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Article Summary: The prairie turnip is one of the most widely distributed native food plants in the Northern American Great Plains. It was an economic asset of the region, even though the flesh of the bison was the most important single food resource. It served as emergency food in times of famine and was served regularly in soups, stews, and in any boiled dishes to help stretch meat supplies. It is neither a turnip nor a potato, but the demonstrable importance of the prairie turnip historically raises the question of its significance to the pre-white Plains Indians.

Cataloging Information:

Names: J W Abert, R B Marcy, Meriwether Lewis, William Clark, Sacajawea, Frederick Pursh, Benjamin S Barton, A B Lambert, John Bradbury, Henry Youle Hind, John Mix Stanley, Valery Havard, I I Stevens, John Colter, Edward Harris, Clifford Richardson

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Photographs / Images: Figure 1: the prairie turnip as depicted by Frederick Pursh in plate 22 of *Flora Americae Septentrionalis*, v 2, London, 1814; prairie turnip at the spring flowering in Saline County, Kansas, in May, 1974; Assiniboin woman with decorated stick for digging prairie turnips; tuber of the prairie turnip, sectioned to show rind and edible white cord; braided string of peeled prairie turnips from Standing Rock Indian Reservation, North Dakota; Table 1: Composition of Prairie Turnip as percent by weight; Table 2: re-calculated composition of prairie turnip and white potato as percent by weight



Figure 1. The prairie turnip (*Psoralea esculenta*) as depicted by Frederick Pursh in plate 22 of *Flora Americae Septentrionalis*, vol. 2, London, 1814.

NOTES ON THE PRAIRIE TURNIP
(*Psoralea esculenta*)
AMONG THE PLAINS INDIANS

By Waldo R. Wedel

Psoralea esculenta—Indian bread root, Indian turnip, Pomme de prairie, Pomme blanche, Prairie potato, Scurfpea, Ground apple, White apple, Tipsin, Tipsinna, Prairie turnip, Dakota turnip.

One of the most widely distributed native food plants in the North American Great Plains, the Indian bread root or prairie turnip (*Psoralea esculenta*) was probably the non-domesticated most sought after by the Indians of the region. Notwithstanding the popular names by which it was known, it is neither a turnip nor an apple nor a potato. It is a perennial of the pea family (*Leguminosae*), which includes a considerable number of other plants, wild and domestic, that are useful to man as dietary items and for other purposes. In the pre-agricultural plains and prairie grasslands, from Alberta, Manitoba, and Wisconsin southward to Missouri, Texas, and New Mexico, the prairie turnip was frequently noted by observant 19th century travelers and explorers across the Great Plains, as was its usefulness to the human residents of the area. Despite its obvious importance to the Indians as a food staple, and its considerable utilization by their white contemporaries on the frontier, the prairie turnip was botanically unknown to Euro-Americans before 1800.

Throughout its wide range, the prairie turnip grew in various kinds of soils and locations. Generally thought to prefer dry, somewhat gravelly, and well-drained upland soils, it thrived best, according to Havard (Maisch 1889:348), "in deep and fertile soil, if, at the same time, dry and porous." In the north, it could be found naturally as far as the Saskatchewan and Qu'Appelle rivers in Canada's prairie provinces (Hind 1859; Havard in Maisch 1889; Budd 1957). Hillsides, foothills, and other prairie lands in Montana, the Dakotas, Nebraska, and Kansas (Havard 1895) provided suitable habitats. So did the western Minnesota

prairies (Upham 1884; Moyle and Moyle 1977), where the Pomme de Terre derives its name from the Dakota designation for the prairie turnip (Riggs 1852:171); prairie hills in northwestern Iowa (Hayden 1943; Fitzpatrick 1899); the Driftless Area in southwestern Wisconsin (Curtis 1959); the limestone-derived soils eastward to the vicinity of St. Louis (Bradbury 1817:338; Steyermark 1963:897); and the black prairie lands of central Texas (Bray 1906:88; Reeves and Bain 1947:183).

The plant seems to have attracted somewhat less notice in the central and southern plains than in the Missouri River valley, and it may have been of less importance economically to the Indians there than farther north. In Kansas, specimens so identified were collected by Lieutenant J. W. Abert on July 8, 1846, at Turkey Creek in present McPherson County, and it was included in a list of plants seen on "low ground" between Fort Leavenworth and Pawnee Fork east of the 99th meridian (Emory 1848:11). Richards (1968:161) reports it in the Cimarron River drainage in Morton County (cf. Stevens 1961:281). Captain R.B. Marcy (1854:251) collected specimens on Cache Creek and in the Wichita Mountains in present Oklahoma in May, 1852. None of the 19th century observers in the above group alludes to its significance economically among the Indians of the region (but cf. Carlson and Jones 1940:529). Occurrence of the prairie turnip in the Llano Estacado of Texas and New Mexico appears doubtful from the available literature.

Perhaps the earliest description, and still one of the most complete by a non-botanist, appears in the journals of the Lewis and Clark expedition. On May 8, 1805, near the mouth of Milk River in northern Montana, Captain Meriwether Lewis wrote (Lewis and Clark 1904-05:11:10):

... The white apple is found in great abundance in this neighborhood; it is confined to the highlands principally. The white apple, so called by the French Engagees, is a plant which rises to the height of 6 or 9 inches, rarely exceeding a foot; it puts forth from one to four and sometimes more stalks from the same root, but is most generally found with only one, which is branched but not defusely . . . ; the leaf, digitate, tough, from 3 to 5 in number, oval 1 inch long . . . cottony . . . the whole plant of a pale green . . . the radix a tuberous bulb; generally ova formed [oviform], sometimes longer and more rarely partially divided or branching; always attended with one or more radicles at its lower extremity which sink from 4-6 inches deep. The bulb covered with a rough black, tough, thin rind which separates from the bulk which is a fine white substance, somewhat porous, spongy, and moist, and rather tough before it is dressed: the center of the bulk is penetrated with a small tough string or liga-ment, which passing from the bottom of the stem terminates in the extremity of the radicle, which last is also covered by a prolongation of the rind which

invelopes the bulb. The bulb is usually found at the depth of 4 inches and frequently much deeper. . . .

