

as the milt, on account of its abundance of blood, is more affected than other organs. The principal causes, however, are found to exist in the watering places, inasmuch as the sheep are in the habit of drinking from stagnant and foul ponds.

In a disease so rapid in its progress, a special treatment of the several affected animals may be out of the question, though the most valuable may be subjected to such care. In this, we must first look at the nature of the disease. If there are symptoms of great heat, both about the mouth and horns, as well as a difficulty of breathing, we should bleed the neck of the animals until they faint, pour cold water on them for from eight to ten minutes, in intervals of two minutes each, and put bandages around them, of the breadth of six fingers, soaked with turpentine oil and strewn with the dust of blister-flies. Internally, they should receive, in half a glass of water, from two to three drachms of camphor, finely pulverized and dissolved with spirits; to this should be added from one and a half to two drachms of sulphuric acid, or, still better, some tincture of iron mixed with the water. Of this mixture the animals should be given a dose every hour. If there are any signs of recovery after the lapse of twenty-four hours, the mixture should be given only twice or thrice a day until they are completely restored. The boils should be cut and cleaned of the matter they may contain, after which the wound is to be washed with a mixture of water, vinegar, and kitchen salt. We must be careful in cutting them, so that the poisonous matter may not touch either the face or hands, which, as a protection, should previously be well oiled, or greased.

The following rules may be laid down to prevent the disease:

The sheep should not be kept in too fat a condition.

In the summer months they should not be exposed to the burning heat of the mid-day sun.

All running and chasing should be avoided; they should be led, and treated in a mild and gentle way.

They should be provided with new pastures every week.

They should not be allowed to graze in the neighborhood of dusty roads, frequented by carriages, so as to inhale the dust.

They should not be allowed to rest in valleys and low places, but only on heights; where they may enjoy the comfortable breeze, undisturbed by insects.

To deprive the milt disease of its contagiousness, the lambs should be kept warm in winter; for it is the severe cold, stormy, sharp, and changeable weather, that creates the germ, and which, if favored by circumstances, is very apt to assume the character of contagious disorder during summer.

Healthy sheep should not be allowed to come in contact with diseased ones.

Give them always pure water to drink; the greatest advantage would result from well-water containing iron.

At the appearance of any symptoms of disease, the sheep should be removed from their pastures as far as possible.

They should also receive proper medicines in the latter part of May.

For this purpose a mixture should be used, consisting of one part of

wormwood, (*Artemisia absinthium*,) one half of juniper berries, (*Juniperus communis*,) one part of gentian wort, (*Gentiana*,) one half of saltpeter, (nitrate of potassa,) one part of kitchen salt, and one part of bitter salt, (Epsom salt.) These ingredients, finely pulverized and mixed with eight or ten parts of bran, must be given to the sheep to lick.

A cheaper mixture consists of one part of wormwood, (*Artemisia absinthium*,) one part of gentian wort, (*Gentiana*,) one half part of saltpeter, (nitrate of potassa,) one part kitchen salt, one part of bitter salt, (Epsom salt,) one half part of vitriol of iron, and one part of tar. After a fine pulverization of all the ingredients, they are to be mixed with fifteen or eighteen parts of pure loam, and well worked. Of this mixture loaves of from fifteen to twenty pounds are formed, and dried in a moderate warmth, when they will be put in accessible places to be licked by the sheep.

If all these preventives prove ineffectual, the application of chloric water is highly recommended. For one hundred head of sheep, one part of chloride of lime is dissolved in water, and poured into the troughs. The animals should be induced to drink the chloric water by a dose of pure salt, given to them to be licked some hours before.

Mr. W. Reidemeister recommends the vitriol of iron as an effectual preventive. It is to be dissolved in the water intended for drinking. In other diseases of domestic animals, especially the atrophy of cattle, the tumor of horses, and even the diseases of poultry, it has been found a reliable cure.

ON THE PRINCIPAL PLANTS USED AS FOOD BY MAN.

SKETCH OF THE PLANTS CHIEFLY USED AS FOOD BY MAN, IN DIFFERENT PARTS OF THE WORLD AND AT VARIOUS PERIODS.

