acid, and not pleasant; though the wild hogs in Jamaica devour it greedily. In some parts of America a sort of wine is made from it. It is found most plentifully in the northern parts of Colombia. The *great maccaw-tree* (*Cocos aculeata*) grows abundantly in the West India Islands. It is a large palm, the trunk being from a foot to a foot and a half in diameter, and rising to the height of about thirty feet. The fruit is small, of a globular form, but a little flattened, and not more than an inch in diameter. The pulp that surrounds the nut has an astringent taste, but the kernel is pleasant. The *Cocos nypa* is thick, but very low; and in its fruit resembles the cocoa-nut, only the nuts are smaller. It grows in salt-marshes and by the mouths of rivers, in the south-eastern parts of Asia.

All the species yield fixed oil: that of the cocoa-nut is clear and sweet. The true palm-oil is obtained from the *Elais guineensis*, an African plant.

The Cashew-nut (*Anacardium occidentale*).

The CASHEW-NUT (*Anacardium occidentale*). The cashew-nut tree bears a considerable resemblance to the walnut, and the leaves have nearly the same scent. The fleshy receptacle, vulgarly called apple, which the tree produces, is of an agreeable subacid flavour, and may be fermented into a kind of wine, or distilled into arrack. The nut, of a kidney shape, is attached to the end of the apple; it is inclosed in two shells, between which there is an acrid inflammable oil, which is so caustic that it will blister the skin. The kernel, contained in the second or inner shell, is of a very fine flavour, and used to give a pleasant taste to many products of cookery: it also greatly improves the flavour of chocolate.

BRAZIL-NUT, or JUVIA (*Bertholletia excelsa*). This is one of the most extraordinary fruits of South America, which has been made familiar to us principally by the interesting description of Humboldt. It was first noticed in a geographical work published in 1633, by Laet, who says that the weight of this fruit is so enormous, that, at the period when it falls, the savages dare not enter the forests without covering their heads and shoulders with a strong buckler of wood. The natives of Esmerelda still describe the dangers which they run when the fruit falls from a height of fifty or sixty feet. The triangular grains which the shell of the juvia incloses, are known in commerce under the name of Brazil-nuts; and it has been erroneously thought that they grow upon the tree in the form in which they are imported.

The tree which produces the juvia is only about two or three feet in diameter, but it reaches a height of a hundred and twenty feet. The fruit is as large as a child's head. Humboldt justly observes that nothing can give a more forcible idea of the power of vegetable life in the equinoctial zone than these enormous ligneous pericarps. In fifty or sixty days a shell is formed half an inch in thickness, which it is difficult to open with the sharpest instrument. The grains which this shell contains have two distinct envelopes. Four or five, and sometimes as many as eight of these grains are attached to a central membrane. The Capuchin apes (*Simia chiropotes*) are exceedingly fond of the seeds of the juvia; and the noise of the falling fruit excites their appetites in the highest degree. The natives say that these animals unite their strength to break the pericarp with a stone, and thus to obtain the coveted nuts. Humboldt doubts this; but he thinks that some of the order of *Rodentia*, such as the *Cavia aguti*, are able to open the outer shell with their sharp teeth applied with unwearied pertinacity. When the triangular nuts are spread on the ground, all the animals of the forest surround them, and dispute their possession. The Indians, who collect these nuts, say "it is the feast of the animals, as well as of ourselves;" but they are angry with their rivalry. The gathering of the juvia is celebrated with rejoicings, like the vintage of Europe.

Some other plants yield oil, as the chocolate-nut tree (*Theobroma Cacao*), but these are spoken of under other heads.

CHAPTER XX.

PLANTS YIELDING MEDICINAL SECRETIONS — ACIDS — CITRIC ACID, ORANGE, LEMON, ETC.

In the foregoing chapters we have spoken of the principal forms of the secretions of plants which, entering into the system, are either employed for the building up of the fabric of the body or the maintaining its animal heat. We have now to refer to plants which, although they yield in many instances an abundance of both nutritious and carbonaceous secretion, are nevertheless not consumed on their account, but on account of some other secretion they produce. These remaining secretions may be comprehended under the head of acids, volatile oils, and alkaloids. None of these classes of substances, that we are aware, are essential to life, at the same time they are constantly taken by man and the lower animals in their food, and seem to act medicinally on the system.

The first group of these substances, the organic acids, are used extensively by man in his food. Nearly every fruit, and most of the parts of vegetables which are eaten whole, contain a larger or smaller quantity of the vegetable acids. When acids do not naturally exist in the food which he takes, man has recourse to vinegar, acetic acid, which results from the decomposition of various vegetable substances.

The most frequent vegetable acids consumed by man are the citric, tartaric, malic, and oxalic acids. The composition of these compounds is as follows:

	Carbon.	Hydrogen.	Oxygen.
Citric Acid	12	5	11
Tartaric Acid	8	4	10
Malic Acid	8	4	8
Oxalic Acid	2	—	3

It will at once be seen that the composition of these acids is very similar to that of the various carbonaceous secretions; at the same time we have no evidence to prove that these acids are burned in the system in the same way as starch, sugar, and oil. That they are digested and decomposed there can be little doubt, but beyond their results their action is not known. One of the most curious facts in the history of the action of the vegetable acids on the system is the power which citric acid, contained in the juice of the orange, lemon, lime, &c., has in arresting and preventing the disease called scurvy. This disease, which at one time was the great plague of our navy, and the cause of the death of many thousands of seamen annually, is now seldom seen, and this entirely from the use of lemon-juice on board our vessels. It is however a curious fact that the acid, which is easily separated from the juice of the fruit, is not nearly so efficacious as the juice itself. Many theories are advanced to explain these phenomena,* but none are satisfactory. A great fact is, however, very apparent, and that is, that this fruit acts medicinally on the system. It is not fruits that contain citric acid alone that cure the scurvy, but many fresh uncooked vegetable matters have this power, although none appear so efficacious as the fruits of the genus *Citrus*. We think, then, that it is a fair presumption that the vegetable acids generally act upon the system medicinally by preventing a state of the system, the most severe results of which we see in the scurvy of sailors.

The first plants we shall mention are those which produce fruits containing citric acid; of these the most remarkable are the species of the genus *Citrus*, to which the well known orange belongs. The orange is originally a native of tropical climates, and naturally growing only in climates hotter than our own, but by commerce it has been made one of our commonest fruits. The *orange* may be procured at little more cost than that of the

* Lankester, 'Lectures on the Natural History of Plants yielding Food,' p. 31.

commonest of our domestic fruits; while it is the most refreshing and healthy, perhaps, of all the fruits of the warm countries. It has thus become a peculiar blessing to us: for while it offers a gratification within the reach of the poorest, it is so superior to other fruits, that it cannot be despised for its cheapness, even by the richest. The duty upon oranges is 68,000*l.* per annum, at the rate of 2*s.* 6*d.* for a package not exceeding 5000 cubic inches. Assuming the cubical contents of an orange as ten inches, there are 500 in each package—and thus we see that 272,000,000 of this fruit are annually imported, allowing about a dozen per annum to every individual of the population.

This extraordinary consumption of a production which is brought here from very distant places, is a natural consequence of certain qualities which fit the orange, in a remarkable degree, for being the universal fruit of commerce. If we would have foreign figs and grapes, they must be dried, for the undried grapes, which we bring even from the short distance of Portugal, are flat and vapid; the tamarind is a liquid preserve; the guava must be made into a jelly; the mango destined for us requires to be pulled before it is ripe, and is pickled; the date must be dried; and the cocoa-nut becomes, when here, consolidated and indigestible. With regard to the orange, man may have it fresh in every region of the world, and at almost every season of the year. The aromatic oil and the rind preserve it from the effects both of heat and of cold; and the acridity of the former renders it proof against the attacks of insects. It is true that oranges rot, like other fruits; but that does not happen for a long time, if the rind is uninjured, and they are kept from moisture, and so ventilated as not to ferment.

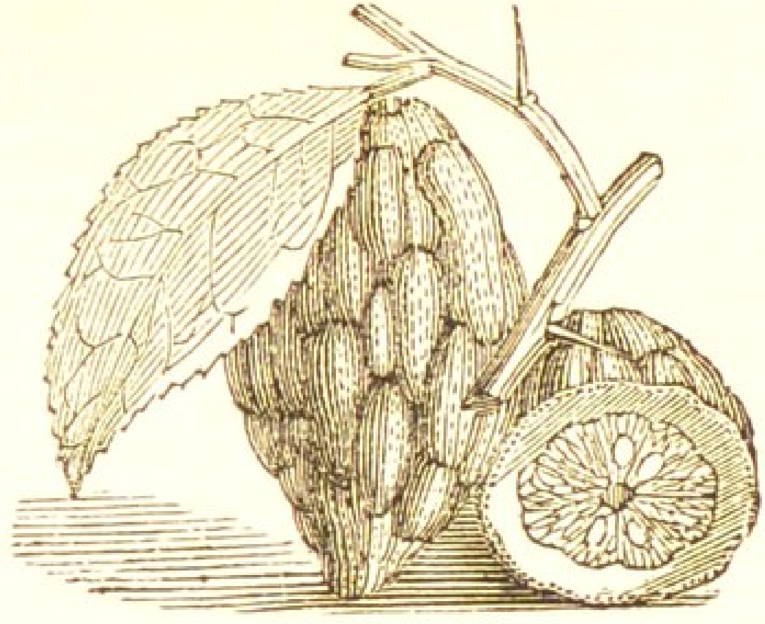
Most of the oranges and lemons intended for exportation are gathered while they are still green; for if the fruit were allowed to become mature it would spoil in the transport. Lemons are sometimes preserved by being impregnated with sea-water. The gathering of oranges and lemons for the British market generally occupies from the commencement of October to the end of December. Oranges are not fully ripe till the spring has commenced. It is remarkable that the orange-trees from which the fruit is gathered green bear plentifully every year; while those upon which the fruit is suffered to ripen afford abundant crops only on alternate years.*

The species of the genus *Citrus* form one of the most interesting groups of plants. They are all originally natives of the warmer parts of Asia, though they have been long introduced into the West Indies, the tropical parts of America, the Atlantic Isles, the warmer countries of Europe, and even Britain, where they bear the open air during the summer, and, in favourable situations, do not need artificial heat, if kept from the frost, through the winter. They are all either small trees or shrubs, with brown stems, green twigs and leaves, bearing some resemblance to those of the laurel. We cannot, however, judge of the size of the orange-tree by the specimens we ordinarily see in England. In parts of Spain there are some old orange-trees forming large timber;† in the convent of St. Sabina, at Rome, there is an orange-tree thirty-one feet high, which is said to be six hundred years old; and at Nice, in 1789, there was a tree which generally bore five or six thousand oranges, which was more than fifty feet high, with a trunk which required two men to embrace it.‡ The size depends much upon the age of the plant.

There are several distinct species, of which the Lemon, the Citron, the Orange, the Mandarin Orange, and the Shaddock, with their varieties, are the principal. They are, even in the East, where they are natives, not a little capricious in their growth; the fruit, and even the leaves, frequently altering, so that it is not always easy to say which is a distinct species, and which only a variety. They continue flowering during nearly all the summer, and the fruit takes two years to come to maturity; so that, for a considerable period of each year, a healthy tree has every stage of the production, from the flower-bud to the ripe fruit, in perfection at the same time.

* Dict. des Sciences Naturelles.

† Laborde. ‡ Risso.



The Citron.

The CITRON (*Citrus medica*, Risso), when growing wild, is a thorny tree, about eight feet high, with leaves of a pale green; the flowers are white, and have a very agreeable odour. The fruit is oblong, five or six inches long, with a rough yellow rind; the outer part of it contains (as is the case with most of the family) a considerable quantity of highly aromatic and inflammable oil; the pulp is white and edible, but very acid, and preferred when prepared as a sweatmeat. Of a particular variety of the citron a conserve is made which is in great demand by the Jews, who use it in their Feast of Tabernacles. With a little artificial heat in winter, the citron comes to as much perfection in England as in Spain or Italy. There are two varieties noticed—the common and the sweet, but whether they have been produced by natural difference or culture is not known.

The LEMON (*Citrus Limonum*, Risso), grows naturally in that part of India which is situated beyond the Ganges; but its transmigration to Europe belongs to the invasion of the West by those mighty caliphs, who, from the heart of Southern Asia, extended their conquests to the foot of the Pyrenees, leaving everywhere traces of their power and of their knowledge. The lemon, thus transported by the Arabs into every part of their vast empire where it would grow, was found by the Crusaders in Syria and Palestine towards the end of the eleventh century. By them it was introduced into Sicily and Italy; though it is probable that at the same period it was already multiplied in Africa and Spain.* Arabic writers of the twelfth century speak of the lemon-tree as then cultivated in Egypt and many other places. Matthew Silvaticus, a writer of that time, says that the lemon was then spread over all Italy.

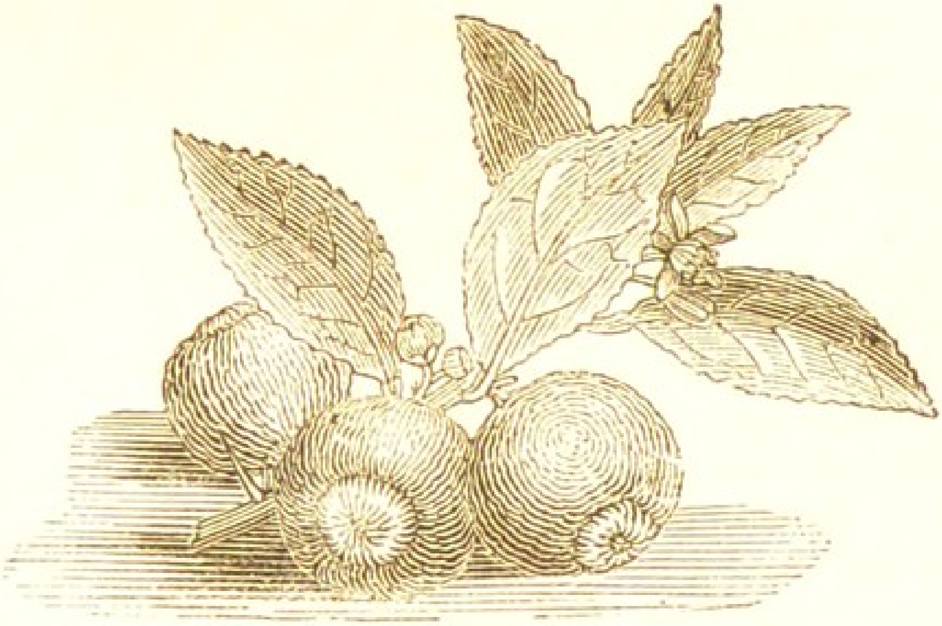
In the southern parts of Europe, where the lemon is abundant, there are many varieties.

The rind of the lemon is much smoother than that of the citron; the bark of the tree is less smooth.

The LIME (*Citrus Limetta*, Risso), or sour lemon, is a small and shrubby tree, the fruit of which is much smaller than that of the citron or lemon, being only about an inch, or an inch and a half in diameter. The lime is not much cultivated in Europe; but it is a great favourite in the West Indies, being more acid and cooling than

The Lemon.

* Risso, p. 7.



The Lime.

the lemon. In that country there is a sweet lime, intermediate between the lemon and the sour lime; and botanical writers are of opinion that hybrids or mules are produced between all the varieties, and probably also the species, of the citrons.

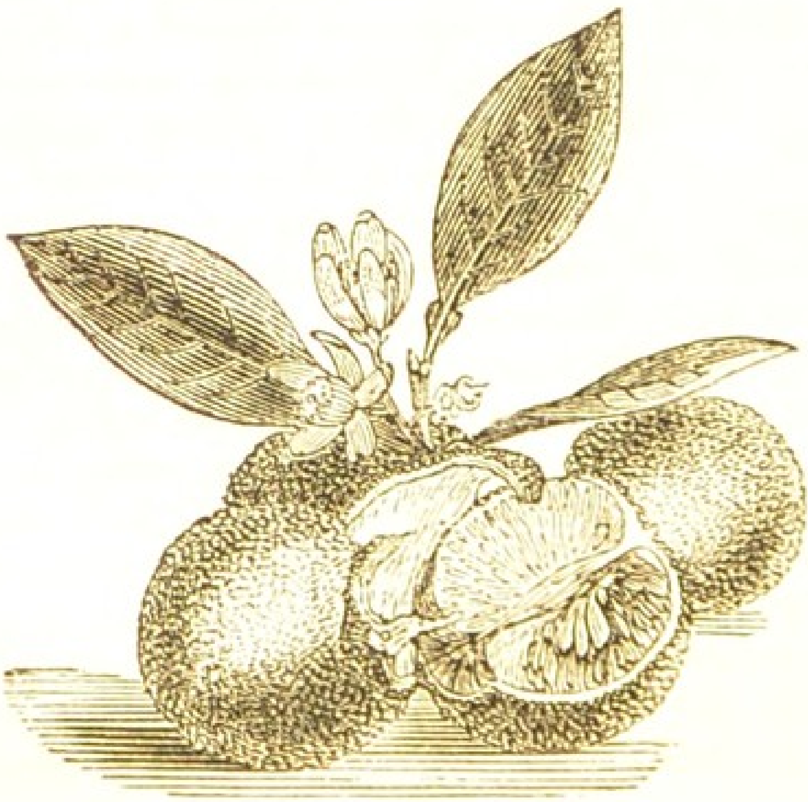
The ORANGE (*Citrus aurantium*, Risso) is a taller and more beautiful tree than either the citron or the lemon; but, like them, it has prickly branches when in its native country. The orange was originally brought from India.

The precise time at which the orange was introduced into England is not known with certainty, but probably it may have taken place not long after their introduction into Portugal, which was in the early part of the sixteenth century.

The first oranges, it is stated, were imported into England by Sir Walter Raleigh;* and it is added that Sir Francis Carew, who married the niece of Sir Walter, planted their seeds, and they produced the orange-trees at Beddington, in Surrey, of which Bishop Gibson, in his additions to Camden's Britannia, speaks as having been there for a hundred years previous to 1695. As

* Biographia Britannica; art. Raleigh.

these trees always produced fruit, they could not, as Professor Martyn justly observes, have been raised from seeds; but they may have been brought from Portugal, or from Italy (the place whence orange-trees have usually been obtained) as early as the close of the sixteenth century. The trees at Beddington were planted in the open ground, with a moveable cover to screen them from the inclemency of the winter months. In the beginning of the eighteenth century they had attained the height of eighteen feet, and the stems were about nine inches in diameter; while the spread of the head of the largest one was twelve feet the one way and nine the other. There had always been a wall on the north side of them to screen them from the cold of that quarter, but they were at such a distance from the wall as to have room to spread, and plenty of air and light. In 1738 they were surrounded by a permanent inclosure, like a greenhouse. They were all destroyed by the great frost of the following winter; but whether wholly owing to the frost, or partly to the confinement and damp of the permanent inclosure, cannot now be ascertained.

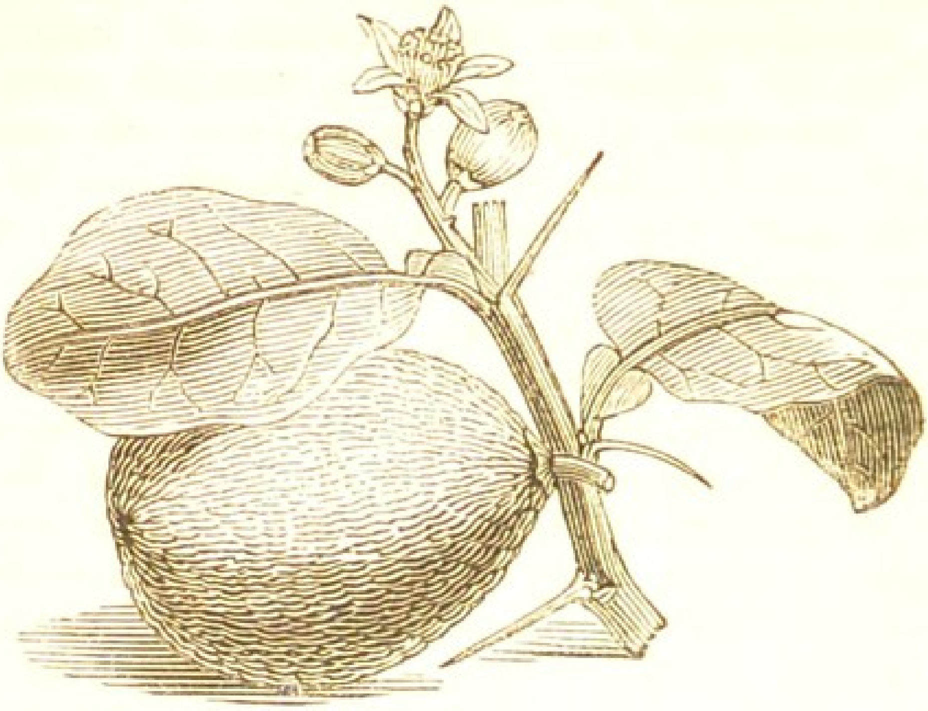


The Orange.

John Parkinson, apothecary, of London, one of the most voluminous of our early writers on plants, who published his 'Practise of Plants' in 1629, gives some curious directions for the preservation of orange-trees, from which one would be led to conclude that the trees at Beddington, with their ample protection of a moveable covering in winter, had not been in existence then. "The orange-tree," says he, "hath abiden, with some extraordinary branching and budding of it, when as neither citron nor lemon trees would by any means be preserved for any long time. Some keepe them in square boxes, and lift them to and fro by iron hooks on the sides, or cause them to be rowled on trundels or small wheels under them, to place them in an house, or close galerie, for the winter time; others plant them against a bricke wall in the ground, and defend them by a shed of boardes, covered with sear-cloth in the winter; and by the warmth of a stove, or such other thing, give them some comfort in the colder times; but no tent or meane provision will preserve them." The orange-trees at Versailles are, during the winter, wheeled into warm places under the terrace; and the same plan is to be pursued with respect to some fine orange-trees at Windsor, which have been lately presented to his Majesty by the King of France. At Hampton Court there are many orange-trees, some of which are stated to be three hundred years old. They are generally moved into the open air about the middle of June, when the perfume of their blossoms is most delicious. Orange and lemon trees have been cultivated in the open air in England. For a hundred years, in a few gardens of the south of Devonshire, they have been seen, trained as peach-trees against walls, and sheltered only with mats of straw during the winter. The fruit of these is stated to be as large and fine as any from Portugal.*

The SHADDOCK (*Citrus decumana*, Linn.) is much larger than the orange, both in the tree and the fruit. The tree is both lofty and spreading, and the fruit is

* Hort. Trans., vol. i.



The Shaddock.

about eight inches in circumference—some, indeed, much larger. The shaddock is a native of China and the adjoining countries, where the name of "sweet ball" is given to it. There are many varieties—some with the pulp white, others with it nearly red; some that are sweet, with but little acidity—and some acid, with but little sweetness. The shaddock derived its specific name from having been first carried from China to the West Indies by Captain Shaddock. It has, however, been neglected there, and now but seldom merits its oriental name of sweet ball. The planters have never been remarkable for their knowledge of science, or their skill in the new operations of the arts; and thus, instead of propagating the shaddock by budding, as is done in China, and which is the only way that it can be improved, or even kept from degenerating, they have reared it from seed, and consequently have generally obtained a harsh and sour sort, which is of very little value. It is showy, no doubt, from its size, and the appearance of the tree when growing; but it is the least valuable or desirable species of the genus produced in the West.

These are the species of the orange genus usually known in commerce; but on account of the beauty, the good qualities, and the abundance of these delightful fruits, as well as the length of time that they remain in season, they demand a more detailed account than can, in this sketch, be given of many of the other acid fruits. The manner, too, in which truth and fable are blended in their common history, renders such an account more desirable; and thus we shall devote a few pages to the further consideration of the genus.

At the time when the people of Europe first visited the Levant in great numbers—that is, during the Crusades for the recovery of Syria from the dominion of the Saracens—oranges were found abundant in that country. Though they were in reality cultivated trees, their number, and the beauty and goodness of their fruit, naturally caused the adventurers (who were not very conversant with Natural History, and not a little prone to romance and credulity) to believe and state that these were indigenous to the country, and formed a portion of the glories of the "Holy Land."

The fables of the profane writers, and the ambiguity of the descriptions of vegetables in Holy Writ, helped further to confirm this opinion. As the oranges were of the form of apples, and the colour of gold, it did not require much stretch of imagination to make them the golden apples of the Garden of the Hesperides; and the only point that remained was to settle the locality of that fabled paradise, which was generally laid in the part of Africa which lies between the mountains of Atlas and the southern shore of the Mediterranean. The authority of Moses was called in to confirm the existence of this fruit in Syria, even at the time when the children of Jacob were wandering in the wilderness; and one of the trees borne in the procession commanded in the twenty-third chapter of the book of Leviticus, was considered to have been the orange. The *mala medica* of the Romans, which is mentioned by Virgil, and afterwards by Palladio and others; the *kitron* of the Greeks; and the *citrus* of Josephus, were all understood to mean the same fruit; and, as has been found to be the case with many other substances, the moderns supposed that, because there was an identity of the name, there must be an identity of substance—never reflecting that the name had been imposed by themselves, and that therefore its identity proved nothing.

The fable continued, however; and, though there was a good deal of writing upon the subject, there was no attempt to examine the authorities with that minuteness which the search of truth demanded, till the nineteenth century. The history of this fruit was first carefully traced by Galessio, who published his '*Traité du Citrus*,' at Paris, in 1811. He maintains that the orange, instead of being found in the north of Africa, in Syria, or even in Media, whence the Romans must have obtained their "Median Apples," was not in that part of India which is watered by the Indus at the time of Alexander the Great's Indian expedition, as it is not mentioned by Nearchus among the fruits and productions of that country. It is not mentioned either by Arrian, by Diodorus, or Pliny; and even so late as the year 1300, Pietro di Cuescengi, a senator of Bologna, who wrote on agriculture and vegetable productions, does not take the least notice of the orange.

The first distinct mention of oranges is by the Arabs; and Avicenna (book v.) not only describes *oleum de citrangula* (oil of oranges) and *oleum de citrangulorum seminibus* (oil of orange-seeds), but speaks of *citric acid* (salt of lemons), which is contained in all the genus, though more abundantly in that species from which it got its common English name.

According to Galessio, the Arabs, when they penetrated to India, found the orange tribes there, further in the interior than Alexander had penetrated; and they brought them thence by two routes: the sweet ones, now called China oranges, through Persia to Syria, and thence to the shores of Italy and the south of France; and the bitter oranges, called in the commerce of England, Seville oranges, by Arabia, Egypt, and the north of Africa to Spain.

It does not appear that the orange was originally a

Chinese fruit, as it is not mentioned by Marco Polo, the father of modern travellers, who is so circumstantial in describing all the other wonders of that country.

Now these facts certainly go far to show that the orange was not known to the ancients either in Europe or in Syria; but that we are indebted for the first knowledge of it to the Arabs, who, with their zeal to propagate the religion of the Koran, were as anxious to extend the advantages of agriculture and medicine. The sweet orange which they introduced was not, strictly speaking, that which has since been called the China orange, and under that name introduced into Spain, Portugal, St. Michael's, the other Atlantic isles, and the West Indies; but rather the orange which was known in Italy before Vasco de Gama had doubled the Cape of Good Hope.

The orange is said to have been found by the Portuguese upon the east coast of Africa; but it is not known whether it has been indigenous there, or disseminated by the Arabs. When the Portuguese reached India, they found the orange there, and also in China, which was visited for the first time by sea in the early part of the sixteenth century.

Although the oranges of St. Michael, in the Azores, are now the best that are to be met with in the European market, they are not indigenous productions of that island; but were sent there by the Portuguese, as the same fruit was originally sent to the American continent by the Spaniards. In the middle of a forest, on the banks of the Rio Cedeno, Humboldt found wild orange-trees, laden with large and sweet fruit. They were, probably, the remains of some old Indian plantations; for the orange cannot be reckoned amongst the spontaneous vegetable productions of the New World.

Bnt, in whatever way oranges were first introduced into those parts of the world of which they are not natives, they are now very widely diffused; and wherever they are found they are among the most ornamental of trees, and the most delightful of fruits. The species and varieties have also been greatly multiplied; but whether from their proneness to produce varieties, from some original differences, or from difference of soil and climate, cannot now be ascertained. Including all the different species, Risso, an eminent naturalist at Nice (and, from his living in a country producing oranges, he had the best opportunities of examining and studying them), has, in a very elegant and elaborate natural history of oranges, published at Paris in the year 1818, enumerated, described, and, with respect to all the more important sorts, figured no fewer than one hundred and sixty-nine varieties: these he has divided into eight species—sweet oranges, bitter oranges, bergamottes, limes, pampelucos, sweet limes, lemons, and citrons.

Of the first of these there are no fewer than forty-three varieties; though, in the opinion of Galessio, they are all derived from the common orange. The others are, generally speaking, more acid in their flavour; though some of them, such as the bergamottes, from the rind of which the celebrated oil of bergamot is obtained, are highly perfumed.

Of the bitter oranges Risso enumerates thirty-two varieties; of the bergamottes, five; of the limes, eight; of the pampelucos, six; of the sweet limes, twelve; of the lemons, forty-seven; and of the citron, seventeen.

There is something peculiar in the organization of all the fruit of the orange tribe. The rind or external pericarp of them all is a spongy texture, containing but little juice or sap of any kind in its substance; but the external surface is covered, or tuberculated over, with little glands that secrete a volatile oil which is very inflammable, more or less acrid according to the species, and of a very strong and pungent scent.

The family of the oranges, in some places in many of their varieties, are now cultivated in Portugal, in Spain, in France, in Italy, and in Greece. In the first two countries they especially abound—in Algarve, and in the fine plains of Andalusia, on the banks of the Guadalquivir. The latter is the place from which the bitter or Seville oranges (*Citrus vulgaris*) are chiefly obtained. In Algarve and Andalusia the orange-trees are of great size; and extensive orchards of oranges have formed the principal revenue of the monks for several centuries; and in the latter province, whose craggy mountains are covered with gardens, and vineyards, and forests abounding in fruit, the flowers of the orange fill the air with their perfume, and lead the imagination back to those days which the Moorish poets and historians delight in describing, when the land which they conquered was adorned with all the refinements of their taste and intelligence, and the luxuries of the East were naturalized in the most delicious regions of the South. In Cordova, the seat of Moorish grandeur and luxury, there are orange-trees still remaining, which are considered to be six or seven hundred years old; the trunks of these old trees have begun to decay; and when they get diseased, they are crusted with a kind of lichen, which is supposed to be peculiar to the orange. In France, the orange country is chiefly Provence, or that part of the south which lies to the eastward of the Rhone; and plantations or groves of oranges are the most abundant and the most beautiful on the banks of the Var, and especially in the environs of Nice, where the species are very many, and come to great perfection. To the west of the Rhone, the country along the coast is flat, sandy, and barren; and on the plains of Languedoc, that lie interior of this barren tract, the olive thrives better than the orange, apparently because there are no secondary mountains between the cold heights of the Cevennes and the plains. The country to the eastward of the Rhone is much better adapted for choice vegetables, both in soil and in aspect. In the western or French part of it, the Alps descend gradually, by successive elevations, from the high summits of Mont Blanc, Mont Rosa, and St. Bernard, to the sea. Thus the low grounds are finely exposed to the southern sun; and being at the same time sheltered from every quarter whence a cold wind could come, the vegetation is at once luxuriant and choice. The finest bulbous flowers, the myrtle, the cactus, and many others, give more the air of the perpetual summer of the tropical countries, than is to be found perhaps in any other country of Europe—certainly in any other of the same extent.

The glory of that delightful country is the orange, which, when full grown, attains the height of about five and twenty feet, and is graceful in all its parts. The trunk and older branches are of a delicate ash colour; the twigs of so soft a colour that they almost appear transparent; the leaves are moderately large, beautifully shaped, of a fine healthy green, and shining on the upper sides, while the under ones have a slight appearance of down. The flowers, which are in little bunches, and very graceful in their form, are, in the sweet oranges, of a delicate white, and, in the more acid varieties of the family, lightly marked with pink. Some plants have a more powerful odour, and are for the moment more rich; but there is a freshness in the aroma of an orange-grove which never offends or cloys; and as the tree is at one and the same time in all stages of its bearing—in flower, in fruit just set, and in golden fruit, inviting the hand to pull and the palate to taste—it is hardly possible to imagine any object more delightful. The perfumes of Arabia do not exceed the fragrance of the groves on the north of the Mediterranean, in which the beautiful white Provence rose, the tuberose, and countless other flowers, blend their sweets with that of the orange; and where, with all this richness, the pestilent airs of the tropics, and even the *sirocco* of the southern parts of Italy, are altogether unknown. This delightful fertility and fragrance accompany the chain of the Apennines round the whole gulf of Genoa, and until, upon the boundary of the plain of Tuscany, they subside in elevation, and bend more towards the Adriatic.

Tuscany is farther to the south; but the climate and the vegetation cannot be compared to those of the little valleys of Provence and Liguria, especially the latter. About Florence there are still orange-trees in the gardens; but there are none of those aromatic groves and plantations which are found farther to the west. Nor are the causes difficult to find out. There is an enemy on each side of the plain of Tuscany, which will not allow the orange to arrive at perfection. The gales that come from the south-east, over the sandy shores near Leghorn, are not adapted for a plant which, as well as heat and pure air, requires a considerable quantity of moisture; and the winds from the north, that are cooled in passing over the Adriatic, are not so genial as those from the Alps, that are warmed in passing over the vale of Lombardy. But still the olives, the grapes, and the melons of the vale of the Arno, in so far compensate the inhabitants for the want of the orange.

Eastward of Tuscany, though the coast of Italy inclines still farther to the south, it is even less adapted for the production of the orange; the sea-coast is barren, the interior is dreary, and over the whole the pestilent *malaria* creeps, forbidding man to approach even for the cultivation of the fields; and thus it may be that, ere long, the arid downs by the sea will meet the marsh of the interior, and the centre of Italy shall be desolation to the very base of the Apennines. After the gulf of Gaeta is passed, and the shelter of the more elevated mountains of Calabria is obtained, orange-groves again make their appearance.

Thus the locality of the orange depends fully as much upon situation and soil as upon latitude; and therefore we need not wonder that, considering the many and varied lands in which it is cultivated, there should be so many varieties of its fruit. There is no absolute reason for supposing that the sweet and the bitter orange were originally different; and even now they are not so different as two mushrooms of the very same variety—the one produced upon a dry and airy down, and the other upon a marsh. Now, if it be true that the bitter orange of Seville came, by successive removals, from the head of the Persian Gulf, along the margin of the salt desert, till it reached the states of Barbary, where it was transplanted into Spain; if the sweet orange of Malta, Italy, and France, came through the more fertile parts of Persia and Syria; and if the orange of India and the Azores came direct from China; it would follow that each should have those qualities which we find in it;

and that the opinion of Galessio is borne out by the only evidence which the case admits.

Looking at the facts, we are induced to infer, that, if the temperature be sufficiently high for maturing its flavour, the orange is delicious in proportion to the uniform salubrity of the air; and that those high temperatures which force a very large expansion of the fruit are against the fineness of its quality. In this respect, we have an opportunity of contrasting both the oranges of islands and those of continents. St. Michael's, in the Azores, and Malta, are both small islands: the former always exposed to the equalizing breezes, which, from whatever quarter they blow, are always wafted across the expanse of the Atlantic; and the latter lying near the dry and sultry shores of Africa, and, of course, subjected to more changes of season and a higher temperature. There is also some difference in the soil. Whether it be the decomposition of the rock, or saline particles brought by the same pestilent wind that withers the south of Italy and Sicily with the *sirocco*, it is well known, that under the artificial earth (brought originally from Sicily) which forms the soil of Malta, there gathers a crust; and that if the earth be not trenched, and this crust removed at the end of a certain number of years, it ceases to be productive, or the produce becomes so bitter that it is not healthful. St. Michael's has no such disadvantage; the soil there is native and fertile, and deposits nothing calculated to injure its fertility, or impair the qualities of its produce.