On the same day Captain William Clark walked on shore with Charbonneau, the interpreter, and his wife Sacajawea, and noted that the latter was gathering wild licorice and the "whiteapple." The Indians along the Missouri, he observed (*Ibid.*:13), "make great use of the white apple dressed in different ways." On this point Lewis (*Ibid.*:11) supplied more details:

This root forms a considerable article of food with the Indians of the Missouri, who for this purpose prepare them in several ways. They are esteemed good at all seasons of the year, but are best from the middle of July to the latter end of Autumn when they are sought and gathered by the provident part of the natives for their winter store, when collected they are striped of their rhind and strong on small throngs or chords and exposed to the sun or plased in the smoke of their fires to dry; when well dried they will keep for several years, provided they are not permitted to become moist or damp; in this situation they usually pound them between two stones placed on a piece of parchment, untill they reduce it to a fine powder, thus prepared they thicken their soope with it; sometimes they also boil these dried roots with their meat without breaking them; when green they are generally boiled with their meat, sometimes mashing them or otherwise as they think proper. They also prepare an agreeable dish with them by boiling and mashing them and adding the marrow grease of the buffaloe and some buries, untill the whole be of the consistency of hasty pudding. They also eat this root roasted and frequently make hearty meals of it raw without sustaining any inconvenience or injury therefrom. . .

On the return trip down the Missouri River more than a year later, three days travel above the Little Missouri River, Clark wrote (Lewis and Clark 1905:V:328):

The men dug great parcel of the root which the Nativs call *Hankee* and the engagees the white apple which they boiled and made use of with their meat. This is a large insipid root and very tasteless, the natives use the root after it is dry and pounded in their Scup [sic-soup].

Specimens of the "white apple" were included among the plants collected on this journey, to partially replace a much larger botanical sample which had been destroyed by flooding of the winter cache of equipment and other materials left at the foot of the mountains on the outward trip. Soon after Captain Lewis' arrival in the East, these found their way into the hands of Frederick Pursh, a German-born botanist who resided from 1799 to 1811 in Philadelphia and at other centers of botanical activity. The exact nature of arrangements made between Lewis and Pursh for eventual publication of the latter's identifications are obscure, even controversial (McKelvey 1955:74).

Pursh (1814:x) says that he met Lewis soon after the latter's return late in 1806 from the western expedition, and that a "small but highly interesting collection of dried plants was put

into my hands by this gentleman" for description and eventual inclusion in the official report which Lewis was then preparing for publication. Lewis' untimely demise on October 11, 1809, brought further delay in these preparations—delay which persisted even though William Clark had agreed to take over the unfinished task and Pursh said that he had sent to Clark "all the drawings prepared for the work." It has been suggested (McKelvey 1955:72) that the plant collection Pursh allegedly received from Lewis may have been intended for further transmittal by him to Benjamin S. Barton, "who, from the first, seems to have been regarded as the person destined to publish this phase of the work," and whose assistant Pursh was for a time. Following Lewis' death, Barton contracted with Clark to complete a botanical report within six months after publication of the narrative report. Up to the time of his death in 1815, Barton appears to have done nothing toward completing this commitment. His failure to perform may have come about when he found the specimens missing, presumably because they were included among the botanical materials taken by Pursh to England (cf Pennell 1950:144) when he departed in 1811 in anticipation of war with the United States, taking "all my materials" along. So it came about that the prairie turnip was given its scientific name by Pursh, who "apparently without authority" (McKelvey 1955:63) published the first Latin description and the first professional illustration (see Figure 1) in his two-volume *Flora Americae Septentrionalis*, all presumably based on dried specimens in the Lewis herbarium (Pursh 1814:x,475).

Following publication of his opus in 1814, Pursh went to Canada to continue his botanical studies, leaving his plant specimens with A.B. Lambert, his sponsor and vice-president of the Linnean Society. Subsequently, Lambert's herbarium was dispersed, and a number of Lewis plants forming Pursh's types and marked "from Lambert's herbarium," became part of the herbarium of the Academy of Natural Sciences in Philadelphia. According to Meehan (1898:48), "for all practical purposes, all the plants of the Lewis and Clark expedition are now deposited in the Academy," including the type specimen of the Indian turnip, *Psoralea esculenta*.

To judge from the record, Pursh was a competent botanist of somewhat uncertain character as a person. His *Flora* was termed an "amazingly brilliant" work by the same scholar (Fernald

1942:65, fn 15) who called him "one of the most active and apparently unscrupulous early Philadelphia botanists." While he was compiling that work, which more than doubled the named and published plant species of North America (McKelvey 1955:105), he was reportedly (Fernald 1942:66, fn 15) an inveterate drinker, kept in his study under lock and key with a carefully metered allowance of spiritous refreshment, and was permitted an hour's walk daily under guard to insure return to the task at hand. The English botanist, John Bradbury, who shipped to England seven boxes of botanical materials from St. Louis but was unable to follow them until after the war of 1812, found (Bradbury 1817:vii) that his collections had been "submitted to the inspection of a person by the name of Pursh, who has published the most interesting of my plants in an appendix to the *Flora Americae Septentrionalis*." Although Bradbury returned to the United States to live out his life, he never again undertook plant collecting as a profession (McKelvey 1955). His fiscal and other difficulties with his Liverpool sponsors may have had some bearing on the matter (Rickett 1950), no less than the preemption of his Missouri Basin botanical collections by Pursh.