BY DR. F. UNGER.

[Translated from the German for this Report.]

Nothing has had so powerful an influence in changing the nature of the savage as becoming accustomed to a bloodless food derived from the vegetable kingdom. It is true, that plants contain the materials of the blood and flesh, but nutriment derived from plants is very different from that derived from animals. Instead of a deadly struggle for existence, the vegetable world freely yields up its best gifts without being essentially impoverished itself. The kernel, the ripe fruit, the tender, juicy sprout, the marrowy substance of the mushroom, even the farinaceous tuber and root, in their season of perfection and fitness for the use of man, usually only precede the period of their unavoidable decay and decomposition. That which is derived from the vegetable

world depends upon no strife with nature, and in the peaceful search after vegetable nourishment, man becomes himself peaceable.

It is quite reasonable to suppose that, in moving around vaguely in the forest and on the plains, by the sea-shore, and on the bank of rivers, the human race should ere long have discovered some esculent grain or nutritious root or fruit, even without taking into consideration what it might have learned from the instincts of animals. This much is certain: that with less rich endowments or gifts, the correct application of these materials to the necessities of his support, must have involved many labors and dangers, and the rectification of many mistakes.

From the various researches into the peculiarities of the vegetable kingdom, and from historical investigations, it may readily be shown that no portion of the earth's surface, even though of but slight extent, was originally entirely without nutritious plants. Nevertheless, it is equally certain that the original and natural distribution of such plants was very unequal in different parts of the world, whatever it may have since become through the aid of man and from other causes.

The vegetable world manifestly increases in variety with a milder climate, a warmer sun, and a less marked alternation of temperature. It is, consequently, not to be wondered at, that, with the increasing amount of heat in passing from the ice-encircled pole towards the equator, edible plants should increase in number, and their products gain in size and palatability. The cold portions of the northern and southern hemispheres produce few native nutritious plants, excepting such as algae, lichens, mushrooms, and some edible berries. The tropical regions, on the other hand, furnish a superfluity of farinaceous roots, and of sweet and juicy fruits, while the pierced bark of a tree (*Galactodendron utile*, H. B.) even supplies a nutritious milk. The East and West Indies, Central America, the coast of tropical Africa, are, in this respect, equally favored, each in its own way.

This is not the case, however, in the temperate zone, and especially in the warmer temperate regions of the earth. While the southern hemisphere can claim little prominence in this respect, the northern furnishes a large and varied series of nutritious plants, all important to its inhabitants. It is, nevertheless, remarkable how little the Western World can enter into competition with the Eastern in this respect, while the western portions of the latter (South Europe and North Africa), as also the eastern (China and Japan), are of much less importance when compared with its middle region.

All the investigations which we have been enabled to make, in reference to the native country of our most important cultivated plants, point unanimously to one particular district as most favored in its position, and from which the greatest number and most important of plants have been derived. It is that which is encircled by the great inland seas of the earth, namely, by the Persian and Arabian gulfs, the Mediterranean, the Black, and the Caspian seas. From the slopes of the Caucasus, of Taurus, and of the Albors, not only do our most generally distributed fruits derive their origin, but the cereals also; and if we are not able to detect and to recognize the progenitors of these plants

in their native localities, yet history shows Armenia, Persia, Mesopotamia, and Syria, to have been their cradle. Even if there were no other mode of determining the locality of Paradise, the point of radiation of all European civilization, our knowledge of the origin of the most nutritious plants would enable us to establish its position.

It is a fact, by no means to be kept in the back-ground, that hardly one of the plants, the products of which are used for purposes of nutrition, is pleasant or palatable in its original condition. Their different methods of culture, their transportation to portions of the earth remote from their place of origin, and the varied operations of Nature by which changes are induced in size, character, texture, and chemical constitution, have, little by little, caused them to differ from the original just in proportion as the hand of man has cared for them. This has caused the cereals and the tuberous plants to be more nutritious, and has rendered the vegetables of the kitchen-garden and fruits more palatable. How great a difference exists between the wild original plants, and those altered by the agency of man, is shown by our roots, as the turnip, the parsnip, the shallot, &c.; and such fruits as the pineapple, banana, grape, strawberry, &c.

