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Source: *Economic Botany*, Apr. - Jun., 1986, Vol. 40, No. 2 (Apr. - Jun., 1986), pp. 233-249

Published by: Springer on behalf of New York Botanical Garden Press

Stable URL: https://www.jstor.org/stable/4254858

Ginseng: America's Botanical Drug Connection to the Orient[1]

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Ginseng has long been one of this country's major botanical drugs in foreign trade. Once harvested only in the forests of the Eastern frontiers, it became a domesticated crop in the late 1800s and now is raised largely in northcentral Wisconsin. Growers there produce an estimated 90% of the cultivated ginseng in the United States. Most American ginseng has been consumed in the Orient, as is reflected in export records dating back to 1821. Over 95% of the nearly 21,000 metric tons (T) shipped in the period 1821–1983 went to the Far East. Hong Kong has served as the center for re-exporting ginseng to China and Southeast Asia. Ginseng has been used in Asia for many purposes, mostly as a curative agent. It has also gained increasing acceptance elsewhere in the world for its alleged value.

Ginseng has long been recognized in the Orient, especially in China, as an herb possessing great value. Early Chinese emperors proclaimed its roots as having many uses, primarily as a tonic or stimulant for both physical and mental disorders or ailments, for increasing fertility and sexuality, and most importantly for strengthening the human body and ultimately prolonging life (Dixon, 1976; Emboden, 1973; Goldstein, 1975; Harriman, 1973; Hou, 1978; see Rashap et al., 1984, for extensive, recent bibliography). Asiatic ginseng (*Panax ginseng* C. A. Meyer) was so esteemed as a botanical drug that it was an important trade commodity and even accepted for ransom payments and as tributes to the Chinese government. Marco Polo commented on extensive use of ginseng among the Chinese in his travels during the late 1200s (Goldstein, 1975; Hou, 1978). Reportedly, early Dutch merchants had brought ginseng to Europe, but it was the missionaries in China during the early 1700s who became aware of the plant and subsequently their knowledge about its commercial value spread to eastern North America (Hou, 1978; Massey, 1976). Evidently, wild ginseng did not grow in Europe.

An analysis is presented here of the factors that have led to the continuous exporting of American ginseng (*Panax quinquefolius* L.), nearly 21,000 T in the period 1821–1983, and the eventual concentration of ginseng production in the United States in Marathon County in northcentral Wisconsin, which produces approximately one-tenth of the world's supply today.

EARLY HARVESTING OF WILD GINSENG

In the early 1700s, a French Jesuit priest, Père Jartoux, reportedly commented on ginseng in a letter from China to a fellow priest. His description of ginseng and its uses was published in 1709 in *Mémoires de L'Académie Royale des Sciences, Paris* and translated to English in the 1714 *Philosophical Transactions of*

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Economic Botany, 40(2), 1986, pp. 233–249

the Royal Society of London. While travelling in China doing surveys and making maps, he had observed people searching for ginseng. The recipient of the letter was Joseph François Lafitau, assigned to work with Indians, mostly Iroquois, near Montreal in eastern Canada (Goldstein, 1975; Hardacre, 1968; Hou, 1978; Schorger, 1969).

Father Lafitau, with the help of Indians, obtained ginseng plants and sent them to his counterparts in China for positive identification. It is not certain whether North American Indians had used ginseng even though the plant could be found in much of eastern North America. They may have known the plant, but, if so, it was certainly not used routinely and does not appear to have been an early intertribal trade item. It is quite possible that some of the priests and later European settlers used the plant and told the Indians of its value. In fact, it was reported that the Iroquois were unable to find the ginseng plant for Father Lafitau until one year after he had received the letter from Father Jartoux (Goldstein, 1975). It is known that a number of Indian tribes later used ginseng for medicinal purposes similar to those of the Chinese (Harriman, 1973). For instance, the Iroquois reportedly used it for both diarrhea and constipation in children (Henry, 1955), curing the dried root to a white translucence (Harris, 1948). The Menominees in northern Wisconsin used it as a tonic and to increase one's mental capability (Smith, 1923), while the Penobscots in Maine used it to promote fertility (Goldstein, 1975).

It is fairly certain that missionaries and others encouraged the Indians to search for wild American ginseng in the forests. By 1720, ginseng gathered by Indians for traders in Quebec was collected in Montreal and exported by consignment to China by the Company of the Indies, a French trading company. French colonists also collected ginseng for export. Some was used in France to promote fertility and for medicinal purposes (Hou, 1978). The gathering of the plant was extended later into Ontario, largely by Indians working for fur traders.

China's voracious demand for ginseng grew to an extent whereby the plant became nearly extinct because of overharvesting, mostly in the forested uplands and mountains. By edict, the Chinese government at first limited and eventually prohibited gathering wild ginseng. In response, more wild ginseng was harvested for China's market in nearby Manchuria, Korea, and Nepal.