Accompanying Pursh's description of the new species is the following commentary (Pursh 1814:476), presumably based on information from Meriwether Lewis:

The present plant produces the famous *Bread-root* of the American Western Indians, on which they partly subsist in winter. They collect them in large quantities, and if for present use, they roast them in the ashes, when they give a food similar to yams: if intended for winter use, they are carefully dried, and preserved in a dry place in their huts. When wanted for use, they are mashed between two stones, mixed with some water, and baked in ashes over the coals. It is a wholesome and nourishing food, and, according to Mr. Lewis' observation, agreeable to most constitutions; which, he observed, was not the case with the rest of the roots collected by these Indians for food. This root has been frequently found by travelers in the canoes of the Indians, but the plant which produces it has not been known until lately. . . .

The *Psoraleas* as range plants are regarded as having little forage value (Forest Service 1937:W157). The generic name is derived from the Greek *psoraleos*, meaning mangy or scabby, presumably an allusion to "the peculiar, dark glandular dots characteristic of the herbage of this genus" (Ibid). The specific name *esculenta* refers, of course, to the edible nature of the root of this particular species. Enlarged roots of lesser proportions that were sometimes used as food occur also in *P. cuspidata* (Gray 1970:898) and in *P. hypogaeae* (Havard 1895:108). Tubers

of both these latter forms may have been subsumed under the *pomme blanche* of the early Plains travelers, as well as of later observers. To the Indians and their white contemporaries, the nutritional qualities of certain *Psoraleas* were doubtless much more important than minor taxonomic distinctions.

Except in a few exceptionally favorable locations, *P. esculenta* grows in scattering stands rather than in dense colonies. It does not withstand well the close grazing to which it may be subjected by confined livestock (Weaver and Albertson 1956:47), and it soon disappears from regularly grazed pastures. Among upland forbs, it is ranked by Weaver (1954:72) as sixtieth in importance among prairie plants.

Meriwether Lewis accurately described *P. esculenta* as small, rarely over one foot (30 centimeters) high, and as abundant in the upper Missouri River locality where he prepared his description. He made no mention of the thick spike of blue to purplish pea-like flowers, described by Pursh as "pale blue," and, like the plant itself, relatively inconspicuous. The plant, which occasionally reaches heights of 18 inches (46 centimeters) or a little more, has somewhat the appearance superficially of a lupine, which lacks the tuberous root that made *P. esculenta* particularly useful to man (Figure 2). Unlike several other *Psoraleas*, *esculenta* may be easily overlooked by one not familiar with its delicate five-fingered leaf pattern, thin light-green foliage, downy stem, and relative inconspicuousness in a healthy and flourishing prairie grassland.

The esculent tuber so industriously sought by the Indians—and also, according to Captain Clark, a favorite food of the plains grizzly bear—has been described in varying detail and completeness by numerous observers. Meriwether Lewis said it was usually found "at the depth of 4 inches and frequently much more;" but neither he nor Clark provide any details as to size. The English-born botanist, John Bradbury, who accompanied Hunt's Astorians up the Missouri River as far as the Arikara villages in 1811, described (Bradbury 1817:140) freshly dug tubers he saw on June 23 in the Minnataree (Hidatsa) village on Knife River as "of the shape of an egg: some of them were nearly as large as those of a goose; others were smaller." According to Professor Say of the Long expedition (James 1823:1:206), the root resembled "a long turnip, about the size of a hen's egg." In July, 1859, writing from among the Cree near Qu'Appelle Mission in southeastern Saskatchewan, Henry Youle Hind (1859:48)



Figure 2. Prairie turnip at the spring flowering in Saline County, Kansas, in May, 1974.

reported that he saw "many roots as large as the egg of a goose, and among those brought with me to Canada are some of even larger dimensions." At a much later date, Havard (Maisch 1889:347) wrote that the tubers were "irregularly elliptical in shape, from ovoid to fusiform; in size ranging from a hen's egg to a large filbert, averaging 1-1/2-2 inches in length and one inch in diameter." Still more recently it has been described (Forest Service 1937:W157) as an "egg to spindle-shaped tuberous root (sometimes clustered), encased in a thick, brown, leathery skin which readily peels off, is sometimes as large as a hen's egg, with the stem scars of previous years plainly visible at the upper end."

Important to the users of the prairie turnip was the fact that the aerial parts withered to a brown, rigid mass after the spring flowering, snapped off at ground level when the seed pods matured, and were blown away, to be replaced by a fresh stalk the next year. The "tumble-weed," as it blew across the prairie, scattered its seeds freely; but the root stalk from which it originated and on which the tuber grew was no longer visible from the ground surface. It was desirable, therefore, that the root harvest be started when the flowers began to fade and the tubers were at their best, but before the telltale stalks were carried away by the prairie winds (Gilmore 1919:92; Grinnell 1923:I:250; Forest Service 1937:W157).

The harvest time, of course, varied with the season and the latitude, coming as early as May or June in the southern plains, and running through July and perhaps into August in the north. On the O.S. Fent farm in Saline County, Kansas, during the spring of 1974, the prairie turnips came into bloom in the second and third weeks of May. By May 23, few blossoms were to be seen. On June 30, of the few plants that could still be located, most were virtually dried up, and only a few pods retained their seeds. Semi-detached and recently detached plants were noted, and others were blowing across the meadow here and there. A gathering season of perhaps six or seven weeks in May and June is indicated here, between first appearance of the blooms and final loss of above ground parts.