Even when long-continued effort is not sufficient to effect a desirable change in the plant, it is often possible for man to make use of as food. Who does not know that the farinaceous root of the Mandioca, or Cassava, (*Jatropha manihot*, L.), is not only unpalatable but actually poisonous, on account of the hydrocyanic (prussic) acid in its milky juices. The native, however, has for a long time obtained a substance, by pressing out the grated root, and by washing, drying, and toasting, which serves him for his daily bread, and furnishes at the same time a starch (tapioca) useful for various purposes. The same is the case with various other tuberous substances, as, for instance, the Takka, the *Dracontium polyphyllum*, &c.; as also with fruits and seeds, where portions must be removed and altered in order to render the rest fit for use.

How simple a treatment of many of the farinaceous plants is sufficient to prepare them for food, is shown, for example, by the Tarro root (*Arum esculentum*, L.), the Bread fruit (*Artocarpus incisa*, L.), the Sweet potato *Convolvulus batatas*, L.), and others, which require only to be crushed or grated to furnish daily nourishment. When the pulp of such plants passes into fermentation, or is subjected to the influence of fire, its nutritious qualities and palatability are increased; should spices be added to promote digestibility, or if combinations of different vegetable substances be effected with materials of an animal character, we have the first germ of the art of cookery before us. It is quite probable that the greater mass of mankind has not gone beyond this primitive condition of the art to its more refined modifications.

The farinaceous plants unquestionably constitute the basis of all vegetable nutriment. Starch and different protein substances are the most important constituents of such portions as are used for the purposes of food. Nevertheless, an accumulation of these substances is not to be found in all plants, and just as little in all parts of one and the same plant. They are mostly garnered up in tubers, in roots, in the pith of stems, in fruits, and in seeds. These, therefore, have usually

been sought after by man and introduced into the circle of his household economy, whenever this became fixed on a firm basis. The attempt to remove the small seed-like fruit from the various graminous plants, or to test the thick fleshy fruits in reference to their possession of nutritious substances, was as important to man as to animals. For this reason the seeds of the grasses, and many fleshy tuberous roots, have played the most important part among all cultivated plants, and their multiplication by cultivation first enabled man to produce them in greater number in a given space, and thereby to begin his own political and moral development.

It is interesting to observe how almost every portion of the earth has originally possessed its own breadstuff, which has thereby characterized the life of its inhabitants. While Europe derived its bread from oats, Northern Asia from barley and wheat, and Southern Asia from millet and rice, the Indian millet in Africa, and the Indian corn in America were the most important plants of cultivation. Australia alone was originally deficient in this respect, but the intercourse of nations, which soon by degrees distributed all the *Cerealia* over the whole inhabited earth, has also enriched this country, which seemed to have been so parsimoniously treated by Nature.

The common oat (*Avena sativa*, L.), the true native land of which is no longer known, although the region along the Danube may pass as such, may be legitimately considered as the European bread crop. The Celts and the Germans, as far as we can ascertain, cultivated it two thousand years ago, and it seems to have been distributed from Europe into the temperate and cold regions of the whole world. The names *Avena Oves*, (Russian), *Owes* (Bohemian), *Owies* (Polish), *Oats* (English), have great similarity to the words *Hafer* and *Hauer*, while on the other hand, the Tartarian name *Sulu*, the Hungarian *Zab*, &c., point to a different origin from the former. The Illyrians, besides the names mentioned, had still others for it. It was known to the Egyptians, Hebrews, Greeks, and Romans.* With the introduction of more nutritious and better cerealia, the oat became more and more restricted to poor soils and inhospitable regions, and at the present day it principally serves as food only for domestic animals and the poorer class of people. In Scotland, bread is baked from it even now, as was formerly the case in Germany. The Oriental or Tartarian oat (*Avena orientalis*, Schreber) was first brought from the East to Europe at the end of the preceding century.

