Ethnobotany and Economic Botany of the North American Flora

by Charles B. Heiser Jr.

When Europeans first arrived, in both eastern and southwestern North America north of Mexico, they found people who were practicing agriculture, much of it with crops from Mexico. Consequently, the use of native wild plants received scant attention. This changed, however, when the Europeans penetrated the areas inhabited by hunters and gatherers. According to R. I. Ford (1986), "the traditional use of plants and animals by American Indians is better documented than for the early peoples of any other continental area of the world." Ford has brought together a number of the significant papers dealing with the use of plants and animals by the native people. Furthermore, archaeological investigations, particularly in the last half century, have also contributed greatly to our understanding of the plants used by the native North Americans.

The immigrants to North America from Europe brought the Old World crops to North America, and those plants soon came to be the dominant cultivated crops in northern North America. Many weeds, a few of which were found to serve useful purposes, were also introduced unintentionally.

WILD FOOD PLANTS

The American Indians utilized a large number of plants for food or beverages. E. Yanovsky (1936) listed 1112 species as so used. Many of these plants were of minor use, and a few were not natives but introduced species. The vast majority of the plants in the list are angiosperms, of course, but algae, fungi, lichens, seedless vascular plants, and gymnosperms are also represented.

One of the most widely distributed sources of food was provided by oaks (Quercus spp.). Acorns of over 25 species were used, with those of various western species providing the basic food for some California Indians. Various ways were devised to remove the bitter principles to make the acorns palatable. Nuts of other genera, such as chestnut (Castanea spp.), hickory (Carya spp.), and walnuts (Juglans spp.), were also widely used.

Camas (Camasia quamash) was widely used in western North America. The bulbs were cooked in various ways and then eaten or ground and made into a flour that was used for making a "bread." In the central and eastern area, the tubers of the potato bean (Apios americana) were cooked for food.

Fruits or "berries" belonging to various families were gathered throughout most of North America. Rosaceae provided the greatest number of contributions. Grains of a number of grasses were collected for food. One of the grasses, wild rice (Zizania palustris), was a staple in the Great Lakes region. The tapping of maple (Acer saccharum and other species) for sugar was practiced in the central and eastern areas as it still is today. Less widely known is that the pounded bark of these species was also used for food. Among the gymnosperms, the edible seeds of the pinyon (Pinus edulis) and of several other western pines stand out as important food sources.

Many of these wild plants were used by the Old World immigrants in the early historical period, and even now some people collect wild foods, but more as a hobby than as a necessity. Many books, often regional in their treatment, such as M. L. Fernald et al. (1958), list edible plants and give recipes for their use. A number of the plants gathered from the wild at present are introduced weeds or escapes from cultivation, including favorites such as asparagus (Asparagus officinale), burdock (Arctium lappa), chicory (Cichorium intybus), wintercress (Barbarea vulgaris), daylily (Hemerocallis fulva), and watercress (Rorippa nasturtium-aquaticum).

DOMESTICATED FOOD PLANTS

The archaeological record indicates that food production was being practiced in northern North America over 3000 years ago. The principal food crops in eastern North America at the time of contact with Europeans were corn, also called maize (Zea mays), squash (Cucurbita pepo), and beans (Phaseolus vulgaris). All of these plants are known much earlier in archaeological records from Mexico, and for some time it was naturally assumed that food production came to northern North America, along with these plants, from Mexico. The possibility that there had been an independent domestication of plants in northern North America was mentioned as early as 1924 (B. D. Smith 1987), and for some time evidence has indicated that the sunflower (Helianthus annuus) and sumpweed (Iva annua) were domesticated in eastern North America before the arrival of corn and beans from Mexico.

More recently B. D. Smith (1985) has shown that a domesticated chenopod (Chenopodium berlandieri or C. bushianum) was also present in eastern North America. Other plants, such as May grass (Phalaris caroliniana), were being cultivated, but there is no evidence that they were domesticated (C. W. Cowan 1985). When the Europeans arrived, the sunflower was seen in cultivation, but both Iva and Chenopodium had apparently already disappeared as domesticated plants. Two rather cryptic references in the literature, however, might indicate that Chenopodium was still cultivated at the time Europeans settled the continent (D. L. Asch and N. E. Asch 1977).