Among the Omaha, according to Fletcher and LaFlesche (1911:341), "the root was dug from the time the plant first appeared until late in the fall." One wonders how the tubers were located "late in the fall," after detachment of the aerial parts.

Harvesting the tubers was the responsibility of the women; and the historical sources provide good details of this operation.

Members of the Long expedition in 1820 (James 1823:1:205) noted that when the Omaha Indians left their village on Omaha Creek for the summer hunt, "which occurs usually in June," many of the women, though heavily burdened with camp gear, "often bear a heavy staff of wood, sharpened to a broad edge at one end for the purpose of digging up the *Nu-ga-re*, or ground apple." The line of march followed on the tribal bison hunt of the Omaha "was sometimes determined by the localities where this desirable plant grew in abundance" (Fletcher and LaFlesche 1911:341). At Fort Clarke on the Missouri, the trader Chardon reported all of the women from the nearby Mandan village out after prairie turnips on June 10 and again on July 2, 1837 (Chardon 1932:116, 120). On James River in present eastern South Dakota in July, 1839, Captain Fremont reported (1970:57) that "the squaws had gathered in a quantity of the *pommes des terres* or prairie turnip (*Psoralea esculenta*) which is their chief vegetable food, and abundant on the prairie." Four years later in early June of 1843 on the lower Kansas River, he (*Ibid*:430) saw "five or six Kansas women, engaged in digging prairie potatoes." At Fort McKenzie on the upper Missouri, Maximilian (1843:252) reported of the Blackfeet that "the pomme blanche, or white turnip, is very common in the prairies. The women and children dig them up with a particular kind of wooden instrument, and bring them in strings to the Whites for sale." In July, 1858, at Qu'Appelle Mission on the Fishing Lakes in present Saskatchewan, Hind (1859:48) wrote that the Cree women and children had recently gathered "many bushels" of the tubers and were processing them, but he tells us nothing of the kind of digging tools used. John Mix Stanley, artist with the Stevens railroad survey party in 1853 in present North Dakota, depicted a group of Indian women digging turnips with a stick and transporting them on dog and horse travois (Schoolcraft 1857, opp. 552).

It is not clear just what Maximilian meant by "a particular kind of wooden instrument." Among contemporary accounts, in addition to Long, we have Catlin's depiction (Catlin, 1844:I:56 and plate 29) of an Assiniboin woman, Chin-cha-pee, he sketched in 1832 at the American Fur Company post at the mouth of the Yellowstone River, "holding in her hand a stick curiously carved, with which every woman in this country is supplied; for the purpose of digging up the 'Pomme blanche,' or prairie turnip. . . . The women collect these turnips by striking the end of the stick into the ground, and prying them out." The

stick illustrated incompletely appears to be incised and/or painted, has a flattened tip with one curving edge, and may have been in the neighborhood of 30-36 inches (76-90 centimeters long) (Figure 3).

For a much later period, we have Wissler's (1910:22) observation that the Blackfeet used a digging stick, "an instrument now surviving only in ceremonies." Still later, according to Ewers (1958:86), the Blackfeet used "a birchwood digging stick. . . . The sharp lower end was hardened in a fire and the upper end was rounded so that a woman could bear upon it with her stomach muscles in loosening roots from the ground." Grinnell (1892:145), in a footnote to the Cheyenne tale of *The Dog and The Stick*, describes the root-digger as "a carved and painted stick about 3 feet long, shaped like a sacking needle." Later, he (Grinnell 1923:209) described Cheyenne root diggers of several other kinds. One was a "slender sharp-pointed implement" formerly made of ash, 2-1/2 to 3 feet long, with a fire-hardened tip and the other end knobbed to protect the holder's hand. In hard ground, a folded blanket or robe further cushioned the hand. A shorter form of root-digger was pushed into the ground with the knee. When these implements became



Figure 3. Assiniboin woman with decorated stick for digging prairie turnips. (From Catlin, 1844, plate 29)

dull from long use, they were re-sharpened with a knife and the tip was again fire-hardened. In an earlier day elk antler tips were sometimes put on the working end of the root-diggers.

According to Dr. Valery Havard, army surgeon at Fort Abraham Lincoln, [North] Dakota, in 1877-1878 and again August, 1887, to May, 1889, the prairie turnips were in their best condition in late July; and referring presumably to the Dakota Sioux, he added (Maisch 1889:347) of the women that "formerly they used a strong pointed stick to pry the tuber out; now they use a small iron bar, one end of which is beaten into a narrow blade."

Among the Cheyenne, according to Grinnell (1923:I:68), root-gathering parties included females of all ages, from small girls to crones. On their return, successful parties might stop within sight of the camp and let one of their number give a war-cry, "as if a war party were returning." In camp, men thereupon armed themselves with improvised shields and weapons, mounted worthless old horses, and staged a mock attack upon the women, who defended themselves with sticks and dried bison chips. In the ensuing sham battle, only men who had been wounded or had their horses shot from under them in actual combat were allowed to take roots away from the women. Sometimes a party of mounted men made a surprise raid on the returning root-gatherers, who could defend themselves by drawing a furrow in the ground around their party with digging sticks to simulate breast-works. If an attacker had counted coup or killed an enemy inside a breast-works, he was privileged to pass the protective furrow and help himself to some roots after recounting his exploits within the simulated enclosure. If none of the attackers were thus qualified, they could only ride around outside the circle while the women within jeered them. Mock attacks of this sort were put on only when the women were returning with a root harvest of prairie turnips, not with cherries or berries.