Barley (*Hordeum vulgare*, Linn.), according to Olivier (Voyage en Perse, 460), in his time grew abundantly wild in the historically-important regions between the Euphrates and Tigris. Willdenow is inclined to place its native country towards the bank of the Samara, a tributary of the Wolga. We are enabled to give the native land of the two-lined or common barley only, (*Hordeum distichum*, L.) with some certainty. C. A. Meyer found it growing wild between Lencoran and Baku; C. Koch, on the steppes of Schirwan, in the southeast of the Caucasus; and Th. Kotschy, in South Persia. The six-lined or winter barley (*Hordeum hexastichon*) has been known the longest of all. The

* Plin. Hist. Nat., xviii, p. 17.

Egyptians, Jews, and Indians cultivated it in the earliest times, and grains are found in the mummies of the Egyptian catacombs. The rice or battledore barley, (*Hordeum zeocriton*, L.), formerly more abundant than now, furnishes an excellent meal, and in this respect is distinguished among the other species. The common barley came to Europe by way of Egypt, where, at the present day, the two and the six-lined are still cultivated. Even in Greece, all the three kinds of barley were formerly cultivated, (*Κριθη*, Theoph., *Κριθαρι* of modern Greece,) while at the present day only the common and the six-lined barley are cultivated and used as fodder for horses. The Romans were acquainted with the two and the six-lined barley. In connection with the oat, it has extended its dominion in Europe to beyond the polar circle, and near to it in Asia and America, while the cultivation of these two *Cerealia* is most prevalent in the Arctic Circle, in the eastern portion of the continent, as well as in the greater portion of the sub-arctic zone also.

The Celtic word *Secal*, or *Segal*, as also the German *Rog*, *Rya*, and the Slavonic *Rezi*,* used to indicate one of the most important *Cerealia*, namely, the rye, (*Secale cereale*), point to its origin in the region between the Alps and the Black Sea. Neither the Indians nor the Egyptians were acquainted with the rye. The Greeks received it (*Βριζα*) from Thrace and Macedonia. Pliny mentions its cultivation at the foot of the Alps. Other species of *Secale* grow in southeastern Europe and western Asia, as for instance, *Secale montanum* in Sicily; *Secale villosum* on the Grecian Archipelago; *Secale fragile*, Bieb., in the Caucasus; and *Secale anatolicum*, Boiss., in western Armenia and Asia Minor. The different varieties which have been produced under the influence of cultivation, immediately disappear in a change of the same. At the present day its cultivation in Europe and Asia takes place between 50° and 60°, and in America between 40° and 50° north latitude. In Gulbrandsdale, (Laurgard), at 62° north latitude, I found fields of rye at an elevation of 1,030 feet above the level of the sea, the size of small gardens, and, like them, fenced in with boards.

Wheat (*Triticum vulgare*, Will.), which is the most important and widely distributed of all bread-stuffs, according to the Grecian fable, was originally native on the plains of Enna and in Sicily, but it is much more probable that, like barley, it was received from Central Asia, where Olivier seems to have found it growing wild on the banks of the Euphrates. In any event, it belongs to the longest cultivated cerealia. Even Theophrastes was acquainted with it; (*πυρος*), probably the grained summer variety, from which the winter wheat seems to have been subsequently developed. In a similar manner, Scripture points to its cultivation in Palestine. Even in China it was known 3,000 years before Christ as a cultivated plant. As Isis was supposed to have introduced wheat into Egypt, and Demeter into Greece, so the Emperor Chin-nong is said to have introduced it into China. The great variety of the ancient names used for indicating this plant points to the wide circle of distribution which it originally possessed. At the present day, wheat is cultivated in all parts of the earth, having

* Not *zeta*, which means grain in general.

been taken to America by the Spaniards, at the beginning of the sixteenth century.

Besides the common wheat, several other species of wheat are to be considered as cultivated plants, although they have attained a much more restricted distribution. Among these may be mentioned the *Triticum turgidum*, L. which was cultivated even by the ancient Egyptians, and was known to the Romans in the time of Pliny. As it has not even yet reached India, its native land is to be looked for rather to the south and west of the Mediterranean than in Central Asia.

The many-eared or Egyptian wheat (*Triticum compositum*, L.), is only a variety. It is cultivated chiefly in southern Europe and in England.

Two species of wheat, *Triticum durum*, Desf., and *Triticum polonicum*, L., or Polish wheat, are only cultivated to advantage in the warmer regions of Europe.