There is no doubt that this demand had an economic impact upon colonial and frontier America, first in New England beginning in the 1750s. By 1790, ginseng gatherers, known in local vernacular as "cheng," "chang," "sang" or "shang" hunters, had actively searched the forests of the remaining unsettled eastern United States, such as in the Catskill and Allegheny mountains. Albany, New York, became a trading center for ginseng brought there by both Indians and settlers. Daniel Boone reportedly gathered and traded ginseng in the 1780s, and early Moravians in Ohio at the same time also depended upon it for their livelihood (Schorger, 1969). It was an easily saleable item worth the cost of transportation to Eastern buyers (Baldwin, 1971; Hou, 1978; Nash, 1895; Schorger, 1969). Indians also entered the cash economy on the frontier by selling ginseng to dealers and particularly fur traders, especially in the Great Lakes states. In fact, ginseng harvesting was done in conjunction with the trapping and marketing of wild fur pelts by many frontiersmen and Indians. Early itinerant fur traders commonly set the local prices for ginseng, and later price quotations for ginseng were pub-

lished on handbills displaying fur lists, in magazines such as the monthly *Hunter-Trader-Trapper,* and in newspapers. By the late 1800s, pioneer settling and clear-cutting of forests destroyed much of the plant's natural habitat. In addition, overharvesting led to a scarcity of wild ginseng. Several states and Ontario passed legislation after 1890 to protect the plant by making it illegal to gather it in spring and summer (Kains, 1906; Nash, 1895).

In the United States, wild ginseng grows especially well in the well-drained, upland, deciduous hardwood forests extending from Maine to Minnesota and into the Appalachian Highlands and mountains of the Southern States (Bryant, 1949; Fernald, 1950; Hou, 1978; Houts, 1960; Kains, 1906; Nash, 1895; Porcher, 1863; Stockberger, 1921). It prefers cool locations, such as ravines, considerable shade, no undergrowth, and reportedly will not grow near stagnant water. Loamy soils and the acidic leaf mold found in hardwood forests are conducive to producing firm, brittle roots, which break with a waxy fracture and are the highly-prized part of the plant (Anonymous, 1929; Erkel, 1928). The slow-growing, carrot-like, aromatic roots measure 2–6 in in length and up to 1 in in thickness.

Forked-shaped roots with many annual circular wrinkles or scars on the root-stock, or rhizome, have the greatest value. The closer the resemblance of the root is to the human figure, the greater is it thought of as having associative signature. Thus, in employing the doctrine of signatures, the portion of the root that resembles a leg would be perceived as having medicinal value for an ailment affecting the human leg. Because the "ideal" ginseng root represents the human body, the plant is supposedly a cure-all for the entire body. In fact, the word ginseng is derived from the Chinese term *jen-shen,* meaning "shaped like a man," the "image of man" (Harris, 1948; Hu, 1976). The generic name *Panax* is derived from the Greek *panakeia,* a "universal remedy." Old roots, some nearly a century old with many scars, commanded very high prices because the plant's longevity was said to be transferred to individuals who consumed them. The debilities of old age allegedly would disappear in favor of youth, vigor, and longevity. Overall, the whole ginseng root, not dismembered parts, comprised the bulk of the ginseng exports. Therefore, a "shang" hunter had to dig and handle roots very carefully.

CULTIVATION OF GINSENG

Because of incessant demand, Asiatic ginseng had been cultivated for some time on limited amounts of arable land in northern China, Manchuria, Japan, and particularly in Korea, dating back in the latter case for several centuries (Hou, 1978). Attempts in Virginia and Wisconsin to produce cultivated American ginseng from planted seed and transplanted plants failed in the 1870s. Attempts to raise ginseng in Jamaica also failed (Goldstein, 1975). Digging the root out of season, planting it in open sunlight, and blight were problems that hampered the earliest attempts in America. By the late 1880s, ginseng transplanting from wild rootstocks, and seed planting, had been successful in New York's Onondaga and Cortland counties. The commercial cultivation of ginseng was underway, spreading especially into Pennsylvania, Ohio, Michigan, Kentucky, Indiana, Wisconsin, and Minnesota (Anonymous, 1912; Hardacre, 1968; Harris, 1948; Nash, 1895; Stanton, 1893).

Getting perennial ginseng to grow in open fields and under unnatural conditions

tested both the ingenuity and wisdom of the pioneering experimenters. It was a risky endeavor that became primarily a side pursuit for hundreds of landowners. To assist growers who were trying to understand the secrets of the wild by trial-and-error methods, several growers' associations were formed to pool planting, harvesting, and marketing information. New York growers formed the first association in 1902. At peak enrollment in 1913, the Wisconsin, Michigan, and Ohio growers' associations had the largest memberships. Privately published pamphlets and government farmers' bulletins published the results of experiments, largely on how to control blight, mildew, and other diseases that plagued cultivated ginseng (Butz, 1899; McDowell, 1902; Nash, 1895; Van Fleet, 1913; Whetzel et al., 1916; Williams, 1957). In fact, the United States Department of Agriculture in 1898 endorsed cultivated ginseng as a crop that could produce supplemental income for farmers (Koehler, 1912). The monthly journals *Special Crops* and *Ginseng Journal,* published in Skaneateles, New York, and Arrowsmith, Illinois, respectively, kept ginseng growers informed on current prices and uses, including usage as an ingredient in chewing gum. It was even used in an ice cream, a carbonated beverage, and a toothpaste (Corr, 1979). Insurance policies became available for protection against theft. Many growers had, however, quit as early as 1904 after a widespread fungal blight damaged their crop. Some failed to harvest a single crop.