The hypothesis that plants were domesticated in eastern North America prior to the introduction of Mexican crops seemingly became untenable when both squash (Cucurbita pepo) and bottle gourd (Lagenaria siceraria) were reported at a site in Missouri dated at over 4000 years old (M. Kay et al. 1980), because it was thought that both of these plants came from Mexico where they were cultivated at much earlier dates. It now seems likely, however, that C. pepo was a natural element in northern North America and that it is still represented there by the plant usually known as C. texana. Therefore it is possible that C. pepo was domesticated independently in Mexico and farther north in North America (D. S. Decker 1988; C. B. Heiser 1989). The bottle gourd cannot be considered an indigenous plant of North

America; its entry could have been as a weed, with or without human aid. The possibility even exists that it came to Florida by ocean currents from South America (C. B. Heiser 1990).

In addition to the plants mentioned previously, the Jerusalem artichoke (Helianthus tuberosus) was also cultivated in eastern North America. Because no archaeological material is yet known, it is impossible to assign any dates to its domestication.

In the Southwest about 3000 years ago, agriculture began with what has been designated as the Upper Sonoran agricultural complex (R. I. Ford 1985b). Maize (corn), squash (Cucurbita pepo), beans (Phaseolus vulgaris), and the bottle gourd, all of which apparently came from Mexico, were represented. Some 1500 years later the Lower Sonoran agricultural complex developed. In addition to the plants from the earlier agricultural complex, it included other squashes (Cucurbita mixta and C. moschata), tepary bean (Phaseolus acutifolius var. latifolius), lima bean (P. lunatus), and jack bean (Canavalia ensiformis), and a panic grass (Panicum sonorum). These plants all could have come from Mexico, but possibly some of them, such as the tepary bean and the panic grass, were also domesticated in an area that is now within the boundaries of the United States (R. I. Ford 1985b; G. P. Nabhan 1985).

Following the settlement by Europeans, the agriculture of North America soon underwent a drastic change as crops brought from the Old World spread. The present dependence of North American agriculture on crops of foreign origin is indicated in table 9.1. Of the food crops listed in table 9.1, only the sunflower is indigenous to North America north of Mexico, and only two of the others, maize and beans, were being grown in northern North America at the time of the discovery. Seven other crops of those listed in table 9.1---potato, sweet potato, tomato, peanut, avocado, tobacco, and cotton---are also native to Latin America; all of the others are Old World in origin.

Today the United States is the leading country of the world in the production of maize (corn), oats, sorghum, tomatoes, soybeans, and peaches, and second for six other crops. Canada is first in the production of linseed and second for rapeseed (table 9.1)

NARCOTICS, HALLUCINOGENS, STIMULANTS, AND ALCOHOLIC BEVERAGES

Tobacco, usually smoked, was widely used in northern North America. The domesticated Nicotiana rustica was cultivated in the East in prehistoric times and in the Southwest in the early historical period. In other regions tobacco from several native species was gathered from the wild, or occasionally was cultivated by the Native Americans. All of these tobaccos were replaced by Nicotiana tabacum, which was introduced from Latin America by John Rolfe in 1610 or 1611 and soon became the basis of the tobacco industry in Virginia and, later, in the other colonies (C. B. Heiser 1969).

Although many plants were used as hallucinogens in Mexico, only a very few were employed in northern North America. Species of Datura were employed prehistorically in ceremonies in the Southwest. Datura inoxia, used in Arizona, New Mexico, and California, was apparently the major species. Seeds of the mescal bean, Sophora secundiflora, a species found naturally in New Mexico and Texas, were also used prehistorically as a hallucinogen; a cult involving their use developed in the Plains area in modern times. Peyote (Lophophora williamsii), which has its northernmost limit in the lower Rio Grande valley of Texas, was used by Indians in Texas as a hallucinogen in 1760. Its use among Native Americans began to spread about 1880

and reached Canada in this century. Peyote has been legalized for use in the Native American Church. More details on these plants may be found in R. E. Schultes and A. Hofmann (1980). Today, the introduced marijuana (Cannabis sativa) is the most widely grown hallucinogen in North America. Because it is illegal, exact production figures are not available.