The Spelt (*Triticum spelta*, L.), at present cultivated only in Europe here and there, was met with even by Alexander the Great as a cultivated plant in his campaign in Pontus. Its origin in Mesopotamia and Hamadan, in Persia, is not doubtful; especially as its cultivation in these countries cannot be carried back to any very remote antiquity. It is called *βλωρα* in Greece, (Herodot. II., 36), and it likewise seems to have been known in Egypt, even though at the present day it is not found there. The German name *Spalt* points to its early cultivation in Germany.

We come finally to the little cultivated one-grained wheat, (*Triticum monococcum*, L.); this is the *Kussémeth* of the Scriptures. From it the Syrians and Arabians made their bread. Its cultivation has not extended either to India, Egypt, or Greece. Both the Crimea and the region of Eastern Caucasus have been indicated as the native country of the one-eared wheat. The *Emmercorn*, or German wheat, (*Triticum amyleum*, Serv.), has had an equally ancient cultivation: this is the *Ζεῖα διπορπος* of Dioscorides. It is cultivated more frequently in the southern than in the middle portions of Europe.

Wheat occupies a broader belt than rye, and is cultivated as the principal crop in middle and southern France, England, (where it constitutes the chief object of culture among the cerealia), a part of Germany, Hungary, the lands of the southern Danube, the Crimea, and in the lands of the Caucasus, as well as Central Asia, wherever the soil is cultivated; along its northern border it is associated in culture with rye, in the southern with rice and maize, (Indian corn.) The latter is chiefly the case in the North American States, and in the region of the Mediterranean. Wheat is even cultivated in the southern hemisphere, at the Cape, Buenos Ayres, and Chile, wherever the climatological conditions will allow it.

While wheat is richest in gluten, and therefore the most nutritious bread crop, rice, (*Oryza sativa*, L.) although serving for the nutriment of much greater numbers of men, possesses, nevertheless, a much less capacity of producing blood. Indigenous to Further India and the Isle of Sunda, it is extended over the whole of Southern and Eastern Asia, as well as over Arabia, Persia, and Asia Minor; thence it has

reached on the one side to North Africa, Egypt, and Nubia, and on the other to Greece and Italy, (A. D. 1530.) Rice was already introduced into China 3,000 years before Christ. The Greek words *ορυζον* (Theoph.), *Ορυζα* (Diosc.), were manifestly derived from the Sanscrit *arunga* and the Cingalee *ooruwee*, (*Urui*.) Even in the time of Strabo, rice was cultivated in Babylon, Susiana, and Syria. The Arabians brought it to Sicily. It is only very recently that it has been taken to America. In the African as well as in the American tropical regions it is; however, less exclusively cultivated than in Hindostan, where the people live almost entirely on rice alone.

Rice occurs in a great number of varieties, such as mountain rice, valley rice, summer and spring rice, &c. The different kinds are distinguished not only according to their taste, but also according to their smell.

What rice is to the Old World, maize, *mahiz* (*Zea mais*, L.), or Indian corn is to the New. It was cultivated there at the time of the discovery by Europeans. It is probably indigenous to Central America, and brought by the Toltecs to Mexico. The first European settlers in Pennsylvania (1584) even then found rich fields of maize. The Indians on the Arkansas eat the green ears as their every day food. The Peruvians bake various kinds of bread from its meal. At the present day, maize is the most common article of nutriment of the lower and middle classes in Peru and Central America, and the commencement of its cultivation in these countries is enwrapt in the same degree of fable as the culture of our cerealia. The Mexican Demeter, Cinteutl, (from *Cintli*, maize,) like the Grecian Demeter, was honored with the firstlings of the fruit dedicated to her. The many varieties which are known of the maize, as well as the circumstance that at the present day we are unable to point with certainty to the original species, indicate clearly a very extended period of cultivation for this plant.