Once the tubers had been collected and separated from the plant, their processing continued with removal, sometimes "by the help of the teeth" (Fletcher and La Flesche 1911:341), of the rough, dark brown to black rind — the "thick leathery envelope" (Palmer 1871:408) — in which they were enclosed. This usually separated readily from the white edible portion (Figure 4).

The peeled tubers were then handled in any of several ways. Fresh, they could be eaten raw or roasted; or, they could be

boiled whole, sliced, or mashed — with meat, berries, or other items. Again, by retaining the tough stringy taproot that normally grew deeply into the ground below the enlarged section, the tubers could be braided together in long strings, hung up to dry in the sun or over the lodge fire, then stored by hanging them from the poles or framework of the lodge (Gilmore 1919).

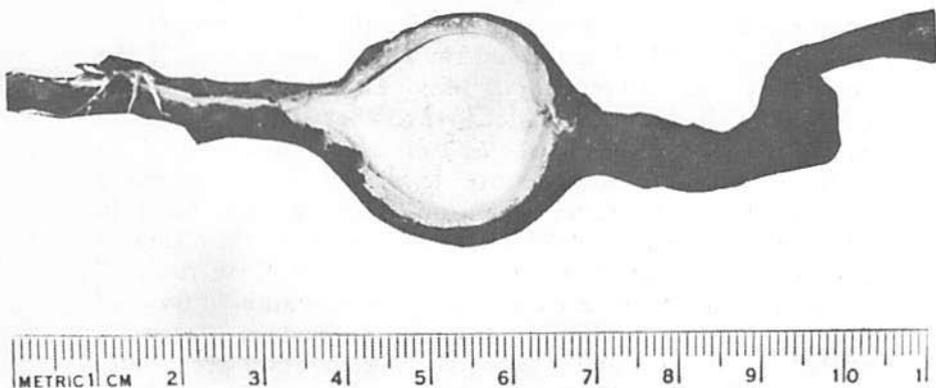
The strings, to judge from available museum and other examples (USNM No. 251990; Figure 5; Bass and Wakefield 1974:39) varied in length from 24 to 60 inches (60-150 centimeters) or more, and included up to 150 or more tubers ranging in size from the largest with which the braiding began downward to little-finger sizes with which the string ended. According to Gilmore (1926:14), the Dakota made strings of standardized length, which was one arm-reach; and his Arikara informant characterized these as the principal commodity traded by the Dakota Sioux to the Arikara, whose fear of the former kept them from gathering their own turnip harvests. One burden-basket, *hunansadu*, or properly *xkuna:nisa:tu?* (D.R. Parks, personal communication) of shelled corn, equivalent to "about a bushel," was said to be worth four strings of turnip roots plus one burden-basket of dried and split turnips. Arikara informants today say that the "arm reach" was measured from the middle of the chest (Parks, p.c.). If Gilmore's figures of equivalence are approximately correct, it appears that the Arikara may have been getting the better of the exchange with the Dakota.

Another method of storage, reported for the Cree, Sioux and Omaha (Hind 1859; Palmer 1871:408), involved the shredding or lengthwise slicing of the peeled tubers, the resulting product on drying being aptly described as "chips" (cf Grinnell 1923:I:250). For these, Hind reported that "large quantities are stored in buffalo bags for winter use" by the Cree. Storage in bags is also attributed to the Omaha (Fletcher and La Flesche 1911:341). Regardless of the particular method followed, all observers agree on the excellent keeping qualities of the prairie turnip when properly dried and protected against dampness and vermin.

The Indians' customary ways of using the prairie turnip have already been touched on in the observations by Meriwether Lewis and Frederick Pursh in an earlier section of this paper. Other details have been provided by later observers. Thus, Governor I.I. Stevens (1860:74) of the Pacific Railroad survey, visiting an Assiniboin camp three days march east of Fort Union on the

Missouri on July 27, 1853, mentioned "the eating of soup, made of buffalo and *Typsina*, a species of turnip, which was rich and greasy but quite palatable." In 1833, feasting with the Blackfeet at Fort McKenzie, Maximilian (1843:266) reported that "a wooden dish was set before each of us, containing boiled beaver's tail with prairie turnips (*pomme blanche*). The beaver's tail was cut into small slices, and was boiled very tender. It did not taste amiss." A favorite dish of the Sioux, according to Palmer (1871:408), "used at great feasts, called *wash-enena*, consist[ed] of dried meat pulverised with marrow, and a preparation of cherries, pounded and sun-dried. . . . To this compound is frequently added, when to be cooked, a kind of flour made from the root of the *pomme blanc* (white apple) . . . derived from the *Psoralea esculenta*." Among the Cree, Hind (1859:48) noted that a "sort of pudding made of the flour of the root and the mesaskatomina berry [Saskatoon or service berry, *Amelanchier canadensis*], is very palatable." The Sioux, said Havard (1895:107), generally ate the turnip cooked, "and as they appreciate the advantages of a mixed *pot-au-feu*, boil it with tripe, fattened pup, or venison." A favorite dish of the Cheyenne (Grinnell 1923:1:255) was "the flesh of a yellow calf boiled with *pomme-blanche* roots in a liquor made of water and the grease from the bones of fat cows."

Figure 4. Tuber of the prairie turnip, sectioned to show rind and edible white core. Note old stem scars (above) and stringy root (below).



In addition to their use whole or sliced in stews, soups, and other dishes, the dried tubers were easily pounded or ground into a fine, light, starchy flour. This was rated "a very good substitute for flour" (Hayden 1862:369), suitable "for all the uses of the ordinary article" (Upham 1884:42). It was extensively used to thicken soups or puddings. Mixed with water, it made "an excellent kind of mush upon which the Indians feed greedily" (Audubon 1843, cited in McDermott 1941:124); or it could be made into "passable bread" (Denig 1930:408) or into cakes baked over the coals (Pursh 1814:476). As "prairie-apple flour," it was included by Tabeau (1939:158) among the commodities traded by the wandering hunter tribes to the Arikara in the early 1800s.