Leaves of yaupon, Ilex vomitoria, were the principal ingredient of a drink used by the Indians of the Southeast to induce vomiting as part of a purification ritual (H. E. Driver 1961). A tea was also made from this and other species of Ilex (E. Yanoksvy 1936). Ilex is known to contain caffeine.

The Indians of the Americas never distilled alcohol from plants; however, naturally fermented beverages were utilized in some places. Fruits of various cacti were sometimes fermented by Indians in Arizona to make a wine (H. E. Driver 1961). Unlike the Indians in many other parts of the Americas, those of northern North America did not adopt maize (corn) as a source for an alcoholic beverage before the conquest. This was remedied sometime later by people of European descent who used maize to prepare a whiskey that became known as bourbon (after Bourbon County, Kentucky), and this is the only distinctive important contribution of northern North America to the world's alcoholic beverages. A beer from persimmon (Diospyros virginiana) was reportedly made by Indians in the East (U. P. Hedrick 1950). The early colonists tried to make wine from the native grapes in eastern North America without much success. The Old World grape (Vitis vinifera) was successfully introduced into California by the Spanish and became the basis for the development of the wine industry in the United States.

MEDICINES

The native North Americans used more plants for medicines than they did for food. D. E. Moerman (1982) lists 2147 species as employed medicinally. Some of the same plants were used, of course, for both food and medicine. Many medicinal plants of Native Americans were later adopted by the European colonists (V. J. Vogel 1970), who also made medicinal use of introduced species that they had brought with them. C. F. Millspaugh (1892) described 180 plants as so used. T. Arnason et al. (1981) have provided a recent treatment of the plants used for medicine in eastern Canada. C. Prescott-Allen and R. Prescott-Allen (1986) reported 67 active ingredients from wild plants as occurring in 10 or more drug products sold in Canada; about one-fourth of the plants are native only to North America.

The principal wild plant of northern North America in terms of number of drug products produced from it is cascara sagrada from the bark of Rhamnus purshianus, native to the northwestern United States and British Columbia. In 1977 the annual retail value of cascara sagrada in the United States was 75 million dollars; it is generally thought to be the world's most widely used cathartic.

A second medicinal plant that deserves particular attention is ginseng, Panax quinquefolius, of eastern North America. Although of limited importance to Native Americans, in 1980 some 575,000 pounds of roots with a value of 39 million dollars were exported. About 85% went to Hong Kong. Approximately 70% of the exported roots were derived from cultivated sources. Destruction of its habitats and overcollecting have contributed to a decline in the supply of the wild plants, whose roots are considered more desirable than those of cultivated plants.

WOOD

Forests, much of them coniferous, once covered much of North America. Trees (as sources of timber and, especially, as sources of fuel) were, in fact, northern North America's most important raw material until the twentieth century. The United States is still the world's leader in timber production by volume, and Canada is sixth; by value Canada is the world's top timber producer, and the United States is second (C. Prescott-Allen and R. Prescott-Allen 1986).

Wood is consumed in four main ways: as fuel, as pulp for the manufacture of paper, for construction (including furniture), and for by-products, such as rosin, turpentine, and terpenes. The use of wood for fuel has declined greatly over the years and now only about 10% of it is burned, whereas its use for pulp has greatly increased, over 30% now being so used. Nearly 60% is used for construction.

Silviculture has slowly taken hold in North America. About 800,000 hectares have been planted to trees each year in the past three decades in the United States. Most of the planting is of soft woods, principally pines (Pinus spp.). The principal hardwoods planted on a commercial scale are cottonwood (Populus spp.) and black walnut (Juglans nigra). Much of the farmland in the southeastern United States is now devoted to production of timber and/or wood for pulp. Most of the information in this section is derived from C. Prescott-Allen and R. Prescott-Allen (1986).

OTHER EARLY USES OF PLANTS

Native Americans used many wild plants both for dyes and for fibers. Species of Apocynum, Urtica, and Linum were most widely used for their fibers. Cotton (Gossypium hirsutum) was the only domesticated fiber plant in prehistoric times. It came to northern North America from Mexico. In precontact times, its cultivation within the flora was limited to a small area in the Southwest. In historical times, of course, cotton became widely cultivated in the southern United States. The devil's-claw (Proboscidea parviflora), used for a fiber in basketry, was domesticated in the Southwest. Its domestication, however, is apparently rather recent (P. K. Bretting and G. P. Nabhan 1986).