Maize was unknown to the Europeans before the discovery of America, and has been extensively distributed in other parts of the world, especially in Europe since the seventeenth century. That the wheat of Theophrastus, a grain the size of an olive kernel, cannot be maize, I consider to be well established, just as certain as it is that his *ζεία* is not maize, but spelt. In Germany, it is called Turkish wheat; in Greece, *arabositi*. Neither in Egypt nor in India and China did its culture precede the discovery of America. The cultivation of maize in America does not extend beyond the southern tropic, although it passes the Tropic of Cancer to the north almost to 50° north latitude. On the western coast of Africa its cultivation is confined to the tropics, while more to the north it is at home in all the lands bordering the Mediterranean.

The common millet (*Panicum miliaceum*, L.), derived from the East Indies and other warmer regions of Asia, has not had the same favorable reception as rice, although yielding little to it in its distribution. It was known to the Greeks and Romans at the time of Julius Caesar, and is the *κερχρος* of Strabo, who states that it thrives excellently in Gaul, and is the best protection against famine. The Slavonians are very fond of a dish of millet, (*Kasha prosna*.) It was

probably this grain and not the Indian millet that the Emperor Ching introduced into China more than 3,000 years ago.

Another species of millet (*Panicum frumentaceum*, Roxb.), is frequently cultivated for food in the East Indies. The ear millet, or the *Fennich* (*Setaria italica*, P. B.), which at the present day is cultivated in Southern Europe, and even here and there in Central, is of East Indian origin, since even the ancient Greeks knew it as *ἔλυμος*, and the Romans as *Panicum*.

The *Himmelthau*, or the manna grits (*Digitaria sanguinalis*, Scop.), is of less importance. The small hulled fruit furnishes a wholesome and palatable nutriment. Indigenous to Europe, it is cultivated here and there on poor, sandy soils.

The common Indian millet (*Sorghum vulgare*, Pers.), which was introduced with rice by the Arabians into Egypt, is to be considered as a characteristic plant of Africa, not because it was originally indigenous there, but because it is principally cultivated in this country, (east and west coast, northern half to Timbuctoo; in Abyssinia, from the level of the sea to the height of 8,000 feet.) Although its native country cannot be positively ascertained, it can scarcely be any other land than India. Even in the time of Pliny* it was known in Europe, and in the thirteenth century had extended to Italy, and at the beginning of the sixteenth century reached France, under the name of Saracen millet. At the present day, it is distributed throughout the whole of Southern Europe, and is raised to advantage in Hungary, Dalmatia, Italy, and Portugal. The different varieties of the Indian millet, however, are not well-defined at the present day. It is doubtful whether the *Sorghum bicolor*, Willd., and the *Sorghum usorum*, N., are entitled to a specific rank.

To these important cerealia may be added some other plants belonging to the grasses, as well as to other families. Here belongs the *Tef*, (*Eragrostis abyssinica*, Link), *Eleusine tocusso*, Fres., and *Eleusine coracana*, Gärt., *Pennisillaria spicata*, Willd.; also, *Amarantus frumentaceus*, Buchan†, *Polygonum fagopyrum* and *tartaricum*, and the *Chenopodium quinoa*. These, however, with the exception of the last two genera, are confined to particular regions and are nowhere used exclusively as an article of food.

The *Tef* (*Eragrostis abyssinica*, Link) is a mountain plant of Abyssinia, cultivated everywhere there, at a height of from 2,500 to 8,000 feet, where gentle heat and rain favor its development (in July and August.) It furnishes the favorite bread of the Abyssinians, in the form of thin, highly-leavened, and spongy cake. Four varieties are cultivated of this palatable grain.

The *Dagussa* (*Eleusine tocusso*, F.) furnishes a poorer bread in Abyssinia, and although cultivated at a height above the sea of 4,000 to 7,000 feet, thrives particularly well in hot and warm regions. There are three varieties, with black, reddish-brown, and white seeds. Its native country is the East Indies.

The *Eleusine coracana*, Gärt., furnishes a grain similar to the millet

* Pliny, xviii, page 7

† Pliny, xviii, 7.

in abundance of flour, although inferior to the preceding species in quality. It is cultivated on a large scale in the East as well as the West Indies.

Eleusine stricta, Roxb., is, perhaps, only a variety of the first.