The oranges of the two islands are such as one would expect from those differences: the Maltese orange is large, the rind is thick and spongy, the glands that secrete the volatile oil are prominent, the pulp is red, and there is a trace of bitterness in the taste; while the St. Michael's orange is small, the rind is thin and smooth, the glands less prominent, the volatile oil in smaller quantity, and the lighter-coloured pulp more sugary and delicious. Some allowance must no doubt be made for the original differences of those oranges, regarding them as having come in the manner stated by Galessio; but they have now been long enough in both islands for having their qualities modified by the different climates and soils.

The modifications produced by differences of soil and climate, in the same vegetable, are among the most important inquiries in the science of plants; and they are at the same time among the most difficult, and certainly the least attended to. One principal source of the difficulty lies in the observer being as much changed as the thing observed. Those who are parched with thirst do not stop to analyze the water, or descant upon the flavour of whatever beverage they may have recourse to for slaking it. The removal of the painful sensation is to them far more delicious than the purity of the most limpid spring, or the flavour of the choicest wine. Just so with man when he is panting under a burning atmosphere: the fruit which is most delicious to him is that which is most cool. This necessary change in the judge, as well as the thing judged of, must never be omitted when we come to compare the fruits of different countries, as reported of by those who have enjoyed them there; and we never can be certain of their real merits till we have them decided by the same individual under the same circumstances. To take a case in point: a guava, apart from its rarity, is certainly not in this country anything comparable to a peach; and yet those who have been in tropical countries talk in raptures of the guava, and say that the fruit grown here is inferior and degenerated. But they should bear in mind, that in the tropical countries there is the tropical zest, as well as the tropical flavour. The man who traverses a mountain country in the north, heeds not the glittering fountains that issue from every rock around him; but send him from Suez to Bassora, or from Morocco to Fezzan, and he would remember them with veneration.

But, again, we have a further confirmation when we compare the Continental oranges. The climate of the slopes and valleys of the Estrella, near the lower Tagus, and that of the Maritime Alps, and the Apennines, in Provence, and Liguria, are certainly very different from the climate of Andalusia. The diversities of surface, and the vicinity of the sea, keep the air over the former places in continual play and motion, and prevent those intense heats which unquestionably (though by a process which chemistry has not yet fully investigated) render the juices of plants acid, acrid, or saline; while, from the wider extent of Andalusia, and its comparative distance from the ocean, the air over it is, in the warmer months, much more quiescent.

These considerations will, to a certain extent, explain why there are so many varieties in a fruit, which, according to the authorities, appear all to have come from the same part of the world; and a further extension of these considerations would form a criterion of the situations in which it would, or it would not, be desirable to cultivate the orange.

CHAPTER XXI.

MULBERRY; CURRANT; GOOSEBERRY; RASPBERRY; STRAWBERRY; BARBERRY; ELDER; BRAMBLE, ETC.

a, Currant. *b*, Gooseberry. *c*, Raspberry. *d*, Strawberry. *e*, Mulberry.

The following plants contain citric acid, and in many instances other acids, in their fruits.

The Mulberry (*Morus nigra*).—The mulberry-tree appears to have formed an object of cultivation at a very early period in the western parts of Asia and in Europe. The attention there bestowed upon it must have been solely on account of its fruit; for the knowledge of the mode of rearing silkworms was confined to the people of central and southern Asia till the sixth century. We read in the Psalms that the Almighty wrath destroyed the "mulberry-trees with frost;" and this must have been recorded as a remarkable instance of the divine displeasure, for the mulberry is universally known not to put forth its buds and leaves till the season is so far advanced that, in the ordinary course of events, there is no inclement weather to be apprehended. It has therefore been called the wisest of trees; and in heraldry it is adopted as "an hieroglyphic of wisdom, whose property is to speak and to do all things in opportune season."* In the history of the wars of David with the Philistines, the mulberry-tree is mentioned as a familiar object. Pliny says of it, somewhat questionably, that "when it begins to bud, it despatches the business in one night, and that with so much force, that their breaking forth may be distinctly heard." Thunberg, an Oriental traveller, tells us, what is still more extraordinary, that the sheath which encloses the flower of the talipot-palm bursts with an explosion like the report of a cannon.

In this country there are many old mulberry-trees of large dimensions, and remarkable also for the quantity of fruit they bear. It is probable that some of these old trees were planted at the latter end of the sixteenth and the beginning of the seventeenth centuries; for James I. endeavoured to render the cultivation of the tree general, in the same way that Henry IV. had laboured to introduce it in France. The first mulberry-trees of England are said to have been planted at Sion House, the seat of the Duke of Northumberland, in 1548; and the trees, though decayed in the trunk, still bear fruit. Mulberry-gardens were common in the seventeenth century, in the neighbourhood of London; but either from the climate or the prejudices of the people, the growth of silk never prospered. The mulberry is distinguished for the facility with which it may be propagated. A cutting from a tree which has borne fruit will soon become a vigorous plant. It is recorded that, at Bruce Castle, at Tottenham, an immense branch being torn off by the wind from an old mulberry-tree, about forty years ago, the branch was

* Guillim's 'Display of Heraldry.'

thrust into the ground, and flourished. It is now a handsome tree. That part of the trunk of the old tree which lost the branch is covered with lead. But at the same time the mulberry has been also remarkable for not producing fruit till the trees have acquired a considerable age; and this circumstance has materially affected its cultivation as a fruit-tree. The same objection has applied to the walnut. Recent experiments, however, have shown that, by proper culture, both the mulberry and the walnut may be made to produce fruit at three years old.

The sort principally cultivated for fruit is the black mulberry (*Morus nigra*), although the fruit of the white, Tartarian, red, and Pennsylvanian species (of the white particularly) "are of sufficient consequence to merit a place in a list of edible fruits."* The black mulberry is a hardy tree; and, as the berries are abundant, and of very wholesome quality, while the wood makes excellent timber, and the leaves are adapted to the feeding of silkworms as well as those of the white mulberry, it deserves more attention than it generally receives.

The mulberry is the latest tree to put forth its leaves; and it drops every leaf on the first night of severe frost. Some trials have been made of mulberries trained against a south wall, and the result has been a great improvement in the fruit.

THE CURRANT AND GOOSEBERRY (*Ribes*).—The currant was formerly erroneously held to be the Corinthian grape degenerated. It is now considered as a native of this country, the red (*Ribes rubrum*) being found growing naturally in many places both of England and Scotland, and the white being merely a variety of the red. Mr. Aiton, in his 'Hortus Kewensis,' is of opinion that it is a native production. Its name, however, being the same as the small seedless grape of the Levant (*Corinth*), is against this theory; and in Dodoen's 'History of Plants,' translated in 1578, it is called "the red beyond-sea gooseberry." The white, having the

* Horticultural Society's Fruit Catalogue.

most delicate flavour, is most in request for the dessert. The red is principally used in the preparation of jellies; and the white is converted into wine, which, with fine fruit, and using the juice alone, or only with sugar, without any mixture of spirits or of water, may, when kept to a proper age, be made to equal some of the inferior wines from the grape. For pastry, the currant is amongst the most valuable of the British fruits, being easily preserved, and growing in sufficient abundance, on account of its hardiness, to offer a cheap luxury to the humblest classes. This bush forms the principal ornament of some of those neat cottages which are or were the peculiar characteristic of England; and which it would be wise, as well as benevolent, in the landlords to multiply, if they could steadily keep out of them all who were unable to maintain themselves. In parts of the country where it is the custom to train the currant against the walls of the house, its rich dark leaves, and its brilliant fruit, growing over the latticed window, offer almost as pleasing a picture as the vines of Italy.

The *Black Currant* (*Ribes nigrum*) is supposed to be a native of Britain; or, at all events, the period of its introduction is unknown. The berries are larger than those of the red or the white, but they are not so juicy; and the crop upon a single bush is less abundant. Their taste is peculiar, and to some disagreeable; they are supposed to have medicinal qualities which do not belong to the other species of currants. They answer well for tarts and puddings; they can be made into a very pleasant jelly, which, in village pharmacy, is recommended in cases of sore throat; and they make a very good *rob* (souring) for flavouring liquors. The leaves of the black currant have a strong taste, especially in the early part of the season; and if a small portion be mixed with black tea, the flavour is changed to one resembling that of green. On this account, it is suspected that those leaves are pretty extensively used in the adulteration of tea,—the coarser sort of black being coloured green by moistening it with vinegar, laying it upon heated plates of copper till it be shrivelled into small balls, and mixing it with black currant leaves, which have also been shrivelled by heat. If this process has been employed the tea will discolour a silver spoon.

There are thirty-five varieties of the currant specified in the Fruit Catalogue of the Horticultural Society; but there is perhaps no class of fruits in which so much ignorance exists as to the merits and difference of the varieties. It is stated to be impossible to obtain the different kinds with certainty from the nurseries.

The GOOSEBERRY (*Ribes grossularia*), if not a native of Britain, is yet a fruit much better adapted to cold than to warm climates. It was cultivated here in the time of Tusser, a writer on husbandry, who flourished in the reign of Henry VIII. He says,

> "The barbery, respis,* and gooseberry too,
> Look now to be planted as other things do."

In the south of Europe, it is small, tasteless, and neglected; and though it grows to a large size in the warmer parts of England, its flavour there is very inferior to that which it has in Scotland. Even in that country, the flavour seems to increase with the cold; for if there be warmth enough for bringing gooseberries to maturity and ripening them, the farther north they are grown the better. The market-gardeners about Edinburgh pay much attention to the culture and kinds of their gooseberries; but they are never equal in flavour to those which are grown at Dundee, Aberdeen, or Inverness.

In England, the Lancashire gooseberries are the finest in appearance. They are very large; but their flavour is far inferior to that of the Scotch. Perhaps the inferiority of the English berries may be in great part owing to the large sorts that are cultivated,—the finest, even in Scotland, being those that are of a middle size.

Gooseberries are of various colours,—white, yellow, green, and red; and of each colour there are many sorts. If, however, any particular sort be wished to be preserved, it must be done by cuttings, because the seeds of

* Raspberry.

any one sort are apt to produce not only all the known sorts, but new ones. In almost all fruit-trees, indeed, that run into sorts, the only way of securing a favourite sort is by budding, grafting, or planting cuttings. The bud or the branch does not change, but the seed does; and most of the varieties of apples called pippins have been obtained by sowing the seeds or pips of other sorts. It is generally supposed that this is effected by variation of soil and climate; and as it is well known that every cultivated vegetable degenerates when repeatedly *sown* in the same soil, it is by no means improbable that the quality of fruit-trees might be very much improved by raising them from the seed, in situations as different as possible from those in which the seed is produced.

The gooseberry plant, under favourable circumstances, will attain a considerable age, and grow to a great size. At Duffield, near Derby, there was, in 1821, a bush ascertained to have been planted at least forty-six years, the branches of which extended twelve yards in circumference. At the garden of the late Sir Joseph Banks, at Overton Hall, near Chesterfield, there were, at the same time, two remarkable gooseberry plants, trained against a wall, measuring each upwards of fifty feet from one extremity to the other.*

The yellow gooseberries have, in general, a more rich and vinous flavour than the white: they are, on that account, the best for the dessert, and also for being fermented into wine. When the sort is choice, and well picked, so that none of the fruit is damaged, or over or under ripe, and when the wine is properly made, it often puzzles an unpractised taste to distinguish the wine of the best yellow gooseberries from champaign. It has the flavour and colour, and it mantles like the best of the foreign wine.

Generally speaking, the green gooseberries are inferior to the yellow, and even to the white: many of them, however, run large, and are used for the sake of appearance. Large gooseberries in general, and large green ones

* Hort. Trans., vol. v.

in particular, are thick in the husk, and contain less pulp than those of a smaller size ; while the flavour is in general rich in proportion to the thickness of the husk. Some of the larger greens, especially those that are smooth, gourd-shaped, and of a brownish tinge, are almost tasteless, or even disagreeable.

The red gooseberries are very various in flavour, but are commonly more acid than the others. The same may be said of most other fruits ; and it agrees with the well-known fact that acids change the vegetable blues to red. In many fruits, and the gooseberry in particular, the amber colour is accompanied by the richest vinous flavour, while the white tends to insipidity. When the green is deep and pure, sweetness seems to be the leading characteristic, as in the Gascoigne gooseberry, the greengage plum, and the small green summer pear known in Scotland by the name of the "Pinkey green." Among the red gooseberries there are, however, many exceptions. Some of the older and smaller red sorts (especially that known by the name of the "old ironmonger") are very sweet. It would be unavailing to fix upon any particular kind of gooseberry as the best, as every year produces new varieties. In the Fruit Catalogue of the Horticultural Society there are nearly two hundred kinds enumerated, of which about a hundred and fifty are the large Lancashire gooseberries.

The cultivation of gooseberries forms a pleasing occupation amongst the manufacturers of that part of the kingdom ; and the custom has doubtless a tendency to improve both the health and the morals of the people. Any pursuit which makes men acquainted with the peculiarities of vegetable economy, in however small a degree, has a beneficial effect upon the heart and understanding : and it is certainly better for weavers and nailers to vie with each other in raising the largest gooseberries, than in those games of chance or cruel sports to which the few leisure hours of the working classes are too often devoted. The one is a rational and innocent emulation ; the other, a degrading excitement, or a brutal indulgence. The names of the Lancashire gooseberries are indicative of their humble origin. "Jolly Miner," "Jolly Painter," "Lancashire Lad," "Pastime," "Top Sawyer," and so forth, may appear odd to a foreigner; but they are characteristic of the manners of the country in which they are produced, as the high-sounding titles which distinguish the fruits of other nations are indicative of theirs.

The gooseberry-shows of Lancashire, Cheshire, Staffordshire, Warwickshire, and other manufacturing counties, are conducted with great system; and an annual account of them, forming a little volume, is printed and published at Manchester. The heaviest gooseberry which appears to have received a prize, was exhibited at the Shakspere Tavern, Nantwich, in 1825; it weighed 31 dwts. 16 grains. The prizes given on these occasions are adapted to the manners of the homely people who contend for them, being generally either a pair of sugar-tongs, a copper tea-kettle (the favourite prize), a cream-jug, or a corner-cupboard. The proceedings of these contests, and the arrangements for future years, are registered with as much precision as the records of horse-racing; and, doubtless, the triumphs which are thus handed down to the collier's or the weaver's children, by the additions which the good-man makes to his household ornaments, are as deeply valued as the "gold cups" of Newmarket.

The Raspberry (*Rubus idæus*).—This plant obtains its common name from the rough and bristly appearance of the fruit. The French call the raspberry "Ronce du Mont Ida," (in common parlance "Framboise,") considering it a native of that classic ground, for which they have the authority of Pliny. The root is perennial and spreading, but the stems last only two years. Both the red and the white varieties are natives of Britain, and prefer situations that are shaded and rather moist. The uses of the raspberry, both for the table and for sweetmeats, are well known. Though the flavour of raspberries is peculiar, it is one which is very generally liked; but it is the most fleeting with which we are acquainted. Even a few hours will diminish it; and if the berries be kept for two or three days, the flavour is almost entirely gone. Even on the bush the flavour does not continue above two or three days after the fruit is ripe. Raspberries, indeed, to be enjoyed in perfection, should be eaten from the bush. They require less attendance than almost any other fruit; and if the twice-bearing kind be mixed with the others, they may be continued till November. The shrubs come into full bearing about three years after the planting of the stools or roots, and they last good for about three years more, at the end of which they begin to degenerate. The common mode of propagation is by cuttings, which should always be taken from plants that are in their prime bearing condition, on or about the fourth year after they are planted. A quantity of peat or bog-earth greatly improves both the size and the flavour of raspberries. New varieties may easily be obtained from the seed, the plants raised from which begin to bear the second year. There are thirty-five varieties of raspberry mentioned in the Fruit Catalogue of the Horticultural Society; of which the differences in quality are very considerable. Gardeners in general appear to have paid too little attention to these differences.

The Strawberry (*Fragaria vesca*).—No vegetable production of the colder latitudes, or which can be ripened in those latitudes without the assistance of artificial heat, is at all comparable with the strawberry in point of flavour; and, if the soil and situation be properly adapted to it, the more cold the climate, indeed the more bleak and elevated, the more delicious is the berry. The fine *aroma* of the strawberry is not quite so evanescent as that of the raspberry; but it is by no means durable, and the berries can be had in absolute perfection only when taken from the plants, and in dry weather, for a very slight shower will render the strawberry comparatively flavourless. The soils and situations in which the strawberry and the raspberry come to the greatest perfection are the very opposites of each other. The strawberry, in all its varieties, certainly in all the finest of them, is a sort of rock plant; and soil which contains a good deal of decomposed rock, more especially if that rock be greenstone, or any other containing much clay, produces fruit of the finest flavour. The places where the strawberry is the finest, as raised for the market, and of course as produced at the least expense of artificial culture, are probably Edinburgh and Dundee, at both of which the soil is of the description mentioned.

The strawberry is very widely diffused, being found in most parts of the world, especially in Europe and America. Its common name is peculiar to England, and is supposed to have been derived from the custom of laying straw under strawberry plants when their fruit begins to swell; which method the gardener of Sir Joseph Banks revived with advantage. Others, however, contend it is *stray*berry, from its trailing along the ground. The fruit was known in London, as an article of ordinary consumption, in the time of Henry VI. In a poem of that age, called 'London Lyckpeny,' by John Lidgate, who died about 1483, we find the following lines:—

> "Then unto London I dyde me hye,
> Of all the land it bearyeth the pryse;
> 'Gode pescode,' owne began to cry—
> 'Strabery rype, and cherrys in the ryse.'"

It is mentioned by Hollinshed, and the fact has been dramatised by Shakspere, that Glo'ster, when he was contemplating the death of Hastings, asked the bishop of Ely for strawberries:—

> "My lord of Ely, when I was last in Holborn,
> I saw good strawberries in your garden there."

The palace and garden of the bishop occupied the site which is now Ely-place.

The cultivation of the strawberry, at the present time, is very extensive in the neighbourhood of London. The largest quantities, and the finest sorts, are grown at Isleworth and Twickenham. One of the most remarkable examples of the power of the human body in the endurance of great and continued fatigue, is shown by the strawberry women, who, during the season, carry a heavy basket on the head twice daily from Twickenham to Covent-Garden, walking upwards of forty miles. Fatigue like this would soon destroy a horse; but these women, who come purposely from Wales and the collieries, endure the labour for weeks without injury or complaint.

The common wood strawberry (which was probably the earliest cultivated) has the leaves rather small, the runners (at the joints of which the new plants are produced) slender, and often of a purple colour. The fruit is small, and generally red, but without much flavour, owing to its being shaded from the sun. When brought out of the shade, or in countries where the influence of the sun is more powerful, both its size and flavour are very much improved; and though not the handsomest, it becomes far from the worst of the cultivated sorts. There is a variety of the wood strawberry a good deal paler, both in the leaves and the fruit, than the one now mentioned, which also ripens later in the season; but it is by no means productive, and is accordingly not much cultivated.

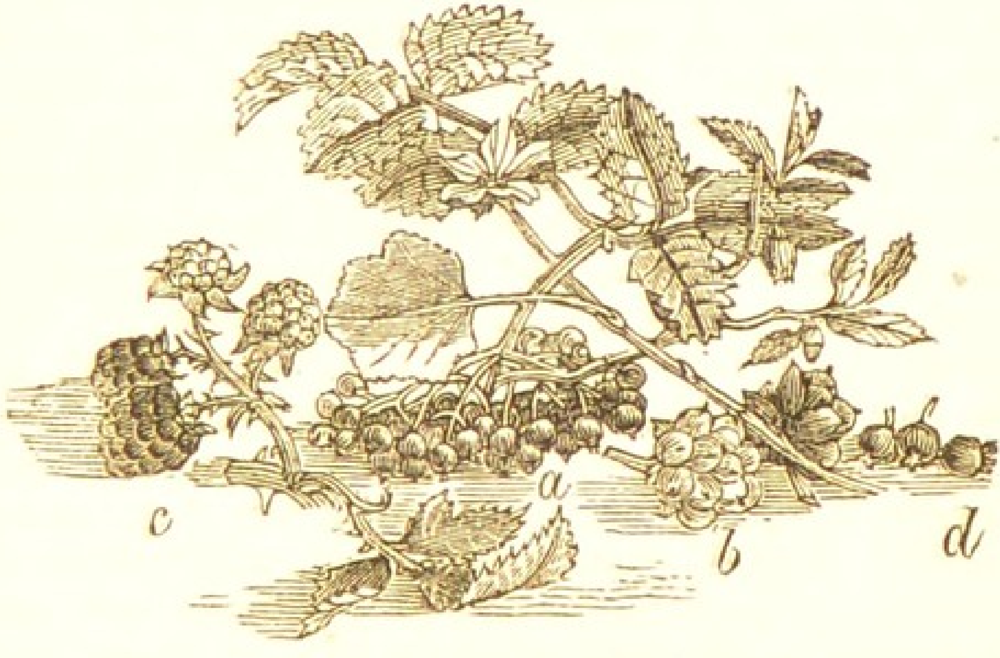
The Alpine strawberry is, in its native situation, a more vigorous plant, and produces larger and more highly flavoured fruit than the common one of the woods. It is often much darker in the colour than any of the other strawberries; and when it is so, the flavour has a sharpness bordering upon austerity.—Still, however, it is an excellent fruit; and it has this advantage, that it continues bearing from June until stopped by the frost; and, in very open seasons, fruit has been gathered from it at Christmas.

The Hautbois was the first known of the larger variety of strawberry. Its history has never been well ascertained, though it has generally believed to be the mountain strawberry of Bohemia, and to have been first improved by cultivation in France. The hautbois is very productive; and the fruit is highly flavoured, with a peculiar kind of perfume; but some care is necessary in order to prevent the plants from degenerating. The name of this strawberry is probably derived from the circumstance of the scape which bears the fruit standing higher than the leaves, and, consequently, being called hautbois (high wood). It is not improbable, however, that its original locality in the *high woods* of Bohemia may have suggested the name. In the old gardening books it is written hautboy.

In the early part of the last century, the Alpine strawberry of Chili was introduced into the Royal Gardens at Paris, and from thence found its way over many parts of Europe. It grew to a very large size, and had a finer colour than the hautbois; but in the southern countries of Europe it was soon neglected, because it ran greatly to leaves, produced comparatively little fruit, and what it did produce was deficient in flavour. The "old scarlet strawberry," which was an original introduction from North America, has been an inhabitant of our gardens for nearly two hundred years. The "old black strawberry," an unproductive sort, has been long known in England. The "Chinese" and the "Surinam" strawberries are of considerable antiquity amongst us. The "old pine, or Carolina," has been cultivated and highly prized by the English growers, for many years.

Since attention began to be paid to the culture of strawberries, the number of varieties has been greatly increased. The British strawberries are divided into scarlet, black, pine, hautbois, green, alpine, and wood, according to a classification in a valuable paper in the sixth volume of the 'Horticultural Transactions.' Of these varieties the pine is the most esteemed. It is a native of Louisiana and of Virginia. Its colour is a deep red on both sides; and it is the most rich and highly flavoured of all strawberries, constituting the most valuable variety that has yet been discovered.

The Barberry (*Berberis vulgaris*).—This tree is a native originally of the Eastern countries, though it is now found in most parts of Europe, where it thrives best upon light and chalky soils. It grew formerly wild, in great quantities, in the hedgerows of England, but has been universally banished, from a general belief that its presence is injurious to the growth of corn. Duhamel, Broussonet, and other scientific writers, treat this belief as a vulgar prejudice. It should, however, be remarked, that the fructification of the barberry is incomplete, unless the stamens be irritated by insects, when the filaments suddenly contract in a most remarkable manner towards the germ. The flowers are, therefore, by a beautiful arrangement of nature, peculiarly attractive to insects; and thus the barberry may become injurious to neighbouring plants. The berries grow in bunches, and are so very acid, that they are seldom eaten; but with the requisite quantity of sugar, they make an excellent jelly.



a. Elder-berry. *b*. Cloud-berry. *c*. Bramble-berry. *d*. Bilberry.

The Elder (*Sambucus*).—The Elder is a native of this country; is very generally diffused; grows with singular rapidity, though it never arrives at great size; and endures the most bleak situations, though in the northern parts of Scotland the fruit seldom ripens. The berries of the elder are fermented into a wine, which, when spiced and drunk warm, is a pleasing winter beverage. They are supposed to contain a portion of the narcotic principle. The black variety is chiefly cultivated for wine-making; but the berries of the yellow and green are also applicable to this purpose. There is also an elder-*flower* wine, with a flavour resembling Frontignac.

The elder-tree furnishes the unscientific practitioner of the healing art with many of the most approved remedies; and perhaps not without reason. Boerhaave, the great physician, is said to have regarded the elder with such reverence, for its medicinal virtues, that he sometimes took off his hat in passing a tree of this species.

The Bramble (*Rubus fruticosus*).—Though the bramble is rather annoying with its long trailing stems and its sharp thorns, the fruit, commonly called *blackberry*, is perhaps, in its wild state (and it does not need to be cultivated), among the best, and certainly it is the most abundant, of our native berries. The bramble prefers a soil that is moderately good; but it is found in every situation, except marshes, to the borders of which it creeps very close. On the slopes of the Welsh mountains, more especially in Denbighshire, the bramble-berry grows to the size of a middling gooseberry; and in a dry and sunny autumn is really an excellent fruit. Pliny mentions the mulberry growing on a brier, which probably was a fine blackberry. In England there are a number of species confounded under the names of *rubus fruticosus*, and *rubus corylifolius*, that vary very much in the quality of their fruit, some of them really deserving cultivation. The family of brambles is divided into those with upright stems, those with prostrate stems, and those with herbaceous stems.

There is another species of bramble, the Arctic or Dwarf crimson (*Rubus arcticus*). This is a small species, and a native of the coldest regions of the world. Its fruit, however, is exceedingly delicious; and were it possible to cultivate it in any habitable situation, it would be a most important addition to garden berries. We have not heard of its ever having been found either in England or in the Welsh mountains; and in Scotland it grows only in the most wild and elevated situations. Some of the Scottish horticulturists have tried to raise it from the seed, and have, we believe, obtained plants;

though the fruit, when they bore any, has been tasteless, and the plants themselves are preserved alive with difficulty. The arctic berry, which grows in the wildest and most exposed districts of Lapland, sometimes offered to Linnæus the only food which he found in his perilous journey in those dreary regions; and he thus speaks of it with much feeling:—"I should be ungrateful towards this beneficent plant, which often, when I was almost prostrate with hunger and fatigue, restored me with the vinous nectar of its berries, did I not bestow on it a full description."*

CLOUD-BERRY (*Rubus chamæmorus*).—This is another mountainous berry, which it is exceedingly difficult to cultivate. A single berry grows on the top of the stem. These berries are much more numerous than the former, though, like them, they are found only in very elevated and exposed situations—on the sides of the loftiest mountains in Scotland. The berries are about the size of small strawberries, and the flavour is exceedingly fine, superior to that of any of the strawberries, as found wild in this country, and having a sharpness which does not belong even to the best of those which are cultivated. They remain in season for about a month; and, during that time, the Highlanders, in the districts where they are found, (for they are by no means generally diffused over the Highlands,) collect them in considerable quantities, and make them into excellent preserves. In the East, as well as the North, the wild berries of the mountains and valleys, which nature offers in such abundance for a short season, are thus used by man:

> "With rich conserve of Visna cherries,
> Of orange flowers, and of those berries
> That, wild and fresh, the young gazelles
> Feed on in Erac's rocky dells."†

In more northern countries the cloud-berry is still more abundant, so much so as to justify the encomium

* Flora Lapponica. † Moore's 'Lalla Rookh.'

passed on it by the poet, while speaking of those dreary lands:—

> "Ever enduring snows, perpetual shades
> Of darkness, would congeal the living blood,
> Did not the arctic tract spontaneous yield
> A cheering purple berry, big with wine."

In the northern parts of Sweden and Norway, and in Lapland, even to the North Cape, the cloud-berry grows in such abundance as to be an article of extensive commerce. Great quantities of it are sent every autumn to the Swedish capital, and to the southern parts of that country, where they are used in a variety of ways; and, in fact, it forms the principal fruit that they have.

Dr. Clarke notices the value of this berry in his Travels:—"In woods, and moist situations near the river, we found the *Rubus chamæmorus* still in flower. The Swedes call it Hiortron; the Laplanders give it the name of Latoch; the inhabitants of Westro-Bothnia call it Snotter; and in Norway its appellation is Multebæar. The same plant is found upon some of the highest mountains, and in some of the peat-bogs of the north of England; on which account, perhaps, it is called cloud-berry in our island; but it is not likely that its fruit ever attains the same degree of maturity and perfection in Great Britain as in Lapland, where the sun acts with such power during the summer. Its medicinal properties have certainly been overlooked, owing, perhaps, either to this circumstance, or to its rarity in Great Britain. The fruit is sent in immense quantities, in autumn, from all the north of the Gulf of Bothnia to Stockholm, where it is used for sauces, and in making vinegar."*

Our English traveller, as appears by the following passage, was under greater obligations to the cloud-berry than the Swedish naturalist to the other species of Arctic fruit:—

* Clarke's Travels, vol. ix. pp. 371, 372.

"Mr. Grape's children came into the room, bringing with them two or three gallons of the fruit of the cloud-berry, or *Rubus chamæmorus*. This plant grows so abundantly near the river, that it is easy to gather bushels of the fruit. As the large berry ripens, which is as big as the top of a man's thumb, its colour, at first scarlet, becomes yellow. When eaten with sugar and cream, it is cooling and delicious, and tastes like the large American hautboy-strawberries. Little did the author dream of the blessed effects he was to experience by tasting of the offering brought by these little children; who, proud of having their gifts accepted, would gladly run and gather daily a fresh supply; which was as often blended with cream and sugar by the hands of their mother; until at last he perceived that his fever rapidly abated; his spirits and his appetite returned; and, when, sinking under a disorder so obstinate that it seemed to be incurable, the blessings of health were restored to him, where he had reason to believe he should have found his grave. The symptoms of amendment were almost instantaneous, after eating of these berries."*

THE BILBERRY, or BLEABERRY (*Vaccinium myrtillus*).—This berry grows plentifully on heaths and waste places; and though it does not live in situations as cold as those that have been mentioned, it is very hardy. It is a handsome berry, with a delicate bloom when in perfection; but it is tender, and, when kept for some time, ferments. In some of the pine-forests in Scotland it grows to the height of three feet; and there are places where the pedestrian can pull handfuls of berries as large as the common black currant of the gardens.

Two other species of *Vaccinium*, the black whortle-berry, and the red (the cranberrry), are common enough in some parts of this country. One, if not both of these, grows most readily in moist situations, such as the dry patches in peat-bogs. Tusser mentions "hurtil-berries" amongst the cultivated fruits of his time. These were,

* Clarke's Travels, vol. ix. p. 470, 471.

perhaps, confounded with the fruit of the brambles. "Dewberries" (though supposed by some to be gooseberries) were formerly amongst the delicacies of fruit, if we may judge from the celebrated passage in Midsummer Night's Dream :—

> "Feed him with apricocks and dewberries,
> With purple grapes, green figs, and mulberries."

The red cranberry (*Vaccinium vitis idæa*), of which the berries are excellent, has borne fruit abundantly under cultivation. The berries of the Pennsylvanian *Vaccinium* are very ornamental.

This genus of berry-bearing plants is very abundant in North America, and also in the northern parts of Russia. The American cranberry (*Vaccinium macrocarpon*) forms a considerable article of commerce; and, as does not appear to be the case with some others of the genus, it may be cultivated to advantage on the margins of ponds, and in other moist situations. The importation of cranberries to this country is about 30,000 gallons annually, the duty being sixpence per gallon. This species has been grown in England.

CHAPTER XXII.

TARTARIC ACID—TAMARIND—MALIC ACID—APPLE—PEAR—QUINCE—MEDLAR—POMEGRANATE.

MANY fruits which contain citric and malic acids contain also tartaric acid. The best example, however, of a fruit containing tartaric acid is the vine. The grape contains also sugar, and it has been already spoken of amongst fruits containing sugar.

Amongst the plants possessing tartaric acid must be placed the tamarind. The fruit contains, in addition to tartaric acid, citric acid.

The Tamarind (*Tamarindus Indica*).

THE TAMARIND (*Tamarindus Indica*).—The tamarind-tree is a native both of the East Indies and of tropical America, and probably also of Arabia and some parts of Africa. It was very early introduced into this country; for Gerarde, whose Herbal was published in 1633, makes mention of it as growing here. It does not often flower in England, though it has done so in the Royal Gardens at Kew. It is, however, a common ornament of our hothouses. Where it is a native, it grows to be a large tree, and affords excellent timber—heavy, firm, hard, and durable. The stem is large, covered with brown bark, and divides into many branches; the leaves are not unlike those of the mountain ash, only they are of a brighter green, and the leaflets are closer to the midrib. The leaflets are small, but the number in a leaf (sixteen or eighteen pairs in a leaf, with an odd one at the extremity) give the tree a very light and elegant appearance. The flowers come out from the sides of the branches in loose bunches, and are followed by the pods, of which there are generally about five or six on a bunch. The pods of the West India tamarinds are, on an average, about three inches long, and contain about three seeds; those from the East are about double the size.

The pulp, in which the seeds of the tamarind are inclosed, contains more acid than any other vegetable substance, in a natural state, with which we are acquainted; and therefore it is used both for sharpening food and drink, and for medicinal purposes. Niebuhr says, "The tamarind is equally useful and agreeable. It has a pulp of a vinous taste, of which a wholesome refreshing liquor is prepared; its shade shelters houses from the torrid heat of the sun; and its fine figure greatly adorns the scenery of the country." Its refreshing properties have given it a place in our poetry:

> "The damsel from the tamarind-tree
> Had pluck'd its acid fruit,
> And steep'd it in water long,
> And whoso drank of the cooling draught,
> He would not wish for wine." *

Mandelslo, an old traveller, says, that as soon as the sun

* Thalaba.

is set the leaves of the tamarind close up the fruit to preserve it from the dew, and open as soon as that luminary appears again:

> "'Tis the cool evening hour:
> The tamarind from the dew
> Sheathes its young fruit, yet green." *

The East India tamarinds are preserved without sugar, and therefore they are the best for medicinal use. About forty tons of tamarinds are annually imported into Great Britain.

Of plants containing malic acid, the pomaceous group of the natural order Rosaceæ are most distinguished. To this group belong the apple, the pear, the quince, and the medlar.

a. Apples. *b.* Pears. *c.* Quince. *d.* Medlar.

The Apple (*Pyrus malus*).—The apple is distinguished as the fruit of colder climates. It is at once the most brisk and refreshing of any of the common hardy orchard fruits. It remains the longest in season, is used in the greatest number of ways, and therefore is the

* Thalaba.

most generally cultivated. The stone-fruits of the English orchard keep only for a few days, unless they are preserved ; and in this state they lose that natural flavour on which their value chiefly depends. Many of the finer pears keep only for a short time, when they become vapid and flat : but there are apples of very rich and vinous flavour, which, with care, can be preserved till the early sorts of the succeeding season come in to supply their place.

The useful qualities of the apple have extended its cultivation throughout Europe, as far as the 60th degree of latitude. It has been observed by a distinguished traveller, that the commoner fruit-trees, such as apples, pears, cherries, and apricots, grow in the open air, wherever oaks thrive.* As we proceed farther north, the apple is scarcely known. The people of Lapland showed Linnæus what they called an apple-tree, which, they said, bore no fruit because it had been cursed by a beggar woman, to whom the owner of the tree had refused some of its produce. The naturalist found that it was the common elm, a tree also rare in that severe climate.† The apple, as well as most other European fruits, which now appear indigenous, is probably a native of the East. The Prophet Joel, enumerating the trees of Syria, says, "The vine is dried up, and the fig-tree languisheth ; the pomegranate-tree, the palm-tree also, and the apple-tree, even all the trees of the field, are withered." The cultivated apple was probably scarce at Rome in the time of Pliny ; for he states that there were some apple-trees in the villages near the city which yielded more profit than a small farm. The art of grafting was at that period either very recently discovered, or comparatively little known. This practice must evidently have belonged to an advanced state of civilization. It is remarkable that Moses, in his directions to the Israelites when they "shall come into the land, and shall have planted all manner of trees for food,"‡ makes no mention

* Von Buch's Travels, p. 41. 4to.

