FOOD AND FIBER PLANTS

OF THE

NORTH AMERICAN INDIANS.

BY

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J. S. Newberry

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IT has happened to me to visit nearly forty tribes of the native population of North America, and many of these at a time when they had had little or no intercourse with the whites. As a physician and botanist, my attention was naturally directed to the use of plants among them for food, and as remedies. I made many notes on these subjects, and, as they have never been published, and contain some items that may be interesting, it has seemed to me worth while to put them on record. Most of the observations to which I have referred were made a quarter of a century ago among the Indians of the Far West, remote from civilization, and where they were living in the "state of nature." The plants, of which the Indians I have visited have made use, are the following:

1. Maize (*Zea mais*), our Indian corn, seems to have been the most widely diffused and most important of all the kinds of vegetable food employed by the native population. In all parts of North and South America, where the climate was favorable, the whites found corn cultivated by the aborigines, and in the tombs of Peru as well as in the mounds of the mound-builders, ears of corn have been discovered, which prove that it was an important element of subsistence as far back as human records extend. Even the nomadic Indians who inhabited the forest-covered region between the Mississippi and Atlantic had their corn-fields and their patches of beans and squashes, and succotash (the Indian name) was the dish most esteemed in their *cuisine*, and is almost the only one which has been adopted by the whites.

In the region west of the Mississippi only a limited district is adapted to the cultivation of maize. It is a plant which finishes its growth and ripens its seed within three or four months, and it there-

fore matures within the tropical summer which prevails even to the northern boundary of the United States. But it requires both warmth and moisture; hence in the dry regions of the Far West it can only be cultivated in few localities, and there attains but imperfect development. In California, where so many fruits, flowers, and grains reach unequaled perfection, the cultivation of corn is rarely successful. Even where irrigation supplies the necessary moisture and the midday sun is hotter than in any Eastern State, the cloudless sky permits such rapid radiation that the nights are always cool, often cold, and the warm, moist nights of midsummer in the Mississippi Valley, when the corn may be heard to grow, never occur. On the table-lands of Arizona, New Mexico, and Mexico corn is quite extensively cultivated, but under difficulties, and never with what we should call success. The plant is always small, the grain light in texture and usually of some fancy color, and it is not uncommon to see the bread or cakes baked from it of a positive blue. Among the Moquis of Northeastern Arizona, where the plains that are cultivated are sandy, the seed-corn is dropped to the bottom of holes twelve to fifteen inches deep, made with a stick. Though dry at the surface, the sand is moist below, having absorbed all the water furnished by the snows of winter, and the cloudless sun warms the soil so that the grains germinate even at that depth. When the growing plant rises above the surface of the ground it immediately shoots out its ears, and the field when the crops mature looks as though it had been inundated and sand deposited around the stems to half their height. The color of the grain is usually blue, and the bread made from it and baked between two flat, smooth stones by the Moquis, though well flavored, looks like blue wrapping-paper.

2. Beans (*Phaseolus vulgaris*). It has been demonstrated that one or several kinds of beans were generally cultivated in America at the time of the discovery by Columbus. The "Lima-bean" was certainly unknown in Europe before it was received from America, and that is probably true of other varieties. Among the Pueblo Indians of the table-lands, and the Mohaves on the Colorado, we found many different kinds of beans in cultivation. Some of these were of excellent quality, more delicate in texture and flavor than any cultivated by the whites.

Among the Mexicans and the inhabitants of our Territories bordering on Mexico the *frijole* is the most important article of diet, and in all campaigns and exploring expeditions in the West our people have come to consider beans as the most useful element in the commissary department. In making forced marches where the least possible weight could be carried, two articles of food were chosen in preference to all others, viz., beans and coffee; if only one could be taken, that was always the bean, which possesses more and more varied nutritious elements than any other fruit or seed cultivated by man.

3. *Psoralea esculenta* (*pomme blanche*). The root of this leguminous plant has been for centuries an article of food among the Indians inhabiting the Rocky Mountains and the plains bordering them. It is frequently referred to by the earlier travelers in that region, and was sometimes their main subsistence during the intervals when for any reason game was not to be had, and transported supplies had been exhausted. The root is white and farinaceous, but has a negative flavor, and as it nowhere exists in great quantity, it has been rather a make-shift than a staple, and its use has been abandoned wherever the supplies furnished by the white man have been attainable. The plant is about a foot high, with hairy stems and leaves, and with compact spikes, of bluish-white flowers. The root is tuberous, an inch or more in diameter, white, farinaceous, and wholesome.