Meanwhile, in Wisconsin's hilly Marathon County, settled largely by German and Polish-American farmers, ginseng cultivation was established in 1904, eventually growing to be the country's major source of the herb. Its successful cultivation there is attributed mostly to 4 brothers, the Fromms, who lived in the township of Hamburg, northwest of Wausau, the county seat (Floyd and Tuchscher, 1966; Freund, 1963; Hartman, 1979; Pinkerton, 1947). They transplanted over 100 wild ginseng plants from the nearby forests by carefully duplicating the growing conditions in the wild. Over time, their combined efforts consisted primarily of designing elevated 5-ft-wide beds for better drainage, promoting air circulation or ventilation, mulching the beds in winter, building arbors or sheds with canopy laths running north to south to create alternating sunlight and cool, shady conditions, and stratifying the seed. Cultivated ginseng grows well on adequately drained hillslopes, preferably facing north and in acidic fertile, loamy soil rich in humus that is underlain by a granite subsoil—conditions present in Marathon County (Anonymous, 1929; Gilbertson, 1936; Hartman, 1979; L. Martin, pers. interview, 1981).

In cultivating ginseng, ripe seeds are gathered in the fall from plants that begin to produce fruit (red berries) after the third year. Some growers who do not want seed will remove all blooms from plants so that the roots grow larger and faster. The fruit must be harvested carefully to avoid their breaking open, resulting in wind-blown seeds. When removed from the fruit, the seeds are washed and placed by layers in barrels of slightly damp sand, sawdust or forest soil, for 1 yr—the stratification process (Hemmerly, 1977; Kains, 1906; Koehler, 1912). In the following fall, 3–4 seeds are planted 1 in deep in hills 1 ft apart in beds 5 ft wide in the "shang" gardens. They germinate in the spring after freezing temperatures have broken their 18-mo dormancy. It takes approximately 6–7 growing seasons to produce a marketable root from seed. Ginseng seed can be planted in seed beds, 25–50 seeds/sq. ft, in the spring to obtain seedlings. The seedlings, when

1–2 yr old, are transplanted to the shang gardens in the fall, putting the roots 2 in into the ground and 6 in apart in rows that are 1 ft apart. They can be harvested in about 5 yr. Mulch, consisting of straw, sawdust, and occasionally forest leaves, is spread several inches deep, especially over the new beds in the fall to protect the seeds or seedlings, primarily from frost upheaval, and to retain moisture in the spring.

Intensive hand labor was an integral component in the early production of cultivated ginseng. Preparation of the shang gardens, commonly called plantations in early times, included raising the beds and building the lattice work for the framed lath sheds. Planting seed and transplanting seedlings both required many laborers. Although the plants needed no cultivation in the summer months people were needed to pull weeds in the gardens. In the fall, laborers gathered the fruit and later dug the marketable-potent, and properly sized roots after the removal of the foilage. As the plants grew older, they became more susceptible to various diseases. Timing was important throughout the cultivation of ginseng; for instance, in avoiding freezing rains at planting time and in gathering the fruit and digging the harvestable roots before rust could attack the plants.

As ginseng cultivation increased in the area, many women and teenagers were hired as laborers. In the early years, the Fromms even had dormitories for them, some working in both their ginseng and silver-fox operations. Moreover, in efforts to reduce labor costs and enlarge their production, their ingenuity was further evidenced as early as the mid-1920s in the development of a special planter that used stratified seed, thus reducing the need for transplanting seedlings, which were often subjected to disease. World War II reduced the labor supply in the community, but the Fromms adapted to this situation by using an improved double potato digger to harvest their roots and also by developing a bed-raising machine (Pinkerton, 1947). Today, ginseng production still provides some seasonal employment to women and teenagers, especially in the summer months in pulling weeds, and during harvest time when crews are needed on the mechanical harvesters.

Upon harvesting the roots, careful and immediate attention is given to washing, grading, and drying the crop. If not properly dried, mildew and rot become problems. After experimentation, growers began to dry their roots on lattice or wire-netting shelves in well-ventilated, heated rooms or sheds for 14–15 days. Some growers set the temperature at first between 60–80°F and then raised it to 90°F, while others started at 100–110°F and lowered it to 90°F (Kains, 1906; Smith, 1935; Williams and Duke, 1978). Three tons of green ginseng roots will result in 1 T of dried roots, the average amount harvested per acre. After the dry fibrous rootlets are rubbed off, about 30 or more roots are needed to make 1 lb of dried ginseng. The dried roots are packed immediately for export in 100 lb, or larger, cylindrical, cardboard containers or drums to protect them from breaking and to avoid absorption of moisture.