The white man's reactions to the prairie turnip as a food item were varied but generally favorable. Meriwether Lewis closed his admirable description (Lewis and Clark 1904:11) of its Indian uses with this observation:

The white apple appears to me to be a tasteless insipid food of itself, tho' I have no doubt but it is a very healthy and moderately nutritious food. I have no doubt but our epicures would admire this root very much, it would serve them in their ragouts and gravies instead of the truffles morella.

Bradbury (1817:140) "on tasting found them very palatable, even in a raw state," and he decided further that this root "cannot but be extremely grateful to those who otherwise must exist on animal food alone, without bread or salt; at least I then thought so." In a footnote recounting John Colter's escape from the Blackfeet in 1808, Bradbury says that Colter "subsisted on a root much esteemed by the Indians of the Missouri, now known by naturalists as *psoralea esculenta*." Bradbury's contemporary, Brackenridge (1814:249), allowed the tuber "something of the taste of the turnip, but more dry." Major Long's men said (James 1823:I:206) it had a sweet taste, though they thought it rather dry; but they approved its use as "the chief ingredient of an excellent soup" (cf. Brackenridge 1814:249). Tixier, traveling with the Osages in June, 1840, on their summer hunt in south-central Kansas, said (McDermott 1940) that "the taste and shape of the [pomme blanche] remind you of horse radish," leaving one to doubt the accuracy of his identification of the root involved. Palmer (1871:408) thought it had a "sweetish turnip-like taste, . . . and is very palatable, however prepared." Havard (1895:107) wrote that "raw it has a very palatable flavor entirely devoid of bitterness." Fletcher and La Flesche (1911:341)

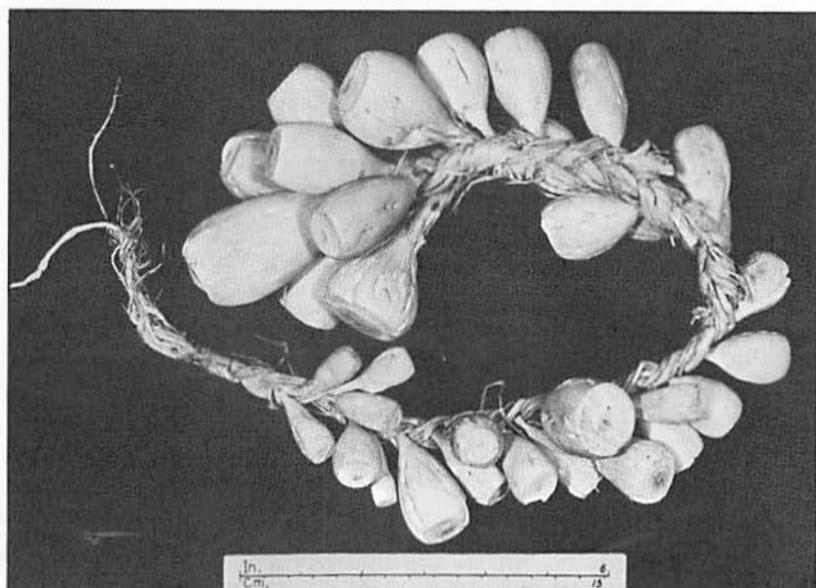


Figure 5. Braided string of peeled prairie turnips from Standing Rock Indian reservation, North Dakota. Collected by M.A. Bass in 1970. Courtesy of Mrs. Marion Willey, Lawrence, Kansas.

describe the inner white flesh as "rather tasteless but not unpleasant." To Gilmore (1919:92) it had "a palatable taste characteristic of the bean family."

As a food, the prairie turnip was characterized by most 19th century observers as starchy and farinaceous, sometimes as glutinous. Nutritionally, it supplied mainly carbohydrates and was comparable to the Irish potato (*Solanum tuberosum*) among Euro-Americans. Edward Harris, traveling up the Missouri in 1843 with Audubon, said (Harris 1951:26) that it "appears to be highly farinaceous and although it might not be worth cultivating to make bread, still it may make an excellent substitute for Arrow Root or perhaps it might improve by cultivation." Nuttall (1818:102) asserted that it was "never farinaceous; it is also somewhat medicinal and operates as a diuretic." In terms of food value, Havard (1895:107) gives the results of an analysis as "70% of starch, about 5% of a sugar new to chemistry, and 9% of nitrogenous matter." Whether these findings pertain to the fresh or dry tuber, and the locality from which the sample was obtained, are not indicated.

Among the several statements bearing on composition and nutritional value of the prairie turnip, the most detailed are those

by Clifford Richardson, chemical engineer, published in Maisch (1889), and by Yanovsky and Kingsbury (1938). Nearly 50 years separate these analyses, and direct comparison of their results is difficult. Moreover, modern food-value analysis is presented in yet another format. In Table 1 herewith, the data on the prairie turnip are presented side by side with more recent data on the white potato, which is drawn from Agriculture Handbook No. 8 (Watt and Merrill 1963). The data are arranged roughly in groups to bring into concordance the two older studies as well as the more modern Department of Agriculture nutritional classification. Dashes indicate that values for a particular substance, or group of substances (e.g., the "ether extract" of Yanovsky and Kingsbury) were not determined as such by other workers, or were not determined for a particular sample. It should be noted that the four analyses by Yanovsky and Kingsbury do not total 100% recovery. The authors were aware of this and noted that although their analyses were incomplete, it was hoped that the information they presented would be of some use to agricultural chemists and nutritionists.