4. *Camassia esculenta* (*camass*). Over all the country drained by the Columbia River, and especially the plains and mountain valleys about its sources, the camass grows in considerable abundance, and it has been not only a common resource for the Indians inhabiting that region, but certain localities where it is found in large quantities have taken their names from it, and they are places of resort for the purpose of gathering it. One of these is the somewhat noted Camass prairie on the line of travel from the Upper Missouri to the Columbia. The plant is liliacious, has linear leaves, a scape usually twelve to eighteen inches in height, bearing pretty blue or white flowers. The bulb is about an inch in diameter, mucilaginous, sweetish, and quite nutritious. Where it abounds it is gathered in large quantities, baked, and stored for winter use.

5. *Peucedanum farinosum* (biscuit-root, couse). In the country bordering the Columbia and in Northern California there are many plants which belong to the umbelliferous genus *Peucedanum*, some with yellow and a few with white flowers. The foliage is much dissected, sometimes capillary like that of the fennel. Among these is one which has a round or oblong, white, farinaceous root somewhat like a small parsnip. It is called couse, or biscuit-root, by the Oregon Indians, and is quite an important source of food among them. It is gathered and dried for winter use, is then ground between stones to a kind of flour, and of this a palatable and nutritious cake is made. It is also sometimes boiled with meat.

6. *Apios tuberosa* (ground-nut). In all the United States on or east of the Mississippi the twining stem and purple flowers of the ground-nut are well known to the country boys, for they have learned that at the base of that stem are tubers which may be eaten and with a little make-believe enjoyed. These tubers were quite as well known to the aboriginal inhabitants, and to them they were a more important article of food. They are, however, small, somewhat woody, and in all respects inferior to the potato, which superseded them wherever attainable.

7. *Helianthus tuberosus* (Jerusalem artichoke). This plant is usually supposed to have been introduced from Europe, but Dr. Gray has given good reasons for believing that it is a native of this country, and that its tubers were used by the Indians of the Mississippi Valley for food. It has been said to be a variety of *H. doronicoides*, but is probably a form of *H. giganteus*.

8. *Helianthus annuus* (sunflower). In the central part of the continent—Colorado, Utah, Idaho, and Wyoming—are large areas of open ground which sustain a vigorous growth of the sunflower. It is always an evidence of good soil where it grows, and the magnitude of the stem, which is often six or seven feet high, and the flowers four to five inches broad, measures the richness of that soil. Nowhere in nature do the flowers become so large and the seeds so abundant as in the cultivated variety, but the seeds have long been used for food by the Indians, and it is probable that the plant grew larger about their villages than we now find it in the dry and comparatively sterile regions of the Far West. The Indians use the seeds for food, and sometimes extract an oil from them which is employed for the hair, or to lubricate or paint the face or body.

9. *Wyethia robusta* (Nutt.). In Oregon and Northern California I found the Indians gathering the seeds of a species of *Wyethia*, which Dr. Gray considers that described by Nuttall. On the east side of the Sierra Nevada, several species of the genus are very widely distributed, the larger ones having flowers which resemble those of *Inula*, and in many dry regions for a brief interval in the spring the surface is quite covered with their broad ovate leaves, and the scene made brilliant by their showy golden flowers. Their glory is, however, short-lived, for early in the summer the flowers disappear, the leaves become dry and brown, and rustle under the feet like those which fall from the trees in our forests with the autumn frosts. The achenia of *Wyethia* are relatively large, and contain a sufficient amount of albumen to afford considerable nutrition, but the chaff is quite in excess of the kernel, and, when bruised together in their rude mortars, the Indians are compelled to gorge quantities of the material to satisfy their hunger. It is poor food at best, but is a welcome resort when, as it often happens, they are on the verge of starvation.

10. Nut-Pines.—In various parts of the Far West grow species of *Pinus* in which the seeds are of unusual size. The primary object of this is undoubtedly to furnish an adequate amount of prepared food to the germinating plant in regions where the struggle for existence is desperate, not with competing forms of vegetable life, but against the sterility of the soil or the severity of the climate. Incidentally this provision of Nature is of great benefit to a variety of animals, and even to man himself. It is evident that this special device for securing the perpetuation of the species is vicarious with the development of the wing upon the seed by which it is caught in the wind and its

distribution favored. Where the seed is unusually large and heavy the samara can do little for its transportation, and where it is largest the wing is reduced to a simple raphe, or has entirely disappeared. For the most part these nut-pines are the inhabitants of arid regions where the amount of animal life is small, and therefore there are few enemies by which the seed would be destroyed. And there the sterility is such that any device by which the seed was carried away from the protecting shade and the fertilizing influence of the parent tree would be destructive rather than protective. Hence the seeds are wingless, and are dropped among the decaying leaves that gather under and about it. To the Indians these pine-nuts are in some regions not only an important but almost an indispensable source of subsistence; they gather them systematically, as our farmers harvest their crops, and, in cases where for any reason a failure of this crop occurs, some tribes or bands have been brought nearly or quite to starvation for the want of the nutriment they afford.