Much risk still characterizes ginseng cultivation. The preparation of the hillside shang gardens is time-consuming because care must be taken to kill organisms in the soil that could damage the roots. If the land has been previously under cultivation, plots are commonly plowed 5–6 times before being planted with ginseng. Each location can be used only once because its fertility, particularly nitrogen, is depleted and the soil may harbor blight fungi (or their spores) and other diseases.

The failure to realize these factors led to growers replanting the same ground with resultant failures. Some growers attempted to disinfect or sterilize the soil by using steam, fire, and chemicals, especially formaldehyde, in order to reuse the same ground, but with little success (Erkel, 1928; Floyd and Tuchscher, 1966; Whetzel et al., 1916). Stones must also be removed in order to use a harvester. Except for some rotted manure and leaf mold added to the soil before planting, fertilizers tend to promote too rapid growth of the roots and reduce their resistance to disease.

Ginseng has been sprayed with insecticides and fungicides since the early 1900s. Pyrox, consisting of bordeaux and arsenate of lead, was an early spray obtainable from the Bowker Insecticide Company of Boston and Cincinnati. Sprays are used especially after summer rains to avoid mildew, and greater amounts are used on plants as they get older to prevent, in particular, blight (Anonymous, 1911; Bryant, 1949; Kains, 1906; Miller, 1979). By 1972, most pesticides (insecticides and fungicides) used in ginseng cultivation were not registered under Environmental Protection Agency regulations and therefore they could no longer be used legally. There has been growing concern in recent years over the use of pesticides and also spray dust affecting neighbors of shang gardens. Chemical companies are reluctant to expend large sums of money to conduct tolerance tests on pesticides for a minor crop (Berger, 1982; Hanousek, 1982). Herbicides, on the other hand, generally destroy ginseng and have limited use, consequently there has been the continuous need for hand labor to weed shang gardens. In addition, burrowing rodents and deer can destroy plants and thieves can steal them. All growers, of course, face annually the vagaries of the weather.

The extent of capital investments is in itself a risk proposition. By the late 1970s, the initial cost of preparing and planting one acre of ginseng involved thousands of dollars. Planting alone involved nearly 120 lb of stratified seed per acre at a cost of $85./lb, amounting to nearly $10,000. Constructing the lath sheds, maintaining the plants, and harvesting the roots raised the cost of production to another $10,000. an acre. Frequently, black woven nylon or polypropylene tarps are used today in place of the wooden laths to reduce expenses.

EXPORTING GINSENG

Only great demand and expectation of high returns could have sustained the production of this specialty crop. Prior to the continuous exporting of cultivated ginseng from around 1900 onward, wild ginseng dominated the export markets. Over 750,000 lb of wild ginseng were exported in 1822, the high point, and over 600,000 lb in 1824, 1841, and 1862. In the period 1821–1899, an average of 381,000 lb of ginseng were exported annually. The decade of the 1880s ranked the highest in ginseng exports (Table 1). Much of the ginseng came from Minnesota and Wisconsin (Lass, 1969). This decade was followed by a significant decline in ginseng exports in the 1890s, reflecting the decline in the availability of wild ginseng and the transition period to cultivating ginseng as a crop.

Nearly all this crude or unprocessed ginseng was exported to China and Hong Kong; to the latter after 1873 when it started to serve as the port of entry for ginseng bound for China. Upon arrival, the ginseng was treated, clarified, and sorted based upon color, texture, shape, taste, and age into about a dozen grades

Table 1. United States Exports of Domestic Ginseng, 1821-1899.

	1821-29	1830-39	1840-49	1850-59	1860-69	1870-79	1880-89	1890-99	Totals	(%)
Lb	3,871,765	3,192,375	3,915,129	1,999,999	4,149,445	4,041,727	6,771,830	2,163,302	30,105,572	
Metric tons	1,756	1,448	1,776	907	1,882	1,833	3,071	981	13,654	
Value $	1,432,524	1,108,010	1,637,340	978,462	3,902,218	4,537,008	3,457,294	7,639,859	24,692,715	
Average value/lb	.37	.35	.42	.49	.94	1.12	.51	3.53	.97	
Destinations (lb):[a]										
Africa:	--	--	--	--	6,747	--	--	--	6,747	(.02)
Asia:										
Far East	3,612,081	3,136,122	3,871,901	1,997,797	4,141,342	3,672,527	6,712,824	2,162,187	29,306,781	(97.35)
Southeast Asia	14,996	10,408	28,059	--	--	--	--	--	53,463	(.18)
Europe:										
Northern	97,072	15,031	13,443	--	1,356	366,187	58,946	--	552,035	(1.83)
Southern	127,891	16,955	--	--	--	--	--	--	144,846	(.48)
Latin America:										
South America	--	10,000	--	1,500	--	3,013	--	--	14,513	(.05)
West Indies	70	3,859	--	--	--	--	--	--	3,929	(.01)
Oceania:										
Australia	--	--	1,036	--	--	--	--	--	1,036	(--)
Other Pacific	1,338	--	--	--	--	--	60	--	1,398	(.01)
Canada:	--	--	690	702	--	--	--	1,115	2,507	(.01)
Other:	18,317[b]	--	--	--	--	--	--	--	18,317	(.06)