† Linnæus's Tour in Lapland, vol. i. p. 23.

‡ Leviticus, xix. 23.

of the art of grafting. Hesiod and Homer, in like manner, have no allusion to a practice which would naturally have formed part of their subject had it existed when they wrote.* The art of grafting, as well as that of pruning, has been ascribed to an accidental origin. The more vigorous shooting of a vine, after a goat had broused on it, is said to have suggested the one great principle in the management of fruit-trees; and it is probable that the occasional natural union of the boughs of distinct trees may have shown the general practicability of the other. Pliny mentions apple-trees "that will honour the first grafters for ever;" and this enthusiastic sort of praise belongs to the infancy of an art, when mankind are first conscious of its blessings, and therefore not disposed to undervalue them through their familiarity. To the facility of multiplying varieties by grafting, is to be ascribed the amazing extension of the sorts of apple, probably from one common stock. The varieties at present known are considerably more than a thousand. Of late years these varieties have been increased in a remarkable manner, by the application of the pollen† of one sort to the blossom of another.

Many of the better sorts of English apples were probably at first introduced into this country from the Continent. The greater part of our names of apples are French, either pure or corrupted. Those varieties which had been celebrated abroad were spread through the kingdom by their cultivation in the gardens of the religious houses; and many of these fine old sorts still exist. Thus the *Nonpareil*, according to the old herbalists, was brought from France by a Jesuit in the time of Queen Mary, and first planted in the gardens of Oxfordshire. The *Oslin*, or *Arbroath pippin*, an ancient Scotch variety, was either introduced or extensively cultivated by the monks of the abbey of Aberbrothwick. On the other hand, the celebrated *Golden Pippin* has been considered as the native growth of England; and noticed as such

* See Goguet, Origine des Lois.

† The prolific powder contained in the anther of the flower.

by French and Dutch writers. It is described by Duhamel under the name of "Pomme d'Or; Reinette d'Angleterre." The same celebrated authority on fruit-trees also mentions the "Grosse Reinette d'Angleterre." The more delicate apples for the table, such as the pippins, were probably very little known here till the latter part of the sixteenth century. Fuller states that one Leonard Maschal, in the sixteenth year of the reign of Henry VIII., brought pippins from over sea, and planted them at Plumstead in Sussex. Pippins are so called because the trees were raised from the pips, or seeds; and bore the apples which gave them celebrity, without grafting. In the thirty-seventh year of the same king we find the barking of apple-trees declared a felony; and the passing of the law had probably a relation to the more extended growth of the fruit through the introduction of pippins. 'Costard-monger' is an old English term for the dealers in vegetables, derived from their principal commodity of apples; the costard being a large apple, round and bulky as the head, or 'costard.' If we may deduce any meaning from this name, which is the same as 'coster,' it would appear that the costard, or large apple, was the sort in common use, and that hence the name of the variety became synonymous with that of the species; the more delicate sorts were luxuries unknown to the ordinary consumers of our native fruits, till they were rendered common by the planting of orchards in Kent, Sussex, and other parts of the kingdom.

The growth of the more esteemed apple-trees had made such a general progress in half a century, that we find Shakspere putting these words in the mouth of Justice Shallow, in his invitation to Falstaff: "You shall see mine orchard, where, in an arbour, we will eat a last year's pippin of my own graffing." Sir Hugh Evans, in the 'Merry Wives of Windsor,' says, "I will make an end of my dinner—there's pippins and cheese to come." Pippins were, therefore, in the time of Shakspere, delicacies for the dessert. But in another fifty years the national industry had rendered the produce of the apple an important article of general consumption. The fine cider-orchards of Herefordshire began to be planted in the reign of Charles I. The adaptation of these apples to the soil was quickly discovered; and they spread over the face of the whole country. Of the varieties of the cider-apples, the *Redstreak* and the *Sline* were formerly the most prized: and the cider of these apples, and the perry of the *Squash* pear, were celebrated throughout Europe. At the time when cider was first manufactured in England it was believed that it would almost wholly supersede the use of foreign wines. From the period of the Norman conquest England carried on a great wine-trade with France, principally with Bordeaux and the neighbouring provinces. It increased considerably when Henry II. married the daughter of the Duke of Aquitane; and after the kings of England subsequently became possessed of some of the great wine provinces of France, the consumption of their produce was almost universal. About the middle of the sixteenth century, although no wines were permitted to exceed the price of twelve-pence per gallon, we find a law enacted, by which no person, except those who could expend a hundred marks annually, or were of noble birth, should keep in his house any vessel of wine exceeding ten gallons,—a regulation which would suggest that the demand for wine was greater than the supply, owing probably to the increase of the middle ranks of society. In the year 1635 we find a patent granted to Francis Chamberlayne, for making wine from the dried grapes of Spain and Portugal; and the patentee set forth that his wines would keep good during several years, and even in a voyage under the line.* This circumstance also shows that the demand for the luxury of wine amongst the commercial classes (who had become of great number and importance, as the political events of those times fully prove) could not be supplied from the wine countries, probably on account of the prevalence of false principles of trade. Cider, therefore, became a general beverage before the

* Rymer's Fœdera;—see Pennant's London.

time of Charles II., though it had been partially used for nearly a century before. Gerarde, who published his Herbal, as already mentioned, about the close of Elizabeth's reign, says, in his quaint way, "I have seen, about the pastures and hedgerows of a worshipful gentleman's dwelling, two miles from Hereford, called Mr. Roger Badnome, so many trees of all sortes, that the servants drink, for the most part, no other drink but that which is made of apples. The qualitie is such, that, by the report of the gentleman himselfe, the parson hath for tythe many hogsheads of cyder."

During the reigns of William III. and Anne, when there was a constant succession of wars with France, the use of cider was generally inculcated, as tending to the permanent exclusion of the wines of our great rival. Philips, a contemporary of Addison, wrote a long poem in praise of cider; and embodied in his work a good deal of the art of selecting and managing apple-trees. But he wrote as a poet, and maintained the unwise and impolitic doctrine of a nation's wholly depending on its own resources, instead of living in intercourse with its neighbours, and thus advancing the comforts and riches of all. After praising the cider of Hereford, Philips says,

"What should we wish for more? or why, in quest
Of foreign vintage, insincere and mixed,
Traverse the extremest world? why tempt the rage
Of the rough ocean, when our native glebe
Imparts from bounteous womb annual recruits
Of wine delectable, that far surmounts
Gallic or Latin grapes, or those that see
The setting sun near Calpe's towering height?"

We have at length learnt that the truest way to advance the prosperity of nations is, by exchanging the best natural products of one country for those of another. If we are to drink the cider of Hereford in preference to the claret of Bordeaux, for the sole reason that we grow it, the same principle, applied to ourselves by other nations, would cut us off from the greater part of that commerce with the whole world which constitutes our peculiar superiority. The interests of each individual, and of each country, are best consulted by the facilities with which each can secure a share of the natural advantages and the mechanical skill that belong to the rest. The advice of the well-meaning poet of cider, if acted upon by individuals as well as nations, (and if it be applicable to the one it must be applicable to the other,) would destroy society altogether, by making self the means as well as the end in everything. The freedom of commercial intercourse has no tendency to the repression of internal improvement, but has a contrary effect. The finest cider and perry of Herefordshire is bought for exportation to the East and West Indies and to America; and this foreign demand for the better sorts keeps up an attention in the cultivators which domestic consumption alone could perhaps not induce.

The Cider counties of England have always been considered as highly interesting. They lie something in the form of a horseshoe round the Bristol Channel; and the best are, Worcester and Hereford on the north of the channel, and Somerset and Devon on the south. In appearance, they have a considerable advantage over those counties in which grain alone is cultivated. The blossoms cover an extensive district with a profusion of flowers in the spring, and the fruit is beautiful in autumn. Some of the orchards occupy a space of forty or fifty acres; and the trees being at considerable intervals, the land is also kept in tillage. A great deal of practical acquaintance with the qualities of soil is required in the culture of apple and pear trees; and his skill in the adaptation of trees to their situation principally determines the success of the manufacturer of cider and perry. The produce of the orchards is very fluctuating: and the growers seldom expect an abundant crop more than once in three years. The quantity of apples required to make a hogshead of cider is from twenty to thirty-four bushels; and in a good year an acre of orchard will produce somewhere about six hundred bushels, or from twenty to twenty-five hogsheads. The cider harvest is in September. When the season is favourable, the heaps of apples collected at the presses are immense—consisting of hundreds of tons. If any of the vessels used in the manufacture of cider are of lead, the beverage is not wholesome. The price of a hogshead of cider generally varies from 2*l.* to 5*l.*, according to the season and quality; but cider of the finest growth has sometimes been sold as high as 20*l.* by the hogshead, direct from the press—a price equal to that of many of the fine wines of the Rhine or the Garonne.

The varieties of the apple are so many, and they are so rapidly multiplied, that it would be impossible for us, within our limits, to present any account of them which should be either useful or interesting. The knowledge of varieties is a part, and a very important one, of the science of the practical horticulturist; and one of the most valuable objects which individual growers of fruit, or societies for the encouragement of experiments in cultivation, could propose to themselves, would be to diminish the embarrassing list of varieties, by directing their attention to the best sorts alone. In a great public establishment, such as the gardens of the Horticultural Society, it is perhaps necessary that almost every known variety should be found. Their catalogue presents a list of more than twelve hundred sorts of apple. In the introductory observations to this list, the difficulties produced by this almost unlimited choice are thus noticed: —"A considerable reduction of the names is to be anticipated whenever a general comparison of the varieties can be effected; but, after all the discovery of synonyms that can be expected, the list will remain far more extensive than can be either desirable or useful. No sufficient reduction, however, can effectually take place until a public declaration shall be made of those sorts which are undeserving further cultivation.*

Seeing, therefore, the embarrassing extent of the varieties of the apple in particular, and of fruits generally,

* See a valuable paper on the 'Formation of a Select Collection of Apple-Trees,' by Mr. Sabine. Hort. Trans. vol. iii.

and knowing that the progress of experiment is daily adding to their number, we forbear to touch at all upon this branch of the subject. The *general* history of fruits is full of amusing information; and to that, in this work, we must confine our attention.

It has been asserted that many of the fine old varieties of the apple are now going into decay. This may be owing partly to their being more generally cultivated, and consequently grown in a great variety of soils and situations, some of which would suit them, and others not; and that this is the case may be inferred from the fact, that in some places these sorts are to be found healthy enough. There are many theories upon this matter which form subjects of curious inquiry to the practical horticulturist.

American apples are brought into England, as well as many French apples. About twenty thousand bushels is the average amount of the importation.

The Pear (*Pyrus communis*).—Amongst the trees which Homer describes as forming the orchard of Laertes, the father of Ulysses, we find the pear.* Pliny mentions several sorts of pears which were grown in Italy, and particularly mentions that a fermented liquor was formed of their expressed juice. It is probable that the Romans brought the cultivated pear to England, and that the monks paid great attention to its varieties. There is a tradition that King John was poisoned in a dish of pears by the monks of Swinsted; and the tale, whether true or false, would imply that the fruit was such as the churchmen would offer to the monarch as a luxury. In an old book of household accounts of Henry VIII., there is an item of twopence "to a woman who gaff the Kyng peres;" and in the time of Gerarde we find that great attention was paid to their growth by the nurserymen in the neighbourhood of London. The old herbalist, after declaring that in his time to write of the sorts of apples and pears, "and those exceeding good," would require "a particular volume," adds—"Master Richard Pointer

* Odyssey, xxiv. 337.

has them all growing in his ground at Twickenham, near London, who is a most cunning and curious grafter and planter of all manner of rare fruits; and also in the ground of an excellent grafter and painful planter, Master Henry Bunbury, of Touthil-street near unto Westminster; and likewise in the ground of a diligent and most affectionate lover of plants, Master Warner, neere Horsley Down, by London; and in divers other grounds about London." The neighbourhood of Worcester was probably then celebrated, as at the present day, for the cultivation of this fruit, for three pears are borne in the arms of the city. We have already alluded to the manufacture of perry, which is almost peculiar to Worcestershire.

Most of the fine sorts of pears are of Continental origin, the horticulturists of France and the Netherlands having paid more attention to that species of fruit than those of England. As these varieties have retained their original names, a good many laughable corruptions have been produced in their popular nomenclature: in just the same way that "the Boulogne Mouth" is now rendered "the Bull and Mouth." Thus the *Bon Chrêtien* is converted into the *Boncrutching*; the *Beurré* into the *Bury*; the *Chaumontelle* into the *Charmingtel*. Such odd names as the *Bishop's-Thumb*, and many others which our fruiterers use, may probably be traced to a similar cause. In the names of apples there is the same corruption,—as *Runnet* for *Reinette*. The names of fruits in all countries occasionally present some laughable anomalies, such as the "*Bon-Chrêtien Turc*," one of the finest of the French pears.

The Chinese, who are said to carry the cultivation of fruit to much greater perfection than the European gardeners, are stated by Marco Polo to have pears, white in the inside, melting, and with a fragrant smell, of the enormous weight of ten pounds each.

The wood of the pear is much firmer than that of the apple, and it is much less liable to be attacked by insects, or to decay. In some of the old orchards, where the apple-trees have wholly disappeared, the pears are in full vigour and bear abundantly. This is remarkably the case at the old Abbey-garden at Lindores, on the south bank of the Tay, in the county of Fife: disease could have nothing to do with the death of the apple-trees there, as the soil is one of the very best for apples in the kingdom, being fine strong black loam to a great depth. Yet there are many old apple-trees in the kingdom. At Horton, in Buckinghamshire, where Milton spent some of his earlier years, there is an apple-tree still growing, of which the oldest people remember to have heard it said that the poet was accustomed to sit under it. And upon the low leads of the church at Rumsey, in Hampshire, there is an apple-tree still bearing fruit, which is said to be two hundred years old.

The Fruit Catalogue of the Horticultural Society contains above six hundred varieties of the pear; and it is there observed, that "the newly-introduced Flemish kinds are of much more importance than the greater part of the sorts which have been hitherto cultivated in Great Britain, and when brought into use, will give quite a new feature to the dessert."

The Quince (*Cydonia vulgaris*).—The quince was introduced into Europe, according to Pliny, from the island of Crete. From the largeness of this fruit, and its splendid colour, it is not improbable that it was the same with the apples of the Hesperides; for Galesio, in his treatise on the orange, has shown that the orange-tree was unknown to the Greeks, and that it did not naturally grow in those parts where the gardens of the Hesperides were placed by them. The fruit of the quince, however useful and ornamental it may be in some respects, does not warrant such honours, and in truth has not continued to receive them; for the French, who have paid great attention to its cultivation, particularly for grafting pears upon its stocks, call the quince-tree "*coignassier*," probably, according to Duhamel, because the disagreeable odour of the fruit requires that it should be placed in a corner (*coin*) of the orchard or garden. In the south of France, particularly on the borders of the Garonne, the quince is very extensively grown; and the peasants prepare from it a marmalade which they call *cotignac.* The term marmalade is derived from the Portuguese name for the quince, *marmelo.* Gerarde says, that in his time quince-trees were planted in the hedges of gardens and vineyards; and marmalade, two centuries ago, seems to have been in general use, principally from a belief that it possessed valuable medicinal properties. The seeds of the quince are still used in medicine, on account of the great quantity of mucilage which they yield to boiling water.

There are eight varieties of the quince noticed in the Fruit Catalogue of the Horticultural Society. Amongst these the Chinese quince (*Cydonia Sinensis*) is inserted on account of the resemblance which its fruit has to that of the common quince; although in France, where only in Europe it has produced fruit, it is not considered eatable. The Chinese quince was introduced into England and Holland nearly forty years ago, and was planted in France about ten years later. The tree has much the appearance of the common quince, as well as the fruit. It is remarkable for the number and brilliancy of its flowers.

Ornamental Crabs.—The crab of Siberia, which had been introduced into this country within the last fifty years, has contributed to the extension of our varieties of apple, by offering a valuable stock for grafting. The fruits thus produced by the union of our richest apples and the Siberian crab are remarkably hardy and luxuriant. The Siberian crab differs in a peculiar manner from our native crab. It furnishes one of the many evidences of the continued influence of original climate upon vegetables, when they are naturalized in another region. The winters of Siberia are intensely cold, the change to summer is sudden, and the heat equally violent. Our own changes of temperature are much slower, and more irregular. Thus, when the native crab scarcely shows signs of life, the Siberian variety puts forth its leaves, blossoms, and bears fruit, early even in an unfavourable season.* The flowers of the Siberian crab are

* See Hort. Trans., vol. i.

beautiful; and its fruit is of a sharp yet pleasant flavour. There are many pretty varieties of *Pyrus*, which are principally cultivated in our gardens for their flowers. The Chinese crab (*Pyrus spectabilis*) is most showy and ornamental. It grows to the height of twenty or thirty feet. Its blossoms are of a pale red, but they are of short duration. Dr. Fothergill is considered to have introduced this native of China, which he cultivated in 1780. The Japan crab or quince (*Pyrus* or *Cydonia Japonica*) was brought here about 1796; but it was described as a very rare plant in the Botanical Magazine of 1803. Its blossoms are of a deep red, and its flowers succeed each other during many months. The white variety of the *Pyrus Japonica* is a yet more recent introduction. It blooms abundantly in April and May; and as it will grow in almost any soil, and may be increased by layers and cuttings, is very valuable as an ornamental tree. The *Pyrus pollveria* (figured in Loddiges' Botanical Cabinet, vol. xi.) is a native of Germany. Its flowers are beautiful, and its fruit not unpleasant. The *Pyrus salicifolia* is said to have been introduced into this country by Pallas, the celebrated naturalist. He found it in sandy deserts between the rivers Terec and Cuma. It grows also on Caucasus and in Persia. With us it is a small tree, with pendulous branches and beautiful silvery leaves.*

THE MEDLAR (*Mespilus Germanica*).—The medlar is a fruit resembling the smaller apples, and has a good deal of flavour, but is not fit for use until it is very ripe. This ripeness is seldom or never attained while the fruit remains on the tree. It is generally understood to be a native of the south of Europe; but it has been naturalized, though rarely, in the hedgerows in England.

The common medlar is a middle or small-sized branching tree; covered with spines in the wild state, and having ash-coloured bark. In Sicily, according to Miller, it rises to be a large tree, with a straight stem, and the fruit shaped like a pear. The Dutch medlar, which is the kind most cultivated in England, does not reach to a

* Loddiges' Cabinet, vol. xii

great height, and is crooked and unsightly in the branches. The leaves are much larger than those of the common medlar, and they are downy on their under sides. The fruit, also, is larger, and so are the flowers; but it is inferior in pungency and flavour to the smaller sort, which is known by the name of the Nottingham medlar.

The timber of the medlar is very hard and durable. The tree is also rather a slow grower, and lasts to a great age.

The POMEGRANATE (*Punica Granatum*).—Before the peach, the nectarine, and the apricot had travelled from Persia to the more western countries on the borders of the Red Sea, the pomegranate was there assiduously cultivated, and held in the greatest esteem. In the wilderness, when the children of Israel murmured for the fruits of Egypt, they exclaimed, "It is no place of seed, or of figs, or of vines, or of pomegranates." On the borders of the promised land, Moses described it as "a land of wheat, and barley, and vines, and fig-trees, and pomegranates; a land of oil-olive and honey." In the Canticles, Solomon speaks of "an orchard of pomegranates, with pleasant fruits." A tree, therefore, which partakes of the antiquity of the vine, the fig, and the olive—and which, in point of utility, is numbered with the grain-bearing plants, and with honey, all constituting the principal food of the nations of antiquity in their early stages of civilization—must possess a considerable historical interest. It is probable that the pomegranate, differing from the stone-fruits, travelled from the West to the East. Pliny says that it is a native of Carthage, as its name (*Punica Granatum*) imports. Yet as it is found wild in the same botanical regions of Europe—that is, in countries having the same temperature as the northern coasts of Africa—it is probably indigenous there also. It is still common in Barbary (where, according to Shaw, the fruit often weighs a pound, and is three or four inches in diameter*), in the south of France, in Italy, in Spain, and throughout the East. The Jews

* Travels, vol. i.

employ the fruit in their religious ceremonials; and it has entered into the heathen mythology—for in the isle of Eubœa there was formerly a statue of Juno holding in one hand a sceptre and in the other hand a pomegranate.

This general diffusion of the pomegranate throughout the climates suited to it, implies that it possesses highly valuable properties. In hot countries its utility is incontestable; for its juice is most grateful to the palate, and assuages thirst in a degree quite peculiar to it from its pleasant acid—an acid so soft, that the pomegranate may still be called "full of melting sweetness."* The bark is very astringent, and was anciently employed in dyeing leather; the yellow morocco of Tunis is still tinted with an extract from it. The flowers were also used to dye cloth of a light red. The tree is easily propagated by cuttings.

The pomegranate-tree attains the height of about twenty feet. The branches are thick, and in some of the varieties they are armed with spines. The leaves, which are of a beautiful green, stand opposite, and are about three inches long, and half an inch broad in the middle. The flowers come out at the end of the branches; they are sometimes in clusters of three or four, and the times of their blowing are so irregular, that the succession is often continued for months. The petals are handsome, very thick, and fleshy. The beauty of the tree, independently of its fruit, has caused it to be planted for ornament in the south of Europe and in the East. "The nightingale," says Russel, in his account of Aleppo, "sings from the pomegranate-groves in the day-time."

In England the fruit very seldom arrives at maturity; but the tree is highly prized as an ornament, the flowers being of a bright scarlet colour, and (especially the double ones) very handsome. Their odour, too, is as fragrant as their colour is bright. The longevity of the pomegranate-tree is remarkable. At Paris and at Ver-

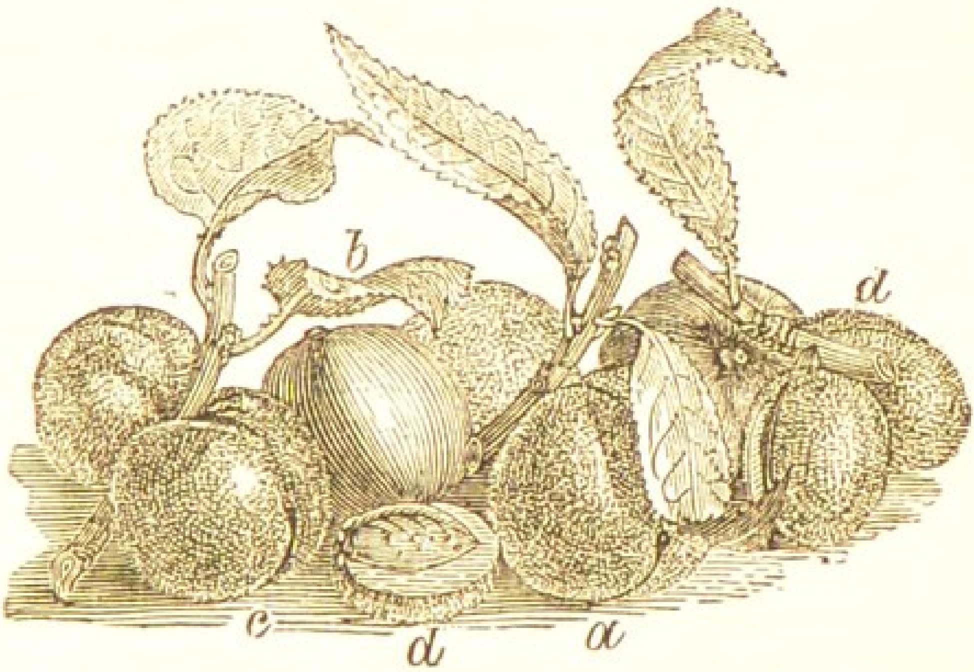
* Moore.

sailles there are specimens which are distinctly ascertained to have existed more than two centuries. The pomegranate, even at Paris, will not bear exposure in the open air too early in the spring; but it is not quite so delicate as the orange, and is therefore generally removed from the houses eight or ten days earlier.

It is stated that the pomegranate was first cultivated in England in the time of Henry VIII. Gerarde says he reared several plants from the seeds, and it is mentioned amongst the trees that bore fruit in the orangery of Charles I.

CHAPTER XXIII.

THE PEACH, NECTARINE, APRICOT, PLUM, CHERRY, AND LOVE-APPLE.



a. Peach. *b*. Nectarine. *c*. Apricot. *d*. Almond.

In connexion with the fruits belonging to the natural order *Rosaceæ*, those belonging to the Amygdaleous group of that order may be mentioned here—the peach, nectarine, cherry, plum, &c. Their fruits contain tartaric and malic acids; and on account of their hardened endocarps, they are commonly called stone-fruits.

The principal stone-fruits that are valued chiefly as fruits, without any reference to their other qualities, are the peach and nectarine, which are only varieties of the same species, the almond, the apricot, the plum, and the cherry. The first belong to the Linnæan genus *Amygdalus*, and the latter to that of *Prunus*.

It seems doubtful whether the almond, however different it is in its fructification, is not the same species with the peach. The identity of the peach and the nectarine has been fully established. Specimens raised from the stone have not only borne fruit, having on one part of the tree the downy coat of the peach, and on another the smooth coat of the nectarine, but they have exhibited varieties even closer than that, for single fruits have been produced with the coat of the peach on the one side, and that of the nectarine on the other.* The identity of the apricot and the plum was also believed by the elder gardeners.

The PEACH and NECTARINE.—Of the *Peach* (*Amygdalus Persica*) there are two distinct varieties, although there is but little difference in the appearance of the trees, and hardly any in that of the blossoms: these are, the peach, with a downy coat, and the nectarine with a smooth one. Of what country the peach actually is a native, it is impossible to ascertain. From the distinctive name *Persica*, bestowed upon it by the Romans, it is very evident, and Pliny expressly states, that they imported the peach from Persia; but whether it was indigenous to Persia, or sent thither from a country still nearer the equator, we have no information. When growing in its natural state, the peach is rather a small tree, with wide-spreading branches. The flowers appear before the leaves; they are of a very delicate colour, but of scarcely any scent. The fruit is roundish, with a furrow along one side, and having a very delicate downy cuticle when ripe. Peaches are distinguished into two classes; those which separate easily from the stone or nut, and those which do not. The former are, generally speaking, the best flavoured, though to that there are exceptions. The varieties of the peach are exceedingly numerous, but of late years as many new peaches have probably not been introduced as there have been new varieties of some other fruits. There are upwards of two hundred varieties inserted in the Fruit Catalogue of

* See Hort. Trans., vol. i.

the Horticultural Society. The qualities of the peach appear to depend a good deal upon the soil and climate in which it has for a considerable time been cultivated; and the soil in which the tree is immediately planted should neither be too rich nor too poor,—the former causing the trees to make too much wood, and the latter making the fruit hard and deficient in flavour.

Of the history of the nectarine as little is known as that of the peach; neither is it ascertained which of them was the variety first cultivated. Delicious as the peach is, the nectarine, when of a good sort, and properly cultivated, is superior to it; and though it wants the lusciousness of some of the tropical fruits, perhaps few vegetable productions are more grateful to the palate even of the epicure.

In the warmer parts of Asia the peach is very generally cultivated, and in many it grows abundantly without culture.

On some parts of the American continent, also, the peach grows readily and in great plenty. Capt. Head, in his 'Rough Notes,' mentions the beauty and productiveness of the peach-trees which are scattered over the corn-fields in the neighbourhood of Mendoza, on the east side of the Andes; and the same traveller notices dried peaches as an article of food in the mountainous parts, to which they must, of course, be carried from the plains.

In many parts of the United States peach-trees grow in extensive plantations. They continue without culture; and the fruit is of little value, except in the distillation of peach-brandy and the fattening of hogs. The following account of the peach-orchards in the United States was communicated to the Horticultural Society in 1815, by Mr. John Braddick, of Thames Ditton:—

"Some years ago, when travelling through Maryland, Virginia, and the neighbouring provinces of the United States of America, I had an opportunity of observing the mode in which the peach-trees of those provinces were cultivated, which was invariably from the stone of the peach, the plant being never budded, but always remaining in a state of nature. In the middle and southern provinces of the United States, it is no uncommon circumstance for a planter to possess a sufficient number of peach-trees to produce him, after fermenting and distilling the pulp, from fifty to one hundred gallons of peach-brandy; the manufacturing of this liquor, and the feeding of hogs, being the principal uses to which the peach is applied in those countries. A peach-orchard usually contains a thousand or more standard trees. The tree being raised in the manner I have detailed, it is easy to conceive that the fruit growing on them must be an endless variety, scarcely two trees producing exactly alike; and although by far the greater number of trees, in any of these orchards, will always be found to produce fruit below mediocrity in point of flavour, yet a judicious observer will never fail, among so great a number, to pick out a few trees, the race of which may be considered worthy of preserving."

The peach is said to have been first cultivated in England about the middle of the sixteenth century. Gerarde describes several varieties of peach as growing in his garden. Tusser mentions it among his list of fruits in 1557.

In the neighbourhood of Paris much attention is paid to the culture of peach-trees, and the peaches there are of excellent quality. The principal gardens for the supply of the French capital are at Montreuil, a village near Paris; and one tree there sometimes covers sixty feet of wall, from the one extremity to the other. The Montreuil peaches are of the finest flavour; and their excellence is properly attributed to the exclusive attention of the people to their culture. The subdivision of labour and skill produces the same results in every art.

The espalier peaches of the Duc de Praslin, near Melun, are stated to be the finest in Europe.*

All the peaches have in the kernel a flavour resembling that of the noyau, which depends on the presence of prussic or hydrocyanic acid. The leaves have the

* Le Bon Jardinier, 1829.

same flavour, which they impart by infusion either in water or in spirits.

The facility of raising the peach from the stone has probably tended to its general diffusion throughout the world. This fruit has steadily followed the progress of civilization; and man, "from China to Peru," has surrounded himself with the luxury of this, and of the other stone-fruits, very soon after he has begun to taste the blessings of a settled life. There are still spots where ignorance prevents portions of the human race from enjoying the blessings which Providence has everywhere ordained for industry; and there are others where tyranny forbids the earth to be cultivated and produce its fruits. The inhabitanis of the Haouran, who are constantly wandering, to escape the dreadful exactions of some petty tyrant, have neither orchards nor fruit-trees, nor gardens for the growth of vegetables. "Shall we sow for strangers?" was the affecting answer of one of them to Burckhardt.

Even in the same land there is a striking contrast between such scenes as Burckhardt thus describes, and the effects of a settled industry, proceeding from a peaceful security. Dandini, in remarking the richness of Western Syria, observes, "that it is to an industry less harassed by predatory encroachments than that of any other part of Syria, that the hills of Lebanon owe those fine terraces, in long succession, which preserve the fertile earth; those well-planted vineyards; those fields of wheat raised by the industrious hand of the husbandman; those plantations of cotton, of olives, and of mulberries, which present themselves everywhere in the midst of the rocky steeps, and give a pleasing example of the effects of human activity. The clusters of grapes are enormous, and the grapes themselves as large as cherries."

One of the greatest blessings that can be conferred upon any rude people (and it is a blessing which will bring knowledge, and virtue, and peace, in its train) is to teach them how to cultivate those vegetable productions which constitute the best riches of mankind. The traveller Burchell rendered such a service to the Bachapins, a tribe in the interior of Southern Africa. He gave to their chief a bag of fresh peach-stones, in quantity about a quart; "nor did I fail," says the benevolent visitor of these poor people, "to impress on his mind a just idea of their value and nature, by telling him that they would produce trees which would continue every year to yield, without further trouble, abundance of large fruit of a more agreeable flavour than any which grew in the country of the Bachapins." This is an interesting example of how much good a right-minded and active individual may do to his humbler brethren of the human family. "Why have not everywhere the names been preserved," says Humboldt, "of those who, in place of ravaging the earth, have enriched it with plants useful to the human race?" It is satisfactory to observe, however, that when men are highly civilized, there is an elasticity in their mental energies, which makes the destruction of tyranny and war of less permanent injury than when their inflictions fall upon a rude people. Sickler, a distinguished naturalist of Germany, who has paid particular attention to the cultivation of fruit-trees, had, in the Duchy of Saxe-Gotha, formed three nurseries for fruit-trees, one of which contained eight thousand grafted plants. In 1806 this nursery was entirely destroyed by the French, after the battle of Jena: Ney's corps bivouacked in it. After the battle of Leipsic, in 1814, another nursery, planted by the same eminent man, was destroyed by the Cossacks. Yet in 1817 he had planted and reared a third nursery with his own hand—persevering, in spite of the injuries which he had received in these dreadful contests, to distribute his fine plants and the knowledge of their cultivation over his native country.* The labours of such a man will endure when the fame of conquerors is forgotten, or thought worthless, or only remembered to be hated as it deserves.

It has been already stated that some doubts exist as to

* See an interesting memoir of Sickler in the Hort. Trans.

the difference between the peach and the almond being more than apparent. With reference to this subject, there is a curious fact recorded by the President of the Horticultural Society. The fruit of a sweet almond-tree, which had been obtained from an almond kernel that had, when in flower, been impregnated with peach pollen, was sown, and produced a tree: this tree bore eight peaches, some of which were perfect, and the others burst at the centre when ripe, as is the case with almonds. The peaches were finely formed and coloured; the flesh white, soft, melting, and of good flavour. This experiment is curious; for though it does not completely establish the fact of the convertibility of an almond into a peach, it does so in great part, by showing that only the pollen is necessary to effect such a change.

The *Flat Peach of China* is perhaps the most singular of the peach tribe. The size of it resembles that of the apple; and the stalk and eye approach so near as to give it the appearance of a ring of flesh, with a stone in the middle. The following description accompanied specimens presented to the Horticultural Society by Mr. Braddick:—

"This fruit is of truly singular form, and perhaps will be best described as having the appearance of a peach flattened by pressure at the head and stalk; its upright diameter, taken through the centre, from eye to stalk, being eleven-sixteenths of an inch, consisting wholly of the stone, except the skin; that of its sides is one inch and one-eighth, its transverse diameter being two inches and a half. The head of the fruit is crooked in such a manner as to look like a broad and rather hollow eye of an irregular and five-angled (or lobed) shape, surrounded by the appearance of the remains of the leaves of a calyx: the whole surface of this eye is roughly marked with small irregular warted lines, like the crown of a medlar. The colour of the skin of the fruit is pale yellow, mottled, or rather speckled, with red on the part exposed to the sun, and covered with a fine down. The flesh is pale yellow, having a beautiful radiated circle of fine red surrounding the stone, and extending far into the fruit. The stone is flatly compressed, small, rough, and irregular. The consistence and flavour of the flesh is that of a good melting peach, being sweet and juicy, with a little noyau flavour, or bitter aroma. This peach is cultivated in China, representations of it being continually seen on the papers and drawings received from that country; and it is well known at Canton, where it is esteemed as a good fruit."

THE APRICOT (*Prunus Armeniaca*).—The apricot belongs to a very numerous genus of fruit-bearing trees, and trees which are a good deal different in their characters. The genus *Prunus* comprises all the varieties of the cherry, the laurels properly so called, the plums, the sloe, and a number of others that are never cultivated for the sake of their fruit. Many of the genus are poisonous; and though the fruit of some of them is agreeable to the taste, and safe enough when taken in limited quantities, there is none of the family that can be indulged in to excess with impunity. Columella says that the Persians sent the peach to Egypt to poison the inhabitants; and a species of apricot is called by the people of Barbary "matza Franca," or the killer of Christians.* All these evil qualities are, however, destroyed by cultivation; for it is the privilege of man not only to distinguish between the good and evil properties of vegetables, but to eradicate the evil, in many cases, by his skill and industry.

The apricot is very widely diffused in Asia, and grows upon the slopes of the sterile mountains westward of China. Many species of it are cultivated; and, as they ripen earlier than the peach and nectarine, they are in considerable estimation. Some varieties are exceedingly delicious; and the Persians, in their figurative language, call the apricot of Iran "the seed of the sun."