The list of the nut-pines of the Far West includes the following species: *Pinus Sabiniana* and *P. Coulteri*, of California; *P. albicaulis* and *P. flexilis*, which grow on the mountains of Oregon, Idaho, Montana, etc.; *P. edulis* and its variety, *P. monophylla*, of the arid districts of Nevada, Utah, Arizona, and New Mexico; and, finally, *P. Parryana* and *P. cembroides*, of Lower California and Northern Mexico. Of these, *P. Sabiniana* has large, ovoid, massive cones, six to eight inches in length and four to six inches in diameter, of which the surface bristles with strong and curved spines. The seeds are as large as good-sized beans, and of much the same form. The tree grows to a moderate or large size, but never forms forests. It is generally found scattered over the rocky foot-hills of the mountains, up to the height of three or four thousand feet—its great spiny cones, its spreading form, and blue-green foliage, making it everywhere conspicuous.

Pinus Coulteri, which in many respects resembles the last, is more southern in its habit, occupying the mountains of California south of San Francisco. The cones are similar to those of *P. Sabiniana*, but much longer, often one foot in length by five or six inches in diameter, and having a conical form. The seeds are large, bean-shaped, and edible. Like those of all the nut-pines they have a strong terebinthine taste when raw, but this disappears when they are roasted, as they generally are by Indians and whites.

By far the most interesting and economically important of the nut-pines is the "Piñon" (*P. edulis*), which inhabits the almost desert portions of the Great Basin of Arizona, New Mexico, and Colorado. In some parts of Nevada and Utah its monophyllous variety occupies, with a sparse and scattered growth, large areas, where it is the only tree, except a bushy cedar (*Juniperus Utahensis*). In Arizona, New Mexico, and Southwestern Colorado, its normal or two-leaved form is

everywhere present, sometimes forming what might be called a forest-growth, though the trees are never large nor closely set. In all these regions the wood of the "Piñon" is the chief dependence of the lead-smelters for fuel, since it is quite dense, and, unlike that of any other conifer, furnishes good charcoal. Equally valuable is this tree to the native population, from the subsistence afforded by its nuts. The cones are small and ovoid in form; the wingless seeds are elliptical in outline, half an inch in length, and very palatable when roasted. The tree is said to fruit abundantly but once in three years; different colonies, fortunately, having different periods, so that there is no year in which there is entire failure of the crop, except when one of the terrible droughts characteristic of the climate occurs.

At the season of the nut-harvest the natives migrate to the groves of "Piñon," and gather the nuts in large quantities to be stored for future use. They are treasured as their choicest delicacies; and a handful of pine-nuts is to an Indian child as much of a treat as are sugar-plums to our boys and girls. Some of the Piñon-groves on the flanks of the Sierra de la Plata in Southwestern Colorado have evidently been visited periodically by the Pueblo Indians for ages; for fragments of their peculiar ornamented pottery cover the ground; at least every square yard has its potsherd.

The seeds of *Pinus flexilis* and *P. albicaulis* are smaller than those already mentioned, and the trees are more Alpine in habit and scattered; the nuts have, therefore, comparatively little value to the Indians, but they are an all-important source of food to the squirrels which inhabit the regions where they grow.

The more southern nut-pines, *Pinus cembroides* and *P. Parryiana*, are similar in their habit to *P. edulis*, of which they are, indeed, probably varieties. Their seeds, like those of the Piñon, are used by the natives in the same way, and are only less important because the trees are more restricted in their range.

Fruit of the Cactus.—The prickly pears which grow on so many species of cactus, differ very much among themselves, but quite a large number are edible. The fruit of the giant cactus (*Cereus giganteus*) is in size, consistence, and flavor, somewhat like a fig. The plant sometimes grows to fifty feet in height, and flowers near the summit, and since it can not be climbed on account of the spines by which the trunk is thickly set, it is a matter of no little difficulty to get at the fruit when it ripens. The Indians beat it off with stones, if any chance to be near, and sometimes shoot it off with arrows.

The fruit of many other species of *Cereus* is eaten and is doubtless nutritious, but the flavor is usually insipid, and, however, attractive it may be, in the "eyes" which are scattered over the surface lurk many minute, sharp, and brittle needles, which will penetrate the tongue and lips, and cause great suffering to any one who bites it

rashly. The natives are always careful to wipe or brush off these spines before the fruit is either handled or eaten.