[a]Pounds by country/area: Argentina (10,000), Australia (1,036), British Amer colonies (1,563), British East Indies (9,385), Canada (1,817), Chile (1,500), China (16,464,975), China, including Hong Kong & Singapore (474,310), China & Japan (1,356,656), Cisplatine Republic (1,046), Colombia (3,013), Danish West Indies (2,986), Dutch East Indies (38,718), England/United Kingdom (548,151), Floridas (70), Germany (150), Gibraltar (144,567), Hanse Towns (122), Hawaiian Islands (60), Holland/Netherlands (1,360), Holland & Dutch colonial possessions (1,206), Hong Kong (10,947,459), Japan (63,381), Liberia and ports in Africa (6,747), Northwest coast of America (18,317), Philippine Islands (5,360), South Seas (1,338) and Spain (279). [b]Northwest coast of America. Source: U.S. Treasury Dept, Statistics Bur, Foreign Commerce and Navigation, Annual reports, 1821-1899.

to accommodate the pharmacological or folk medicinal demands of residents in different cities and localities within China. People in southern China tended to prefer a short, stocky, thick root whereas the northern Chinese preferred a long, heavy root (Anonymous, 1914). It is to be noted here that partially because of this preference by the southern Chinese, cultivated ginseng became important in trade because of its rather short, thick, stubby, roots (Gilbertson, 1936). Furthermore, growers could control somewhat the growth of roots in order to produce the desired results. Because of considerable internal turmoil, northern China did not provide as large a market for ginseng exports from the United States as southern China.

Until the late 1700s, much of the wild ginseng was reportedly exported from Philadelphia, but by 1800 early brokerage firms, some handling furs, had been located in New York City. By the mid-1800s, however, San Francisco exported approximately 85% of all ginseng. The rest was exported largely from New York City and Puget Sound, Washington. Little ginseng was used in this country although a few ginseng remedies, such as "Seng," could be found in pharmacies and were used for stomach and other ailments (Lawrence, 1964). Those Americans who consumed ginseng in the mid-1800s did so largely by chewing it for its aromatic, sweet, licorice-like taste (Wood and Bache, 1849).

From the 1820s to 1950, *The Dispensatory of the United States of America* (first published in 1826) listed ginseng in the catalog of secondary plants from around the world that were used in remedies. This authoritative compendium of materia medica did not recognize ginseng, however, as an officinal drug, following the pharmacopeias of both the United States and Great Britain. The plant continued to be listed because of its historical use in Chinese domestic medicine, possible toxic properties, and potential use as a demulcent (Osol and Farrar, 1950; Wood and Bache, 1849, 1887, 1907; Wood et al., 1926, 1937).

Cultivated ginseng roots initially commanded a higher price in the market place than wild roots because they were considered to be of better and more uniform quality (Table 2). World War I had little impact upon ginseng exports. Prices for cultivated ginseng after the War, however, nearly doubled to an average of over $10./lb in the 1920s. By then, the estimated several hundred ginseng growers in the United States were located mostly in New York, Ohio, Michigan, Minnesota, and Wisconsin. The Fromm operation had helped to make Wisconsin the leader in the production of cultivated ginseng (Lass, 1969). A small number of shang gardens had been started in Washington, Oregon, and British Columbia, all outside of the plant's natural range in North America. In most cases, shang gardens were plots under one acre and planted in a staggered manner to be managed as a sideline activity for growers.

Despite political unrest and problems resulting from floods and famine in China in the early 1930s and the world depression, Chinese and other Asian markets remained strong. In fact, more ginseng was exported to the Orient in the 1930s than in the previous decade, although prices dropped dramatically (Table 2). Subsequently, many growers let their shang gardens deteriorate, or be planted in another crop. The *Sixteenth Census of the United States: 1940, Agriculture* reported a total of 303 ginseng growers in 1929 with 434 acres, but the same census reported only 112 growers in 1939 with 138 acres (U.S. Bureau of the Census, 1943).

Table 2. United States Exports of Domestic (Cultivated and Wild) Ginseng, 1900-1983.