It should seem that the apricot was known in Italy in the time of Dioscorides; and that it got its name *precocia* from ripening earlier than some other fruits. The modern Greek name, περικυκκα is very like the Arabic

* Shaw.

name *berikach.* The Romans set little value upon the apricot, as appears by an epigram of Martial. If the ancient name is to be retained, a-precoke, as it used to be styled by our most early writers on horticulture, is the classical appellation, and the modern apricot the vulgarism or corruption.

The apricot is said to derive its scientific name from its almost covering the slopes of the Caucasus, the Ararat, and the other mountains in and about Armenia, up almost to the margin of the snow. The general opinion that it is a native of Armenia has, however, been controverted by M. Regnier, a French naturalist, who contends, that as Armenia is a high mountainous country, the climate of which resembles that of middle Europe, it cannot possibly be the country of a tree which begins to flower so early that its blossoms are often destroyed by the frost notwithstanding every care of the cultivator. The apricot, too, although it has been cultivated in Europe for many ages, never sprang up from seeds in any of our forests; neither has it been found wild either in Armenia or any of the neighbouring provinces. M. Regnier is of opinion that it is a native of Africa, and that its limits appear to be a parallel between the Niger and the range of the Atlas mountains, from whence it has, by cultivation, been carried towards the North.

Apricots are very plentiful, and in great variety, in China; and the natives employ them variously in the art. From the wild tree, the pulp of whose fruit is of little value, but which has a large kernel, they extract an oil; they preserve the fruit wet in all its flavour; and they make lozenges of the clarified juice, which afford a very agreeable beverage when dissolved in water. The apricot attains the size of a large tree in Japan. It also flourishes in such abundance upon the Oases, as to be dried and carried to Egypt as an article of commerce. In those sultry climates the flavour is exquisite, though the fruit is small.

Gough, in his British Topography, states that the apricot-tree was first brought to England, in 1524, by

a, Plum. *b*, Cherry.

Woolf, the gardener to Henry VIII. Gerarde had two varieties in his garden.

The Plum (*Prunus domestica*).—The plum appears to be still more widely diffused in its original locality than the apricot; and it is much more prone to run into varieties. It is a native of Asia, and of many parts of Europe; and even grows wild in the hedges in some parts of Britain, though possibly it may have found its way there from some of the cultivated sorts, and have degenerated. The plum, and almost all its species, is very apt to run under ground, and produce suckers from the roots. Duhamel says that if plums are grafted low, and covered with earth, they push out shoots which may be transplanted.

Plums of various sorts appear to have been introduced into England as early as the fifteenth century. These varieties came to us from France and Italy. The "Greengage" is the *Reine Claude* of France, so called from having been introduced into that country by the wife of Francis I. It is called Gage in England, after the name of the family who first cultivated it here. The "Orleans" probably came to us when we held possession of that part of France from which it takes its name. Lord

Cromwell introduced several plums from Italy, in the time of Henry VII. The damson, or damascene, as its name imports, is from Damascus.

In some countries, particularly in Alsatia, a considerable quantity of alcohol is produced from plums and cherries by fermentation. Dried plums form a large article of commerce, under the name of prunes and French plums.

There are nearly three hundred varieties of plums, many of which are, perhaps, only dissimilar in name. The Washington, a modern variety, which is stated in the Pomological Magazine not to be surpassed in richness of flavour, beauty, and other good qualities, by any, is curious in its origin. The parent tree was purchased in the market of New York, some time in the end of last century. It remained barren several years, till, during a violent thunder-storm, the whole trunk was struck to the earth and destroyed. The root afterwards threw out a number of vigorous shoots, all of which were allowed to remain, and finally produced fruit. It is, therefore, to be presumed that the stock of the barren kind was the parent of this. Trees were sent to Mr. Robert Barclay, of Bury Hill, in 1819; and in 1821 several others were sent to the Horticultural Society by Dr. Hosack.

THE CHERRY (*Prunus Cerasus*).—The Cherry is a native of most temperate countries of the northern hemisphere. The small black is found not only in some parts of England, but even in places among the Scottish mountains, where it would be difficult to imagine them to have been carried. It is generally said that the first of the present cultivated sorts was introduced about the time of Henry VIII., and were originally planted at Sittingbourn, in Kent. The cherry-orchards of Kent are still celebrated. It seems, however, that they were known much earlier, or, at any rate, that cherries were hawked about London before the middle of the sixteenth century, in the very same manner as at present. The commencement of the season was announced by one carrying a bough or twig loaded with the fruit. Our present popular song of "Cherry ripe, ripe, I cry," is very slightly altered from Herrick, a poet of the time of Charles I. One of our old English games, *cherry-pit*, consisted of pitching cherry-stones into a little hole :—" I have loved a witch ever since I played at cherry-pit."* Shakspere also alludes to the same custom.

The wild cherry, of which there are a good many varieties, is a much more hardy tree than any of those that produce the finer sorts of fruit ; and it is therefore much cultivated for stocks upon which to graft the others, as trees so grafted attain a larger size, are more durable, and less subject to disease. At some of the ruined abbeys and baronial castles there are found cherry-trees, chiefly black ones, which have attained the height of sixty or eighty feet, and continue to produce great quantities of fruit. These ancient sorts are not confined to the warmer parts of the country, but are met with in some of the northern counties of Scotland. Evelyn ranks the black cherry amongst " the forest berry-bearing trees, frequent in the hedges, and growing wild in Herefordshire, and many places."

The cherry is generally understood to have been brought to Rome, from Armenia, by Lucullus, the conqueror of Mithridates. This was about sixty-eight years before the Christian era ; and such was the fondness for the fruit, that, Pliny says, " in less than one hundred and twenty years after, other lands had cherries, even as far as Britain beyond the ocean." The cherry is spread over Africa. In Barbary it is called " The Berry of the King." Desfontaines (*Histoire des Arbres*) contends, in opposition to the received opinion, that the wild cherry is indigenous to France, and of equal antiquity with the oak ; nor can we help thinking, from the situation in which we have seen wild cherries, that the same may be the case with parts of the United Kingdom.

The transplantation of fruit-trees from one distant locality to another has been employed by Hume as an argument to prove " the youth, or rather infancy, of the world," in opposition to the opinions of those who

* Witch of Edmonton.

maintain that this earth has existed, in its present condition, from countless ages :—

"Lucullus was the first that brought cherry-trees from Asia to Europe; though that tree thrives so well in many European climates, that it grows in the woods without any culture. Is it possible, that, throughout a whole eternity, no European had ever passed into Asia, and thought of transplanting so delicious a fruit into his own country? Or if the tree was once transplanted and propagated, how could it ever afterwards perish? Empires may rise and fall; liberty and slavery succeed alternately; ignorance and knowledge give place to each other; but the cherry-tree will still remain in the woods of Greece, Spain, and Italy, and will never be affected by the revolutions of human society.

"It is not two thousand years since vines were transplanted into France; though there is no climate in the world more favourable to them. It is not three centuries since horses, cows, sheep, swine, dogs, corn, were known in America. Is it possible, that, during the revolutions of a whole eternity, there never arose a Columbus, who might open the communication between Europe and that continent? We may as well imagine that all men would wear stockings for ten thousand years, and never have the sense to think of garters to tie them. All these seem convincing proofs of the youth, or rather infancy, of the world; as being founded on the operation of principles more constant and steady than those by which human society is governed and directed. Nothing less than a total convulsion of the elements will ever destroy all the European animals and vegetables which are now to be found in the western world."

Several liqueurs are manufactured from cherries. A large black cherry (*Marise noire*) is used in the composition of the *Ratafia* of Grenoble; and the *Maraschino* of Zara is prepared from a particular species of cherry cultivated in Dalmatia. *Kirschwasser*, which is a cheap spirit, forming a considerable article of commerce, is the fermented liquor of a small black cherry.

The whole of the genus *Prunus* yield what is commonly called gum; that of the cherry-tree being the best. But this substance, which is called *cerassin*, resembles *tragacanth* (the gum of the *Astragalus*), and is therefore improperly called gum, as the term is usually understood and applied to gum-Arabic.

There are about two hundred and fifty varieties of cherries cultivated in England.

The Chinese cherry (*Prunus pseudo-cerasus*) is a valuable new species of that fruit, introduced into this country so recently as 1819. The following is an extract from the account of this variety, presented to the Horticultural Society by Mr. Knight, their President:—

"I received a plant of the Chinese cherry from the garden of the Horticultural Society in the summer of 1824, after it had produced its crop of fruit; and it was preserved under glass, and subjected to a slight degree of artificial heat till the autumn of that year. It appeared very little disposed to grow; but produced one young shoot, which afforded me a couple of buds for insertion in stocks of the common cherry. Soon after Christmas the tree was placed in a pine-stove, where it presently bloomed abundantly, and its fruit set perfectly well, as it had previously done in the gardens of the Society, and it ripened in March. The cherries were middle-sized, or rather small compared with the larger varieties of the common cherry; were of a reddish amber colour, very sweet and juicy, and excellent for the season in which they ripened. The roots of the tree were confined to rather a small pot, and the plant was not even in a moderately vigorous state of growth. I, therefore, infer that the fruit did not acquire either the size or state of perfection which it would have attained if the tree had been larger, and in a vigorous state of growth, and the season of the year favourable."

CHAPTER XXIV.

VARIOUS FRUITS, CONTAINING VEGETABLE ACIDS, SUGAR, STARCH, PROTEIN, AND VOLATILE OILS.

THE PINE-APPLE (*Bromelia*).—The earliest exchanges of tropical plants that took place between the Portuguese in the East, and the Spaniards in the West, have not been recorded with perfect accuracy, so that we are not absolutely certain that the pine-apple may not be a native of some parts of Asia, and even of Africa, as well as of America. That it is a native of the West is certain, however, as all the varieties, except some of the trivial ones arising from cultivation, are found wild on the continent or the islands of that quarter of the world.

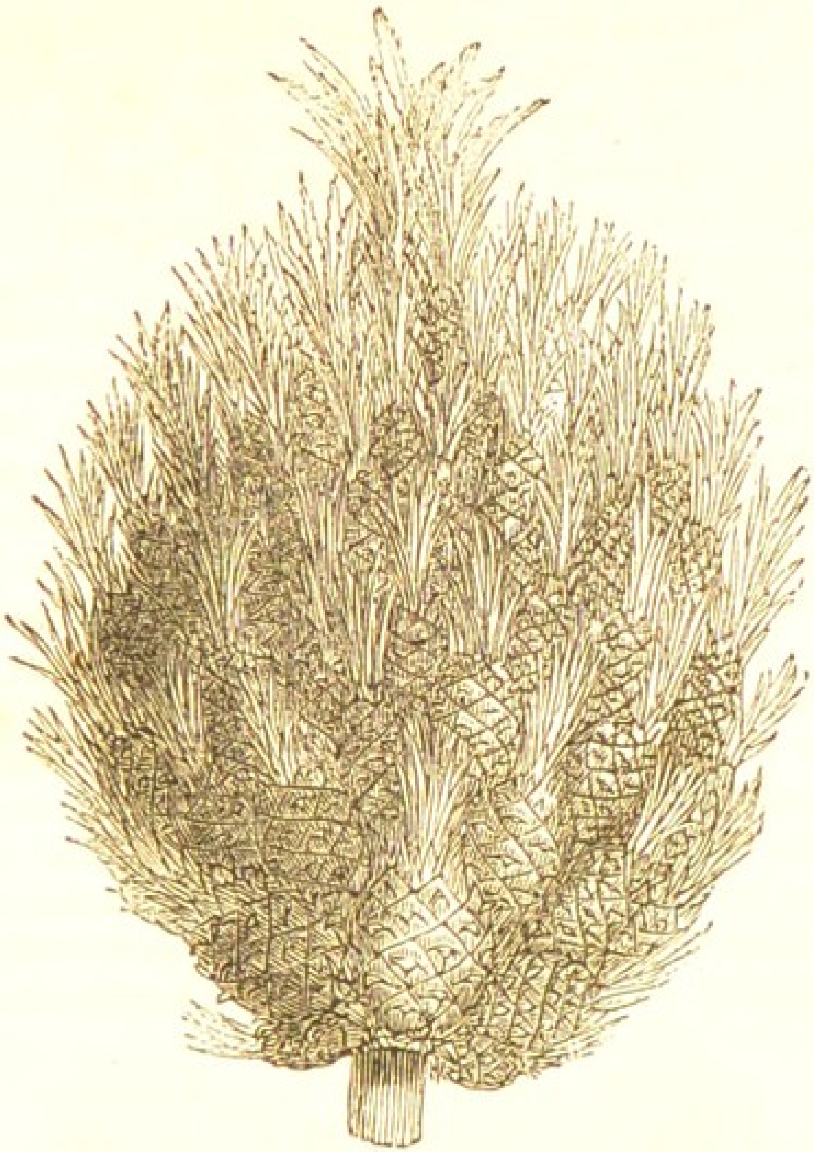
The *Ananas*, or pine-apple, properly so called, is now so generally known in this country (being cultivated in hot-houses and pits almost from Cornwall to Caithness), that no minute account of it is necessary. When of a good sort and healthy, it is accounted the best, at least the most luscious, fruit that this country produces; and, with careful cultivation, is equal in quality to that of places where it is a native. It is said even to be superior, because the English gardeners may, by skilful treatment and choice of sorts, more than make up for the want of sun and the deficiency of natural temperature.

It has been said that the pine-apple was brought from Brazil, first to the West Indies, and thence to the East; but the evidence is not complete. It was known in Holland some time before its introduction into this country; and even about its introduction here there are some disputes. The picture of King Charles II., with his gardener presenting him with a pine, said to be the first grown in England, is rejected by the better informed authorities; and the pine, if ever such a fruit was offered to that monarch, is supposed to have been brought from Holland, or the pine to have been presented, and the picture drawn, before his return to this country. Mr. Bentinck, the ancestor of the Duke of Portland, is, according to the best accounts, supposed to have first introduced and cultivated the pine in the year 1690; and this is rendered the more likely, from the fact that he was previously acquainted with the fruit in Holland. And yet the cultivation of the pine had made so little progress in England a quarter of a century later, that Lady Mary Wortley Montagu, on her journey to Constantinople in 1716, remarks the circumstance of pine-apples being served up in the dessert, at the Electoral table at Hanover, as a thing she had never before seen or heard of.*

Pine-apples have been grown in this country of an extraordinary size. One of the New Providence kind, that weighed nine pounds four ounces, was presented to his Majesty, in June, 1820, by John Edwards, Esq., of Rheola, Glamorganshire, where it was grown. In July, 1821, another Providence pine is mentioned, in the Transactions of the Horticultural Society,† to have weighed ten pounds eight ounces: it was grown by Mr. Buchan, gardener to Lord Cawdor, at Stackpool Court, Pembrokeshire. It was ten inches and a half high, exclusive of the crown and stalk, and twenty-two inches in circumference. From the extraordinary size and beauty of the fruit, it was thought proper by the Fellows of the Horticultural Society to present it to his Majesty, which was accordingly done; and it was served up in the dessert at the royal table at the Coronation banquet. Mr. Buchan raised three other pines of extraordinary weight in the same season: one weighed ten pounds six ounces; another, ten pounds two ounces; and a third, nine pounds eight ounces; making the total weight of the four, forty pounds eight ounces.

In the Indian Archipelago, and in China, an extraordinary monstrous state of the pine-apple is sometimes

* Letters of Lady M. W. Montagu. † Vol. v. p. 264.



Many-headed Pine.

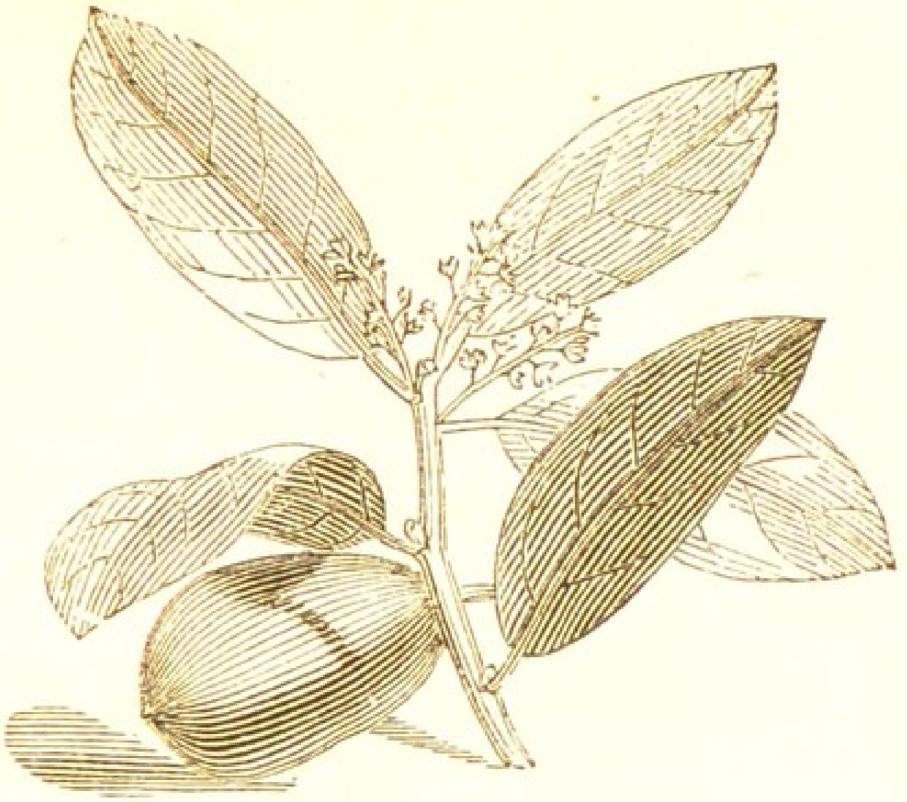
seen, called "the many-headed pine." It is caused by the plant producing branches bearing fruit at each point where, under common circumstances, it produces single flowers. There are fine specimens preserved in spirits in the Library of the Horticultural Society, and the plant itself is in their garden.

Pine-apples are now regularly imported into this country from South America, where they are cultivated for the European market. This has placed the pine-apple within the reach of almost all classes of consumers, and that which a few years ago was seen only occasionally on the tables of the rich, may be purchased for a few pence at the corners of our streets. The foreign pine-apples, however, have not so fine a flavour as those grown in our own hothouses.

The MAMMEE (*Mammea Americana*).—The mammee is a native of the West Indies, where it grows to a large tree, sixty or seventy feet in height. It is a handsome straight-growing tree, with a spreading head, and the leaves are oblong and obtuse, with very many, fine, closely set, parallel veins. The fruit of the mammee is yellow, not unlike one of the largest russet apples, either in shape or in size. The skin, which easily peels off, and the seeds, of which there are two or three in the centre, are resinous, and very bitter; but the pulp under the skin, which, when ripe, is of a deep yellow, resembling that of the finest apricot, and of considerable consistency, is very fragrant, and has a delicious flavour. To people with weak stomachs it is said to be more delicious than healthful; but still it is highly prized, very abundant in the West Indian markets, and accounted one of the best native fruits they have. The mammee was found by Don in the vicinity of Sierra Leone; but whether native there, or imported from America, cannot be ascertained. It was introduced into England in 1735.

Mammee.

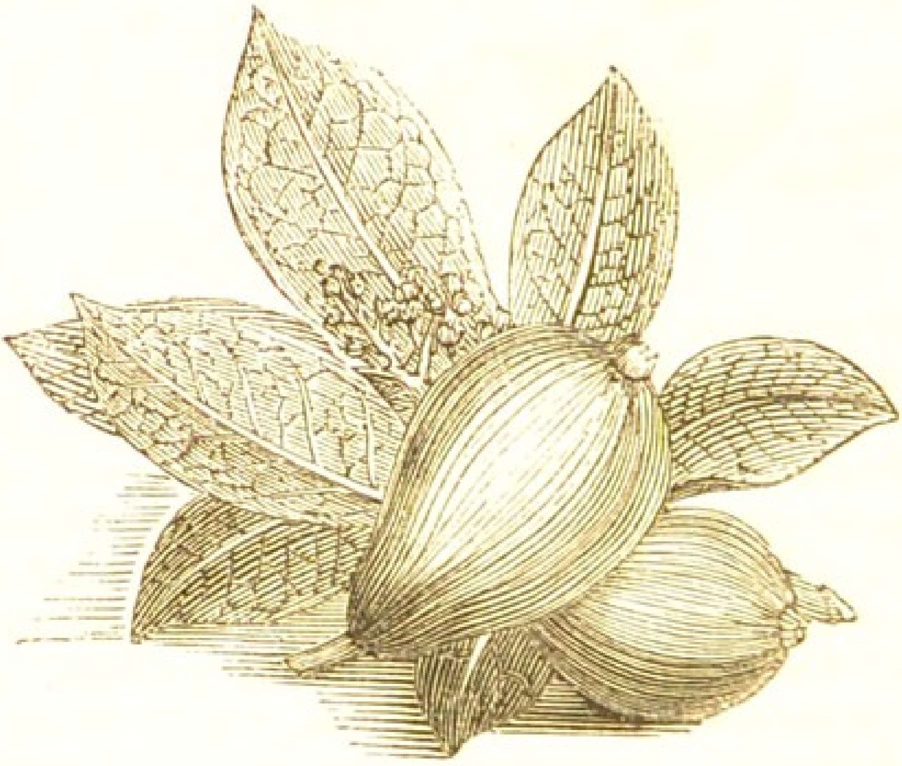
The ALLIGATOR PEAR (*Laurus Persea*).—The Avo-



Alligator Pear.

cado, or Alligator Pear, grows upon a tree about the size of the common apple. It is a native of the West Indies. The leaves are oblong and veiny, the flowers of a yellowish green colour, and the fruit, which is the size of a large pear, is considered the most delicious in the world. It contains a kernel, inclosed in a soft rind; and the yellow pulp, which is firm, has the delicate rich flavour of the peach, but infinitely more grateful. It is sometimes called Vegetable Marrow, and is eaten with pepper and salt. It appears necessary, on account of the richness of the pulp, to apply some spice or acid, and thus lime-juice is also frequently added to it, mixed with sugar. Of the three kinds, the red, the purple, and the green, the last is the best. The fruit is eaten with avidity, not only by men, but by birds and quadrupeds.

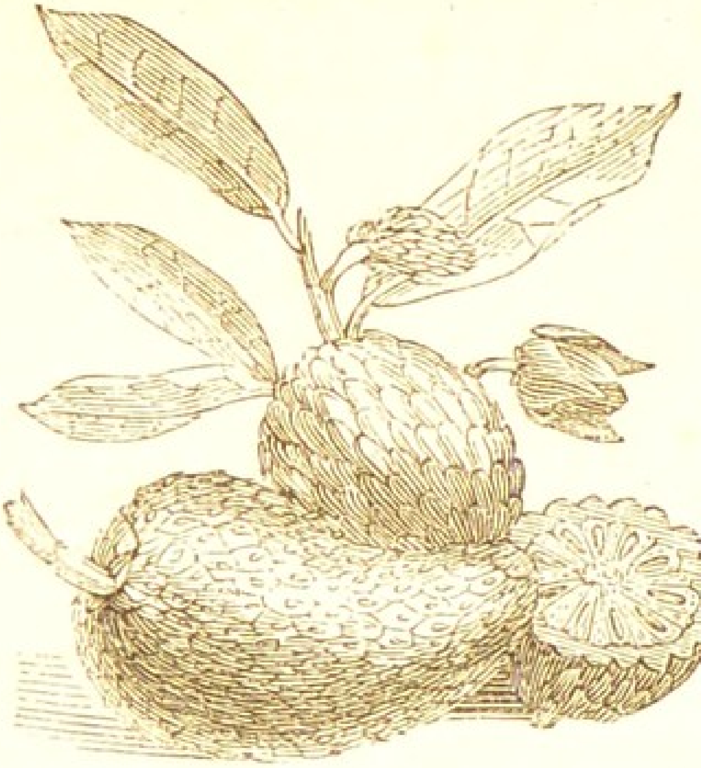
The Anchovy Pear (*Grias cauliflora*).—The Anchovy pear is a fruit also much esteemed in the West Indies, of which islands it is a native. The tree on which it grows is tall, upright, and handsome; rising to the height of about fifty feet, with leaves two or three feet long. It bears large whitish flowers, that come from the stem; and these are followed by the fruit, which is of considerable size, brownish, having a kind of pulp over a single oval kernel. The fruit very much resembles the mango in taste; and, like that, it is often made into pickles before it is ripe. The tree grows in the moist parts of Jamaica, and other places of the West Indies; where, in addition to the value of its fruit, it is a highly ornamental tree. It may be reared in England, by the joint effects of bark and the heat of a stove, as is done with the pine-apple. In the West Indies it grows readily from the kernel, and is often cultivated in clumps.



Anchovy Pear.

The CUSTARD-APPLE (*Anona muricata* and *Anona squamosa*).—Ten or twelve species of the custard-apple are enumerated. They are natives of the tropical parts of Africa, Asia, and America; but the better sorts are more abundant in the last part of the globe.

The *Sour-sop*, rough custard-apple (*Anona muricata*), is a middle-sized tree, growing abundantly on the savannas in Jamaica; and bearing a large oval fruit of a greenish yellow colour, covered with small knobs on the outside, and containing a white pulp, having a flavour



Custard Apple.

compounded of sweet and acid, and very cooling and agreeable. It is, however, too common to be much esteemed by the wealthier people, though it is much sought after and relished by the negroes. The odour and taste of the whole plant are very similar to those of the black currant. It was early introduced into England, but has not come into cultivation as a fruit-tree.

The *Cherimoyer* (*Anona cherimolia*) is a native of the continent of America; and in Peru it is accounted one of the best fruits they have. Humboldt speaks of it with high praise; but Feuillée, another traveller in South America, says a European pear or plum is worth all the Cherimoyers of Peru. The tree which produces this fruit has a trunk about ten feet high; the leaves are oval, and pointed at both ends; the flowers are solitary, very fragrant, and of a greenish colour; the fruit of considerable size, somewhat heart-shaped, rough on the outside, and greyish brown, or even nearly black, when ripe. The flesh, in which the seeds are contained, is soft, sweet, and pleasant, and highly esteemed both by natives and foreigners. It has been introduced into England for about a century, but not cultivated as a fruit-tree. In the south of Spain it is occasionally found in gardens, where it bears its fruit as an orchard-tree.

The *Sweet-sop* (*Anona squamosa*) is a very small tree, being, in many situations, little better than a bush. It is found both in the East and the West Indies. The fruit is almost the size of the head of an artichoke, scaly, and of a greenish yellow colour. The rind is strong and thick; but the pulp is delicious, having the odour of rose-water, and tasting like clotted cream mixed with sugar. It is, like many other fruits, said to have a much finer flavour in the Indian Archipelago than in the West Indies. It, too, was early known in England, but has not become general.

The *Alligator apple* (*Anona palustris*) grows wild in the marshes of Jamaica. The fruit is shining and smooth in appearance, and sweet and not unpleasant to the taste; but it is a strong narcotic, and, therefore, not generally eaten. One thing worthy of remark is, that the wood of the alligator apple-tree is so soft and compressible, that the people of Jamaica call it cork-wood, and employ it for stoppers.

Wild Plums (*Achras*).—There are various species of the wild plum in the West Indies, some of them timber-trees of large dimensions; but those most valued for their fruit are the sappodilla plum (*Achras sapota*) and the mammee sapota (*Achras mammosa*).

The *sappodilla plum* is a large and straight tree, which runs to a considerable height without any branches, with a dark grey bark, very much chapped. The leaves are smooth and beautiful, and the flowers white and bell-shaped. The fruit resembles a bergamot pear in shape and size, but in colour is like a medlar, and is similar also to that, in being eaten when it is beginning to decay.

The *mammee sapota* grows on a much smaller tree, with larger leaves and flowers of a cream-colour; the fruit about the same size as the former, but brownish when ripe, and containing a pulp resembling marmalade of quinces in consistency, and of a very delicious flavour. On account of this the tree is sometimes called the marmalade-tree, and is, in all probability, the same which Stedman, in his account of Surinam, call the *marmalade box*. It is a native of the West Indies and the adjoining coast, and is very much cultivated in the gardens there for the sake of its fruit.

STAR-APPLE (*Chrysophyllum Cainito*).—This is also a native of the West Indies. It grows on a moderately-sized spreading tree, with slender, flexible branches. There are some species, or, at least, varieties of the fruit. The star-apple, properly so called, bears fruit resembling a large apple, which, in the inside, is divided into ten cells, each containing a black seed, surrounded by a gelatinous pulp. The West Indian damson-plum has small fruit, and is chiefly found in the woods. The milky juice of the star-apple, both of the tree and the fruit, before it is ripe is remarkably astringent; but when the fruit ripens, it is sweet and very agreeable to the taste.

MELON-THISTLE, TORCH-THISTLE, CREEPING CEREUS, INDIAN FIG, OR PRICKLY PEAR (*Cactus*).—The *cactus* is a very large and very singular genus of vegetables. With the exception of, perhaps, one species, the common prickly pear, which is found in the south of Europe, in Barbary,* and in some parts of North America, they are all natives of the West Indies. In the warmer parts of the American continent they are found growing upon the bare rocks, without soil, and apparently, in many instances, without humidity. The leaf-like stems are thick, succulent, generally covered with spines; and the individual masses, which are often fantastically joined together by narrow necks, have some resemblance to the fruit of the cucumber. These stems or leaves are, in all their singular varieties, perennial; and, from their succulent nature, they can live almost without water. The stems are jointed, and generally armed with bunches of sharp spines intermixed with bristles; they produce flowers on proper foot-stalks, or adhering to the stem; some of these flowers are of great beauty; and the fruit

* See Shaw's Travels, vol. i. p. 266.

by which they are followed is, in several of the species, edible.

The small melon-thistles are covered with tubercles or warts all over, and the flowers come out between them: while on the great melon-thistles, which are of an oval or globular form, the spines are arranged in rows along a kind of ribs. The torch-thistles rise to a greater height, in prismatic or cylindrical stalks, with projecting ribs; and they are very much jointed and branched. The creeping cereuses are like the former, only the stems are much slenderer, and the joints much more flexible; so that they cannot support themselves, but lie along the ground or climb up trees, in doing which they throw out roots from the stem, like ivy. The Indian figs have the portions or lobes of the stem flattened, like the sole of a shoe; they are scattered over with spines; and the flowers are produced from the extremities of the remotest branches. The *Phyllanthus*, has the lobes flattened so as to resemble leaves indented at the edges, and without any spines, the flowers appearing nearly in the indentations; while the Barbadoes gooseberry (*Cactus pereskia*) has a round stalk, with leaves which are thick and flat, and come alternately from the stalk; the spines are large and stiff, and appear chiefly at the junctions of the leaves with the stem; at which places, also, the flowers make their appearance. The flowers vary in form, some being pitcher-shaped, and some elongated; and many of them are of the most brilliant colours. The fruit varies from the size of a currant to the size and shape of a fig; from which latter circumstance, and their being natives of the West Indies and the adjoining countries, they are called Indian figs. Throughout the West Indies, Mexico, and the other cultivated parts of tropical America, the larger species of the cactus are used for hedgerows, the strength of the stems, and formidable armature of the spines, rendering a hedge of them proof against animals.

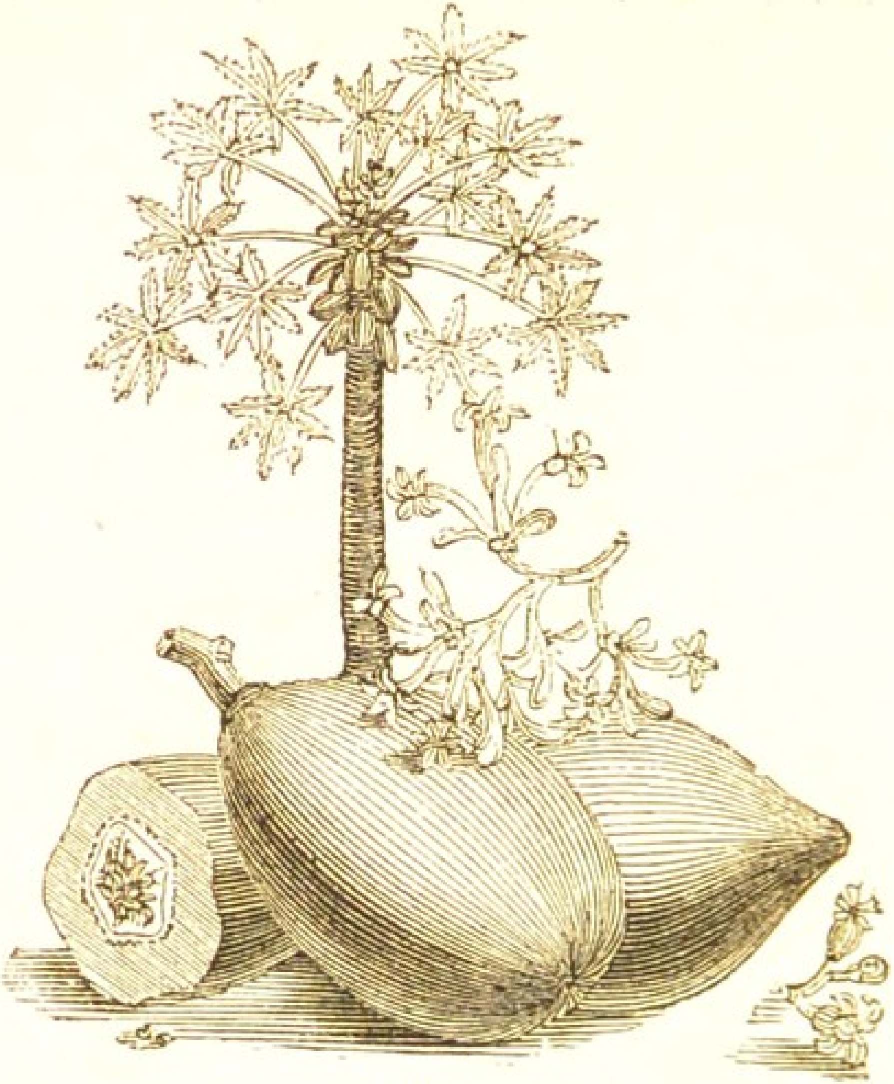
The fruit of several of the species is eaten; but those which are most esteemed are the *C. Opuntia*, or Indian fig; the *C. triangularis*, or strawberry-pear; and the

C. speciosissimus. The first is the prickly-pear, having fruit about the size of figs, and internally of a red colour; but varying in quality with the variety and the climate in which it is produced. The strawberry-pear belongs to the creeping class; the fruit is small, but it is the finest flavoured of any, and is much relished in some of the West Indian Islands. The *C. speciosissimus* has fruit twice as large as a large gooseberry, green, and exceedingly delicious.

The species denominated "cochinellifer" is generally understood to be that which feeds the cochineal insect; but probably that insect feeds upon various sorts of cactus and other succulent plants, though its efficiency and brilliance as a dye may vary with the plant.

Strawberry-Pear.

THE PAPAW (*Carica papaya*).—Though the papaw-tree is now found in the East as well as in the West, it is generally understood to be a native of America, and to have been carried to the East about the time of the



Papaw.

first intercourse between the two continents. The papaw rises with a hollow stem to the height of about twenty feet, after which it has a head composed, not of branches, but of leaves and very long foot-stalks. The male and female flowers are on different trees: the female flowers are bell-shaped, large, generally yellow, and followed by a fleshy fruit, about the size of a small melon. The tree, and even the fruit, are full of an acrid milky juice; but the fruit is eaten with sugar and pepper, like melon; and when the half-grown fruit is properly pickled, it is but little inferior to the pickled mango of the East Indies. There are many forms in the fruit, and some varieties in the colour of the flower of the papaw: and there is also a dwarf species; though, as this has been observed chiefly in arid situations, it may be the common sort stunted for want of moisture.

Passion-flower and fruit.