The *Opuntias* (*palmate cactus*) include a great number of species differing considerably in size and habit. As among the other kinds of cactus, the fruit is usually brilliantly colored, has a smooth and spiny skin, and pulpy interior thickly set with seeds. Though generally somewhat tasteless, and sometimes having a disagreeable flavor, the fruit of certain species is esteemed by the Mexicans and Indians, and one species at least may be said to be cultivated for its fruit. This is the *Tuna*, the gigantic *Opuntia* of Chihuahua and Sonora. Around the old missions may be seen many of these plants, some of which are so large that the fruit is gathered by the help of ladders! Among all the prickly pears, however, the fruit of the strawberry cactus (*Cereus stramineus*) is the most delicious. It is ovoid in form, as large as the largest strawberry, of similar color and even finer flavor. It grows sparingly in New Mexico and Chihuahua, and the fruit is eagerly sought by men, birds, and insects; so that, being a shy bearer, the supply is decidedly behind the demand.

Dr. V. Harvard, United States Army, who has given us much interesting information in regard to the botany of the region bordering the Rio Grande, mentions several other species of cactus, of which the fruits are edible, viz., *Cereus dasyacanthus*, (Eng.), fruit sub-globose one inch in diameter, green or greenish-purple, when fully ripe delicious to eat, much like a gooseberry; and *Echinocactus longehamatus*, fruit one to two inches long, red, and as delicious as that of the strawberry cactus. Of these I have collected the plants, but have never seen the mature fruit.

Nuphar polysepala (Western water-lily). In Oregon our yellow water-lily (*Nuphar advena*) is represented by a species which resembles it in flower, leaf, and habit, but differs from it in having a larger number of sepals. The seed-pod is also larger, often having the size and form of an egg, and being filled with seeds which are not unlike the grains of our broom-corn. They are well flavored and nutritious, and are locally much used by the Indians for food. One of the Klamath lakes, which is about ten miles in diameter, is very shallow, and a large part of the surface is covered with the leaves of this water-lily. The Indians who live upon the banks of this lake gather the capsules as they mature, and store them for winter use. In some of their wigwams we found as many as twenty or thirty bushels of them at the time of our visit in August. Just how they are used I can not say, but I believe they are either ground to make a kind of coarse flour, or are parched, as the grains of maize so frequently are by the Indians. Perhaps nowhere else does this plant furnish an important food-staple, but for many hundreds of the Klamath Indians it is one of the most valuable of their winter stores.

Acorns.—At least two kinds of oak in California furnish acorns

which are used as food by the Indians (*Quercus lobata* and *Quercus agrifolia*). Of these, the first is the largest of Western oaks; it is found in the greatest perfection along the streams in the Sacramento valley, where I have sometimes seen it a hundred feet in height, and covering with its spreading branches a circle more than one hundred feet in diameter. The acorns are long—elliptical in outline, an inch and a half in length by half an inch or more in diameter. The kernel is sometimes rather bitter, but more palatable than that of any of our Eastern oaks, and quite nutritious. In the region where the tree abounds, the Indians in former times were in the habit of collecting acorns in large quantities and storing them for winter, and I have seen nearly a hundred bushels in one wigwam. They are prepared for eating by grinding the kernels to a kind of coarse flour; this is mixed with water to a thick paste; a circular depression with raised edges is made in the sand, into which this paste is poured. A fire is then built over it, and it is half-baked, half-steamed, to the Indian taste. This treatment takes the bitterness from the acorn, and the resulting cake, though according to our notions somewhat lacking in cleanliness, is well-flavored and wholesome.

In Southern California the evergreen-oak (*Q. agrifolia*) grows to be a magnificent tree, but throughout the broad region it inhabits it is more generally a small tree or even a large bush. Its acorns are long and pointed, sometimes quite acute; the kernel is somewhat bitter, but it is often used for food by the Indians who inhabit the more arid portions of the region where it is found, and where the scarcity of subsistence drives them to eat whatever is nutritious and not positively harmful.

The mezquite (*Prosopis glandulosa*) is one of the most widespread and useful plants in the southwestern portion of the United States and Northern Mexico. In Texas it is a tree of respectable size, the trunks attaining on the Brazos a diameter of a foot or more, but it is always low and spreading. In the more arid regions it sometimes grows abundantly, but only as a bush. In such cases, however, the roots are of large size, of peculiarly dense texture, and furnish an excellent fuel. The fruit of the mesquite is a yellow, bean-like pod, six to eight inches in length, by one half an inch wide. In this there are numerous hard, dark seeds, and between them a considerable quantity of a yellow, farinaceous substance, sweet and agreeable to the taste. Where the tree abounds these pods are eaten by all herbivorous animals, and in certain localities they serve as subsistence for human beings. In the Mohave Valley, on the Colorado River, we found Indians making considerable use of the fruit of the mesquite for food. The pods were pounded together in a kind of rude mortar, the seeds and husks imperfectly separated, and the farinaceous substance made into a kind of cake. This closely resembled a preparation of yellow corn-meal, and tasted a little like it.