ORNAMENTALS

Plants from northern North America are now used for their ornamental value in landscape plantings or in gardens both in North America and other parts of the world. Many woody species, often little or not at all changed from the wild types, are planted, and some, such as Magnolia grandiflora, have particularly extensive distributions as cultivated plants. A number of native and horticulturally unchanged herbaceous angiosperms and ferns are used in wildflower gardens, and cultivars of many of the native species are offered in the trade for use in more formal gardens. Some species, such as those of goldenrod (Solidago spp.) and sunflower (Helianthus spp.), are more appreciated in Europe than in their homeland. Descriptions of many of the native North American plants grown as ornamentals may be found in Hortus Third (L. H. Bailey et al. 1976).

NEW AND INCIPIENT DOMESTICATES

Certain plants consumed by Native Americans for food have become domesticated only in the past century or so; these include the pecan (Carya illinoinensis), the blueberry (Vaccinium corymbosum), the cranberry (V. macrocarpon), and most recently, wild rice (Zizania palustris).

According to U. P. Hedrick (1950), 11 kinds of plums (Prunus spp.), 15 kinds of grapes (Vitis spp.), 6 species of blackberries (Rubus spp.), and 4 species of raspberries (Rubus spp.) have also become commercially valuable cultivars derived from native species. Research is proceeding with several other native plants, particularly those for cultivation in semiarid regions, and particularly for products that might have industrial uses (e.g., jojoba [Simmondsia chinensis] for oil, buffalo gourd [Cucurbita foetidissima] for starch and oil, guayule [Parthenium argentatum] for rubber, and gumweed [Grindelia camporum] for resin). Some of these have already proved to be of value.

Table 9.1. Production of Important Crops Grown in Canada and the United States and Total Production for the World [see NOTE below]

Grains

Maize (corn)		Sugar beets	
Canada	6,400	Canada	805
U.S.	191,197	U.S.	23,547
World	470,318	World	305,882
Wheat		Potatoes	
Canada	24,383	Canada	2,754
U.S.	55,407	U.S.	16,659
World	538,056	World	276,740
Sorghum		Onions	
Canada	---	Canada	131
U.S.	15,694	U.S.	2,168
World	57,976	World	26,319
Barley		Sweet potatoes	
Canada	11,672	Canada	---
U.S.	8,784	U.S.	542
World	168,964	World	133,234
Rice			
Canada	---	Fruits	
U.S.	7,007		
World	506,291	Oranges	
Oats		Canada	---
Canada	3,549	U.S.	8,149
U.S.	5,425	World	50,630
World	42,197	Grapes	
Rye		Canada	63
Canada	835	U.S.	5,334
U.S.	343	World	59,158
World	34,893	Apples	
		Canada	495
Legumes		U.S.	4,367
		World	40,226

Soybeans		Plums	
Canada	1,219	Canada	6
U.S.	52,440	U.S.	786
World	107,350	World	6,518

Peanuts		Peaches	
Canada	---	Canada	47
U.S.	1,828	U.S.	1,205
World	22,594	World	8,586

Beans		Pears	
Canada	77	Canada	25
U.S.	1,104	U.S.	764
World	15,872	World	9,675

Peas		Avocados	
Canada	274	Canada	---
U.S.	177	U.S.	175
World	16,447	World	1,549

Lentils	
Canada	105

Miscellaneous	
U.S.	54
World	2,242

Tomatoes	
Canada	548

Oil Crops	
U.S.	10,255
World	69,328

Cottonseed		Tobacco	
Canada	---	Canada	74
U.S.	8,986	U.S.	670
World	49,085	World	7,293

Sunflowers		Hops	
Canada	69	Canada	450
U.S.	813	U.S.	25,000
World	21,867	World	112,038

Rapeseed	
Canada	3,058
U.S.	56
World	22,302

Linseed	
Canada	531
U.S.	34
World	2,121

Food and Agricultural Organization of the United Nations. 1990. FAO Yearbook [for 1989]. Rome.

[NOTE] All figures are in 1000s of metric tons except those for hops, which are in metric tons.

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