The Brush-grass (*Pennisillaria spicata*, W.), with its numerous varieties, is derived from the East Indies and distributed over Egypt and the neighboring regions. The seeds, which are rich in flour and similar to those of the millet, constitute the principal article of food in several countries. Various tribes of negroes subsist almost entirely upon it on their travels.

Buckwheat (*Polygonum fagopyrum*, Link) was first brought to Europe at the beginning of the sixteenth century, having been unknown both to the Greeks and Romans. From the northwestern region of the Chinese empire, whence came the great devastating hordes of mankind, its cultivation has extended in some unknown way to the coast of the Mediterranean, and thence it has been still further distributed by the Saracens, whence its name *Sarasin*, *grano Saraceno*, *blé Sarasin*. The Polish, Bohemian, and Levant names, *Tatarka*, *Tattar*, very clearly point to its original native land and its first distributors, as also do the Russian, Lithuanian, and Polish terms, *Gretscha*, *Gryka*, *Grikki*, &c. to the intervention of the oriental Greeks. The names buckwheat, (beechwheat,) fagina, and the other different names of this plant, are connected either with the mode of its introduction, or are based upon the form of the fruit.

While the buckwheat has a very extended culture in the whole of Middle and Northern Europe, as well as in Northern Asia, in Northern India and Ceylon it is confined to narrow limits, and is there of very recent introduction.

The *Polygonum tartaricum*, L. is of the same origin as the buckwheat, though it is much less widely distributed, and was introduced at a much later period into Europe. The same may be said also of the *Polygonum emarginatum*, Roth., chiefly cultivated in China and Nepaul, the native country of which is along the borders of China and Northern India. The Quinoa (*Quinoa chenopodium*, Willd.), constituted the most important article of food of the inhabitants of New Granada, Peru, and Chile, at the time of the discovery of America, and at the present day is still extensively cultivated on account of its rich yield. A variety, with light and more mealy seeds, has arisen in cultivation from the original species with dark seeds, and is now raised more than the former. It is not known at how early a period it was cultivated, although it is remarkable that it has been disseminated but little from the plateau of the Chuquito. The white Quinoa is cultivated in Europe more on account of its leaves which answer instead of spinage, than for the seeds, which are used chiefly as food for poultry.

The *Amarantus frumentaceus*, Buchan., Roxb., in the East Indies, furnishes an equivalent to the Quinoa. The seeds of this plant supply an important article of food to the native races. It is frequently cultivated on the mountain slopes of Mysore and Coimbatore.

We may here mention some grasses and other plants which are here and there used as furnishing flour in a general deficiency of other food.

Among these are *Glyceria fruitans*, some species of *Bromus*, the rhizome, and root of the *Triticum repens*, the seeds of *Calla palustris*, *Ranunculus ficaria*, *Arum maculatum*, *Brionia alba*, *B. dioica*, and *Butomus umbellatus*, which, in Norway, often serves as material for bread, and the seeds of the *Croix lacrima* which are used as food in Tongatabu and Euwa.

Certain roots and tuberous root-like shoots are rich in starch though not abounding in albuminous substances. To a limited extent they serve to replace the above-named cerealia, if not to supplant them, and may, therefore, when cultivated, serve whole nations for food. The potato (*Solanum tuberosa*, L.), the sweet potato, the mandioca, the yam (*Dioscorea alata*), the Takka (*Tacca pinnatifida*, Forst.), and the Tarro (*Arum esculentum*). While the first three belong to America and have been propagated thence to other parts of the world, the last three are the true bread plants of New Zealand and of the islands of the Pacific ocean, and may have served the inhabitants as the first means of nutriment just as the root stalk of the Papyrus and *Nymphaea lotus* did the old Egyptians.

The potato (*Solanum tuberosum*, L.) is not only one of the most important of farinaceous plants for America, but has become such for Europe and the other parts of the world.

It is beyond a doubt that the potato, at the time of the discovery of America, was already cultivated in the greatest portion of the Andes of South America, and even from Chile to New Granada, although at that time it was not known in Mexico, and only shortly afterwards in North America.