Nelumbium luteum (water-chinquapin). This beautiful plant is found in comparatively few localities, and it therefore can not be regarded as an important source of food-supply; but the filbert-like nuts which are contained in its discoid receptacles, and which have given it its common name, are eatable, and have always been valued by the Indians. The *Nelumbium* is most abundant in the western part of Lake Erie, especially about the mouth of the Maumee River. It also grows on the islands in that lake, in Lake Winnebago, in the Ohio at North Bend, Sodus Bay, New York, Seldon's Cove on the Connecticut, and in the Delaware. In many of these localities it is supposed to have been planted by the Indians. This is the finest of our North American water-lilies, and it may be at once recognized by its large peltate leaves, and its flowers, six inches in diameter, greenish-yellow in color, often with a flush of red.

Our plant is closely allied to *N. speciosum*, which grows spontaneously in India, and, like the papyrus, was formerly cultivated on the Nile, but is not now found in Egypt. This is sometimes called the lotus, but the true lotus was a *Nymphæa* (*N. lotus*), a species very much like our white water-lily (*N. odorota*).*

Wild rice (*Zizania aquatica*). This plant, though very widely distributed, is most abundant in the shallows of our chain of Great Lakes. In some places many thousand acres are occupied by it, and it resembles fields of grain. The stalk is often seven or eight feet in height, projecting four or five feet above the water. In the autumn, when the seeds are ripe, such localities are now thronged with water-fowl, which are very fond of it. In early days, while the Indians were numerous about the Great Lakes, the wild-rice harvest was an important epoch in their year. As usual, the labor of collecting the seed fell to the lot of the women. These, pushing their canoes into the thickest growth, bent the heavily-laden tassels down and beat off the seeds with sticks. In this way their boats were soon loaded, and the grain became their most important resource during the long winter that followed. The shores of the west end of Lake Erie are still occupied by the wild rice, just as in ancient times, for it grows where man can

* Both the white water-lily, the true lotus, and a blue one (*Nymphæa cærulea*) grow abundantly in the delta of the Nile, and were highly esteemed by the flower-loving Egyptians. They were used by them to decorate the tables in their feasts, and as crowns and garlands for the guests. They also formed a conspicuous feature in their offerings to the gods, and at funeral ceremonies.

There is considerable difference of opinion among scholars as to the identity of the plant which bore the fruit said by Homer in the "Odyssey" to have been offered to Ulysses in North Africa, and reputed to have the peculiar property of making those who ate of it forget home and country. It certainly was not the Indian nor the Egyptian water-lily, for Herodotus has described them both; but it was probably the fruit of *Zizi-phus lotus*, a small tree which grows in Barbary. This is something like a date or plum in appearance, has a delicious flavor, and the Arabian poets ascribe to it a lethal influence similar to that felt by Homer's *lotophagoi*.

neither cultivate the soil nor navigate the water. Here, where it was gathered in greater quantities than anywhere else by the Indians, it still feeds great flocks of water-fowl, but not a human being. The grain is small, with great difficulty separated from its envelopes—is, in fact, a poor kind of oat, which was superseded by the wheat of the white man in the estimation of the Indian long before he took his departure to the happy hunting-grounds.

Mescal. The different species of *Agave* have played a most important part in the economy of the native population of Northern Mexico and our Southwestern Territories. From them they have obtained food which, though not to our taste, is in their estimation a luxury. They have also distilled from them intoxicating liquors which, for the time being, have made them happier than the food they ate, and from some of the species they have obtained fibers of great strength, of which they have made varied use. At least two species (*A. Parryi* and *A. Palmeri*) are known by the popular name *mescal* among the Indians and Mexicans. Of these the central bud from which the flower-stalk springs is, at certain seasons, charged with a sweet, gummy substance which is prepared beforehand to supply the rapid drain of material in the growth of the flower-scape, flowers, and fruit. When cut out at this time it looks somewhat like a small cabbage ; this is roasted in the ashes, and is considered by some of the Indian tribes a great delicacy. It is very sweet, but is a mass of fibers, and I can only compare it to oakum dipped in molasses. Probably its sweetness commends it to those who get very little sugar in other forms. Sometimes this central bud when roasted is distilled, and furnishes a fiery kind of whisky, which is also known as *mescal.*

The maguey, or century-plant (*Agave Americana*), throughout Northern Mexico supplies both fermented and distilled liquors. It is sometimes cultivated for this purpose, but over large districts is so common as to be the most striking feature in the vegetation, and the demand is fully supplied from this spontaneous growth. The Indian name of the liquor made from it is *pulque*, and the establishment where it is distilled is called a *pulqueria.*

Other species of *Agave*, which have narrower and less fleshy leaves, furnish neither food nor drink, but valuable fibers. Of these the most celebrated is the Sisal hemp (*Agave sisalana*), a tropical plant of which the home is in Southern Mexico. It furnishes a fiber similar to the Manila hemp, and of equal value. This plant will grow in Florida, and many years ago Dr. Perrine obtained a grant from the American Government to establish a plantation of it. He was in the full tide of successful experiment when the Seminole War broke out, and his plantation was destroyed by the Indians, from which he with his family made an almost miraculous escape.