GRENADILLAS (*Passiflora*).—The passion-flowers are a very numerous genus; they are mostly natives of the West Indies and the tropical parts of America, from which some of the species have been introduced into this country, chiefly on account of the beauty of their flowers. Few of the species bear fruit in this country.

The grenadillas with which we are best acquainted are those of the West Indian Islands, the chief of which are the *purple-fruited* (*Passiflora edulis*)—the *Passiflora quadrangularis*—and the *water-lemon* (*Passiflora laurifolia*). The stem of the first is herbaceous, the fruit round, of a light purple, when ripe, with a whitish and rather pleasant pulp. The *Passiflora quadrangularis* is the most valuable for cultivation here; and it has borne fruit in the gardens of the Horticultural Society. The water-lemon is a larger and more woody plant: the flowers are handsome, and very fragrant; and the fruit something in the shape and of the size of a lemon, full of a watery but very agreeable tasted juice, whence the name. The plant grows wild in the woods, but is often cultivated for the sake of its fruit. It was introduced into England about the same time with the pine-apple, but it has not met with equal attention.

On the American continent, and especially in Brazil, where the productions of the vegetable kingdom are very numerous and luxuriant, there are many varieties of grenadilla, if not distinct species, with which botanists do not appear to be very well acquainted; indeed, the forests and savannas of Brazil appear to offer the richest harvest for botanical research of any places now on the surface of the globe. Piso, in his 'Natural History of Brazil,' enumerates and gives figures of several sorts of grenadilla, under the name of Murucuja. One, he says, has five-lobed leaves and purple flowers, with oblong fruit, larger than any European pear, filled with a mucilaginous pulp, of a scent and flavour that nothing can exceed. Another has the same leaf and flavour, but fruit in the form and size of an apple, the pulp of which has a vinous flavour. There are many other sorts, but these are described as the best. The grenadillas generally, which are called *parchas* by the Spaniards, have a pleasant sweetish acid, with a fragrance something between that of a melon and a strawberry.

THE MANGO (*Mangifera indica*).—The mango, which grows abundantly in India, the south-eastern countries of Asia, Brazil, and some other places, is accounted one of the most delicious of the tropical fruits, and second only to the mangostan. The tree on which it is produced is large, with lancet-shaped leaves, bearing some resemblance to the walnut. The flowers are small and whitish, formed into pyramidal bunches; the fruit has some resemblance to a short, thick cucumber, and on the average of the varieties, of which there are many, about the size of a goose's egg. At first the fruit is of a fine green colour, and in some of the varieties it continues so, while

The Mango (*Mangifera indica*).

others become partly or wholly orange. When ripe, the mango emits a smell, which, though faint, is very pleasant; and the flavour of it is then as delicious as can be imagined. Externally there is a thin skin; and upon removing that, a pulp, which has some appearance of consistency, but which melts in the mouth with a cooling sweetness, that can hardly be imagined by those who have not tasted that choicest of nature's delicacies. In the heart of the pulp there is a pretty large stone, resembling that of a peach, to which the pulp adheres firmly.

The mangos of Asia are said to be superior both in size and flavour to those of America; and so highly are some of the finer trees prized in India, that guards are placed over them during the fruit season. The mangos of Mazagong, which are thus carefully watched, are thought to be superior to any other. The varieties of a fruit so much esteemed must be numerous,—accordingly it is reckoned that there are upwards of forty in the island of Java alone, while those of some of the islands farther to the east, such as Amboyna and Banda, are said to be still finer. The *Mango dodol* is the largest variety, the fruit weighing upwards of two pounds,—generally about the size of a middling shaddock. Some of the others, which make up the five principal heads into which Rumphius, in his 'Herbarium Amboinense,' arranges the whole, are of superior size and flavour; but the fruit, taken altogether, is one of the chief dainties of the vegetable world.

The mango is never brought from India to this country in any other state than the green fruit pickled, from which no idea of the flavour can be formed. The ripe fruit is very perishable; and when it begins to decay it is offensive, and tastes strongly like turpentine. It is not easy even to secure the vegetative power of the nut or kernel during the voyage from India, unless it be inclosed in wax; and the plants are with difficulty preserved as objects of curiosity.

In the Transactions of the Horticultural Society for 1826 there is an account of some mangos, raised by Earl Powis, at Walcot Hall, in Shropshire. "The mango," says Mr. Sabine, the secretary to the society, in his very able paper upon the subject, "is well known to all travellers who have visited the tropical parts of the world, as being by far the best fruit that is generally produced in those regions, and as that which is the most uniformly grateful to a European palate. In such climates, it is cultivated wherever the arts of civilization have penetrated: and it may there be said to hold the same station, among other fruits, as the apple possesses among those of northern regions. Like the apple, the number of varieties raised from the seed of the mango is also very great; and of these, while some possess the highest excellence, there are others in which the flesh of the fruit is so fibrous and ill-flavoured, as to resemble, as is commonly said, nothing so much as a mixture of 'tow and turpentine.'"

The MANGOSTAN (*Garcinia mangostana*).—The Mangostan, or Mangustin, is one of the most delicious

Mangostan.

fruits that grows; and the tree (*Garcinia mangostana*) on which it is produced is one of the most graceful and beautiful anywhere to be met with. It is a native of Sumatra, and also of the Molucca or Spice Islands, from which it has been transplanted in Java, and some other parts of the eastern Archipelago. The stem, which is of a variegated brownish-red colour, rises to the height of about twenty feet; the branches come out in regular order, and give the head of the tree the form of a parabola; and the leaves are entire, about eight inches long, and four broad at the middle, of a beautiful green on the upper side, and a fine olive on the under. The flower resembles that of a single rose, with some dark red petals. The fruit is round, about the size of an ordinary orange; and has a little cap on the extremity, under which it is platted into rays. The shell of the fruit, which is at first green, but changes to brown marked with yellow spots, has some resemblance to that of a pomegranate, but is thicker and softer, and the contents are more juicy. The pulp is divided internally by thin septa, like those in an orange, and the seeds are lodged in the divisions. The flavour of the pulp is said to be that of the finest grape and strawberry united; but those who have tasted the fruit in perfection, and attempted to convey to others some idea of the impression that it had made on them, are not agreed as to what it resembles. Abel says that "he and his companions were anxious to carry with them some precise expression of its flavour; but after satisfying themselves that it partook of the compound nature of the pine-apple and the peach, they were obliged to confess that it had many other equally good but utterly inexpressible flavours."

There are two other species of this tree. These are the Celebes mangostan (*Garcinia celebica*), and the horny mangostan (*Garcinia cornea*). The first is found wild in the words of Celebes, near Macassar, whence it has been transplanted to Amboyna, Java, and other places; but the fruit, which is rather larger than that of the true mangostan, does not always ripen. The corneous species is found in the high remote mountains of Amboyna: it is a lofty tree, though not of very great diameter. The fruit is so excellent as nearly to equal the true mangostan.. The wood is very hard, heavy, and tough, and of the colour of horn, from which latter circumstance the specific name is given to it.

The Durion (*Durio zibethinus*).—The durion, which is pretty generally diffused over the south-east of Asia, is accounted next to the mangostan; and, in the opinion of some, is superior to it. However excellent the taste may be, the durion is revolting to those unaccustomed to it; for it has a strong smell, which is said to arise from sulphuretted hydrogen. Yet this quality is soon forgotten, after the palate becomes familiar with it. Though of the most nutritious quality, and the most dainty taste, the durion never palls upon the appetite or injures the digestion; its effects are directly opposite.

The tree which produces the durion is about the size and sometimes in the form of a pear-tree; but the leaves are in shape like those of the cherry, only they are entire and smooth at the edges. The flowers are large, and of a yellowish white. The fruit is large,—in some of the species as large as a man's head; and, externally, it is not unlike the bread-fruit. It has a hard rind covered with warts and tubercles. When ripe, it becomes of a brownish yellow, and opens at the top. It

Durion.

must then be eaten fresh from the tree, as it putrifies in less than twenty-four hours.

Internally, the fruit contains five large longitudinal cells, in each of which are the seeds, about the sizes of pigeons' eggs, and from one to four in each cell. The remainder of the cells is filled with the pulp, which is the delicious part of the fruit. It is of the consistence of thick cream, of a milk-white colour, highly nutritious, and blending the flavour and qualities of a delicate animal substance with the cool acidity of a vegetable. This compound flavour is peculiarly its own, and cannot be imitated by any process of cookery. The Spanish *Mangia blanco*, pullets' flesh distilled with vinegar, is said to come the nearest to it.

The durion is a particular favourite with the natives of the Eastern Archipelago; and there are many varieties of it. They all, however, belong to three principal ones:—The *Borneo* durion is found in the island after which it is named. It grows to so great a size, that one fruit is a load for a man. The *Cassomba*, which has a smoother rind, is more orange in the colour, more elongated in the shape, and contains fewer seeds and more pulp. The *Babi* is a small, but very delicious sort. The kernels or seeds of the durion, when roasted, have nearly the same taste as chesnuts. It has not been found in a wild state; but in the countries where it will grow and ripen at all, it is easily cultivated. So highly is it esteemed, that it is the most costly fruit in the archipelago—a single durion being worth more than a dozen of the choicest pine-apples.

The *Lanseh* and the *Jamlee*, fruits of Sumatra, are esteemed most highly by the natives—the former next to the durion.

The MALAY APPLE (*Eugenia malaccensis*).—This, though an inferior fruit to the durion, is attractive by its fragrance—its smell being that of a rose. The Malay apple belongs to a numerous genus of plants, there being a great number of species very generally diffused over the tropical countries. The fruit of all the species is a fleshy rind, inclosing one or two large seeds. The Malay apple varies in size from about an inch in diameter to the bigness of a man's fist. The skin is yellowish,

Malay Apple.

thin, and shining; the nut large, and without any hard shell; and the pulp very wholesome and agreeable. The tree that produces it has a brown stem, about twenty feet high, very full of branches at the top; the young leaves are bright purple, and the old ones green.

Love-apple (*Solanum lycopersicum*).—The love-apple, or tomata, is a native of the tropical parts of South America, and belongs to the family Solaneæ; but as it now thrives well in the warmer countries of Europe, and will, if the plants are forwarded in a hotbed in the early part of the season, produce fruit with as much certainty in this country, upon a warm border, it may be considered as naturalized in the temperate regions. It is an annual: the leaves and flowers have some resemblance to those of the potato, only the latter are yellow. The fruit, when ripe, attains the size of a small apple. It is compressed at the crown and base, and furrowed along the sides; the whole is of uniform colour, and smooth and shining. There are some varieties both in the shape and colour of the fruit; bright red and orange are the prevailing colours. The love-apple is used for eating in every stage of its growth. When green it is pickled or preserved; when ripe, it is employed for soups and sauces, and the juice is made into a kind of ketchup. In this country, however, where the culture requires a good deal of care, except in favourable situations, the love-apple is not in very general use; but in warmer countries it is in much more esteem, so that in Italy whole fields are covered with it, and it is a general article at table.

Humboldt describes a species of the *Solanum*, which he conceives indigenous to the isle of Cura, and which is at present cultivated in many parts of South America. The fruit is round and small, but very savoury.

The *Egg-plant* belongs to the same family, has the same habits, and requires nearly the same culture as the love-apple. It is found in the warmer parts of Africa, Asia, and America: it is an annual; rises to the height of about two feet; bears light violet flowers, which are followed by large fleshy berries, having the size and shape, and, in the white varieties, very much the colour and resemblance of eggs,—whence the common name. The forms of the egg-plant are globe-shaped and oval; and some of both forms are white and others purple or mottled. The egg-plant, according to the 'Hortus Kewensis,' has been cultivated in England since the year 1596; but it has seldom been made use of as an article of cookery. Even on the Continent, where the temperature agrees better with its habits, it has not so much flavour as the love-apple; but still it is used in soups and stews, and also eaten sliced and fried with oil or butter. Though the young plants require to be forwarded in a hotbed, they may afterwards be made to produce fruit on warm and sheltered borders; and both they and the love-apple succeed best when placed against a sunny wall.

Besides the white egg-plant (*Solanum melongena*, Linnæus), which has been long cultivated as a curiosity, though never used as food, there are several others; and M. Dunal, in his History of Solanums, has separated the edible ones, of which he has enumerated four varieties, into the species of *Solanum esculentum*. The round and the long variety of the esculent are both cultivated in the garden of the Horticultural Society. The plants, which are annuals, are raised to the height of nine or ten inches in the stove, and then planted on the borders in the open air, where they grow to the height of between two and three feet. The fruits of both are large: the round, or rather oval (for that is its proper shape), is four inches long, and about three thick. This variety is called the Mammoth egg-plant. The long has larger fruit, measuring sometimes as much as eight inches in length. They vary much more in colour than the round,—some of them being streaked with yellow. Other varieties are described as being found in India; but the seeds that have been sent to this country have produced fruit similar to the kinds now mentioned.

Various species of the solanum are common in the Levant: and three are particularly described by Dr.

Walsh in the Horticultural Transactions. The following is the substance of his communication :—

Solanum Æthiopicum is the scarlet egg-plant, of which the fruit is produced in the neighbourhood of Constantinople; but it is rare, being never sold in the markets, and but seldom seen in private gardens. It is used as an ingredient in soups.

Solanum Sodomeum is a purple egg-plant, of which the fruit is large and handsome. A species of *cynips* often attacks and punctures the rind; upon which the whole fruit gangrenes, and is converted into a substance like ashes, while the outside is fair and beautiful. It is found on the borders of the Dead Sea, and is that apple the external beauty and the internal deception of which have been so celebrated in fabulous and so perplexing in true history.

> "Dead-Sea fruits, that tempt the eye,
> But turn to ashes on the lips."

The dreadful judgment of the cities of the plain, recorded in sacred history,—the desolation around the Dead Sea,—the extreme saltness of its waters, the bitumen, and, as is reported, the smoke that sometimes issued from its surface,—were all calculated for making it a fit locality for superstitious terrors; and among the rest were the celebrated apples which are mentioned by Josephus, the historian of the Jews, not as fabulous matters of which he had been told, but as real substances which he had seen with his own eyes. He says, they "have a fair colour, as if they were fit to be eaten; but if you pluck them with your hand, they vanish into smoke and ashes."

Milton, who collected all of history or fable that could heighten the effect of his poem, refers to those apples as adding new anguish to the fallen angels after they had been transformed into serpents, upon Satan's return from the temptation of man.

> ———————————— "There stood
> A grove hard by,

——— laden with fair fruit, like that
Which grew in Paradise, the bait of Eve,
Used by the Tempter: on that prospect strange
Their earnest eyes they fix'd, imagining,
For one forbidden tree, a multitude."

* * * * * *

"They, parched with scalding thirst, and hunger fierce,
——————— could not abstain;
But on they rolled in heaps, and up the trees
Climbing, sat thicker than the snaky locks
That curl'd Megæra: Greedily they pluck'd
The fruitage fair to sight, like that which grew
Near that bituminous lake where Sodom placed;
This more delusive, not the touch but taste
Deceives; they fondly thinking to allay
Their thirst with gust, instead of fruit
Chew'd bitter ashes, which the offended taste
With sputtering noise rejected."

Henry Teonge, a chaplain in the English fleet, whose Diary was, a few years since, published from the original manuscript, so well describes the real condition of the decayed *Solanum Sodomeum*, which he states that he saw in December, 1675, that no one can doubt that his notice was founded upon personal examination. "This country (that about the Dead Sea) is altogether unfruitful," says he, "being all over full of stones, which looke just like burnt syndurs. And on some *low shrubbs* there grow *small round things*, which are called apples, *but no witt like them.* They are somewhat fayre to looke at, but touch them and they moulder all to black ashes, like soote, boath for looks and smell." Though these are only the remarks of a popular observer, who told what he saw, without any view to a scientific purpose, the single addition of the attack of the plant by the insect, and the subsequent mortification and internal drying, would have made it just as perfect as the descriptions of the present day.

Pococke, who travelled more than fifty years after Teonge, did not see the apples; and though he did mention them, he pointed to a plant very different from the real one: "As for the fruits of Sodom, fair without and full of ashes within," says he, "*I saw nothing of them:* but from the testimony we have, something of the kind has been produced; but I imagine they may be pomegranates, which, having a tough, hard rind, and being left on the trees for two or three years, the inside may be dried to dust and the outside remain firm." Mariti, who visited those regions thirty years after Pococke, mentions that "No person could point out to me in the neighbourhood that species of fruit called the apples of Sodom, which, being fresh and of a beautiful colour in appearance, fall to dust as soon as they are touched." Hasselquist, however, not only found the apples, but the plant, referred it to the Linnæan species of *Solanum melongena*, and pointed out the cause of the disease; and though, in the more recent and accurate division of the genus *Solanum*, to which allusion has been made, the name of *Sodomeum* has been substituted for that of *melongena*, the fruit and the disease have been proved to be as Hasselquist stated.

Solanum melongena is more common in the markets of Constantinople than either of the former sorts, being almost as abundant as the gourd and the melon, and used for nearly the same purposes. There are several varieties of this solanum. The first appearance of the plant, it is said, is always attended with a north-east wind of some continuance; and therefore the ships for the Black Sea sail before this harbinger, or rather companion, of bad weather comes forth. This is probably one of the superstitions which in all countries attach to matters so uncertain as the weather.

The following fruits belong to the natural order Cucurbitaceæ, and are remarkable for the large quantity of water contained in their tissues. Some of the Cucurbitaceæ, as the Elaterium and Colocynth, secrete in their fruits an acrid principle which is more or less developed in those which are ordinarily taken as food. The melons and cucumber are generally uncooked, and are regarded iu this country as indigestible. This appears to result more from climate than the fruits themselves, as in countries where from the heat of the atmosphere a large demand is made by the system for fluid to supply the constant loss going on from the skin, there these fruits, containing large quantities of water, are easily digested. But where the demand for fluid is small, as in northern climates, these fruits are indigestible.

THE MELON (*Cucumis melo*).—The melon is the richest and most highly flavoured of all the fleshy fruits. It is often said to be a native of the central parts of Asia, and to have been first brought into Europe from Persia; but the date of its first culture is so remote, that there is no certain knowledge on the subject. Pliny and Columella describe the fondness of the Emperor Tiberius for melons, and detail the contrivances by which they were procured for him at all seasons. Stoves appear to have been used in this process; so that forcing-houses were not unknown to the Romans. The melon has certainly been generally cultivated in England since about the middle of the sixteenth century; how much earlier is not known. It is highly probable that those ecclesiastics who paid such attention to the other fruits grown in Italy and France, would not neglect one so delicious as the melon; and it is distinctly said by a writer on British Topography, Gough, that the cultivation of the melon in England preceded the wars of York and Lancaster, but that it was destroyed in the times of civil trouble that succeeded. It is probable, however, that the melon was confounded with the pumpkin by the earlier writers whom Gough consulted. While in France, and in England, melons are grown as an article of luxury, in some parts of the East they are used as a chief necessary of life. Niebuhr, the celebrated traveller, says, "Of pumpkins and melons, several sorts grow naturally in the woods, and serve for feeding camels; but the proper melons are planted in the fields, where a great variety of them is to be found, and in such abundance, that the Arabians of all ranks use them, for some part of the year, as their principal article of food. They afford a very agreeable liquor. When its fruit is nearly ripe, a hole is pierced into the pulp; this hole is then stopped with wax, and the melon left upon the stalk. Within a few days the

Gourds.

pulp is, in consequence of this process, converted into a delicious liquor." Mr. Southey has alluded to this circumstance in the following passage:

> Whither is gone the boy?
> He had pierced the melon's pulp,
> And clothed with wax the wound;
> And he had duly gone at morn
> And watched its ripening rind;
> And now all joyfully he brings
> The treasure, now matured." *

Although the melon is a very delicious fruit, it is not one of the most wholesome; more especially in cold climates, where, if eaten in any considerable quantity, it is apt to derange the stomach, unless corrected by warm and stimulating ingredients; and the same remark may be applied to the cucumber.

Small melons are, when equally ripe, more highly flavoured than large ones. In general, however, the fruit is chosen as much for show as for use, and thus the large ones are preferred. Indeed, in almost all the cultivated fruits and vegetables, quality is very apt to be sacrificed

* Thalaba, book ii.

to appearance ; as in the markets the articles are bought by the judgment of the eye, and not by that of the palate. To obtain the large size, a ranker manuring, and higher culture, must be resorted to than are altogether consistent with the natural development of the juices of the plant.

Of the melon there are many varieties, and the number of them is constantly increasing. The Cantaloupe is one of the best. It obtains its name from a seat belonging to the Pope, not far from Rome, where it was probably first cultivated in Europe, and whence it has spread into most countries. The Cantaloupe is of a middling size, nearly round in form, and remarkably rough and irregular in the surface. The colours, both of the surface and the flesh, vary,—the former from orange mottled with green, to green mottled with black ; and the latter from white, or nearly so, to orange tinged with rose colour. The flesh of some varieties is greenish, but these are inferior to the others. When melons of this sort are equally ripened, it may be considered as a general rule, that those which are darkest on the outside, most richly tinted in the flesh, and of a moderate size, have the most high and musky flavour.

There is also a small African or Egyptian melon, the flesh of which is green, of particular excellence. Frederick the Great was passionately fond of these melons ; and Zimmerman, who attended him in his last illness, finding him very ill from indigestion, discovered that he ate three or four of them daily for breakfast. On remonstrating with the king, the only answer that the physician could get, was, that the king would send him some of the fruit to taste the next day,—as if its excellence would be a sufficient apology for the habitual indiscretion.*

The Romana is also a fine melon ; and it ripens earlier than the Cantaloupe. The surface is often netted. It is of an oval shape, highly flavoured, and, when good, very heavy and solid.

* Zimmerman's Conversations with the King of Prussia.

The Salonica, which has been but recently introduced into this country, is a beautiful melon. It is spherical, smooth, and of a fine golden colour. The flesh is white, very sweet, and in consistency resembling the water-melon. The Salonica preserves its qualities though it is very large; and with good culture specimens may be had weighing seven or eight pounds.

The small Portugal is a very early and productive melon, but not remarkable for flavour. The rock-melons are thickly set with knobs; they are of various colours, and some of them of very fine flavour. The oblong ribbed is marked into segments from the roof to the crown; it is very productive; and the flavour is so high, that it is sometimes called, by way of eminence, the musk-melon.

The melons of Persia have long borne a high character. "Persia," says Malte-Brun, writing after Chardin, Olivier, and Langles, "is consoled for the occasional failure of her grain crop, by the fineness of her fruits. There are twenty sorts of melons—the finest in Khorassan. In Persia this fruit is extremely succulent, and contributes greatly to health: they are sometimes so large that three or four are a full load for a man." It was not till lately that the seeds of melons were received here direct from that country. In 1824, Mr. Willock, the Ambassador to the Court of Persia, sent a parcel of seed; and another parcel in the spring of 1826. An account of ten varieties of these melons, by Mr. Lindley, was read before the Horticultural Society in September, 1826; and the individual fruits referred to were the produce of the Society's garden that season.

The Persian melons are extremely rich and sweet; and instead of the thick rind of the common melons, they have a very thin and delicate skin, which makes a fruit of the same apparent size contain nearly twice as much edible matter. In addition to this, the melons are beautiful, and they bear abundantly; but they require a great deal of care. In the warm climate of Persia, the only attention which they ask from the cultivator, is to be regularly watered; and though the melons may be supplied with water artificially, the air, in their native country, is still very dry: this humid soil and dry atmosphere are, as Mr. Lindley remarks, very difficult to be obtained in this country. The covering which is requisite for confining the heat confines also the moisture raised by evaporation. It is further judiciously observed in this paper, that the supply of water should be at the roots, and not over the plant; and that the air should be kept warm by repeated changes of soil on the surface, and dry by abundant ventilation. Some of the melons, of which Mr. Willock furnished the seed, are ready for the table as soon as cut; and some are winter-melons, which must be kept for some months before they are eaten.

The Cucumber (*Cucumis sativa*).—The cucumber, like the melon, is an annual, and, being a native of warmer climates, it does not ripen in Britain, except in very favourable situations, without the protection either of a frame or a hand-glass.

In the East the cucumber has been very extensively cultivated from the earliest periods, as well as most of the other species of gourd. When the Israelites complained to Moses in the wilderness, comparing their old Egyptian luxuries with the manna upon which they were fed, they exclaimed, "We remember the fish which we did eat in Egypt freely,—the cucumbers and the melons." Hasselquist, in his Travels, states that these cooling fruits still form a great part of the food of the lower class of the people in Egypt, especially during the summer months; and that the water-melon in particular, which is cultivated in the alluvial soil left by the inundation of the Nile, serves them for meat, drink, and physic. The cucumber of Syria was cultivated in large open fields, in which a hut was erected for the abode of the watchman, who guarded the fruit against foxes and jackals. These fields, doubtless, were far away from the habitations of men; for Isaiah, speaking of the desolation of Judah, says, "The daughter of Zion is left as a cottage in a vineyard—as a lodge in a garden of cucumbers." In India beyond the Ganges, Bishop Heber saw a man in a small shed of bamboos and thatch, watching a field of cucumbers; and he was naturally interested in the circumstance, as being the same custom to which Isaiah alludes. He again observed a watcher of cucumbers, who lighted a fire during the night, to keep off the wild dogs and wolves from his fruit. On the west side of the Jordan, Burckhardt saw fields of cucumbers.

The cucumber has been known in England from the very earliest records of horticulture. Gough says, that it was common, like the melon, in the time of Edward III.; but being neglected and disused, became entirely forgotten till the reign of Henry VIII. It was not generally cultivated till about the middle of the seventeenth century. There are many varieties of cucumbers.

Some cucumbers are cultivated for their fantastic shapes, of which the *Snake* is remarkable for its great length and small diameter; but it is of no value except for show.

GOURDS (*Cucurbita*).—Of the gourd there are many varieties, some of them of beautiful form and colour, and others of an immense size. In England, however, they are cultivated more as matters of curiosity than for food. One sort, the Pumpkin (*Cucurbita pepo*), is occasionally eaten, but always in a baked state, and combined with other substances of higher flavour. In warm situations, and when highly manured, it grows luxuriantly in the open air; and villagers sometimes grow it, and, when ripe, convert it into a sort of pie, by cutting a hole in the side, extracting the seeds and filaments, stuffing the cavity with apples and spices, and baking the whole. The pumpkin seems to have been earlier introduced into general culture than either the cucumber or the melon: the pumpkin is, in fact, the melon of the old English writers, the true melon being then styled the musk-melon. The pumpkin or gourd enters more into the cookery of the southern nations on the Continent, than into those of Britain.

The Squash (*Cucurbita melopepo*) is little cultivated or eaten in this country, though it is often used in the southern parts of Europe and in North America. It is said to be a native of the Levant, but probably it is found in many other places. It is better adapted for boiling or stewing, in a green state, than any other gourd. At Versailles the people esteem it so much for this purpose, that they call it a "*livre de beurre*." The orange-fruited gourd (*Cucurbita aurantia*) is a native of the East Indies. It is a very handsome variety, but cultivated only as a curiosity. The calabash, or bottle-gourd (*Cucurbita lagenaria*), is similar to the other in quality, and gets its trivial name* as well from its forms, as from the use to which the hard and tough rind is applied. It is a native both of the East and West Indies; and the humbler inhabitants employ these gourds as ready-made bowls and other vessels. In some parts of the East gourds are sufficiently large to support a man in the water, who floats upon a cross-bar fastened to the top of two of vast dimensions.

Vegetable Marrow (*Cucurbita succada*) is a very important gourd; and though it has been but lately introduced into this country, it is already cultivated to a considerable extent. It is straw coloured, of an oval or elongated shape, and when full grown attains the length of about nine inches. When very young, it eats well fried in butter; when half grown, it may be cooked in a variety of ways, and is peculiarly soft and rich, having an oily and almost an animal flavour; when fully matured, it may be made into pies, for which purpose it is much superior to any of the other gonrds. But it is in the intermediate or half-grown state only, that it deserves its common appellation of vegetable marrow. The vegetable marrow gourd is a native of Persia; but if the soil on which it is placed be rich and warm enough, it thrives very well with us in the open air.

"I have been able," says Mr. Sabine, "to obtain but very imperfect accounts of the origin of this gourd. It was certainly new in this country within a few years; and I

* *Trivial* is a term used by botanists for a name descriptive of the species only—as distinguished from other names which point out a genus.

think the most probable account, of the many that I have heard, of its introduction, is, that the first seeds were brought here in one of our East India ships, and came probably from Persia, where, as I am told, it is known, and called Cicader. Its cultivation is easy." If any other kind of gourd grow in the neighbourhood, no reliance can be placed on the goodness of the seed of the vegetable marrow.

The Water-melon (*Cucurbita Citrullus*), though not much cultivated in this country, is one of the most valuable vegetables in warm and arid climates, answering there both for food and drink. The fruit is large, the flesh sweet and succulent, and the juice delightfully cool. Hasselquist, however, recommends caution in the use of this gourd, "for," says he, "it chilled my stomach like a bit of ice."* It is a native of the south of Europe, of Egypt and the Levant, and of South America. In the peninsula of Araya, where sometimes rain does not fall for fifteen months, water-melons weighing from fifty to seventy pounds are not uncommon.† It was introduced into England about the same time with the common melon.

* Travels in the Levant, p. 257, 8vo.

† Humboldt, Voyages, liv. iii., chap. viii.

CHAPTER XXV.

OXALIC ACID, RHUBARB, AND SORREL.

Oxalic acid, although a poison when taken pure in large quantities, is found combined with potassa in many plants, in the form of a super-salt, and gives to them a pleasant acidity. In this state it may be used with impunity. One of these plants is the Rhubarb (*Rheum*), which belongs to the natural order Polygonaceæ.

The petioles of the rhubarb contain the largest quantity of acid; these, when peeled and cut into pieces, form no unworthy substitute for fruit in spring tarts; to furnish a supply for which this plant is now largely cultivated in the vicinity of the metropolis.

Several species of *Rheum* are cultivated in England. The root of the true Rhubarb (*Rheum palmatum*) is well known as a medicinal drug, and for that purpose has long been imported from the Levant, though the particular plant of which it was the root was not ascertained until 1758, when it was first introduced and cultivated in this country by Dr. John Hope.* It is a native of some parts of Tartary, where the physical characters of the climate are well adapted for the perfecting of its root, the properties of which are very faintly retained in countries where the season of dormant vegetation is humid. This plant is of very handsome appearance. Its beautiful palmate leaves distinguish it from the other species; but as the parts used for culinary purposes, the footstalks of the radical leaves, are much smaller than those of the other kinds, it is not in general cultivation.

Monk Rhubarb (*Rheum rhaponticum*) is also a native

* Phil. Trans., vol. lv.

Rhubarb (*Rheum palmatum*).

of Asia, but of what particular part is not known, neither is the time of its introduction ascertained; we find it mentioned by Tusser so early as 1573, as being then cultivated in England.

The leaves of this species are blunt and smooth, with red veins; the footstalks have also a red tinge, they have a groove or furrow on their upper sides, and are rounded at the edges.

The HYBRID RHUBARB (*Rheum hybridum*) is a native of more northern parts of Asia than the others, and is of more recent introduction into Britain. It was first cultivated in this country by Dr. Fothergill in 1778, but it did not come into general use as a culinary vegetable till several years after, having been introduced in our kitchen-gardens for this purpose about thirty years back. This plant is of a much more lively green than the former species. The leaves are slightly heart-shaped and very large, being, in favourable soils and under good culture, sometimes as much as four feet in length, including the footstalk. In the 'Gardener's Magazine' for February, 1829, we find a notice of a plant of this species, the leaves of which attained to great dimensions. One leaf being cut, with its petiole, was found to weigh four pounds. The circumference of the leaf, not including its footstalk, measured twenty-one feet three inches; its diameter, three feet ten inches; length of leaf, including the petiole, five feet two inches; and length of petiole, one foot four inches. The stalks of the hybrid are much more succulent, as well as larger, than those of the Monk Rhubarb, which, therefore, cause it to be the preferable species for cultivation, although *Rheum undulatum*, called by gardeners Buck's Rhubarb, and the Elford Rhubarb, has been found the finest in flavour.

Rhubarb is very easily cultivated, and though it occupies much space, the produce, under proper treatment, is very considerable. The petioles obtained from it will furnish a greater supply of material for tarts than the fruit of either apple or gooseberry trees occupying an equal breadth of ground. It may, therefore, be considered as a good plant for the cottage-garden, more especially as it comes into productive bearing in the earliest spring, a time when fresh fruit cannot be obtained.

Now plantations may be raised either by sowing the seeds or parting the roots. The latter is not, however, an eligible mode of culture. As in most cultivated plants, the produce of a sucker is, when it has to make its own root, always inferior in vegetative power to that which is originally from the seed—and vigorous vegetation is the quality most sought for in rhubarb—the flowering stems should be removed, except in such plants as may be wanted for seed. If the seeds are sown in spring, the plants will be ready for planting out in autumn, and will come up strong enough for use the next spring, after which the plantation will last for many years. The plants of the hybrid kind require from two feet and a half to three feet of space for each, and those of the other species about a foot less: but the superior produce of the former, under favourable circumstances, will more than compensate for the greater breadth required.

The common Wood-Sorrel (*Oxalis acetosella*) contains in its leaves super-oxalate of potassa, and it was from this plant that the acid which it contains was called oxalic acid. This plant is also known by the names of wood-sour trefoil, stubwort, allelujah, cuckoo's-meat, and *sorrel de bois.*

The whole plant has a grateful acid taste, more grateful than the common sorrel, and therefore more fit to be used in salads. It is not, however, much used for this purpose in this country at the present day. Before the discovery of the nature of oxalic acid by Scheele, chemists were in the habit of separating the super-oxalate of potash from this plant, and it was sold in the shops under the names of salts of lemon and salts of sorrel. It was used for taking spots out of linen, and other purposes for which oxalic acid is used at the present day. The wood-sorrel was at one time used in medicine, and found a place in our Pharmacopœias; but it is only used popularly at the present day. The genus Oxalis contains upwards of two hundred and twenty species, most of which also possess oxalic acid.

The common sorrel (*Rumex acetosa*) belonging to the same natural order of plants as the rhubarb, also contains oxalic acid in union with potassa. On this account it is frequently employed as a salad. It has also been employed, as well as the wood-sorrel, for the purpose of procuring the super-oxalate of potash, which is sold under the name of salts of sorrel.

CHAPTER XXVI.

VOLATILE OILS—ALLIACEOUS PLANTS.

VOLATILE oils are distinguished from fixed oils by the readiness with which they are vaporised under the influence of heat. It is to these oils, or compounds closely resembling them, that the vegetable kingdom is indebted for its various scents and perfumes. The action of volatile oils also on the system is very different from that of the fixed oils. Whilst the latter enter directly into the system, through the medium of digestion, and may be taken in large quantities, the former act immediately on the nervous system, and would be destructive of life if taken in large doses. The effect of the volatile oils upon the nervous system is stimulant; and it is for this purpose that they seem to be coveted by man and lower animals as a part of their food. Through the medium of the nervous system they are indirectly excitants of the circulation and the secretions, so that according to their various peculiarities are they adapted to the peculiar wants of the system. Some are general stimulants; others act upon the mouth, fauces, and salivary glands; others on the stomach, liver, and bowels; others again on the kidneys, and so on. They may be divided into several classes, according as they come from one part of the vegetable kingdom or another, or as they are used in food.

First group, *Alliaceous Plants.*—These plants consist of bulbs, belonging to the natural order *Asphodeleæ*, so called from the asphodel, which, though not a native of Britain, is cultivated as an ornament to our gardens.

A bulb differs from a root in being an underground bud, which defends the embryo or future shoot from external injuries during the winter; and which is always made up of parts which are ultimately to be developed in the atmosphere. Whatever may be their form and structure, or whether they grow in the earth or above the surface, they are, in reality, stalks or leaves, generally the latter.

Bulbs are not very nourishing; yet though most of those under present notice have an odour that is far from agreeable, their pungency and supposed sanative qualities render them general favourites, especially among the humbler classes. The rustic inhabitant of the northern parts of Britain looks upon the onion as his chief vegetable dainty; and on some parts of the Continent, the garlic, which is rather too strong in flavour for the people of this country, is as much esteemed, being eaten by the poor as almost the sole addition to their black bread, and entering into many of the made dishes of the rich.