	1900-09	1910-19	1920-29	1930-39	1940-49	1950-59	1960-69	1970-79	1980-83	Totals	(%)
Lb	1,513,558	2,073,442	1,765,722	2,020,558	902,234	1,075,620	1,443,074	2,710,106	2,638,882	16,143,196	
Metric tons	686	940	801	916	409	488	654	1,229	1,197	7,320	
Value $	9,580,614	16,105,075	22,261,180	10,990,818	8,866,943	18,159,989	35,306,663	145,945,068	164,844,879	432,061,229	
Average value/lb	6.33	7.77	12.61	5.44	9.83	16.88	24.47	53.85	62.47	22.18	
Destinations (lb):[a]											
Africa:	--	--	--	--	786	--	44	6,863	20,573	28,266	(.18)
Asia:											
Far East	1,513,012	1,924,576	1,477,625	1,836,200	883,223	791,465	1,398,960	2,453,934	2,434,129	14,713,124	(91.14)
Southeast Asia	--	6,710	3,983	6,605	10,787	272,306	40,172	121,481	73,832	535,876	(3.32)
South Asia	71	13	35	29	199	--	--	--	--	347	(--)
Other	--	--	--	--	--	--	230	1,177	--	1,407	(.01)
Europe											
Northern	120	202	471	286	14	1,754	384	31,140	19,030	53,401	(.33)
Southern	--	--	12	--	90	--	159	--	--	261	(--)
Latin America:											
Mexico & Cent. Amer	1	12	113	16	112	--	--	--	47,247	47,501	(.29)
South America	--	21	2,151	--	110	100	152	--	116	2,650	(.02)
West Indies	--	74	15	352	714	480	20	--	--	1,655	(.01)
Oceania:											
Australia	--	26	--	--	11	300	--	--	249	586	(--)
French Polynesia	--	2	--	28	419	177	20	--	--	646	(--)
Other Pacific	--	--	--	52	68	--	--	--	--	120	(--)
Canada:	354	141,806	281,317	176,990	5,701	8,548	741	59,212	10,488	685,157	(4.25)
Other:	--	--	--	--	--	490	2,192	36,299	33,218	72,199	(.45)

[a]Pounds by country/area: Afghanistan (200), Argentina (2,132), Australia (586), Belgium (23), Bermuda (160), Brazil (21), British East Africa (22), British East Indies (4,855), British Malaya/Fed. Malaya (208,993), British Oceania (43), Burma (1,261), Canada (685,157), Canal Zone (19), Chile (37), China/Mainland (328,274), Colombia (32), Costa Rica (24,734), Cuba (1,355), Curacao (132), Dominican Republic (3), Dutch East Indies/Indonesia (5,839), Dutch Guiana (4), El Salvador (451), Formosa/Taiwan (219,699), France (78), French Polynesia (646), Gaza Strip (1,177), Germany (834), Guinea (20,573), Honduras (28), Hong Kong (14,005,209), India (276), Indochina (17,829), Ireland (22), Italy (37), Jamaica (3), Japan (79,857), Korea Republic (80,085), Malaysia (15,888), Mauritius & Dependencies (717), Mexico (22,268), Mozambique (5), Netherlands (205), New Zealand (77), Nicaragua (1), Nigeria (6,863), Paraguay (114), Peru (80), Philippine Islands (14,531), Saudi Arabia (30), Siam/Thailand (66,168), Singapore (200,583), Spain (159), Sweden (12), Switzerland (65), Trinidad/Tobago (2), Union of South Africa (86), United Kingdom (12,209), Venezuela (230), West Germany (40,018), Other countries (72,199). Source: U.S. Treasury Dept, Statistics Bur, Foreign Commerce and Navigation, Annual reports, 1900-1902; Dept Commerce and Labor, Bur of Statistics, Foreign Commerce and Navigation, Annual reports, 1903-1912; Dept Commerce, Bur of Foreign and Domestic Commerce, Annual reports, 1913-1940 and Dept Commerce, Bur of the Census, United States Exports of Domestic and Foreign Merchandise, Commodity by Country, Annual reports, 1941-1983. Note: Published data for 1978 and 1979 are incorrect. Correct figures were obtained from the Dept Commerce, Foreign Trade Division and are included here.

During World War II, the number of ginseng growers was reduced even further when access was cut off to the Orient's markets. No ginseng was exported to Hong Kong, by far the largest market since the 1870s. In fact, less than 1,000 lb of American ginseng entered international trade in 1942, 1943, and 1944. Unlike most growers, the Fromms concentrated on their successful silver-fox farming and merely stored their ginseng waiting for better prices and markets. After the War, the price for cultivated ginseng rebounded quickly and especially so after the Korean War when it rose to nearly $15./lb. Many Korean gardens had been destroyed. At the same time, the *U.S. Census of Agriculture: 1954* reported only 5 ginseng farmers, with a total of 21 acres, in the United States (U.S. Bureau of the Census, 1956). This was the last census to report ginseng production.