The potato is a sea-shore plant, peculiar to a hilly and rocky soil, and now grows wild in Chile and the neighboring islands (Chiloe and Chonos, about 45° south latitude) to Peru, (Lima). In this wild state it rarely extends more than a few miles inland, and is widely different from the present cultivated potato. Its flower is always white, its tubers at the best attain a length of two inches, while its taste is insipid, but not bitter. Besides the original plant of the cultivated potato, which even in its wild state has passed into several varieties, (according to Hooker, jr., into five varieties), there are found in the East and West Indies still other kinds of *Solanum* with the tips of the shoots thickened into tubers, as *Solanum commersonii*, Poir., *Solanum maglia*, Dun., and *Solanum immite*, Dun. In the Argentine republic, especially in the mountains of Famatina, a potato grows wild, which at the time present is cultivated at Chilcito.

Even in Mexico, where the *Solanum tuberosum* was certainly introduced at a late period only from South America, there are some species of *Solanum*, such as *Solanum demissum*, Lindl., *Solanum cardiophyllum*, Lindl., and *Solanum verrucosum*, Schlecht., the latter of which produces very palatable but small tubers.

The potato was first brought to England from Carolina in the year 1586, and found its way over the rest of Europe in the seventeenth century; but it was not until the nineteenth century that it obtained its fullest reputation. At the present time, in innumerable varieties, it sheds its blessing over all the lands of Europe to the furthest north. I have seen a truly romantic potato field, the last one to the north,

situated upon an enormous mass of rock which lay near the road between Dalevaagan and Dalseidet, (near Bergen, in Norway.)

The mandioca plant (*Jatropha manihot*, L.) possesses an extremely farinaceous root, (one variety, as already mentioned, with a sharp poisonous juice, the other without it,) and may be ranked among the most important of nutritious plants in tropical America. Pohl has shown, however, that the two may be considered as distinct species, and has called the first *Manihot utilissima*, and the other *Manihot aipi*. Both species were cultivated by the inhabitants of Brazil, Guyana, and the warmer portions of Mexico, when the first Europeans landed, and even at that time they had passed into a great number of varieties. Brazil, in which alone forty-six different species of manihot are found, is undoubtedly to be considered as the native country of both the above-named kinds, although they have not yet been found growing wild there. Pohl has even expressed the opinion that *Manihot pusilla* is the original stock of *Manihot utilissima*, which is, however, doubtful.

The mandioc was naturalized in the Antilles as early as the sixteenth century, although its journey around the world, by way of the Isle of Bourbon and the East Indies, took place at a comparatively late period. It reached the west coast of Africa earlier, and the erroneous opinion has even been entertained that it was transplanted from Africa to America.

Of as great, if not greater, importance than the mandioca is the Sweet potato, (*Convolvulus batatas*, L., *Batatas edulis*, Choisy). It is one of the most widely distributed cultivated plants of South and Central America, and it, as an article of food, passes back to the earliest historic period. In Brazil it is called *Jetica*, in Mexico *Camote*, words, the roots of which, belong to the original tongue of the country. The name *Batatas* is a corruption of *potato*. Even upon the Antilles this useful plant was found cultivated in numerous varieties as early as the year 1526. Columbus brought it with other novelties to Europe, and presented it to Queen Isabella; the consequence was that this plant, which is suited to the climate of Spain, was immediately cultivated there. C. Clusius mentions that as early as the year 1601 he had eaten it in Spain.

The sweet potato was first brought by the Spaniards to Manilla and the Moluccas, and thence by the Portuguese distributed over the entire Indian Archipelago. Its names in these countries are never of Malayan, but altogether of Castilian origin. This plant soon reached China, Cochin-China, and India, although when and how is not known at the present time. There is certainly a Chinese, as well as a Sanscrit name for this plant, although this seems to be of more modern origin. The sweet potato has been even believed by some to be of Asiatic origin, or that the American and Asiatic plants are to be considered as different species. Neither of these suppositions is probable on historical grounds, and on account of the fact that the fifteen species of this genus hitherto known are peculiar to America, four of which only have also found their way to other parts of the world. The sweet potato has not been found growing wild by any one, although the tropical portion of America is to be considered as its native country with most show of probability.

The *Ipomœa mammosa*, Choisy, a native of Amboyna, another con-