To partially compensate for the several disparate methods of data reporting represented by Table 1, the values within the groups involving the older data are summed and presented under the single headings of the Department of Agriculture report as Table 2. The numbers listed for potatoes of varying water content represent values which have been adjusted from the "dry flake" values in the Agriculture Handbook. This was done to further facilitate direct comparison between the nutritional make-up of the prairie turnip and the white potato. Since Yanovsky and Kingsbury did not report water content for their dry *Psoralea* analyses, it is assumed that their samples contained about 6.1% water, approximately that of the average Agriculture Handbook dry potato samples.

Arranged in this manner, the data presented by Maisch can be seen to correspond almost exactly with the dry potato adjusted to equal moisture content (Table 2, columns "b" and "c"). The Yanovsky and Kingsbury findings do not exhibit an equally dramatic concordance, but their values are nevertheless close to those of the potato in a nutritional sense. As a source of carbohydrates, the prairie turnip apparently ranks close to the white potato, and this appears to be true also of its protein and fat content. Pending more detailed and up to date analyses of the prairie turnip, one can suggest that there was indeed a sound

TABLE 1. COMPOSITION OF PRAIRIE TURNIP (*PSORALEA ESCULENTA*) AND WHITE POTATO (*SOLANUM TUBEROSUM*) AS PERCENT BY WEIGHT.

Maisch 1889 Dry		PRAIRIE TURNIP (<i>Psoralea esculenta</i>) Yanovsky & Kingsbury 1938						POTATO (<i>Solanum tuberosum</i>) Agri. Hdbk. No. 8		
		Fresh		Dry						
		40	40A	40	40A	Flake Granule				
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	
Water	9.5	Water	24.6	43.9			Water	5.2	7.1	
Globulin	1.0									
Albumin, soluble	1.0									
Albumin insoluble	6.1	Protein	—	—	7.7	13.1	Protein	7.2	8.3	
Oil	0.4									
Resin	0.4	Ether extract	—	—	1.0	—	Fat	0.6	0.6	
Sugar	4.8	Sugar, reducing	2.8	0.9	3.7	1.6				
		Sugar, non-reducing	7.5	7.4	9.9	13.2				
Sweet, unidentif.	1.1									
Starch	69.6	Starch	17.5	17.1	23.2	30.5				
Fiber	3.5	Hemi-cellulose	12.8	12.0	17.0	21.4	Carbohydrate, all	84.0	80.4	
Ash	1.7	Ash	—	—	2.9	3.1	Ash	3.0	3.6	
Non-protein nitrogen	0.9									
Total	100.0	Total	65.2	81.3	65.4	82.9	Total	100.0	100.0	

nutritional basis for the Indian reliance on *P. esculenta* as a basic food item; and the tuber must have complemented well the high animal protein diet of the Plains Indian bison hunters.

Some of the nutritional variations exhibited by the Yanovsky and Kingsbury data may reflect in part the environmental conditions under which the various samples tested attained maturity. Their samples came from an unspecified locality or localities in Nebraska, Maisch's presumably from the vicinity of Fort Abraham Lincoln in North Dakota. Over the very wide area in which the prairie turnip grew in the pre-agricultural grasslands of the Great Plains, the diverse character and

TABLE 2. RE-CALCULATED COMPOSITION OF PRAIRIE TURNIP AND WHITE POTATO AS PERCENT BY WEIGHT.

(a)	(b) Prairie turnip (dry) Maisch	(c) Potato 9.5% H ₂ O* Ag.Hbk. 8	(d) Y & K 40 (fresh)	(e) Potato 24.6% H ₂ O	(f) Y & K 40A (fresh)	(g) Potato 43.9% H ₂ O	(h) Y & K 40 (dry)	(i) Y & K 40A (dry)	(j) Potato 6.1% H ₂ O
Water	9.5	9.5	24.6	24.6	43.9	43.9	6.1	6.1	6.1
Protein	8.1	6.9	—	5.7	—	4.3	7.7	13.1	7.1
Fat	0.8	0.6	—	0.5	—	0.4	1.0	—	0.6
Carbohydrates, total	79.0	80.2	40.6	66.8	37.4	49.7	53.8	66.7	83.2
Ash	1.7	2.9	—	2.4	—	1.8	2.9	3.1	3.0
Total	99.1	100.1	65.2	100.0	81.3	100.1	71.5	89.0	100.0

*If the water content is 5.2%, then solids represent 94.8%. If the water content is 9.5%, then solids represent 90.5%, or 0.95 of the value 94.8. Data for the potato have been adjusted in accord with this formula.

condition of the soils, the amount and timeliness of moisture, the temperature, topography, vegetational cover, and a host of other environmental variables, could have affected the carbohydrate (energy storage) content of the plants. It may be suggested, then, that while the limited and uneven data now available on the nutritional qualities of the prairie turnip are informative and suggestive, far too little is yet known and in print about the food value of tubers grown and gathered in various portions of the region. Urgently needed are modern analytical studies that combine sophisticated instrumentation, wide sampling to compensate for climatic, soil, and other environmental variations, and comparison of fresh versus dry samples in light of current knowledge of possible vitamin and trace element values.

Edward Harris was not the only one, nor even the first, who saw promise in the prairie turnip as a cultigen. According to Maisch (1889:346):

In the beginning of the present century it was brought to Europe by Lamare-Picquot who recommended it as a substitute for the potato. It was cultivated for some time in France where it became known as *picquotiane*; but the results were not encouraging, and at present it is rarely met with in Europe.

Years later, Havard (Maisch 1889:348) wrote: "I have hardly any doubt that under patient cultivation for a few seasons it could be improved, perhaps to an extent that would make such cultivation profitable, and supply our market with another toothsome, wholesome and nutritious vegetable."