By 1960, the growing demand for cultivated ginseng encouraged about 3 dozen Marathon County (WI) landowners to enter ginseng production. The Fromms' fur farm had emerged as not only the largest single producer in the area, but in the country. Of the estimated 300 acres of cultivated ginseng in the United States in the first half of the 1960s, 200 acres were reportedly found in Marathon County, including the approximately 100 acres in the Fromm operation (Floyd and Tuchscher, 1966; Freund, 1963). Wisconsin had retained its position as the leader in cultivated ginseng production (Hardacre, 1968; Houts, 1960). Whereas prices for cultivated ginseng averaged less than $25./lb in the 1970s, they rose to approximately $50./lb in the late 1970s and early 1980s (Table 2). If growers were willing to wait for 5 yr or longer for a crop, it was possible for cultivated ginseng to produce a gross value of more than $100,000. per acre.

These high prices brought about more ginseng acreage in the county where numerous dairy farmers and small nonfarm landowners either entered the business for the first time or expanded their operations, resulting in an estimated 1,000 planted acres in 1980. Ginseng production spilled over into neighboring counties. While in the 1970s there were an estimated 65 growers, there are today approximately 500 growers in the area (Danieli, 1984), many harvesting about an acre or less each year. Many growers kept their operations and profits secret to avoid encouraging further production and competition that they feared would depress prices. Although the Fromm operation continued to be the largest producer, it, however, had to expand its land holdings in order to cultivate new plots on a staggered basis. By 1980, the news media commonly reported that approximately 90% of all cultivated ginseng produced in the United States came from Marathon County (Danieli, 1984; Freund, 1976; Hanousek, 1981; Hartman, 1979; Martin, 1981, pers. comm.).

WILD GINSENG

Even though cultivated ginseng fulfilled most international demands, wild ginseng roots regained their preference quickly because of their older age and better size, form, and often color. In particular, they had more ring scars, a traditionally valued feature. Unlike cultivated ginseng, the strength of wild ginseng supposedly does not deteriorate after many years. From the outset of cultivated ginseng exports, except for the earliest 1900s, wild ginseng from the northcentral states, where growing conditions were ideal, was considered more valuable and was worth much more per pound than cultivated ginseng. In 1980, when the price of cul-

tivated ginseng averaged about $50./lb in the export market, wild ginseng sold for over $130./lb. Wild ginseng has constituted about 25% of the exported tonnage for most years since World War II, amounting to 70 T in 1980 alone. Although it is still gathered in many states, including those in Appalachia (Goolrick, 1983; King, 1975; Price, 1960), Wisconsin has remained one of the largest sources. There have always been more shang hunters than growers, the number fluctuating according to economic conditions such as the Depression and increased demand after the Korean War. The Wisconsin Department of Natural Resources estimated 2,000 shang hunters still search the state's forests (Anonymous, 1979). Most of today's wild ginseng is handled by the United Fur Brokers, a company in New York City (Goolrick, 1983).

After massive exploitation of wild ginseng in the 1800s, Wisconsin eventually passed legislation to protect the plant. A 1905 law prohibited digging ginseng roots between January 1 and August 1, but this was modified in 1923 by legislation that exempted landowners. In 1980, the digging of wild ginseng was further limited from August 15 to November 1. Diggers are required to possess annual licenses unless they gather wild ginseng roots from their own land and the roots are intended for personal use. Furthermore, digging wild ginseng roots on state-owned land was prohibited in 1979. Even though there has been speculation as to the extinction of wild ginseng, it is not classified as an endangered species in Wisconsin nor in the United States. It is classified, however, as an endangered plant in international trade, a federal permit being required to export wild ginseng. Beginning in 1978, no wild ginseng could be exported from a state unless it had passed legislation protecting the plant. The Convention for International Trade in Endangered Species of Wild Fauna and Flora further required in 1983 that all ginseng destined for international markets had to be certified as either cultivated or wild and separated accordingly. These policies are administered by the United States Department of the Interior (Hanousek, 1983; Patty, 1978, 1980).

OLD AND NEW MARKETS

The Far East remains as the major market for both cultivated and wild ginseng harvested in the United States. Because of its reputed mystical powers and medicinal values, ginseng has been chewed, drunk in teas and as extracts, used as a condiment in cooking, burned as incense, and even worn around the neck to ward off evil spirits and as good luck charms. American ginseng is especially sought by the Chinese because it is perceived to be highly aphrodisiac, tastes sweet, and has a pleasant aroma. Consistently high in quality, it is thought of as being American and therefore a "blue ribbon" product (Hsu, 1979). The United States is now the world's third-largest producer of ginseng, behind South Korea and the People's Republic of China (Patty, 1979a,b, 1980).

Most American ginseng is flown to the Far East, especially to Hong Kong where it enters duty free. In 1975, ginseng ranked third in the value of United States exports to Hong Kong (Patty, 1976). Approximately 290 T of ginseng, worth nearly $40. million, were exported in 1980 of which 245 T went to Hong Kong. In 1970, less than 75 T were exported amounting to a value of $5. million. An estimated 90% of this country's annual production of ginseng is exported.