The ONION (*Allium Cepa*).—The use of the onion has been so long known in this country, that whence and at what period it was obtained cannot now be ascertained. It is not supposed that any variety of it is indigenous, since the large and mild roots which are imported from warmer climates deteriorate both in size and sweetness after having been cultivated a few years in this climate. The onion called the Strasbourg, and the varieties which have been obtained from it in this country, appear to be the most naturalized, as they are the hardiest which are grown. It is, therefore, probable that this plant was first introduced into England from the central parts of continental Europe; although it may have been originally the native of countries farther to the south, and have been rendered hardier and less prone to degenerate from its gradual change of climate.

The onions of Spain and Portugal, and even those of the south of France, are very superior to the common onion of our gardens, being of a much larger size, and more mild and succulent. These sorts, however, will not bear the colder climate of this country without degenerating, while their seed seldom comes to maturity in Britain.

Though the history of the onion can be but imperfectly traced in Europe, there is no doubt as to its great antiquity in Africa, since there is evidence to show that this bulb was known and much esteemed in Egypt 2000 years before Christ. It still forms a favourite addition to the food of the Egyptians. Hasselquist, in a panegyric on the exquisite flavour of the Egyptian onion, remarks, that it is no wonder the Israelites, after they had quitted their place of bondage, should have regretted the loss of this delicacy; for whoever has tasted of the onions of Egypt must acknowledge that none can be better in any part of the universe. "There," says he, "they are mild and pleasant to the palate; in other countries they are strong and nauseous. There they are soft and yielding, but in countries to the north they are hard, and their coats so compact as to render them less easy of digestion." The Egyptians divide them into four parts, and eat them roasted together with pieces of meat; which preparation they consider so delicious, that they devoutly wish it may form one of the viands of Paradise. A soup made of these onions was pronounced by the learned traveller to be certainly one of the best dishes of which he ever partook.

This predilection for the savoury bulb extends in Africa, beyond the country of the Nile. Major Denham, in his route south from Bornou, observed numerous gardens, but the only vegetable produced in them appeared to be onions.

This plant is a biennial, having long tubulated leaves, a swelling, pithy stalk, thicker in the middle than at either of the ends, and a large spherical head of flowers, which expand the second summer after sowing. The bulb, tunicated or formed of concentric coats; this varies in size materially, according to the variety, soil, and mode of cultivation. It seems to be a general law among this species of roots, that the small are more pungent than the large,—that those which have a tinge of red or purple are more pungent than those which are white,—and that those which have the rind or outer membranous tunic upon the bulb thin and transparent are always of milder flavour than those which have it thick. It would be unprofitable as well as uninteresting to attempt an enumeration of the varieties of onions; and, even though it should be made complete at the present time, new varieties are so constantly springing up, that it would not long remain a correct list. Nearly twenty different kinds are recommended as being worthy of garden culture.

A rich mellow ground, on a dry subsoil, is the most favourable to the growth of this plant. It is propagated by seed sown broad-cast in spring; the quantity of seed being regulated according to the destination of the onions, whether they are to be drawn young or to remain for bulbing. The plants begin to bulb in June, increasing in growth till the middle of August, when the necks shrink and the leaves decay: they are then in a fit state to be drawn, and preserved for the winter store.

A method of improving the size of onions by transplanting them was recommended by Worlidge, so early as the beginning of the seventeenth century, in his 'Systema Horticulturæ;' and this practice has lately been revived with great success by some eminent horticulturists.

The theory on which it is founded is extremely ingenious. Every plant which lives longer than one year, generates the sap or vegetable blood which will elaborate the leaves and roots of the succeeding spring. In bulbous plants this reserved sap is deposited in the bulb, which, in a great measure, it composes. Now the store which is thus formed varies considerably in the same species of plant, according to the particular circumstances under which it is raised. Thus the onion in the south of Europe accumulates a much greater quantity in a single season, under a greater degree, and longer duration of heat, than is afforded by our colder climates, and therefore it acquires, in a given time, a much larger size. Mr. Knight was induced by these observations to suppose that two short and variable summers in England might, perhaps, be equal in effect to one long and bright season in Portugal; and, accordingly, he attempted a method of culture which has proved his inference to be correct. In pursuance of this plan seeds of the Portugal onion were sown in spring very thickly, on a poor soil, and in a shady situation. Under these circumstances, the bulb in the autumn had attained scarcely beyond the size of a large pea. The bulbs were then taken from the ground and preserved during the winter; in the ensuing spring they were again planted at equal distances: from this treatment the plants afforded bulbs very superior to those raised immediately from seed, some exceeding five inches in diameter; and being more matured, they may be preserved sound throughout the winter with greater certainty than those which are raised from seed in a single season.* Many other cultivators pursue, with some slight alterations, the same method, and find it perfectly successful.

It is found that in those countries in which the onion comes to the greatest perfection, the practice of transplanting it prevails.

In Portugal it is sown in November and December on a moderate hotbed, and protected from the frost, in which situation the plants remain till April or May, when they are transplanted to a rich soil.†

Onions are considered wholesome under any form; but they become more succulent and mild after having undergone culinary preparation.

The Welsh Onion, or Ciboule (*Allium fistulosum*), is originally from Siberia. It is a hardy plant, and strong in flavour, approaching more nearly to garlic than onion. This species does not form a bulb. The cultivation of the ciboule has been known in England since the early part of the seventeenth century; how much earlier, there are now no means of knowing. It is much less cultivated in the present day than it was in former times, when broths and pottages, seasoned with the green tops of the onion tube, were more in fashion. It

* Hort. Trans., vol. iv. † Ibid., vol. iii.

is now only occasionally raised for a spring crop. For this purpose the seed is sown at the end of July or August; in a fortnight the plants usually appear above ground; but in October their leaves wither, and the ground appears quite bare. In the beginning of the ensuing year, however, they become renovated, and in March are fit for drawing to be used as onions. The SCALIEN is another name given to long-necked onions, which produce leaves abundantly, but do not bulb.

Tree-Onion (*Allium proliferum*).

The TREE or BULB-BEARING ONION (*Allium Cepa*, var. *viviparum*) is a singular variety, which has probably been produced by climate. It runs with a strong stem, about two feet in height, on the top of which the flowers are produced in a manner similar to the rest of the species; but instead of being succeeded by capsules containing seeds, the germs swell, and towards the end of the season a crop of bulbs is obtained from the top of the stalk, and which, in a natural state, as soon as they drop off and fall to the ground, begin to put out roots and vegetate. This variety is more an object of curiosity than of use, though we learn that in some parts of Wales these bulbs are planted, and produce ground-onions of a considerable size, while the stem supplies a succession of bulbs for the next year's planting.*

This variety is said to have been introduced here from Canada; the French call it *l'ognon d'Egypte;* there is no proof, however, of its being a native of the country which its name would indicate, while the probability is greatly to the contrary. It is not in such a climate, but in cold and wet countries, that seminal plants are changed to viviparous. The same species of grass which has perfect seeds upon warm and dry grounds, bears little plants in the spike when grown upon the cold and humid mountain top; and the corn, which in a dry season remains firm and without any signs of vegetation in the grain, sprouts in the ear, and becomes green and matted in the shock, when the weather is rainy; this effect being produced much more frequently in the northern parts of the country than in the south. It is by no means improbable that in the humid atmosphere of the Hebrides both grain and pulse would become viviparous, if they were not taken to the barn and dried by artificial means. By analogy drawn from facts it is therefore probable that the tree-onion is not only from Canada, but that it is not indigenous there, being merely the common onion introduced from France by the colonists, and changed to the viviparous form by the climate.

The Ground or Potato Onion is another curious variety. This multiplies itself in an opposite direction to that of the tree-onion, producing, by the formation of young bulbs on the parent root, an ample crop below the surface. This plant has also been described as being a native of Egypt, or at least as having been brought from that country by the British army in the early part of the present century. It must be admitted that a plant which bears an additional number of bulbs is more likely

* Hort. Trans., vol. iii.

to be a native of a dry and warm climate than a plant which is viviparous. The time of the introduction of the potato-onion has, however, been erroneously assigned, since it was known and cultivated in the south and west of England some years prior to the Egyptian expedition. If it be a native of Egypt, or of any other warm country, it is, indeed, a hardy one, since it bears the alteration of the seasons, and resists the attacks of insects much better, it is said, than the common onion.

The bulbs are planted in the middle of winter; as the tops appear they are usually earthed up like potatoes, and by the middle of summer the new crop is ready for removing. The size and number of the new bulbs depend very much on the size of those which have been planted, but they always yield a proportionately large produce.

The CHIVE (*Allium schœnoprasum*) is the smallest, though one of the finest flavoured of the genus. It is a hardy perennial plant, an inhabitant of Siberia, and said to be a native of Britain, though rarely found growing in an uncultivated state. The bulbs are very small, connected in clusters of an elongated form, and the leaves are long, slender, and pointed. The flowering stem, when it is allowed to rise, is slightly curved and seldom attains to more than a few inches in height: the flowers are white, [with a purple tinge; they grow crowded together, and are, even in the most cold and moist situations, followed by capsules and seeds. When cultivated, the plants are, however, seldom allowed to run to seed, as they are not usually drawn to be eaten entire, but have the leaves and young tops cut off to be used as a potherb. Chives are very hardy, and require no attention during their growth except to keep them free from weeds; they are propagated by slips, or by dividing the roots in the spring or autumn.

When the leaves are gathered for use, if they are cut close, others will shoot up in succession, and in this manner a bed lasts three or four years; after which period it must be renewed. When fresh cut, these leaves are by some persons considered as an improvement to salads and seasonings. Their flavour suffers greatly if they be kept after gathering even for a very short time, and their produce is but small in proportion to the labour of gathering. On these accounts they are not much cultivated in places where vegetables are supplied in the markets; and they seldom find a place in the garden of the English peasant, who, partly from ignorance, and partly from prejudice, does not live much upon those soups and savoury dishes which, while they are more wholesome and nourishing than the food which he consumes, are also considerably cheaper.

The LEEK (*Allium porrum*) is said to be indigenous to Switzerland, whence it was introduced into this country; but it has been for so many ages under cultivation, that its native place cannot, perhaps, be very accurately traced. According to translators and commentators, this, as well as the onion and garlic, was included among the Egyptian luxuries after which the Israelites pined. It still makes its constant appearance at the tables of the Egyptians, who eat it chopped small as a savoury accompaniment to meat.

The exact period when the leek was first brought into this country is not known, but it is mentioned by Tusser, in his 'Five Hundred Points of Good Husbandry,' as early as 1562. There is, however, every reason for believing that it was introduced prior to that time, and had long been the favourite badge of the Welsh principality. Shakspere makes this to have arisen at the time of the battle of Cressy. In the play of Henry V., Fluellin, addressing the King, observes:—

"Your grandfather of famous memory, an't please your Majesty, and your great uncle Edward the Plack Prince of Wales, as I have read in the chronicles, fought a most prave pattle here in France.

"*King Henry.* They did, Fluellin.

"*Fluellin.* Your Majesty says very true: if your Majesties is remembered of it, the Welchmen did goot service in a garden where leeks did grow, wearing leeks in their Monmouth caps, which your Majesty knows to this hour is an honourable badge of the service; and I do believe your

Majesty takes no scorn to wear the leek upon Saint Tavy's day."—*Act* 4, *Scene* 7.

Worlidge gives a good idea of the love of the Welsh for these kinds of odoriferous vegetables. He says, "I have seen the greater part of a garden there stored with leeks, and part of the remainder with onions and garlic."

The hardiness and pungency of the leek both tend to recommend it in those countries where few potherbs are grown, and it seems to have great facility in adapting itself to climate. The leek which is cultivated in the colder parts of Scotland, and thence is called the Scotch leek, is more hardy and also more pungent than the broad-leaved variety, chiefly cultivated in England. It was formerly a very favourite ingredient in the "cock-a-leekie" of the Scotch, which is so graphically described in 'The Fortunes of Nigel;' and of which James the First is reported to have been so fond that he retained his preference for it notwithstanding all the dainties of London cookery.

This species requires more boiling than others of the same genus, and, unless it be reduced to nearly a pulp, it taints the breath in a very offensive manner. The offensive odour of a vegetable is, however, no evidence of unwholesomeness, provided the odour is natural to it, and not the result of putrefaction.*

The bulb of the leek consists of the bottoms of the leaves, which do not form in bulbules or cloves like those of the garlic, neither are they so entire as the tunics of the onion; the stem runs to the height of about three feet; the flowers, which are bell-shaped, appear in May, in large close balls, followed by capsules containing seeds. As the root of the leek is rather the blanched end of the leaves than a bulb, properly so called, the plant is to be considered chiefly as a potherb; though in some places both the root and the greater part of the leaves are eaten by the peasantry as an accompaniment to their bread. Its chief value, however, is as a potherb, which stands the winter well, and is in a forward and

* See the account of the Durion, p. 164.

succulent state at that part of the season when fresh vegetables are the least abundant. The culture of the leek is similar to that of the onion.

Garlic (*Allium sativum*).

Garlic (*Allium sativum*) is the species from which the genus takes its name. It is very extensively used in most of the Continental states. This plant was first cultivated in England in 1548, and was held in greater repute by our ancestors than is in accordance with modern English taste. It is a native of the countries on the shores of the Mediterranean, and is still to be found growing wild in the island of Sicily and in the south of France. Though thriving best on a naturally rich and dry soil, garlic is a very hardy plant, and not very particular as to climate. Its leaves are linear, long, and narrow; the root is perennial, composed of twelve or fifteen lesser bulbs, enclosed in one common membranous tunic, and easily separable from one another; these are called *cloves* of garlic, and are the only parts used. The whole plant, and especially the cloves, has a most acrimonious taste and offensive smell; and even in those countries where it is most in favour it is seldom eaten in substance, or even mixed in substance in those culinary preparations which it is intended to flavour. The garlic is generally only introduced during the cooking, for a time longer or shorter according to the intenseness of the flavour required, and is then withdrawn. This plant is readily propagated by the cloves or subdivisions of the bulbs which, if put into the ground in March, produce a crop in July or August.

Several species of garlic are found growing naturally in various countries. The wild garlic of Kamtchatka (*Allium ursinum*) is much prized by the inhabitants, both as a medicine and as an auxiliary article of food. The Russians, as well as the natives, gather it in large quantities for winter use. After being steeped in water, it is mixed with cabbage, onions, and other ingredients, the whole forming a ragout, which is eaten cold. This plant is there considered as almost a specific against the scurvy, no sooner lifting its head above the snow than the dreadful disease loses all its horrors; as even in its worst stages a cure is produced by the plentiful use of the wild garlic.

Three species, the sand-garlic, the crow-garlic, and the leek-garlic, are found native in some parts of Britain; but they are of little or no value, and have never been introduced into culture.

The SHALLOT (*Allium ascalonium*) is a native of warmer climates than that of England; it is found growing wild in many parts of Syria, especially near Ascalon, whence it derives its name. The time of its introduction into this country is not known; some writers assume that it was brought home by the Crusaders. It is mentioned as a well-known plant by Turner, in his 'Signes of Herbes,' published in 1548. This plant resembles the true garlic in having its roots divided into cloves or smaller roots, and enclosed in a thin membrane. Each of these small roots sends forth two or three fistular awl-shaped leaves, issuing from a sheath; they are nearly similar, but not so large as those of the onion. The shallot does not in all situations produce perfect seeds, or even flowers, and sometimes, indeed, does not send up any footstalk. The want of seed is, however, fully compensated by the multiplication of the roots. It is sufficiently hardy to bear uninjured the severest winters of England, but it is liable sometimes to be attacked by insects. This evil is found to be surely prevented when the bulbs are planted rather above the surface, instead of being buried in the earth; and this improved mode of culture has a further advantage of bettering the quality and increasing the quantity of the crop obtained.

The flavour of the shallot is much more pungent than that of garlic, but not nearly so rank. It seasons soups and made-dishes, and makes a good addition in sauces, salads, and pickles.

Rocambole (*Allium scorodoprasum*) is a native of the northern parts of Europe, and is found in situations which are rather elevated. It has been cultivated in this country, though not very extensively, from a period much anterior to any annals of horticulture; the earliest records on this subject mention it as being a plant in common cultivation. It is a perennial, having narrow flat leaves, with the mark of a keel or ridge on the under sides. The flower-stem rises to the height of about two feet; the globular head, on its first appearance, is contorted. As the plant advances, however, the head untwists, and the flowers come to maturity; after which the spherical top changes into a cluster of small bulbules, which have a tinge of purple. The cloves of the rocambole, taken either from the root or the top of the flowering stalk, are the parts used; the latter being the largest in size; but those from the roots have the most pungency, especially when the whole of the bulb is buried in the earth.

Rocambole holds an intermediate place between garlic and shallot, and is applied to the same purpose as the latter.

CHAPTER XXVII.

SPICES, SEASONING HERBS AND PEPPERS, LETTUCE, ETC.

SPICES.—The plants which produce the more esteemed of these are all natives of tropical climates; and with the exception of some of the capsicums, none of them can be fruited in the open air in this country, nor can the choicer sorts be brought to maturity even by artificial heat. These substances are either simply hot and acrid, in which case they get the name of peppers, or they have aromatic flavour in addition; and when they have this, they are called spices,—though, in some cases, the names are applied indiscriminately to the same substance.

Spices have always been regarded as luxurious acquisitions, while their small comparative bulk, and consequent facility of transport, caused them to be among the first articles of commerce obtained from remote countries. The inhabitant of more temperate regions has therefore, for ages, been in the enjoyment of most of the delicious aromatics fostered by a tropical sun.

The higher classes of the Romans used spices in more costly profuseness than the moderns, though the better knowledge of navigation, by producing a direct and frequent intercourse between nations, has now caused them to be sufficiently cheap to place them within the reach of all ranks of society.

Among the ancients, spices of all kinds, as well as frankincense and myrrh, were made to lend their perfume to the wreathed smoke which ascended both from the altars of their gods and the funereal piles of their nobles. Prodigious quantities of frankincense and spices were thus consumed at the funeral of Sylla; and Nero is said to have lavished more than a whole year's supply in celebrating the obsequies of his wife Poppæa. The country of the Sabeans, situated in Arabia Felix, was celebrated for the abundance of these aromatic plants. "Among this people," says Pliny, "no other kinds of wood but those which sent forth sweet odour were used as fuel, and they cooked their food with the branches of trees yielding frankincense and myrrh."* The very ocean, it was said, was perfumed with the fragrance of their spices and aromatics. Agatharchidas, an ancient author, who wrote about two thousand years ago, gave a glowing description of this country. It is probable that his panegyric suggested to Milton the following simile :—

"As when to them who sail
Beyond the Cape of Hope, and now are past
Mozambic, off at sea north-east winds blow
Sabean odours from the spicy shore
Of Araby the Blest: with such delay
Well pleased they slack their course, and many a league
Cheered with the grateful smell, old Ocean smiles."

Although the ancient writers all agree that Arabia Felix has thus obtained its name from its odour-breathing plants, it is probable that their accounts are mostly fabulous, and that being but imperfectly acquainted with the regions beyond, they concluded that the country whence they procured their spicy luxuries must, of necessity, be the country of production. The spices which Queen Sheba presented to Solomon† were not known in Jerusalem, and were probably obtained from Ceylon, or the islands still farther to the east. It is, however, most certain, that, with but one or two exceptions, those of familiar use among the moderns were all originally derived from these latter countries.

CINNAMON (*Laurus Cinnamomum*) is said to be indigenous only to the island of Ceylon, and even there confined to a small district in the south-western part of

* Pliny, lib. xii. cap. 18. Tacitus, Ann., lib. xvi. cap. 6.
† 2 Chron. xi. 9.

True Cinnamon (*Laurus cinnamomum*).

that island. There are, however, doubts whether the inferior sorts, found in other places, known by the name of Cassia, and considered by botanists as a distinct species (*Laurus Cassia*), be not the very same tree, deteriorated by being produced on a soil and in a climate less adapted for the development of its finer qualities. Whether it be cinnamon or cassia, the bark of the tree, freed from the external part, forms the spice.

Although ever since the Dutch first had a settlement in Ceylon, cinnamon was made by them a lucrative article of trade, and one which they strove by every means wholly to monopolize, this tree was not made by them an object of cultivation in Ceylon until 1766.

Before that period cinnamon was collected in the forests and jungles, since an idea prevailed that its excellence depended on its spontaneous growth, and that if once subjected to culture it would no longer be genuine.

When Falk was appointed Governor of Ceylon, he felt the inconvenience of depending for a regular supply on such a resource, the more especially as the greater part of the cinnamon-trees lay in the dominions of the king of Candy, who frequently, with or without apparent reason, refused the cinnamon-peelers admission into his dominions, and the Dutch were, in consequence, often restricted to less than half their required annual exports.

Governor Falk, in his attempt to remedy this evil, by cultivating the cinnamon-tree in the territory belonging to the Dutch, was discouraged by the prejudices of the natives, and discountenanced by the parsimony of the Supreme Government of Batavia. It was said, "For one hundred and fifty years Ceylon had supplied the requisite quantity of cinnamon, the expense of which was ascertained and limited: why then risk the success of a new plan, attended with extraordinary charges?" This public-spirited governor nevertheless persevered in his undertaking; and to his success the English owe the flourishing state in which they found the cinnamon plantations of Ceylon, when they captured that island. This tree is now cultivated in four or five very large gardens, the extent of which may in some measure be imagined by the quantity of cinnamon annually exported thence, amounting to more than 400,000 lbs.; and from the number of people who are employed in the cinnamon department, these being from twenty-five to twenty-six thousand persons.*

The trade in this produce had always been a monopoly; during the government of the Dutch this was enforced with an excessive degree of rigour, at which humanity revolts. It is painful to contemplate man, when greediness for exclusive gains, the meanest of all motives, incites him to acts of oppression and tyranny.

* Trans. of the Royal Asiatic Society, vol. i.

"The selling or giving away the smallest quantity of cinnamon (even were it but a single stick), the exporting of it, the peeling of the bark, extracting the oil either from that or the leaves, or the camphor from the roots, except by the servants of the government, and by their order, as well as the wilful injuring of a cinnamon-plant, were all made crimes, punishable with death, both on the persons committing them, and upon every servant of government who should connive at it."*

In order to keep up the price of the spices, the Dutch government was formerly accustomed to have these destroyed, when supposed to be accumulated in too large quantities. Sometimes, it was said, this Oriental produce was thrown into the sea, and sometimes the work of destruction was accomplished by other means. M. Beaumare relates, that on the 10th June, 1760, he beheld, near the Admiralty at Amsterdam, a blazing pile of these aromatics, which were valued at eight millions of livres, and an equal quantity was to be burnt on the ensuing day. The air was perfumed with this incense, the essential oils, freed from their confinement, distilled over, mixing in one spicy stream, which flowed at the feet of the spectators; but no person was suffered to collect any of this, nor on pain of heavy punishment to rescue the smallest quantity of the spice from the wasting element!

When in its natural state, the cinnamon-tree attains to the height of twenty or thirty feet, sending forth large spreading branches clothed with thick foliage. The leaf, when first developed, is partly of a bright red, and partly of a pale yellow; it soon, however, assumes a verdant hue, and when at its full growth is on the upper surface of a dark olive colour, and on the under side of a lighter green; it somewhat resembles that of the bay, but is longer and narrower. The flowers bloom in January; they grow on footstalks, rising from the axillæ of the leaves and the extremities of the branches, clustering in bunches, which resemble in size and shape those of the lilac, but they are white, with a brownish

* Bertolacci's Ceylon, p. 241.

tinge in the centre; these are followed by one-seeded berries, of the shape of an acorn, but not so large as a common pea. When first gathered their taste resembles that of the juniper-berry. When dry, this fruit becomes merely a thin shell, containing a kernel about the size of an apple-seed. The smell of the flowers, though not powerful, is extremely fragrant. The footstalks of the leaves have a strong flavour of cinnamon. The fruit, if boiled, yields an oil, which when cold becomes a solid substance like wax, and is formed into candles; these emit an agreeable odour, and in the kingdom of Candy are reserved for the sole use of the court.

The trees which are cultivated are kept as a sort of coppice, and numerous shoots spring apparently from the roots; these are not allowed to rise higher than ten feet. We are told that "when the trees first put forth their flame-coloured leaves and delicate blossoms, the scenery is exquisitely beautiful." In three years after planting each tree afford sone shoot fit for cutting; at the fifth year, from three to five shoots may be taken; but it requires the vigour of eight years' growth before it yields as many as ten branches of an inch in thickness. From the ages of ten to twelve years is the period of its greatest perfection; but its duration of life is not limited, as the root spreads, and every year sends up new shoots or suckers.

Trees which grow in rocky situations, and the young shoots, when the leaves are of a reddish colour, yield the the best and most pungent aromatic bark. The tree is known to be in the best state when the bark separates easily from the wood, and has the inside covered with a mucilaginous juice; but if that be not carefully removed, the flavour of the spice is injured. The shoots are cut when from half to three-quarters of an inch in thickness, and in lengths of from two to three feet. Many hands are employed in this work; each man is obliged to furnish a certain quantity of sticks. When this part of his task is fulfilled, he conveys his fragrant load to a shed allotted for the purpose, where the bark is instantly stripped from the wood, and freed from the epidermis, which is scraped off. The fragrance diffused around during this process, is described as being extremely delightful; but in parts of the plantation remote from this spot, unless the trees be agitated with violence, the peculiar smell of the cinnamon cannot be distinguished.* The wood, deprived of the bark, has no smell, and is used as fuel.

When the bark is perfectly cleansed it is of a pale yellow colour, and about the thickness of parchment. It is then placed on mats, to dry in the sun, when it curls up, and acquires a darker tint. The smaller pieces are then put inside the larger, and the whole close together into the tubular form in which it is sold in the shops. When the rind, or part forming the cinnamon, is first taken from the tree, it is described as consisting of an outer portion which tastes like common bark, and an inner portion, which is very sweet and aromatic. In the course of the drying, the oil of the inner portion, on which the flavour depends, is communicated to the whole; and the quality of the entire bark is understood to depend more upon the relative quantities of those portions of the bark than upon anything else. The cinnamon of Ceylon has the outer portion much thinner, in proportion to the inner, than the cassia of other countries; and to that its higher pungency is attributed.

Under favourable circumstances, the cinnamon-tree yields a large and a small harvest every year. The large one is obtained soon after the fruit is ripe; that is, when the tree has again pushed out shoots, and the sap is in vigorous circulation. May and June are the best months in the year for the great harvest: in November and December the little harvest is obtained. In those plantations which belong to government, however, there is but one harvest, beginning in May, and ending in October.

Though cinnamon has found a place in our Pharmacopœia, the purpose to which it has been applied by the South Americans invests it with medicinal properties

* Cordiner's Ceylon.

which it is not usually supposed to possess. "One thousand bales (92,000 lbs.) are said to be consumed annually by the slaves in the mines of South America. Each receives daily a certain quantity, cut into pieces one inch in length, which he eats as a preservative against the noxious effluvia of the mines.*

Oil of cinnamon was formerly obtained at Colombo, from distilling the fragments broken off in packing; latterly a great proportion has been made from coarse cinnamon unfit for exportation. A very small quantity of oil is contained in the bark; three hundred pounds of which are required to yield twenty-four ounces of oil,† and consequently this is extravagantly dear. When made from the finest cinnamon its specific gravity is greater, but from the coarse sort it is less than that of water.

Cassia (*Laurus Cassia*) is a native of several parts of the south of Asia, but it is chiefly brought from China as an article of commerce. The bark and buds are known in commerce as *cassia lignea* and *cassia buds;* these have the same aroma though in an inferior degree to cinnamon, and it is said that they are in many cases very extensively substituted for the latter. They are both imported into this country to a very large amount.

The Clove (*Caryophyllus aromaticus*) is a native of most of the Molucca Islands, where it has been produced, from the earliest records, so abundantly, that in exchange for their spicy produce the inhabitants were enabled, before the intrusion of the Europeans into their country, to procure for themselves the productions which they required of almost every other region. Although Europeans have for more than two thousand years known the use of this spice, yet little more than three hundred years back they were ignorant whence it was obtained. The Persians, Arabians, and Egyptians formerly brought cloves and nutmegs to the ports in the Mediterranean, and hither the Venetians and Genoese resorted to buy the spices of India, until the Portuguese, in 1511, discovered the country of their production. This nation

* Cordiner's Ceylon. † Ibid.

The Clove (*Caryophyllus aromaticus*).

did not, however, long enjoy the fruits of its discovery; the Dutch soon drove them from the Moluccas, and for a long time retained a very strict monopoly over the productions of these islands. It is said that they destroyed the clove-trees growing on the other islands, and confined their culture wholly to Amboyna. They allotted to the inhabitants four thousand parcels of land, on each of which it was expected that one hundred and twenty-five trees should be cultivated; and in 1720 a law was passed compelling the natives to make up this number: there were in consequence five hundred thousand clove-trees planted in this small island; each of these on an average produced annually more than two pounds of cloves, so that the aggregate produce weighed more than a million of pounds. Subsequently to this period, the policy of the Dutch somewhat relaxed, and the tree has been suffered to grow on other islands, and even to be carried to the West Indies, where, however, it does not appear until very lately to have succeeded. Sir Joseph Banks introduced it into this country about 1797, but of course it is raised here only as a mere ornament or curiosity of the hothouse.

The clove is a handsome tree, somewhat like the bay-tree in some of its characters, though the leaves more nearly resemble those of the laurel. The flowers of the clove grow in bunches at the very extremity of the branches; when they first appear, which is at the beginning of the rainy season, they are in the form of elongated greenish buds, from the extremity of which the corolla is expanded, which is of a delicate peach-blossom colour. When the corolla begins to fade, the calyx turns yellow, and then red: the calyces, with the embryo seed, are in this stage of their growth beaten from the tree, and, after being dried in the sun, are what are known as the cloves of commerce. If the fruit be allowed to remain on the tree after arriving at this period, the calyx gradually swells, the seed enlarges, and the pungent properties of the clove are in great part dissipated. Each berry contains only one seed, which is oval, dark-coloured, and of a considerable size. It is a long time before a clove-tree yields any profit to the cultivator, it rarely producing fruit till eight or nine years after being first planted.

The whole tree is highly aromatic, and the footstalks of the leaves have nearly the same pungency as the calyx of the flowers. "Clove-trees," says Sir T. Raffles, "as an avenue to a residence are perhaps unrivalled—their noble height, the beauty of their form, the luxuriance of their foliage, and, above all, the spicy fragrance with which they perfume the air, produce, on driving through a long line of them, a degree of exquisite pleasure only to be enjoyed in the clear light atmosphere of these latitudes."

Cloves contain a very large proportion of essential oil, larger perhaps than any other plant or parts of a plant. This oil is extremely pungent, and is one of the few essential oils which is specifically heavier than water. It is usually procured by distillation, but when the cloves are newly gathered it may be obtained by pressure. A part is often so taken, and the cloves, which are thereby rendered of little value, are fraudulently mixed with sound ones; but the robbed cloves are easily detected by their pale colour, shrivelled appearance, and want of flavour.

The pungent and aromatic virtues of the clove reside in this essential oil, combined with the resinous matter of the spice; but it does not appear that these qualities are absolutely necessary to the growth or fructification of the tree. To give to this its greatest value, it must, however, be cultivated in a situation where they can be elaborated in the greatest quantity. Its profitable growth is therefore limited to a very narrow range of temperature and climate; as the clove loses its flavour if the situation be too moist or too dry, too near the sea, or too much elevated above its level. Though the tree be found in the larger islands of Eastern Asia and in Cochin-China, it has there little or no flavour. The Moluccas seem to be the only places where the clove comes to perfection without cultivation.

This tree is so great an absorbent of moisture that no herbage will grow under its branches; while the cloves, when gathered, if placed in a heap near a vessel of water, are found very much to have increased their weight at the end of only a few hours, in consequence of the large portion of water which they have attracted and imbibed. It is said that both the grower and trader in cloves avail themselves of the knowledge of this fact, and since this spice is always sold by weight, thus give a factitious value to their goods.

Nutmeg (*Myristica moschata*).

The NUTMEG (*Myristica moschata*) is likewise a native of the Moluccas, and after the possession of these islands by the Dutch, was, like the clove, jealously made an object of strict monopoly. Actuated by this narrow-minded policy, the Dutch endeavoured to extirpate the nutmeg-tree from all the islands except Banda; but it is said that the wood-pigeon has often been the unintentional means of thwarting this monopolizing spirit by conveying and dropping the fruit beyond these limits; thus disseminated, the plant has been always more widely diffused than the clove. This tree grows in several islands in the Eastern Ocean, in the southern part of both peninsulas of India, and it has been introduced into the Mauritius and some other places. It was for a long time supposed that though the plant could be transplanted, the peculiar aroma of the nut, which gives to the tree its commercial value, was weakened, if not entirely lost, when this was removed from its native soil, and that, as a spice-producing tree, it, as well as the clove, was confined to the same narrow locality to which the clove was said to be restricted. In Sumatra, however, it has been successfully cultivated to a large extent. Sir Thomas Raffles gives an account of the plantation at Bencoolen in 1820:—"Out of the number of one hundred thousand nutmeg-trees," he writes, "one fourth are in full bearing, and although their culture may be more expensive, their luxuriance and produce are considered fully equal to those of the Moluccas." An attempt has been made at Trinidad to naturalize there the clove and the nutmeg; and, very recently, samples of these spices produced in that island have been transmitted to England, for the inspection and approval of the Society for the Encouragement of Arts, &c. The opinions of the best judges have been taken with respect to their quality as compared with the Oriental produce, and, in consequence of a most favourable report, the gold medal of the Society has been awarded to the western cultivator of these spices; while sanguine hopes are entertained that the clove and the nutmeg will one day be perfectly acclimatized in the tropical regions of the Western Hemisphere. The nutmeg-tree, as well as the clove, was introduced into this country by Sir Joseph Banks as an ornamental hothouse plant.

Two spices are obtained from the nutmeg-tree—*nutmeg*, which is the kernel of the fruit; and *mace*, which is the membranous tunic or covering immediately investing the thin black shell in which the nutmeg is contained; the whole is enveloped by the external portion of the fruit in the same manner as the stone of a peach is by the pulp. This tree is larger than that of the clove; the leaves are more handsome in the outline, and are broader in proportion to the length. They are of a fine green on the upper surface, and grey beneath.

When the trees have attained the age of about nine years they begin to bear. They are diœcious, having male or barren flowers upon one tree, and female or fertile upon another. The flowers of both are small, white, bell-shaped, and without any calyx ; the embryo fruit appearing at the bottom of the female flower, in the form of a little reddish knob. The female flowers grow on slender peduncles, two or three together,but it is rare that more than one flower in each bunch comes to maturity and produces fruit; this resembles in appearance and size a small peach, but it is rather more pointed at both ends. The outer coat is about half an inch thick when ripe, ta which time it bursts at the side and discloses the spices. These are—

The Mace, having the appearance of a leafy network of a fine red colour, which seems the brighter by being contrasted with the shining black of the shell that it surrounds. In general, the more brilliant its hue the better is its quality. This is laid to dry in the shade for a short space ; but if dried too much, a great part of its flavour is lost by evaporation, while it is also more apt to break in packing. On the other hand, if packed too moist, it either ferments or breeds worms. After being dried, it is packed in bags and pressed together very tightly.

The Nutmeg. The shell is larger and harder than that of a filbert, and could not, in the state in which it is gathered, be broken without injuring the nut. On that account the nuts are successively dried in the sun and then by fire-heat, till the kernel shrinks so much as to rattle in the shell, which is then easily broken. After this, the nuts are three times soaked in sea-water and lime ; they are then laid in a heap, where they heat, and get rid of their superfluous moisture by evaporation. This process is pursued to preserve the substance and flavour of the nut, as well as to destroy its vegetative power. Dry lime is the best package for nutmegs.

There are two varieties, the royal and the green. The royal is the largest, and it produces mace longer than the nut ; on the nut of the green the mace reaches only half-way down. A good nutmeg should be large, round, and heavy, of a light grey colour, and finely marbled in the cross section.