Another less known but scarcely less valuable plant belonging to the same genus, is the "lechuguilla" (*Agave heteracantha*) of Chihua-

hua and the surrounding country. Of this the leaves are from a foot to eighteen inches in length, and grow in a tuft like those of the century-plant. Though separated with some difficulty from the parenchyma in which they are enveloped, the fibers that traverse the leaves are numerous and very strong and are largely used by the Mexicans for the manufacture of ropes, sacking, etc. When the proper machinery shall be invented for treating the plant, it is probable that this fiber will become an important article of commerce.

Though less valuable, the fibers contained in the leaves of the large species of yucca (*Yucca baccata*), which abounds in the same region with the lechuguilla, are, to some extent, utilized in the same way.

Among the fiber-plants used by the Indians I should mention one lichen (*Evernia sarmentosa*) which, though of little importance, is interesting as the only plant of this group, so far as I know, serving any useful purpose among the Indians. In certain localities among the mountains of Oregon the fir-forests are draped with the gray fiber of the *Evernia*, which there has much the aspect of the Spanish moss as it hangs from the live-oaks in our Southern States. In a few instances I have seen this fiber utilized by the Indian women, who twist it into rolls as large as the little finger, and then sew these together to make a kind of jacket similar to that which they much more frequently form of strips of rabbit-skin. These garments are not handsome, but are thick and warm, and do much to protect the wearers from the severity of the winter in the Northwest.

The Sotol (*Dasylirion Texanum*). In Southwestern Texas and in Chihuahua one of the most common and striking plants is the *sotol*, as it is called by the Mexicans. In its general habit it resembles the yuccas. Usually the trunk is very short, scarcely rising above the ground, and from its summit radiate a large number of linear leaves, which are about three feet in length by two inches wide at the base, tapering to a fine and flexible point. The sides are armed with strong recurved hooks, which make it very unpleasant to handle, and even to touch. In the regions where it abounds the hemispheres formed by the radiating leaves—four or five feet in diameter and height—are conspicuous objects in the scenery over thousands of square miles; from which it will be seen that the supply of material afforded by this plant is practically inexhaustible. The part which is used is the summit of the trunk, composed of the closely imbricated and thickened bases of the leaves. This is an ovoid mass from six inches to one foot in diameter, which at all times, and particularly before the period of florescence, contains a large amount of farinaceous and saccharine matter. When fresh it is tender and well flavored, and in that form would keep one from starvation; but, when roasted, it is much better, and constitutes an excellent and delicate vegetable. In traveling through that country I have made a lunch on a fraction of one of these roasted heads with great satisfaction to myself. It is, however, not

used for food, except in emergencies. The Comanches and Lipans, the aboriginal inhabitants of this region, when pursued, found an unfailing resource in the sotol, and it is certainly impossible to starve those who have access to it. The most important use made of the sotol is to manufacture from it a kind of whisky, which is known as *mescal*, but is quite different from the other kinds. This liquor is made in a very simple way. A small still is taken to some spring or water-course where the sotol abounds, and there rudely set up; the plant is then collected by cutting off the leaves with a *machete*, leaving a cabbage-like head. This is severed from the root, loaded onto donkeys, and brought to the *vinata*, or distillery, where it is roasted. This is effected in a pit four or five feet deep and ten or twelve feet in diameter, lined with blocks of stone at the sides and bottom. Fuel is heaped into this pit and fired; when the fire is burned out the pit is filled with the heads of sotol. In the course of a few hours they are somewhat irregularly roasted and steamed; they are then taken out, chopped in small pieces, thrown into vats, and allowed to reach vinous fermentation. The liquid extracted from the pomace is then distilled, making a white, peculiarly-flavored, but not disagreeable spirit, that is largely used in this region. Though less highly esteemed than the more carefully-made mescal distilled from the maguey, it is preferred to the whiskies made from corn or rye, and it is certainly much less injurious. It is reported that delirium tremens is unknown in the country where it is most used, and I saw among the people none of the usual effects of alcoholism either in their persons or manners. The country where the sotol abounds is capable of furnishing an unlimited quantity of alcohol, and it might, therefore, replace the grains which are sacrificed to its manufacture in the United States.

Soap-Plants.—*Chlorogalum pomeridianum* (Amole). In the valleys of California grows a tall, slender-stemmed liliaceous plant, with purple and white flowers, which played an important part in the economy of the Spanish population, and is still more or less used by the country people. It is the well-known Amole, or soap-plant. It rises from a subterranean bulb, which is egg-shaped in form, two or three inches in diameter, and enveloped in a thick coating of black, matted, hair-like fibers. This bulb has the detergent properties of soap, cleaning the hands or clothing quite as well as and much more pleasantly than the coarser kinds of soap.