What proportion of the native Plains Indian diet was derived from the harvest of prairie turnips is impossible to say in anything like precise quantitative terms. Most reports speak in relative terms — large quantities, important articles of food, and so on. The impression persists, nevertheless, that the plant was both widespread and relatively plentiful throughout the northern Plains and on the upper Missouri, and that the tubers were extensively utilized for sustenance and trade by those tribes within reach of the harvest. Note has already been taken of the comments by Lewis and Clark, and by Pursh, concerning the heavy Indian reliance on the plant; and later travelers through the region reiterated and amplified their statements. Thus, Bradbury (1817:140) was informed that the root is "of the greatest importance, not only to the Indians, but to the hunters, who, in case of failure of other food, from the want of success in hunting, can always support life by resorting to it." From the

American Fur Company post at the mouth of the Yellowstone, Catlin (1844:I:56) wrote that "the prairie turnip is found in great quantities in these northern prairies, and furnishes the Indians with an abundant and nourishing food." In May, 1843, at Cedar Island on the Missouri, Audubon (McDermott 1941:124) wrote that "this plant is collected in great quantities by the Indians at this season and during the whole summer." In 1853, describing the geography of the land between the Missouri and Mouse rivers, Stevens (1860:85) observed that "a kind of wild turnip is found in comparative abundance, being the only useful production yet known, and the food of the wandering Indians, by whom it is regularly gathered."

Hayden (Warren 1856:78) characterized the *pomme blanche* as the most important of the edible roots in the middle Missouri country, saying that it "forms the most useful article of food to the Indian, among the spontaneous products of the country," and that "the lower tribes of the Sioux, who have but little game, subsist almost entirely on it for several months of the year." In a later observation, he (Hayden 1862:369; cf Denig 1930:408) added that "in any form it will sustain life for several months without the assistance of animal food." According to Palmer (1871:408), the Indians of Kansas and Nebraska "consider this root an especial luxury," and the Sioux "use [it] very extensively." In southwestern Minnesota, the "camp sites of traveling bands of Dakota were often marked by piles of used roots" (Moyle and Moyle 1977:28).

The historical and ethnographic materials, as sampled above, make it clear that the prairie turnip was an economic asset of major importance to the historic Indians and early whites in the Great Plains region, even though, to non-horticultural groups at least, the flesh of the bison was the most important single food resource. In times of famine, the prairie turnip was an essential emergency food; at other times, it served regularly in soups, stews, and in any boiled dishes to help stretch meat supplies. In terms of ready availability, nutritional value, general and widespread abundance, ease of processing for immediate or future use, palatability, and excellent keeping qualities, the prairie turnip would seem to have qualified eminently as a staple food among the Plains Indians. Its repeated mention in the myths and legends of the Indians, along with maize and the bison, perhaps further underlines its continuing significance in

the lifeways of the Plains peoples. Possibly, had its procurement and processing involved male participation instead of being a primary responsibility of women, more attention would have been given it by travelers and others.

In recent years, since imposition of reservation conditions on the Indian, the use of prairie turnips has apparently declined nearly to the vanishing point. At Standing Rock reservation, straddling the North Dakota-South Dakota boundary west of the Missouri River, Sioux women today plead fear of rattlesnakes and the difficulty of digging as reasons for their no longer harvesting the tuber (Bass and Wakefield 1974), though it still grows abundantly in the locality and is well known to the Indians. At this and other reservations, the free foods distributed under the government commodity program and the ready availability of certain staple convenience foods sold at neighborhood or district stores, apparently have effectively ended reliance on the older native vegetal items. The prairie turnip today seems to function more as a snack or a children's tidbit; and, braided into strings as in former days, it has become a part of the stock in trade of individuals serving the tourists and other transient visitors to the Indian country. At one western trading post, for example, strings of dried prairie turnips 45 inches (1.14 meters) long were being offered at \$15.00 each in 1975 (R. De Mallie, p.c.).

The demonstrable importance of the prairie turnip historically raises the question of its possible significance to the pre-white Plains Indians. That it was utilized by the prehistoric plainsmen when and where it was obtainable, I do not doubt. Unhappily for the archeologist, however, in the absence of hard pits or other durable parts in the tuber, the nature of this important dietary item is such that it would leave no archeological evidence of its former presence except under very unusual circumstances of preservation, such as charring. We thus have no hard data regarding the extent to which it may have been used in prehistoric days and its time depth in the native Indian subsistence economies of the Plains region.

Acknowledgements — Most of the information assembled in this paper has accumulated bit by bit during many years of reading in the historical, geographical, ethnographical, and other literature bearing on the Plains Indians and their

subsistence economies. Frustrated by the tantalizingly fragmentary nature of the pieces, I finally decided to try to put them together. Deficiencies in my training for the task have been partially offset by the cordial helpfulness of a number of people. To O.S. (Nick) and Joyce Fent, Salina, Kansas, I owe a particular debt of gratitude. They first introduced me to the prairie turnip where it still grows wild in a parcel of unbroken Saline County sod that testifies eloquently to the beauty and the bounty of the native grasslands before the white man made them over for his own uses. Douglas R. Parks, Mary College, Bismarck, and Ray DeMallie, Indiana University, kindly provided unpublished first hand information on present day Indian attitudes and recollections. M.A. Bass and P. Willey, University of Tennessee, were generous with information and suggestions. Mrs. Marion Willey, Lawrence, Kansas, loaned a braided string of turnips for study and photographing. David von Endt, Smithsonian Institution, collated the several published analyses of the composition of the tuber and so made possible their closer comparison with the white (Irish) potato.

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