Oil of nutmegs is obtained by pressure from the broken kernels; a pound of them generally yields three ounces of oil. According to Neumann's experiments, the oil produced is one-third of the weight of nutmeg; it is yellow, of the consistence of tallow, and of a pleasant smell. This is a fixed oil, but a transparent volatile oil may likewise be obtained by distillation, in the proportion of $\frac{1}{32}$ part of the weight of nutmeg used.

There are other spices natives of the Moluccas; the principal of these are Massoy bark, and a species of cinnamon, or cassia; but these, though much used in Chinese and Japanese cookery, are of inferior consequence, and nearly confined to the commerce of the East.

GINGER (*Zingiber officinale*) is a native of the south-east of Asia and the adjacent isles. It was naturalized in America very soon after the discovery of that country by the Spaniards; indeed, at so early a period that it is scarcely believed to be an exotic, and is supposed to have been found indigenous in the Western World. Acosta relates that a person named Francisco de Mendoza first transplanted it from the East Indies into New Spain, where its cultivation was diligently pursued by the Spanish Americans to no small extent, as, from the testimony of the same author, 22,053 cwt. were exported thence to Europe in the year 1547.*

The plant is now cultivated in great quantities in the West Indies, especially in the island of Jamaica. Ginger is imported into this country under the form of dried roots and as a preserve. We receive it both from the East and West Indies, but that from the latter is much superior in quality to the former. British plantation ginger paysel even shillings per cwt. import duty, and all other is not admitted under fifty-three shillings per

* Edwards's West Indies, vol. ii.

Ginger (*Zingiber officinale*).

cwt.; these two causes unite in confining the home consumption of ginger almost entirely to that coming from the West Indies.

The ginger plant has been cultivated in this country as a stove exotic since about the year 1600. It has a perennial root, which creeps and increases under ground in tuberous joints, from each of which arises in the spring a green reed-like stalk of about two feet and a half in height, having narrow and lanceolate leaves. The stem is annual; the flowering stalk rises directly from the root, ending in an oblong scaly spike; from each of these scales a single white and blue flower is produced. The ginger of commerce is distinguished into black and white; but the difference of colour depends wholly on the modes of preparation. For both of these kinds the tubers are allowed to be ripe, that is, the roots are taken up after the annual stalks are withered. For the black, they are scalded in boiling water and then dried in the sun; and for the white, they are scraped clean and dried carefully without being scalded. The best and soundest roots are selected for the latter process, and therefore white ginger is, independent of the manner of preparation, superior to the black, and it always bears a much higher price in the market. When a preserve is to be made of the roots, they are dug up in the sap, the stalks not being then more than five or six inches long. For this purpose the young roots are scalded, then washed in cold water, and afterwards carefully peeled. This process lasts for three or four days, during which period the water is frequently changed.

When the cleansing is complete, the tubers are put into jars, and covered with weak syrup of sugar. After a day or two the weak syrup is removed, and replaced by a stronger; and the shifting is two or three times repeated, increasing the strength of the syrup each time. The preserve thus formed is one of the finest that is made; and the removed syrups are not lost, but fermented into a pleasant liquor, which gets the name of "cool drink."

The manner of cultivating ginger is extremely simple, requiring little skill or care; it is propagated with as much ease and nearly in the same manner as potatoes are in Great Britain.

Pepper (*Piper*).—The species of this genus are very numerous—botanists describing about sixty—some of which are to be found in every quarter of the world except Europe. The *Piper nigrum* produces the black and white pepper of commerce. This pepper-bush is a perennial plant found native upon the slopes of mountains in the southern parts of both the Indian peninsulas, especially on the coast of Malabar. It is likewise cultivated to a great extent in Sumatra, Java, and the adjacent places. Pepper at one time formed the principal export from Java; it was chiefly cultivated in Bantam and likewise in the dependencies of that province in the southern part of Sumatra; these districts producing the greater part of the supply exclusively furnished by the Dutch to the European market. It is, however, a satisfaction to find that the greedy spirit which would appropriate all to self, may sometimes, in its unjust efforts to secure this end, defeat its own purpose. We learn from Sir T. S. Raffles, that "the system by which it (pepper) was procured, was too oppressive and unprincipled in its nature, and too impolitic in its provisions, to admit of long duration. It was calculated to destroy the energies of the country, and with them the source whence the fruits of the monopoly proceeded. In the year 1811, accordingly, neither Bantam nor its dependencies furnished the European government with a single pound of this article."*

The system of raising pepper in Java is now, however, completely changed; there is no longer a monopoly, and the cultivation of pepper has for the last few years been declared free.

This plant was introduced some time back at Cayenne, by General Bernard, who has with unceasing perseverance attended to its cultivation in that settlement, in the hope of making the French independent of foreign supply for its produce. It is said that he has already formed a plantation of more than thirty thousand pepper-trees on his estate.†

The pepper-plant, or pepper-vine, as it is sometimes called, is a creeping or climbing plant, with a dark-coloured stem, which requires support. When dry it exactly resembles the grape-vine branch, having the same sort of knots or joints. It is usual to plant a thorny tree by the side of this plant, to which it may cling. In Malabar, the chief pepper country of India, the Jacca-tree (*Artocarpus integrifolia*) is made thus to yield its sup-

* History of Java, vol. i. p. 131.

† La Guiane Française for 5th January, 1825.

port, because the same soil is well adapted to the growth of both plants.

The stem of the pepper-plant entwines round its support to a considerable height; the flexile branches then droop downwards, bearing at their extremities, as well as at other parts, spikes of green flowers, which are followed by the pungent berries; these hang in large bunches resembling in shape those of grapes, but the fruit grows distinct on little stalks like currants. Each berry contains a single seed, which is of a globular form and brownish colour, but changes to nearly a black when dried—this is the pepper of commerce. The leaves somewhat resemble those of the ivy, but they are larger, and of rather a lighter colour; they partake strongly of the peculiar smell and pungent taste of the berry.

The plant is propagated by shoots, which do not produce fruit the first three years; the fourth year they come into bearing, and yield an increase of produce annually until the eighth year of their growth; they then gradually decline, and rarely bear for more than two or three years longer. When in full vigour, the pepper-plant is very prolific; each bunch usually contains from twenty to thirty berries, and sometimes as much as six or seven pounds of pepper are obtained from one tree. The time of the pepper-harvest on the western coast of Sumatra is usually about September and October, and sometimes another smaller crop is gathered in March and April. The pepper-plantations on this island are described as being most carefully cultivated; not a weed is to be seen, every species of litter is removed, and, if the season be dry, the plants are watered with unremitting assiduity.

The black and white sorts of pepper are both the produce of the same plant; the best white peppers are supposed to be the finest berries which drop from the tree, and lying under it become somewhat blanched by exposure to weather—these the poor people pick up and bring to the merchants; they are, however, obtained in very small quantities, and are on that account, as well as for their superior quality, sold much dearer than the gathered pepper. The greater part of the white pepper used as a condiment, is, however, the black merely steeped in water and decorticated, by which means the pungency and real value of the pepper are diminished; but in this state it can be more readily reduced to powder, and, when thus prepared, it has a fairer and more uniform appearance.

The pepper is distinguished in Sumatra into three sorts: the *Molucca*, which is the best; the second, *Caytongee*; and the worst sort, *Negaree*, which last is the most abundant; this is a small pepper usually full of dust; it is much lighter than the others, and therefore, unless the buyer be wise enough to purchase his pepper by weight instead of measure, he will assuredly be imposed upon, and have this substituted for the heavy Molucca berry.

By distillation, a green coloured matter is obtained from pepper; this is partly resinous, and partly oily, and to this the pepper owes its pungent quality.*

Several other species of this genus are used besides the *P. nigrum*. The southern Asiatics wrap up the slices of the areca-nut, which they are in the habit of chewing, in the leaves of the beetta codi (*Piper betle*), which is a native of India and China. Some species are likewise found in the West Indies and in South America; they are used there to season food, but are not at present known in commerce.

Pimento, Jamaica Pepper, or Allspice Tree (*Myrtus pimenta*), is an extremely handsome tree; native of South America and the West Indies—especially of the island of Jamaica, whence the berries, or pimento of commerce, are exported in large quantities. This tree grows to the height of about thirty feet, with a smooth brown trunk, and shining green leaves, resembling those of the bay; branches, coming out on all sides, are clothed in the most luxuriant foliage. In the months of July and August a profusion of white flowers pleasingly contrast with the dark green leaves—the whole forming an object

* Thomson's Chemistry.

Allspice (*Myrtus pimenta*).

of vegetable beauty rarely surpassed; while the rich perfume which is exhaled around, and which is wafted by the gentlest breeze, renders an assemblage of these trees one of the most delicious plantations of even a tropical clime. When the leaves are bruised, they emit a fine aromatic odour as powerful as that of the fruit; indeed it is said that they yield by distillation a delicate oil which is often used in the dispensaries as a substitute for oil of cloves.

The pimento-tree grows spontaneously in many parts of Jamaica; it abounds more particularly on the northern side of that island in elevated spots near the coast. When a new plantation of these is to be formed, no regular planting or sowing takes place; it is usual to appropriate a piece of land either in the neighbourhood of a plantation already formed, or in a part of the woodlands where these trees are scattered in a native state. The land is then cleared of all wood but these trees, which are left standing, and the felled timber is allowed to remain where it falls to decay and perish. In the course of a year young pimento plants are found springing up on all parts of the land; produced, it is supposed, in consequence of the ripe berries having been scattered there by the birds, while the prostrate trees protect and shade the tender seedlings. At the end of two years the land is thoroughly cleared, only those plants being left which promise a vigorous growth; these come to maturity in about seven years from the first formation of the plantation, and usually attain to the height of thirty feet. But though apparently of so easy propagation, it is only in those parts where the tree is of spontaneous production. Edwards observes that "this tree is purely a child of nature, and seems to mock all the labours of man, in his endeavours to extend or improve its growth: not one attempt in fifty to propagate the young plants, or to raise them from the seeds, in parts of the country where it is not found growing spontaneously, having succeeded." The tree was introduced into this country in the early part of last century, but the fruit does not ripen. It is delicate and difficult to manage, requiring at the same time warmth and a great deal of air.

The flowers scarcely fade and give place to the berries, ere these are fit for gathering; since, if the fruit be suffered to ripen on the tree, it loses its pungency and becomes valueless. While yet green, therefore, the berries are carefully picked by hand; one person on the tree gathers the small branches; and three others, usually women and children, find full employment in picking the berries from these. The produce is then spread on terraced floors, and exposed to the action of the solar heat for about a week; in the course of this time the berries lose their green hue, and become of a reddish brown. When perfectly dry, they are in a fit state for exportation.

In a favourable season the pimento crop is enormous. "A single tree has been known to yield one hundred and fifty pounds of the raw fruit, or one hundredweight of the dried spice; there being commonly a loss in weight of about one-third in curing." This return is not, however, of very usual occurrence, as the produce is variable; a very plenteous harvest seldom occurring above once in five years.

Pimento combines the flavour and properties of many of the Oriental spices, hence its popular name.

The CAPSICUM is a native of tropical regions, but is become so far acclimatized in this country as to be successfully reared, and during summer to endure the open air uninjured.

Three species of capsicum are cultivated in England. The GUINEA PEPPER (*Capsicum annuum*) was introduced into England, from India, so early as 1548, and is mentioned by Gerarde as being under cultivation in his time. This plant has a branchy stem, rising about two feet high; the leaves are long, narrow, and of a dark green colour. White flowers bloom in June or July, and are succeeded by pods varying in shape and colour; some being long, others short, some round, and others again heart-shaped, while the colour is either red or yellow.

The CHERRY PEPPER (*Capsicum cerasiforme*) is a native of the West Indies, and was not cultivated in England until 1759. This species is very similar in appearance to the first, and is only characterized by the different shape of the pods, which take somewhat the form of a cherry; sometimes heart-shaped, bell-shaped, or angular; their colour is the same as the preceding. Both these species are annuals.

The BELL PEPPER (*Capsicum grossum*) is a biennial, a native of India; it produces larger pods than either of the others. It may be transplanted with safety in the

Capsicum (*Capsicum annuum*).

open garden, on the arrival of summer, but it requires a place in the stove during the winter season.

The green pods of all these varieties are used for pickling; those of the last are generally preferred, being not only larger, but having the skin more pulpy and tender.

Seasoning Herbs.—Vegetables of this description are never used with any reference to their substantive qualities, as articles of food. They are employed merely for their flavour, forming subordinate ingredients in the culinary art, and are respectively applied in various combinations according to the skill or the pleasure of the operator.

Many of this class of plants were formerly much esteemed for their real or imaginary medicinal virtues, and some of them are in the present day considered of sufficient value to be ranked among pharmaceutic simples.

Parsley (*Apium petroselinum*) was known to the Greeks, and received its distinctive name of *petroselinum* from Dioscorides. It is said to be a native of Sardinia, whence it was brought into England about the middle of the sixteenth century; but the plant is of so ancient culture in this country, that the period of its introduction cannot, perhaps, be accurately assigned, and though supposed not to be indigenous to Britain, it is now completely naturalized in various parts both of England and Scotland. It is a hardy biennial plant.

The principal varieties are the common plain-leaved, the curled-leaf, and the Hamburg or broad-leaved. The plain-leaved parsley was the first known in this country; but it is not now much cultivated, since the leaves are not so handsome as those of the curled, are of a less brilliant green, and are coarser in flavour. Another reason for banishing it from the gardens is its resemblance to fool's-parsley, or lesser hemlock, *Æthusa cynapium*, which is a noxious weed of a poisonous nature, infesting gardens and fields. If this intruder were growing among plain parsley, an unobservant person might confound the leaves of the one with the other, although they differ somewhat in shape and colour; the leaves of the poisonous plant being of rather a darker green, and, if bruised, they emit an unpleasant odour, very different to that of parsley. When in flower they are easily distinguished, the *æthusa* having an involucrum of three long, narrow, sharp-pointed leaflets, hanging down under every partial umbel, and vulgarly termed the *beard*; while in the garden-parsley there is usually only one leaflet at the general umbel, and at the partial umbel the involucrum consists of only a few short folioles, almost as fine as hairs.

Parsley is raised from seed, which is sown in the early part of spring, most generally in single drills, round the edges of any of the vegetable beds. The plants appear in three or four weeks, and soon the tender leaves are fit to be gathered for use; a succession springing forth and furnishing a supply throughout the whole of the year, till the ensuing May, when the flower-stalks begin to run, bloom, and bear seed in July or August.

Parsley has been supposed to be an effectual cure for the rot in sheep, provided it be given to them in sufficient quantities. Attempts were made some years ago to promote its extensive culture in fields for this purpose, under the auspices of the Society for the Encouragement of Arts, &c. It is said that this specific was tried in Hampshire with success; and Mortimer* mentions the cultivation of parsley, as a remedy against this destructive disease, being practised in Buckinghamshire. This herb, when used as food for sheep, imparts to their flesh, it is said, a very agreeable flavour.†

Hares and rabbits, we are told, will come from a great distance in order to indulge their taste for parsley; and in countries where these animals abound, in no situation does their favourite herb escape from their depredations, unless securely fenced.

Purslane (*Portulaca oleracea*) was introduced from South America into this country in 1652. It was formerly held in more esteem, and was more cultivated than it is at present.

Fennel (*Anethum fœniculum*) is a plant of very ancient use, and if not native, is at least naturalized in England, where it is sometimes found growing on chalky soils. It is a perennial, rising to the height of five or six feet. The leaves are divided into a variety of fine, long segments, of a bright green colour. Yellow flowers, growing in umbels, appear in July and August. The whole plant has a strong and disagreeable odour. Its light and delicately-formed leaves are occasionally used

* Mortimer's Husbandry, vol. i.

† Campbell's Pol. Survey, vol. ii.

as a garnish; and, when boiled, enter into the composition of certain fish-sauces.

Horse-radish (*Cochlearia armoracia*) is a native of some marshy situations in Britain, where it may be found of spontaneous growth. It has long been an inmate of our gardens, and is well known with its large oblong leaves, sometimes entire round their edges, and sometimes deeply serrated. White cruciform flowers, growing in loose panicles, bloom in the beginning of summer. This plant is made the object of careful cultivation among market-gardeners, who find that its most congenial soil is a deep sandy loam. It is propagated by offsets, planted in February, and in the autumn of the ensuing year the roots are fit for use.

Mint (*Mentha*) is a perennial plant, of which there are many species and varieties. They are all indigenous to Britain, and chiefly delight in low moist situations. They are all more or less aromatic in the scent, and pungent in the flavour. Many of them yield sharp volatile oils by distillation. With very few exceptions, the whole of this description of plants is perennial, though the leaves in some, and the flowering stem in most, die down in the winter. They are all native plants, and their qualities are pungent and agreeable, not one of them being in the least degree poisonous; thus, whenever their taste is such that they can be used as giving flavour to food, that application may always be made with perfect safety. Much of the natural fragrance of the fields is owing to the *Labiatæ*, the family to which these sweet herbs belong. The various species of thyme impart their grateful odours to the arid wastes; the balmy calamint and others of the same genus diffuse their aromatic sweets over the cultivated fields; and the mints correct the effluvia arising from stagnant pools in marshy lands.

Spearmint, or common mint (*Mentha viridis*), Peppermint (*Mentha piperita*), and Penny-royal Mint (*Mentha pulegium*), are the principal species of mint. All are propagated either by parting at the root, by offsets, or by cuttings. When designed for distillation, the stalks should not be gathered until they have attained their full growth and are beginning to bloom; they should then be used as soon as cut. The same roots will send forth annual stalks for many years without degenerating.

Thyme (*Thymus*). Two species are found natives of Britain, the *Thymus serpyllum* and *Thymus acinus;* but that which is cultivated in our gardens, *Thymus vulgaris,* is a native of Spain and other parts of Southern Europe. The climate of Spain seems peculiarly genial to the growth of all sweet herbs. At Marvella, about midway between Malaga and Gibraltar, De Laborde speaks of "sage, thyme, marjorum, lavender, myrtle, and rosemary, more than six feet high, embalming the air on all sides."* Thyme was introduced into this country certainly before the middle of the sixteenth century, but how long previous to that period is not ascertained. This herb is well known as a low shrubby evergreen, of a strongly aromatic odour. When of the largest growth it scarcely attains to a foot in height. Its minute leaves are smooth and oval, and the flowers are smaller than those of the wild thyme. Three varieties are usually cultivated, and distinguished as the broad, the narrow, and the variegated leaved.

Two or three tufts of another species, the Lemon Thyme (*Thymus citriodorus*), sometimes finds a place in the herb compartment of the kitchen-garden. This is a trailing evergreen, of still smaller growth than the common kind, and is remarkable for its smell, which resembles that of the rind of lemons, whence its distinctive name. Both the species thrive best in a dry soil. They are propagated most generally from seed; but they can likewise be multiplied by slips, or by parting the roots.

This herb is used in many savoury preparations. It was employed by the Romans to give its peculiar aromatic flavour to cheese—a practice pursued likewise with some

* De Laborde's Spain, vol. iii.

flowers and seeds of other plants. This manner of preparing cheese was still continued during the middle ages. We collect this from an anecdote told of Charlemagne, who, travelling unattended, arrived at a bishop's palace. It was unfortunately a fast-day, and the only fare which the bishop would set before his royal guest was bread and some choice cheese; this the king did not appear particularly to relish, picking out with his knife small specks, which he mistook for unsound parts, but which, in fact, were parsley seeds. The prelate ventured to hint that he was throwing away the best parts of the cheese; when the monarch tasted it, and liked it so much, that he requested the bishop to send him an annual supply of this excellent flavoured curd; and, lest the cheese-merchant might by chance pack cheeses without any admixture of seeds, the king desired that they might always be cut in two, in order to ascertain the fact, and be then fastened together again with a skewer.* The mountaineers in the canton of Glaris, in Switzerland, prepare a cheese known by the name of Schabzieger, which is readily distinguished by its peculiar marbled appearance and aromatic flavour; these are communicated by the pressed flowers or the bruised seeds of the *Melilotus officinalis*.

SAGE (*Salvia officinalis*) is a native of the warmer parts of Europe, but it has long been cultivated in Britain. Gerarde notices it as being, in 1597, a well-known herb of the English garden. It is a hardy plant, but, though a perennial, does not last above three or four years without degenerating. New plantations are readily made by cuttings of the young shoots taken in the latter end of spring.

This aromatic herb is chiefly used with the more strong and oily kinds of food, as a mixture in stuffings and an ingredient in sauces. The leaves are sometimes introduced into English cheese.

A species of sage (*Salvia pomifera*), of a very peculiar growth, is common to some of the Greek islands.

* Foreign Review, and Continental Miscellany.

It has firm fleshy tumours, of about three-quarters of an inch in thickness, swelling out from the branches of the plant, and supposed to be produced in the same manner as oak-apples, by the puncture of an insect of the Cynips genus. These excrescences are semi-transparent, like jelly. They are called sage-apples, and under that name are always to be met with in the markets as an article of ordinary sale. They are made into a kind of conserve, which is highly esteemed by the Greeks. Dr. Clarke, in the sixth volume of his Travels, mentions having been regaled with this delicacy by the English consul at the island of Syros, and he bears testimony to its excellence. This plant is considerably larger than the common sage of our gardens, and its flavour and smell are much more powerful. It grows very abundantly in Candia, Syros, and Crete, where it attains to the size of a small shrub.

Clary (*Salvia sclarea*) is a biennial plant, a native of the south of France, of Switzerland, and of Italy. It was first introduced into English cultivation in the year 1562.

Marjoram (*Origanum*). The common marjoram, or *Origanum vulgare*, is a native of Britain ; it is a perennial under-shrub, growing among copsewood in calcareous soils. The leaves are small and acute. The flowers are slightly red, and appear in July and August, in smooth clustered spikes. The winter marjoram (*Origanum heracleoticum*) very much resembles the above species in appearance ; but it is of a more aromatic flavour, and is always used in preference. It is indigenous to Greece, whence it was introduced into this country in 1640. A sheltered dry situation is most favourable to its growth. The seeds of this and of the two following species seldom come to maturity in England. Winter marjoram is, therefore, usually propagated by cuttings. Sweet marjoram, *Origanum majorana*, was an inhabitant of the English garden about seventy years prior to the first cultivation in this country of the above species. It is a biennial, having its flowers growing in close knotted-like heads. As soon as it blossoms, this plant is cut and dried for winter use; it must be renewed by seed annually, for which purpose the seed is imported from France and Italy into England. Pot marjoram, *Origanum onites*, was not introduced into English cultivation until the middle of the last century. It is a hardy perennial, with a hairy stem, rising to more than a foot high; it blooms from July to November, and is usually propagated by cuttings.

Basil (*Ocymum*) is rich in aroma, its odour and pungency being very similar to those of cloves. It is a favourite herb among French cooks, as giving an additional zest to highly-seasoned dishes. The leaves in small quantities are sometimes mixed in salads, or are made a flavouring ingredient in soups.

Balm (*Melissa officinalis*) is a native of the south of France, and was introduced into this country in 1573. It is a hardy perennial.

Balm was long famed for its medicinal virtues; and although it has ceased to be invested with its former supposed potent qualities, it still retains a kind of posthumous fame, and "balm" has become the generic name for a soothing healer of wounds, both of the body and the mind. Balm was the plant which the adept Paracelsus selected from which to prepare his *elixir vitæ*, his *primum ens melissæ*, whereby he was to renovate man; and, if he did not bestow on him absolute immortality, to produce a very close approximation to that state. Such strange conceits of ill-directed minds have, however, long gone by; and balm, stripped of its fancied virtues, is now only employed as an infusion in preparing a cooling drink, or in giving flavour to a weak factitious wine.

There are other seasoning herbs which were once much esteemed in this country, but are now little used. Among these are, Tarragon, Chervil, Borage, Costmary, and Marigold. The leaves and flowers of these plants were in request for their slight aromatic taste; and they sometimes imparted their flavour to "cool tankards," and sometimes to soups and salads. There was a notion that they produced exhilaration of spirits, and some of them were called "comforters of the heart." The delusion has passed away, yielding in too many cases to more violent excitements, and in others to the conviction that the heart must derive its best comfort from a steady performance of our duties.

The lettuce, endive, and some other plants are used as salads, and although they do not contain compounds recognised as volatile oils, yet they contain peculiar secretions which have caused them to be used as food by animals, and which probably act medicinally.

Vegetables which are eaten raw, either in their natural state or blanched, are usually termed acetarious, or salad plants. Though these contain scarcely any nourishment, and are not at all essential accompaniments to a meal, yet they are recommended by so agreeable a coolness, pungency, or flavour, as to render the food with which they are eaten more grateful to the palate; while some are considered a wholesome addition to more substantial aliment.

Lettuce (*Lactuca sativa*) has acquired its generic name from the milky juice which it contains. This species comprises many varieties, all of which possess a slightly narcotic principle in their juice, which is, in general, elaborated only in small quantities during the early stages of the plant, but increases greatly as that advances towards flowering. This juice is very bitter, and when it becomes abundant, the plant ceases to be useful.

The absolute quantity and strength of the opiate portion of the juice most probably varies both with the variety of the plant and with the soil on which it is produced. In the strong-scented wild lettuce (*Lactuca virosa*) the narcotic juice is so abundant, and so acrid in itself, or so mixed with other acrid principles, as almost to bring the plant within the class of vegetable poisons.

The narcotic property of lettuce-juice has long been familiarly known. This quality has not been overlooked even by the poets. Pope says,

> "If your wish be rest,
> *Lettuce* and cowslip-wine *Probatum est.*"

It is only very recently, however, that this juice, inspissated, or the extract of lettuce, has found a place among our pharmaceutic preparations, under the name of *Lactucarium.* It is supposed to possess, though in an inferior degree, the virtues of opium, without producing the same deleterious effects ; and, therefore, it is held that it may be safely administered in cases where the more powerful medicine is not desirable, or even admissible. Brechin, in the county of Forfar, is among the places where the lettuce is cultivated, and its juice collected in considerable quantity for medical purposes. The plants are grown in a dell, composed of rich soil, and opening to the south. In so favourable a situation they thrive very vigorously, sending up thick and juicy flower-stems. As soon as these have attained a considerable size and height, but before the flowers begin to expand, a portion of the top is cut off transversely. This operation is performed when the sun has excited the plants into powerful action. The milky juice quickly exudes from the wound, while the heat of the sun renders it so immediately viscid, that it does not flow down in a fluid state, but concretes around the part whence it issues, forming a brownish scale, about the size of a sixpence. When it has acquired the proper consistence it is removed, and as the inspissated juice closes up the extremities of the divided vessels, it is necessary to cut off another small piece of the stem ; this causes the escape of the juice again, and another scale is formed. The same process is repeated as long as the weather is favourable or the plant will yield any juice.

Under so variable an atmosphere as that of Britain, a crop of this kind must be precarious, unless in those places where there is generally a week or two of settled drought about the warmest period of the year, and where the cultivator has sufficient local knowledge for enabling him to time the state of his plants accordingly. Mr. Henderson, the Brechin cultivator, an intelligent and experienced horticulturist, states, that in favourable years the lettuce-opium, notwithstanding the trouble of collecting it, is much more profitable than any other crop that comes to maturity, in so short a time, upon the same breadth of land.

Turner mentions the lettuce as being, in 1652, not a rare or recently cultivated plant, but one with which the public generally had been long familiar. In the Privy-Purse expenses of Henry VIII., in 1530, we find that the gardener at York-Place received a reward for bringing "lettuze" and cherries to Hampton Court. Although it cannot now be definitely ascertained when or how this plant was first introduced into England, we are no doubt indebted for some of its varieties to the Greek islands. The Cos lettuce, as its name indicates, is a native of the island of Cos, and was most probably brought thence into this country.

The culture of this plant is so simple, and it requires so little space, that a garden of the most humble dimensions is seldom found without having a small nook appropriated to this cooling and agreeable vegetable. There are many varieties of the lettuce, very nearly twenty being enumerated as objects worthy of garden culture, and each of them differing somewhat in colour, shape, or some other circumstance attending its growth. These, however, may all be ranged under two distinctive heads, the *Cos* and the *cabbage* lettuce. The former grows upright, and its leaves are of an oblong shape; the latter has rounder leaves folded together, and forming a low full head, spreading out close to the ground. When in perfection for gathering, the leaves of both sorts are lapped one over the other in a compact close order, forming what is usually called the *heart*, the inner part of which, being thus excluded from light and air, becomes nearly white. This natural blanching is often assisted by artificial means, and when the inner leaves begin to close, the outer ones are tied round them with a piece of *bast*.* The blanching prevents the formation of the bitter or acrid principle, which is very perceptible in all the varieties, if allowed to remain in the ground and

* The material of Russia matting, made from the inner bark of the lime-tree, and which is a well-known essential in kitchen-gardens.

complete their growth, when the leaves expand and the flower-stalk begins to ascend.

Lettuce being a hardy and free growing plant, may be obtained early in the season, if sown in a warm border, and protected from the frost during the night. For early use the *cabbage* is the best, as in that stage it is more delicate in flavour than the other; but when both have arrived at maturity, the *Cos* is the most succulent.

Endive (*Cichorium endivia*) is abundantly cultivated, if not found wild, in China and Japan; and thus the accounts that describe it as a native of those countries, and as having been imported into the West about the early part of the sixteenth century, have probability on their side. Few particulars of the history of this plant, however, are known.

It is a hardy annual, producing a great stock of leaves from the crown of the root. These leaves are large, smooth on the surface, but much divided into lobes, and toothed at the edge. The flowering stem rises to the height of about two feet, and the flowers, which are of a pale blue colour, bloom in July and August. Like the lettuce, its leaves are used as an edible before its flowering stem begins to appear. These leaves are very harsh and bitter when exposed to the air; they are therefore blanched, and if this be properly performed, they become crisp and tender, and retain only an agreeable bitterness. Endive may be blanched for use by tying the leaves together, by earthing up the plants, or by covering them with pots. By judicious culture and a succession of sowing, endive may be obtained during autumn, winter, and spring; it is considered a valuable salad at a time when few other vegetables are furnished for the table; and it also serves as an ingredient in some other culinary preparations.

Succory, Chicory, or Wild Endive (*Cichorium intybus*). There is little doubt that the *Cichorium*, as mentioned by Theophrastus, in use among the ancients, was the wild endive, since the names by which this plant is known in all the languages of Modern Europe are merely corruptions of the original Greek word; while there are different names in different countries for the garden endive.

Succory is a hardy perennial plant, not uncommonly growing about the hedges of fields in those parts of England where the subsoil is lime. It will bear all the varieties of climate in Europe, being cultivated from Italy to St. Petersburg. This plant has a strong and fleshy root; the leaves have some resemblance to those of endive, differing only in being narrower, more feathery at the edges, and having the midrib beset with hairs. The flowering stem rises much higher, sometimes attaining to five feet in height; the flowers are like those of the garden plant in appearance as well as in time of blooming.

This plant is not much valued or cultivated in Britain. On the Continent it is held in greater esteem, and is used as an edible vegetable in a variety of ways.

Both in France and England succory has occasionally been cultivated as food for cattle; it is in a proper state for this purpose just as it is coming into flower.

The root of this plant is used as a substitute for coffee; and it is sometimes considered superior to the exotic berry. Dr. Howison* is of this opinion; while Dr. Duncan† believes that the plant might be cultivated for this purpose with great national advantages. In many parts of Holland and Germany this prepared root is used in large quantities, either alone or mixed with coffee by those who cannot afford to indulge in the latter luxury in its genuine state. Indeed, it has been very recently introduced into this country as an addition which much improves the flavour of coffee; but where economy is not the consideration, it is not likely to gain much esteem. The succory root, when applied to this purpose, is merely cut in pieces, and sufficiently dried to admit of its being easily ground.

Cress is the general name of a number of plants, mostly, if not all, bearing cruciform flowers, and possess-

* Caled. Hort. Mem. iv. 132.

† Disc. to Caled. Hort. Soc. 1820.

ing, in common with plants of the same family, pungent and aromatic qualities.

Garden Cress (*Lepidium sativum*) is a hardy annual, not found wild in England. Its native country is Persia, and also Cyprus. It has been cultivated here since the middle of the sixteenth century. This plant produces a number of small leaves, which are curled in some of the varieties and plain in others. The flowering stem is branched and rises to the height of about a foot and a half, producing white flowers which blow in June or July. It germinates very rapidly, and is most generally used in its earliest growth. In this state it is mixed with the young leaves of mustard, and is the most esteemed of all the small salads or plants which are used in the early leaf.

Its flavour is so warm and pungent as to have procured for it the name of pepper-wort. During the greater part of the year a constant supply may be obtained by sowing a portion every week, and the application of a moderate artificial heat will furnish it throughout the winter.

Mustard (*Sinapis alba*) is often found growing wild among corn; but it is very generally cultivated, being sown with the garden cress to be eaten in the seed-leaf as a small salad; but when the plants are of a more advanced growth, the leaves become harsh and rank. Its flowers appear in June or July, and these are succeeded by round rough pods. Like cress it most readily germinates, and is, indeed, of still quicker growth. The seeds, strewed on wet flannel, or on cork, floating on water, quickly put forth tender leaves, and a salad is thus in a few days produced at the winter fireside.

The *Sinapis alba* is not generally cultivated for its seeds, which are used as a condiment; the species usually grown for this purpose is the *nigra*.

Burnet (*Poterium sanguisorba*) is an upland perennial, found upon dry soils, and attaining to rather more than a foot in height. Its flowers, forming small greenish heads tinged with purple, appear in July.

The leaves, when bruised, smell like cucumber. They have a slightly pungent taste; but their chief value consists in their continuing green and fit for use during winter. This plant was formerly much more cultivated than it is at present.

Garden Rocket (*Brassica eruco*) was likewise cultivated by our ancestors, who first obtained it from Austria in 1573. It has now entirely fallen into disuse in this country, but is still to be found in gardens on some parts of the Continent.

The list of plants which are occasionally eaten as salads is so numerous, and some of them are so little used, that a further detail of them would possess little interest. In fact any plant of rapid growth, and which has the seed-leaves pungent, without any deleterious property, may be used as small salad.

Celery (*Apium graveolens*). There are several varieties of the cultivated celery. The upright kinds are distinguished as the red and the white, and by having their stems either hollow or solid. Of these the red variety is of a coarse but more hardy nature than the others, and though not so good in its crude state, is well adapted for stews and soups.

The blanched footstalks of the leaves are the part generally used as an esculent. The Italians, however, take the unblanched leaves as an ingredient for soup; and when no other part of the plant can be obtained, the seeds alone will communicate a very agreeable flavour to certain culinary preparations.

The turnip-rooted celery, or celeriac, is more hardy than the upright varieties. The root of this is the only part used. It attains to a very considerable size, especially in Germany, where it is much esteemed, either as forming an ingredient with other viands, or prepared by itself, the outer coat and fibres being always previously detached. The boiled root, sliced when cold, and mixed with oil and vinegar, is considered a very choice salad.

CHAPTER XXVIII.

ALKALOIDS :—TEA, COFFEE, CHOCOLATE, PARAGUAY TEA.

In the tissues of various parts of plants, giving to many of them their peculiar properties, have been found a class of substances called alkaloids, on account of their resemblance in chemical relations to the alkalies potassa and soda. These alkaloids have been the result of recent chemical research, and they have added greatly to the resources of the medical man in the treatment of disease. In almost every case they have been found to form the active principle of the plants from which they are obtained. Thus Quinine is found to be the active principle of the various forms of Cinchona bark, Strychnia of the Strychnos nux vomica, Morphia of Opium, and so on.

There can be no doubt that in many of the plants which man takes as food these alkaloids are present, and exert an influence upon the system. It has not, however, till recently been found that in particular kinds of food one of these alkaloids forms a conspicuous ingredient. It is now known that an alkaloid exists in tea, coffee, and chocolate; and, what is very remarkable, this substance is the same in both tea and coffee, and closely analogous in chocolate. This alkaloid is called *Theine*, from its having been first discovered in tea (Thea), and the Caffeine of chemists is identical with it. It is curious that the only substance used by other nations that could vie with the consumption of tea, coffee, and chocolate in Europe, the Paraguay tea, used by the inhabitants of South America, contains also this identical alkaloid Theine. From this we think it may be fairly inferred that this alkaloid is the substance for the sake of which these plants are had recourse to. There can also be little doubt that the action of this substance is purely medicinal, and we have therefore classed these plants amongst those yielding medicinal secretions.