In Mexico and our Southwestern Territories there are several other soap-plants, of which the narrow-leaved yucca (*Y. angustifolia*) is the most famous, because of its wider distribution rather than its greater efficiency. Aside from baser uses it is generally employed by the Mexican women to wash their luxuriant and lustrous hair, of which the beauty is said to be largely due to this practice. The leaf pulp and the roots of the larger yucca (*Y. baccata*) have the same properties though to a less degree; but the most effective soap-plant of this

region is the lechuguilla, of which the parenchyma of the leaves is thought by the inhabitants of the country where it grows to be better than the best soap for washing, and it is claimed that this portion of the leaf if dried and powdered may be made as useful an article of export as the fibers.

Still another and very different soap-plant is found in Texas and Mexico, the (soap-berry) *Sapindus marginatus* (Wild.). This is a tree twenty or thirty feet in height, which bears a multitude of whitish berries as large as small cherries, and which have a very mild and yet efficient detergent property.

Berries.—The Indians are great berry-eaters. During the summer the huckleberries, strawberries, blackberries, etc., contributed largely to the subsistence of the Indians who formerly lived in the Mississippi Valley and the Eastern States; and when the white population increased, and villages and towns came near enough to offer markets, the women depended largely upon their baskets of berries for the purchase of the muslin, calico, blankets, and trinkets that soon became necessary for their happiness.

In the Far West berries are a much more important element in the commissary of the Indians, probably because they are produced there in an abundance and variety unknown in any other part of the world. The service-berry (*Amelanchier Canadensis*) grows throughout nearly the entire wooded region west of the Mississippi, not as a tree, but as a shrub, which forms tufts or thickets that in some regions become storehouses of delicious food. The berry is black when ripe, ovoid in form, and often half an inch in length. It is very sweet, palatable, and nutritious, and no one need starve or suffer from hunger where it is plentiful. In places it covers mountain-slopes continuously for miles, and I have there seen thousands of acres thickly set with bushes six or eight feet high, fairly bending under the weight of fruit, which was drying up and decaying because there seemed neither insect, bird, animal, nor man to eat it.

In a great number of localities service-berries are stored for winter use by the Indians. They are gathered where most abundant, crushed and made into a paste which is spread out on bark or stones in the sun until it is thoroughly dried. It is then put in sacks, and during the winter serves to give variety to their diet which otherwise consists of flesh or dried fish.

Huckleberries.—As formerly among the Eastern Indians, so now among those of the Far West the huckleberry is not only a luxury but almost a necessity. The species in the two districts are not the same: in the East the high and low blueberries (*Vaccinium corymbosum* and *V. Pennsylvanicum*), and the black huckleberry (*Gaylussacia resinosa*), are the most useful kinds. In the West are many species, but only two which have economic importance. Of these, one is small, and resembles our *V. Pennsylvanicum*, but has a berry covered with

bloom of a very pronounced blue color; the juice is very red and somewhat acid. This covers glades on the slopes of the Cascade Mountains, Oregon, and the fruit is so abundant as to give a bluish color to the whole suface; this I suppose to be *V. occidentalis* of Gray. Another species, which does not correspond to any description yet written, but may be a form of *V. Myrtillus*, surpasses in the excellence and abundance of its fruit any other huckleberry of which I have knowledge. It covers great areas on the flanks of the Cascade Mountains, in Oregon, where the forest has been burned off; growing two to four feet in height, and standing close on the ground; sometimes really bending under its load of berries. These are round, half an inch in diameter, of light wine-color, and of a delicious vinous flavor. So abundant is this fruit that, sitting down in a clump of these bushes, I have filled a quart cup without changing my position. The Indians make long journeys to the localities where these berries are most abundant and gather and dry them for winter use. The drying is rapidly effected by burning one of the great fir-trees which, killed by fire, have been subsequently prostrated by the wind and now lie thickly strewed over the open surfaces where the berries grow. When this is well burned and affords a steady heat, flat stones, if they can be found, are covered with crushed berries and set up before the fire where the drying is soon effected.

Several other berries that abound in the country bordering the Columbia are gathered and stored much in the same way. Of these, that which after the huckleberries and service-berries is most used is the salal (*Gaultheria shallon*). This plant is as unlike our Eastern wintergreen (*C. procumbens*), or the closely allied but acaulescent species of Oregon (*C. myrsinites*), as can well be imagined. It is a decumbent shrub, of which the stem is one to two feet long, the large ovate alternate leaves so thickly set as almost to touch their edges, and hanging below are a considerable number of black, pedunculate berries, growing in the axils of the leaves. These are larger and longer than those of our wintergreen, are less aromatic, but well flavored. As the plant which bears them grows in the wooded districts so thickly set as almost to cover the ground, the quantity of fruit is very large, and it therefore becomes an important source of food to the Indians.

The small cranberry (*Vaccinium oxycoccus*), is found in the bogs of Oregon as well as those of Maine, and probably stretches quite across the continent. It is used by the Indians, but is nowhere abundant, and is therefore of little value to them.

One of the most noted fruits gathered by the Indians in the Northwest is the salmon-berry (*Rubus spectabilis*). The bush grows to the height of eight or ten feet, has handsome foliage, showy flowers, and a pinkish-yellow berry an inch in length, which resembles our Antwerp raspberry. It is wholesome and nutritious, and is largely used

by both Indians and whites, but the taste is rather insipid, and it hardly justifies the promise of its beautiful appearance.

The Oregon grape—the fruit of two species of *Berberis* (*B. aquifolium* and *B. pinnata*)—affords agreeable variety to the diet of the Indians of the Northwest, and is sometimes eaten by the whites. The pretty yellow flowers, for which these plants are sometimes cultivated, are followed by clusters of deep-blue, bloom-covered berries which have a sharp yet pleasant acid taste; but they are small, and the quantity attainable in any locality is not large.

Throughout all the Rocky Mountain region the red-berried elder (*Sambucus racemosa*) grows as in the Eastern States and Europe, and makes its display of showy but useless berries. There, however, another species of the genus (*S. glauca*) has taken the place of the common elder (*S. Canadensis*) of the Eastern States. It is a larger plant than ours, and is sometimes loaded with black but very glaucous fruit, which is rather better than the fruit of *S. Canadensis* and is more used.

The buffalo-berry (*Shepherdia argentea*). Along the tributaries of the Missouri in Montana, of the Colorado in Utah, and San Juan in New Mexico, and in many other places throughout the Far West, may be found thickets of a somewhat spiny shrub ten to fifteen feet in height with peculiar glaucous, narrow, elliptical leaves resembling those of the olive. This shrub in July and August is sometimes loaded with bright-red pellucid berries which have the acidity and flavor of the red currant. These berries are much used and highly esteemed by the Indians and whites, affording a most agreeable change from ordinary camp-fare, and, by their acidity, supplying a physiological want to the system.

Another closely allied plant (*Eleganus argentea*), and more eastern in its habits, has a larger and edible though drier and less esteemed berry. Both these are close relatives of *Shepherdia Canadensis*, which grows throughout the Northern United States from New England to Washington Territory, but which is a smaller and useless plant, easily distinguished by its ferruginous, scurfy leaves.

Gooseberries and Currants.—In the valley of the Mississippi and in the mountains of the Far West, a large number of species of *Ribes* are found which, for the most part would be called gooseberries, but among them at least one should be considered as a currant. Some of these plants are showy and interesting, but they are of very little utility. Several of them fruit abundantly, but the berries are insipid or even disagreeable to the taste. In the drier portions of Oregon and Northern California a species of *Ribes* is very abundant and a noticeable feature in the vegetation. It forms tufts or thickets which in the late summer are loaded with red and attractive fruit, but it is only a disappointment, the flavor being flat and insipid, so that it is never eaten by man. In the mountains of Utah I have seen a large

and strong species bearing in great abundance a nearly smooth, purplish-brown berry. No small fruit could be more inviting, but it is never eaten; the taste is disagreeable, and the inhabitants have a conviction that it is poisonous.

NUTS.—The Indians of the Eastern States valued more highly, and gathered more abundantly than the whites have since done, the chestnuts, hickory-nuts, walnuts, and butternuts that are here so abundant. For these the Western Indians are compelled to content themselves with acorns and pine-nuts, for there are no chestnut nor hickory trees in all the Western country. The only nuts, indeed, to be found there are the chinquapin of Oregon (*Castanopsis chrysophylla*) and the *nogal* of Arizona, New Mexico, and Texas (*Juglans rupestris*), the latter a perfect "black walnut," but not larger than a boy's marble.

PINE-BARK.—One article of subsistence sometimes employed by the Indians is only resorted to when they are driven to great straits by hunger. Around many of the watering-places in the pine-forests of Oregon and California the trees of *Pinus ponderosa* may be seen stripped of their bark for a space of three or four feet near the base of the trunk. This has been accomplished by cutting with a hatchet a line around the tree as high up as one could conveniently reach, and another lower down, so that the bark, severed above and below, could be removed in strips. At certain seasons of the year a mucilaginous film (the liburnum) separates the bark from the wood of the trunk. Part of this film adheres to each surface and may be scraped off. The resulting mixture of mucilage-cells and half-formed wood is nutritious and not unpalatable, so that, as a last resort, it may be used as a defense against starvation. The frequency with which signs of its having been resorted to are met with is a striking indication of the uncertainties and irregularities of the supply department among savages.