Tea (*Thea viridis*).

TEA.—The history of commerce does not, perhaps, present a parallel to the circumstances which have attended the introduction of tea into Great Britain. This leaf was first imported into Europe by the Dutch East-India Company, in the early part of the seventeenth century; but it was not until the year 1666 that a small quantity was brought over from Holland to this country by the Lords Arlington and Ossory.

In the year 1662, King Charles II. married a princess of Portugal, whence Waller says, "the best of queens and the best of plants we owe to that bold nation." But tea must have continued to be brought in small quantities only; for in the year 1664 the East India Company purchased, for the purpose of presenting to the king, two pounds two ounces of tea; and in the year 1678 they imported 4713 pounds of tea, which was then for the first time thought worthy their attention as a branch of their trade.

The tea-plant is indigenous to China or Japan, and probably to both. It has been used among the natives of the former country from time immemorial; and, from the age of Confucius, has been the constant theme of praise with their poets. It is only in a particular tract of the Chinese empire that the plant is cultivated; and this tract, which is situated on the eastern side, between the 30th and 33rd degree of north latitude, is distinguished by the natives as "the tea country." The more northern part of China would be too cold; and farther south the heat would be too great. There are, however, a few small plantations to be seen near to Canton.

The tree or shrub whence the Tea of commerce is derived is the Thea of botanists. It is very closely allied to the genus Cammellia, and Mr. Griffith, who is well qualified to give an opinion, states that there is no difference between the two genera. The genus *Thea* has a persistent calyx without bracts, five-leaved imbricated leaflets, the outer ones smaller. The petals of the corolla from 6 to 9, hypogynous, imbricated, the inner ones the largest, all adhering together at the base. The stamens are numerous, in several rows, adhering to the bottom of the petals, the filaments filiform, the ovary free and 6-celled.

There are but few species of *Thea*, some botanists assert only one; but, before proceeding to discuss the question of the varieties which yield the teas of commerce, we will describe those usually treated as distinct in systematic works.

T. viridis is a large, strong-growing, almost hardy plant, with spreading branches; its leaves from 3 to 5 inches long, thin, almost membranous, very broadly lanceolate, light green, and wavy, with large irregular serratures; the flowers large, white, usually solitary, mostly confined to the upper axil, with 5 sepals, from 5 to 7 petals, and a nodding fruit. This species is supposed to yield the green tea of commerce. It has repeatedly flowered in England, and may now be seen in the botanical gardens at Kew, Messrs. Loddiges, &c.

T. Bohea is a smaller and more delicate plant than

T. viridis: the leaves are not above two-thirds the size of the former species; they are elliptical, oblong, perfectly flat, more coriaceous, of a dark-green colour, with small and even serratures; they are numerous, and have in their axils two or three flowers of 5 sepals and 5 petals; they are small and have a slight odour, and flower later in the season than *T. viridis.* This plant is supposed to yield the leaves which are converted into black tea, and is a much more tender plant than the green-tea plant, being unable to stand the cold of an English climate. There has been and still is great controversy on the question whether the tea of commerce is the produce of but one plant or a variety of species. The difficulty arises from the fact that no competent person has ever been allowed to visit the tea districts of China so as to make a satisfactory report. The Chinese in the neighbourhood of Canton prepare a tea which is coloured and made up to imitate the various qualities of green tea, and large quantities are thus yearly exported. Tea having become so extensive an article of commerce, various attempts have been made to introduce it into other countries, and this experiment has attracted considerable attention from the cultivation of the tea-plant in Assam, the Himalaya, &c. The Assam tea-plant grows wild, and appears to partake of the characters of both Thea bohea and T. viridis. It first attracted public attention in consequence of replies to the circulars which had been sent to various gentlemen, and it was then discovered that certain individuals had for a length of time been aware of the existence of a kind of tea in this district. The situation of Assam is undoubtedly favourable for the culture of fine-flavoured teas, and the experiment, which has now been tried for five years, seems to be answering as well as can be expected. Each year the quantities have increased and the qualities improved; and, in order to account in a great measure for the inferiority of the flavour to that of Chinese tea, it must be borne in mind that very much depends on the preparation of the leaf, which requires long-practised and delicate hands to accomplish it. As soon as the plantations are sufficiently extended to induce Chinese tea-preparers to settle there, a difference must be found in the quality of the tea. In China no trouble or pains are spared to secure the excellence and flavour of the finest sorts of tea. The collectors are trained to it from a very early age, and some weeks before the harvest commences they are prohibited from eating fish, or any other food which is considered unclean, lest their breath should contaminate the leaves. They are also made to take a bath two or three times a-day, and are not allowed to touch the leaves with the naked fingers, but always wear gloves. The finest tea may, if the proper time for gathering it be neglected, be turned into an inferior tea in a single night. The Chinese propagate the plant by seed, and so uncertain is the vegetation that even in their own native climate it is necessary to sow as many as seven or eight seeds together in small holes in rows four or five feet asunder. The ground between each row is always kept free from weeds, and the plants are not allowed to attain a higher growth than admits of the leaves being conveniently gathered. The first crop of leaves is not collected till the third year after sowing, and when the trees are six or seven years old the produce becomes so inferior that they are removed to make room for a fresh succession. The plant will grow in either high or low situations, but always thrives best and furnishes leaves of the finest quality when produced in light stony ground. The leaves are gathered from one to four times during the year, according to the age of the tree. Most commonly there are three periods of gathering: the first commences about the middle of April, the second at Midsummer, and the last is accomplished during August and September. The leaves that are earliest gathered are of the most delicate colour and most aromatic flavour, with the least portion of either fibre or bitterness. Leaves of the second gathering are of a dull green colour, and have less valuable qualities than the former; while those which are last collected are of a dark green, and possess an inferior value. The quality is further influenced by the age of the wood on which the leaves are borne, and by the degree of expesure to which they have been accustomed; leaves from young wood, and those most exposed, being always the best.

Tea-gathering—from a Chinese drawing.

The leaves, as soon as gathered, are put into wide shallow baskets, and placed in the air or wind, or sunshine, during some hours. They are then placed on a flat cast-iron pan, over a stove heated with charcoal, from a half to three-quarters of a pound of leaves being operated on at one time. These leaves are stirred quickly about with a kind of brush, and are then quickly swept off the pan into baskets. The next process is that of rolling, which is effected by carefully rubbing them between men's hands; after which they are again put, in larger quantities, on the pan, and subjected anew to heat, but at this time to a lower degree than at first, and just sufficient to dry them effectually without risk of scorching. This effected, the tea is placed on a table and carefully picked over, every unsightly or imperfectly-dried leaf that is detected being removed from the rest, in order that the samples may present a more even and a better appearance when offered for sale. With some finer sorts of tea a different manipulation is employed; the heated plates are dispensed with, and the leaves are carefully rolled into balls, leaf by leaf, with the hands.

The names whereby some of the principal sorts of tea are known in China, are taken from the places in which they are produced, while others are distinguished according to the periods of their gathering, the manner employed in curing, or other extrinsic circumstances.

Bohea, of which description there are five kinds, takes its name from the mountain of Vou-yee, which is covered with tea-plantations. The earliest gatherings, in this district, is called Souchong, the Chinese name for which is *Saatyang;* and *Pekoe,* called by the cultivators *back-ho,* or *pack-ho;* Congou, *Kong-fou,* and other commoner kinds of Bohea-tea, are made from the leaves when in a state of greater maturity. Padre-Souchong, or *Pao-sut-tcha,* is gathered in the province where the best green tea is produced. This kind is esteemed on account of some medicinal virtues which it is supposed to possess.

There are three kinds of green tea, of which one called hyson, *hayssuen,* is composed of leaves very carefully picked, and dried with a less degree of heat than others; it is one-fourth dearer than souchong. The kind of green tea which is most abundant is called Singlo, which is the name of a mountain on which it grows, about one hundred and fifty miles to the southward of Nan-king. Gunpowder tea is made of tender green leaves, which yet have attained a considerable size. This kind is sometimes rolled into balls by hand, and is very highly esteemed; it sells for fifteen per cent. more than hyson. It is a commonly received opinion, that the distinctive colour of green tea is imparted to it by sheets of copper, upon which it is dried. For this belief there is not, however, the smallest foundation in fact, since copper is never used for the purpose. Repeated experiments have been made to discover, by an unerring test, whether the leaves of green tea contain any impregnation of copper, but in no case has any trace of this metal been detected.

The succulent tea-leaves are sometimes twisted into thin rolls or cords, about an inch and a half or two inches long, and several of these are tied together by their ends, with coloured silk threads. This is done with both green and black tea.

The Chinese do not use their tea until it is about a year old, considering that it is too actively narcotic when new. Tea is yet older when it is brought into consumption in England, as, in addition to the length of time occupied in its collection, and transport to this country, the East-India Company are obliged by their charter to have always a supply sufficient for one year's consumption in their London warehouses; and this regulation, which enhances the price to the consumer, is said to have been made by way of guarding, in some measure, against the inconvenience that would attend any interruption to a trade entirely dependent upon the caprice of an arbitrary government.

The people of China partake of tea at all their meals, and frequently at other times of the day. They drink the infusion prepared in the same manner as we employ, but they do not mix with it either sugar or milk. The working classes in that country are obliged to content themselves with a very weak infusion. Mr. Anderson, in his narrative of Lord Macartney's embassy, relates that the natives in attendance never failed to beg the tea-leaves remaining after the Europeans had breakfasted, and with these, after submitting them again to boiling water, they made a beverage which they acknowledged was better than they could ordinarily obtain.

The rich and luxurious Chinese keep their tea in fine jars of porcelain, some of which are thought to communicate an additional aroma to the tea, and all of which have narrow mouths (as may be seen in those brought to Europe and sold at a high price) to retain the peculiar odour. If the tea contracts damp, it is taken out and dried again. Siebold is of opinion the agreeable violet-like flavour of tea is inherent in the leaves themselves; but most writers ascribe the different flavours of the choicest kinds of tea to the admixture of the flowers, leaves, or oils of other plants. The Chinese dry many millions of pounds of the leaves of various plants to mingle with the genuine tea-leaf; so that all the spurious leaves found in parcels of bad tea must not be ascribed to adulteration by the dealers in this country. The action of tea upon the human system has been much discussed, and gives rise to various opinions. It has been preposterously praised by some and unjustly accused by others of producing various diseases: above all, it has been charged with causing an increase in nervous diseases. It would perhaps be more just to attribute the increase of such complaints to the more complicated state of our social relations, arising from an augmented population, an advance in luxury and indulgence, and a more general infringement of the laws which nature demands shall be observed for the preservation of health. That tea should not suit all ages and constitutions, is not remarkable. It is less suited for young persons and children than adults, and should by no means take the place of more solid food; yet there appears to be a want in the system which it is eminently adapted to supply, and in peculiar states of the brain produced by alcoholic stimulants or by intense mental excitement it is a salutary remedy. On the contrary, in cases of diminished excitement its effects are injurious. Persons of a gouty and rheumatic nature—above all, those subject to calculous diseases of the lithic acid diathesis—find weak tea the least objectionable article of common drink. They should take it without sugar and very little milk. The medical application of tea is very limited. In fevers it is sometimes used as a diluent at the commencement, and a tincture of tea, made by macerating tea in proof spirit and adding a teaspoonful of this to a small portion of water, has been used and found of service after the acute symptoms have subsided. As an antidote to poison it is nearly as powerful a remedy as coffee; and some cases of poisoning by arsenic and tartarized antimony have been overcome by the immediate administration of a very strong infusion of tea. Tea has been denounced as a useless article of luxury and extravagance to the poor; and some writers have undertaken to calculate the amount yearly uselessly expended on this article of diet; but the observations of Liebig seem to offer a satisfactory explanation for the apparent necessity which exists for the use of this beverage from the highest to the lowest class in civilised communities. The action of caffeine and theine on the system are in all respects identical; and without entering minutely into the medical action of these properties, Liebig proves that, with the addition of oxygen and the elements of water, they will yield *taurine*, the nitrogenized compound peculiar to bile. If, therefore, an infusion of tea contains no more than one-tenth of a grain of theine, still if it contribute to the formation of bile, the action even of so small a quantity has an influence on the system. When there exists an excess of nonazotized food or a deficiency of exercise, which in a healthy and natural state of the body would produce the nitrogenized substances secreted in the formation of bile, the use of a chemical agent capable of supplying this important deficiency must certainly be beneficial. Its action may be imperceptible, but it unquestionably exists; and these two great principles, caffeine and theine, are better adapted to the purpose than all other nitrogenized vegetable products. These facts account in some measure for the universal use of this beverage, and in what manner it supplies the place of more solid food to the poor, as well as the reason for its great popularity amongst females and those who take but little exercise. The first importation of tea into England by the East India Company took place in 1676, when the directors ordered their servants to send home by one of these ships one hundred pounds of the best "*tey*" they could produce. In 1678 4713 lbs. were imported; but in the six following years the entire imports amounted to no more than 410 lbs. In 1725 the consumption of tea in England amounted to 370,323 lbs., and in 1841 it had increased to 36,681,877 lbs. For above a century and a half the sole object of the East India Company's trade with China was to furnish a supply of tea for the consumption of the United Kingdom. They enjoyed an entire monopoly in this respect and realised immense prices; but by the interference of Government this great channel of wealth was directed into a different course, and the duty on tea now produces about one-thirteenth of the total revenue. The number of tea-dealers in 1839, in England, was 82,794; in

Scotland, 13,611; in Ireland, 12,774: total, 109,179. Tea is now sold by the importing merchants by public auction and private sales. Between the years 1631 and 1841 the population of the United Kingdom increased 14 per cent., and the consumption of tea increased 16 per cent. The proportion of black to green teas consumed in England is about as 5 to 1. In America the use of green tea is the greatest. The total export from Canton to Europe and America exceeds 50,000,000 lbs. Russia takes 6,500,000 lbs.; the United States about 8,000,000 lbs.; France, 2,000,000 lbs., and Holland about 2,800,000 lbs. The green-tea districts are about 700 miles from Canton, and those where the black tea is made about 200 miles distant. The article is brought from Canton by land-carriage, chiefly by porters, and canals, and the number of tea-merchants assembling at Canton during the season of active trade is about 700.*

COFFEE is the seed contained in a berry, the produce of a moderate-sized tree called the *Coffea Arabica*, and which has also been named *Jasminum Arabicum*. This tree grows erect, with a single stem, to the height of from eight to twelve feet, and has long, undivided, slender branches, bending downwards: these are furnished with evergreen opposite leaves, not unlike those of the bay-tree. The blossoms are white, sitting on short foot-stalks, and resembling the flower of the jasmine. The fruit which succeeds is a red berry, resembling a cherry, and having a pale, insipid, and somewhat glutinous pulp, inclosing two hard oval seeds, each about the size of an ordinary pea. One side of the seed is convex, while the other is flat, and has a little straight furrow inscribed through its longest dimension: while growing, the flat sides of the seeds are towards each other. These seeds are immediately covered by a cartilaginous membrane which has received the name of *the parchment*. They consist of much horny albumen, and a peculiar principle or alkaloid termed *caffeine*, which contains more nitrogen than any other known vegetable substance, and is identical with theine. In its raw state the seed is used as a

* 'Penny Cyclopædia.' Tea.

medicine, but when roasted it is not only valuable as a medicine, but as an extensive article of diet and luxury.

Botanists have enumerated several varieties of this tree as existing in the Eastern and Western Hemispheres. These varieties result from accidents of soil and climate, and must have been produced subsequently to the naturalizing of the plant in America, since it is pretty certainly shown that all the coffee-trees cultivated there are the progeny of one plant, which so recently as the year 1714 was presented by the magistrates of

Coffee, with the Flower and Berry

Amsterdam to Louis XIV., King of France. This plant was placed at Marly under the care of the celebrated

Mons. de Jussieu, and it was not until some years after this that plants were conveyed to Surinam, Cayenne, and Martinico. The cultivation must have afterwards spread pretty rapidly through the islands, since in the year 1732 the production of coffee was considered to be of sufficient consequence in Jamaica to call for an act of the legislature in its favour.

The use of coffee as an alimentary infusion was known in Arabia, where the plant is supposed to have been indigenous, long before the period just mentioned. All authorities agree in ascribing its introduction to Megalleddin, Mufti of Aden, in Arabia Felix, who had become acquainted with it in Persia, and had recourse to it medicinally when he returned to his own country. The progress which it made was by no means rapid at first, and it was not until the year 1554 that coffee was publicly sold at Constantinople. Its use had, in the meanwhile, been much checked by authority of the Syrian government, on the ground of its intoxicating qualities; but more probably because of its leading to social and festive meetings incompatible with the strictness of Mohammedan discipline.

A similar persecution attended the use of coffee soon after its introduction into the capital of Turkey, where the ministers of religion having made it the subject of solemn complaint that the mosques were deserted while the coffee-houses were crowded, these latter were shut by order of the Mufti, who employed the police of the city to prevent any one from drinking coffee. This prohibition it was found impossible to establish, so that the government, with that instinctive faculty so natural to rulers of converting to their own advantage the desires and prejudices of the people, laid a tax upon the sale of the beverage, which produced a considerable revenue.

The consumption of coffee is exceedingly great in Turkey, and this fact may in a great measure be accounted for by the strict prohibition which the Moslem religion lays against the use of wine and spirituous liquors. So necessary was coffee at one time considered among the people, that the refusal to supply it in reasonable quantity to a wife, was reckoned among the legal causes for a divorce.

Much uncertainty prevails with respect to the first introduction of coffee into use in the western parts of Europe. The Venetians, who traded much with the Levant, were probably the first to adopt its use. A letter, written in 1615 from Constantinople, by Peter de la Valle, a Venetian, acquaints his correspondent with the writer's intention of bringing home to Italy some coffee, which he speaks of as an article unknown in his own country. Thirty years after this, some gentlemen returning from Constantinople to Marseilles brought with them a supply of this luxury, together with the vessels required for its preparation; but it was not until 1671 that the first house was opened in that city for the sale of the prepared beverage.

Coffee-houses date their origin in London from an earlier period. The first was opened in George Yard, Lombard Street, by one Pasqua, a Greek, who was brought over in 1652 by a Turkey merchant named Edwards.

The first mention of coffee that occurs in our statute-books is found in the act 12th Car. II. cap. 24 (Anno 1660), whereby a duty of fourpence per gallon, to be paid by the maker, was imposed upon all coffee made and sold: three years after this, coffee-houses were directed to be licensed by the magistrates at quarter-sessions.

Coffee cannot be cultivated to advantage in climates where the temperature at any time descends below fifty-five degrees of Fahrenheit's scale. The trees flourish most in new soils on a gentle slope, where water will not lodge about the roots. In exposed situations it is necessary to moderate the scorching heat of the sun by planting rows of umbrageous trees at certain intervals throughout the field.

Coffee-trees are usually raised from seed in nursery-grounds, and are afterwards planted out at regular distances, which vary according to the nature of the soil. Where this is very dry or gravelly, the trees seldom rise higher than six feet, and may be planted five feet apart; but in rich soils, where they attain the height of nine or ten feet, or more, the plants should not be so crowded, and intervals of eight or ten feet should be left between them.

It is well known that coffee imported from the West Indies does not equal in its flavour that produced in Arabia and other parts of the East; and it is commonly imagined that this inferiority is principally owing to local causes, and is therefore incapable of being remedied. There is reason for believing, however, that the superior quality of Turkey and East-India coffee is not in any great degree to be referred to the influences of soil and climate, but depends, in part at least, upon the age to which the seeds are kept before they are brought into consumption. Trees planted in a light soil, and in dry and elevated spots, produce smaller berries, which have a better flavour than those grown in rich, flat, and moist soils: the weight of produce yielded by the latter is, however, double that obtained from the former; and as the difference in price between the two is by no means adequate to cover this deficiency of weight, the interest of the planter naturally leads him to the production of the largest but least excellent kind. It is confidently asserted that this difference of quality entirely disappears by keeping, and that "the worst coffee produced in America will, in a course of years not exceeding ten or fourteen, be as good, parch and mix as well, and have as high a flavour as the best we have now from Turkey."

The trees begin bearing when they are two years old; in their third year they are in full bearing. The aspect of a coffee-plantation during the period of flowering, which does not last longer than one or two days, is very interesting. In one night the blossoms expand themselves so profusely as to present the same appearance which has sometimes been witnessed in England when a casual snow-storm at the close of autumn has loaded the trees while still furnished with their full complement of foliage. The seeds are known to be ripe when the berries assume a dark red colour, and if not then gathered will drop from the trees. The planters in Arabia do not pluck the fruit, but place cloths for its reception beneath the trees, which they shake, and the ripened berries drop readily. These are afterwards spread upon mats and exposed to the sun's rays until perfectly dry, when the husk is broken with large heavy rollers made either of wood or stone. The coffee thus cleared of its husk is again dried thoroughly in the sun, that it may not be liable to heat when packed for shipment.

The method employed in the West Indies differs from this. Negroes are set to gather such of the berries as are sufficiently ripe, and for this purpose are provided each with a canvas bag having an iron ring or hoop at its mouth to keep it always distended, and this bag is slung round the neck so as to leave both hands at liberty. As often as this bag is filled, the contents are transferred to a large basket placed conveniently for the purpose. When the trees are in full bearing, an industrious man will pick three bushels in a day. If more are gathered, proper care can hardly be exercised in selecting only the berries that are ripe ; it is the usual calculation, that each bushel of ripe berries will yield ten pounds' weight of merchantable coffee.

In curing coffee it is sometimes usual to expose the berries to the sun's rays in layers, five or six inches deep, on a platform. By this means the pulp ferments in a few days, and having thus thrown off a strong acidulous moisture, dries gradually during about three weeks : the husks are afterwards separated from the seeds in a mill. Other planters remove the pulp from the seeds as soon as the berries are gathered. The pulping-mill used for this purpose consists of a horizontal fluted roller acting against a moveable breast-board so placed as to prevent the passage of whole berries between itself and the roller. The pulp is then separated from the seeds by washing them, and the latter are spread out in the sun to dry. It is then necessary to remove the membranous skin or parchment, which is effected by means of heavy rollers running in a trough wherein the seeds are put. This mill is worked by cattle. The seeds are afterwards winnowed to separate the chaff, and if any among them appear to have escaped the action of the roller, they are again passed through the mill.

Much depends upon the manner of roasting and making coffee, and the French have been almost universally extolled in the preparation of this beverage. They use but little Mocha coffee, which proves that the superiority of the Arabian plant over the West Indian is much less than has been supposed. Beans of a good quality are hard and heavy, sink quickly in water, are of a light yellowish green colour, not discoloured or black, and possess the odour of coffee, which though faint is peculiar, and are free from any damp smell. Beans recently collected are not nearly so good as those which have been kept about a year; when much older, they lose some of their flavour. From the analysis of Seguin and Schrader, coffee consists of coffee-bitter (impure coffee), solid fat, resin, a little aromatic principle, gum, albumen (this albumen, according to Seguin, unites with the yellow coffee-bitter, and forms a green), and lignin. The taste of raw coffee is somewhat sweetish, but the application of heat produces important changes. The bean increases to nearly twice its original size, and loses about a third of its weight. A powerful aromatic odour is evolved, and a large quantity of empyreumatic oil, which appears in small drops on the surface, is formed along with a bitter principle, probably by an alteration in the caffein and of the saccharine matter. The roasting of coffee should take place in a close revolving cylinder over a clear but moderate fire, and should not be carried too far, as is generally the case in Britain; when the beans have acquired a light chesnut colour, the process is completed, and they should then be cooled quickly by being tossed up into the air, and ground immediately in a covered mill or mortar. The infusion should be prepared as soon as possible from the powder; about half an ounce being used for every half-pint of water. In this speedy succession of the various steps of preparation, lies the secret of the excellency of Continental coffee, and the inferiority of our own. When the beans are roasted some days or perhaps weeks before the beverage is prepared, a large portion of the aroma is dissipated, and its fine flavour destroyed. The employment of white of egg or fish-skin to clarify coffee is objectionable; clearness is thus purchased at the expense of strength. The addition of milk, which should always be hot, and of sugar, heighten the nourishing qualities of this beverage, and in the morning render it a substantial article for breakfast, but when it is taken after dinner to promote digestion, the milk, and if possible the sugar, should be dispensed with. The action of coffee on the system is chiefly owing to the empyreumatic oil, and consequently it is greatest when roasted; but its extractive and highly nitrogenous principle must also considerably influence the organs of digestion. It acts powerfully on the ganglionic system of nerves and their ramifications. It elevates their vitality and quickens all their actions. Its influence on the brain is likewise very perceptible, and hence the increased activity and energy of that organ after the use of coffee, and the removal of all sense of fatigue and disposition to sleep. Upon this depends the use of coffee in counteracting the effects of narcotic poisons, such as opium and belladonna. It assists digestion and checks the disturbance of the nervous system arising from too free a use of stimulants, and this will account for its frequent use after dinner. It excites the vascular system and renders more powerful the contractions of all the muscles. It therefore enables the system to resist the influences of cold and damp, and is fitted for the inhabitants of damp climates and those who are exposed to a humid or night atmosphere. In warm climates it removes languor and helps the stomach to perform its office when enervated from the effects of excessive heat. Thus we see from its adaptation to the wants of the human frame in such a variety of circumstances, it has become an almost universally adopted and favourite article of diet, yet it is not without some disadvantages. For plethoric persons, and those who have a tendency to abdominal congestions, it is unsuited; and for persons subject to piles, it is generally improper. Those who have an excitable vascular system should abstain from its use, and on the whole it is more adapted for the slender and those advanced in life than for the young and robust. When used to an injurious extent, it gives rise to a nervous irritability, twitching of the eyelids, congestion, loss of digesting power, obstruction of the liver, &c. Coffee is, as we have said, much more extensively used as an article of diet than of medicine. Raw coffee has, however, been found serviceable in the cure of intermittent fevers. A strong infusion of it, without sugar or milk, often removes megrim or hemicrania; and in some cases of asthma, with tincture of opium or alone, it has kept off the paroxysms. Strong coffee is the safest and best antidote to vegetable poisons which can be applied by unprofessional persons. It is much more proper than vinegar, which should never be given till all the poisonous substance has been removed from the stomach.

The quantity of coffee consumed in Europe is very great. Humboldt estimates it at nearly one hundred and twenty millions of pounds, about one-fourth of which is consumed in France. Since the time this estimate was made, however, a vast increase has taken place from the great amount of consumption in England.

The consumption of coffee in the United Kingdom appears, from official calculation, to have increased in the following ratio since 1820:—

1820	7,103,409 lbs.
1821	7,593,001
1822	7,669,351
1823	8,454,920
1824	8,262,943
1825	11,082,970
1826	13,203,323
1827	15,566,376
1828	17,127,633
1829	19,476,180
1830	22,691,522

It appears from this calculation that the reduction of the duty in 1825 was followed by an immediate and rapid increase in consumption, which rose from $8\frac{1}{4}$ millions of pounds in 1824 to more than $22\frac{1}{2}$ millions in

1830. At this point, the consumption having overtaken the supply of those kinds which were admissible at the lowest rate of duty, the increase stopped, and the consumption has since remained almost stationary. The net revenue derived from the importation of coffee into the United Kingdom in 1835 was 652,123*l*.

The CACAO, or Chocolate-tree, is known to botanists by the name of *Theobroma*, signifying "food for a god," and which name was bestowed upon it by Linnæus, to mark his opinion of the excellent qualities of its seeds. Benzoni, who travelled in the sixteenth century, formed a very different estimate of its merits, and declared that chocolate was a drink "fitter for a pig than for a man."

The genus *Theobroma* consists of trees with large simple leaves and flowers always in clusters. The calyx is composed of five sepals; the petals are five, lengthened into a strap-like form at the apex. The stamens are five, each with double anthers and a horn-like appendage between each filament, the style is filiform with a five-parted stigma; the fruit a 5-celled capsule without valves, the seeds imbedded in a soft pulp, and thick oily wrinkled cotyledons. The species chiefly used in the manufacture of cocoa and chocolate are *T. cacao*, *T. speciosum*, *T. sylvestre*, and *T. subincanum;* and the fruits are collected from both wild and cultivated plants, the size and form of which vary with the species.

The Cacao-tree is carefully cultivated in many of the settlements in Spanish America, and particularly in Mexico, where, we learn from Humboldt, it was extensively reared so long ago as the time of Montezuma; and whence, indeed, it was transplanted into other dependencies of the Spanish monarchy. The names whereby the plant, and the food prepared from its seeds, are recognised in the present time, are both derived from the Mexican language; the former being called by that people *cacava quahuitl*, and the latter *chocolatl*. The seeds of the cacao were made use of as money in Mexico, in the time of the Aztec kings, and this use of them is still partially continued, the smaller seeds being employed for the purpose. The lowest denomination of coined money current in Mexico is of the value of about sixpence; and as there must arise many petty transactions of business to a lower amount, the convenience of these seeds, six of which are reckoned as of the value of one halfpenny, must needs be very great.

The Cacao-tree seldom rises above the height of twenty feet; its leaves are large, oblong, and pointed. The flowers, which are small, and of a pale red colour, spring from the large branches; they are succeeded by oval-pointed pods, that contain a white pithy substance, which is sweet, but disagreeable, and surrounding numerous seeds: these are the cacao of commerce. These seeds are oval-formed, and about as large as a moderate-sized almond-kernel, but not so slender; they are internally of a very dark brown colour, approaching to black, and are covered with a thin skin or husk, of a light reddish brown colour. The nuts are very numerous, but vary in this respect, some pods containing as many as a hundred, while others do not yield more than twenty seeds: they are of a very oily nature.

The trees are raised from seed, which is sown under the shade of the coral-tree, or the banana, and they do not come into bearing until six or seven years old. Their cultivation does not call for any great application of labour; and when the trees are once in a productive state, they require but little attention beyond that necessary for merely collecting the produce. In some instances the fruit is buried in the earth in heaps, and allowed to ferment for thirty or forty days before being prepared for use, a process which greatly improves them and destroys the germinating power of the seed.

Cacao is principally used after having been made into cakes, to which the name of chocolate is given. The method anciently employed by the Indians in making these cakes, was simply to roast the seeds in earthen pots, and after clearing them from the husks, which by reason of the heat employed could be easily removed, the naked seeds were bruised between two stones, and made up with the hands into cakes. The process at present used by Europeans does not differ greatly from that just described: more care is taken in grinding the seeds after they are roasted, so as to convert them into a paste which is perfectly smooth, and some flavouring ingredients are added, according to the taste of the people who are to consume the chocolate. Cloves and cinnamon are much used for this purpose by the Spaniards; other aromatics, and even perfumes, such as musk and ambergris, have sometimes been added; but the principal flavouring ingredient used with cacao is vanilla, a short notice of which is subjoined. The intimate mixture of these substances having been effected, the whole is put while yet hot into tin moulds, where it hardens in cooling, and in this form, if preserved from the air, it will keep good for a considerable time. Chocolate is not very much consumed in England; it is in greater esteem in France; it forms the ordinary breakfast in Spain; and in Mexico, according to Humboldt, it is not considered an object of luxury, but rather of prime necessity.

For invalids plain chocolate is best, the perfumed being too heating; where tea and coffee disagree, cocoa or chocolate is the best substitute. It is sometimes said to create headache and to disturb the stomach. In almost all instances, however, this arises from making the beverage too strong. The printed directions order far too much of the substance to be used, half the quantity being generally sufficient. The Spaniards do not reckon chocolate very nutritious, for the priests, who are supposed to fast for many hours before going to mass, are allowed to drink it. This is however a convenient mistake. Schrader, who analyzed cocoa, regarded the bitter principle as similar to caffeine. The analysis of theobromine by Woskresensky, shows how nearly he was correct, and that this article, being one of the most highly azotised vegetable compounds, is highly nutritious. Liebig considers that this principle contributes to the formation of bile, like theine.

The quantities of cocoa consumed in this country since 1831 are as follows:—

1831	502,806 lbs.
1832	1,150,193
1833	1,268,287
1834	1,173,795
1835	1,085,980

The great increase in consumption between 1831 and 1832 was occasioned by the reduction of the duty in the latter year from sixpence to twopence a pound.

VANILLA (*Vanilla aromatica*) is a native of Mexico and of some parts of India. The Spaniards found its fruit in use among the Aztecs at the time of their first invasion of Mexico. At this day, although a considerable quantity of vanilla pods is collected in that state for the purpose of exportation, the people do not themselves employ them in the manufacture of chocolate—the only use to which they have ever been anywhere applied—conceiving them to be possessed of unwholesome properties.

The vanilla is a parasitical plant; its leaves are lanceolate and ribbed, eighteen inches long and three inches broad. Its flowers are white, intermixed with stripes of red and yellow colours; these are succeeded by long and slender pods, which at first are green, but become yellow as they ripen, and are then collected for use. The cavity of the pod contains, besides its numerous seeds, a substance which is black, oily, and balsamic; when recently gathered this is humid, and its odour is said to induce a kind of temporary intoxication. The pods are harvested during the three latter months of the year, and are carefully dried by exposure to the sun's rays until they are made warm, in which state they are wrapped in woollen cloths, to promote and absorb evaporation. By this process the vanilla acquires a black hue, with a somewhat silvery appearance. Five of the pods thus treated will usually weigh one ounce. The vanilla plant is very easily propagated by cuttings: these reach about a foot in length, and are planted at the root of the tree about which it is intended to climb. These plants will yield pods in their third year, and each will continue to furnish about fifty annually for thirty or forty years. What is a singular advantage in that climate, no insect will attack this plant.

PARAGUAY TEA, or MATE', is the produce of a plant belonging to the family Aquifoliaceæ. It was formerly supposed to be the produce of the *Ilex vomitoria*, which is found in North America, in the Carolinas, and Florida; but from specimens sent from Brazil to Mr. Lambert it appears to be a distinct species, which he has named *Ilex paraguanensis*. It is a shrub which attains the size of the orange-tree, quite smooth, with bluntish, wedge-shaped, remotely serrated leaves, with umbelliferous flowers seated in the axils of the leaves. It is the *Ilex Maté* of Saint Hilaire, and grows wild in Paraguay and Brazil, and is called by the Spaniards *Yerva Mate*. The leaves of this shrub are in great repute amongst the inhabitants of South America, and are used in infusion, in a similar manner to the tea in China. Upwards of 5,000,000 lbs. of the leaves of this tree are annually collected in Paraguay, and are sent to Chile and the vice-royalty of Buenos-Ayres. It is not cultivated, and merchants carry various articles into the interior, which they give the natives for their labour in collecting the leaves of the plant. After the branches are cut away the ground is heated by means of a fire, and the branches, being laid upon the heated ground, are dried, and afterwards they are beaten and pressed into bags, in which state it comes into the market. There are three kinds known in the market: the *Caa-cuys*, which is the bud of the leaf; the *Caa mini*, the leaf torn from its midrib and veins without roasting; and the *Caa guaya*, or *Yerva de Palos* of the Spaniards, the whole leaf with the petioles and small branches roasted. The first does not steep well, and is seldom seen. The plant when used is steeped in boiling water, to which a little sugar, and sometimes lemon-juice, is added. It is drunk out of a vessel called Maté, which has a spout perforated with holes for the purpose of preventing the powdered herb from passing out with the fluid. The Creoles are passionately fond of this beverage, and never partake of a meal without it. The properties of the plant are sedative and stimulant.

Another species of Ilex, the *I. Gonghona*, found in Brazil, is applicable to the same purposes as the last, and, although inferior in quality, was used extensively as a substitute for the true Paraguay tea, when the export of the latter from Paraguay was forbidden by the dictator Francia.

The *Ilex vomitoria* produces the Cassena of Florida and the Carolinas, which is used for the purpose of correcting the flavour of water.

END OF VOL. II.

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