Beginning in 1978, ginseng exports were separated and recorded by crude or

advanced (processed) form, the latter mostly as powders or teas. The bulk of the advanced ginseng is also exported to Hong Kong. For instance in 1982, of the total 382,000 lb of domestic-crude ginseng exported, nearly 340,000 lb went to Hong Kong, and of the 329,000 lb of domestic-advanced ginseng exported, over 234,000 lb went to Hong Kong. In the same year 2 other large buyers of both domestic-crude and advanced ginseng were Taiwan and Singapore. The value of the crude ginseng amounted to nearly $34. million whereas that of the advanced ginseng amounted to approximately $13. million. The discrepancy in the total values is because the crude ginseng included the higher-valued wild ginseng, which for the most part was not processed in the United States for export.

As aforementioned, in 1983 wild and cultivated ginseng were listed separately in the export data. Wild, crude ginseng accounted for approximately one-fifth (75 T) of all domestic export tonnage (356 T), but amounted to over one-third of the total value ($44.9 million). Nearly one-third of the tonnage was exported as cultivated-crude ginseng and slightly less than one-half was exported in advanced form, the growing trend in merchandising the roots. Ginseng in advanced form, which is cultivated ginseng, however, brought the lowest price per pound.

Much of the ginseng exported to Hong Kong is re-exported to other countries, especially to mainland China, which since 1978 has been the destination for small direct shipments. Large quantities are used in Singapore, Indochina, Macao, Indonesia, and Malaysia. In the latter, there is not only a large Chinese population, but other workers also use it to relieve weariness from working in mines and on rubber plantations. Taiwan also imports a considerable amount of American ginseng, but it has a fairly high entry tariff. Other major export markets are Japan, Canada, and West Germany. In Japan, American ginseng is not considered by pharmaceutical codes to be of medicinal value and, therefore, it has limited use. The People's Republic of China has become a large producer of Asiatic ginseng, several hundred tons annually, and recently it has started to export a limited quantity. Although Mao Tse-tung advocated traditional and herbal Chinese medicines in early Communist China, when a birth control program was first inaugurated, the government discouraged the use of ginseng briefly because of its alleged sexual properties and because it was considered a luxury. Although Canada produces and exports a small amount of ginseng, it sporadically imports small quantities of both crude and advanced ginseng from the United States (Proctor, 1980).

Japan and South Korea both export processed Asiatic ginseng to Hong Kong, although much of the ginseng (roots that are steamed or boiled to turn red) from Japan is originally from South Korea and is merely transshipped (Patty, 1974). In fact, South Korea, where ginseng production is subsidized and controlled by the government, has become the chief competitor for growers in the United States. Korean ginseng has long been more highly prized for its alleged superior medicinal properties compared to those of American ginseng.

Not only do ginseng roots enter international trade, but ginseng seed is an important, if limited, commodity. It takes approximately 200 or more plants to produce 1 lb of seed that could produce 7,000–8,000 seedlings. Seed from northern-grown ginseng, such as that found in Wisconsin, has been considered better or more versatile for breeding stock because it produces plants that have bountiful, large seeds in a short growing season compared to seed from southern Appalachia

where ginseng needs a longer growing season. Ginseng seed from the Pacific Northwest produces undesirable long, thin roots. Under controlled conditions, cultivated ginseng produces more seed than wild ginseng where many seeds are lost under forest conditions. Over the years, small quantities of ginseng seed have been exported largely to Hong Kong, mainland China, and Canada. American ginseng seed tends to be more resistant to blight than Chinese-grown seeds, produced largely in Heilungkiang, Kirian, Hopei, and Liaoning provinces. South Korea does not allow Asiatic ginseng seed to be exported. Ginseng seed is also sold domestically to American growers.

USES OF GINSENG

Despite increased research on ginseng that tends to support its alleged medicinal value, consumption has remained concentrated largely in the Far East. In the early 1970s, symposiums on ginseng held in South Korea and research reports claimed that the herb stimulated protein synthesis, lowered blood sugar and cholesterol levels, regulated the metabolism rate, and protected against stress and could therefore reduce mortality (Karzel, 1974; Kim et al., 1970). Koreans also advocated its use for external application, for instance, in shampoo, soap, and skin lotions. They also fed ginseng to race horses to obtain better performance (Hou, 1978). Soviet, Bulgarian, Japanese, and Swedish researchers advanced the claim that ginseng was useful for stress and for other therapeutic and stimulant purposes (Krochmal and Krochmal, 1978). In particular, the Soviet Academy of Sciences' Ginseng Committee conducted extensive research on the plant (Massey, 1976). Asiatic ginseng from eastern Siberia was reportedly used by Soviet cosmonauts and Olympic-team trainees to reduce fatigue. Other researchers have claimed its value for treatment of impotence (Emboden, 1973; Hou, 1978; Massey, 1976). West Germans have used ginseng in facial creams, aspirin, and vitamin preparations (Speerstra, 1971). Incidentally, the Fromm operation funded research in the early 1970s on the possibility of using compounds from American ginseng in cancer research (Luedtke, 1972).

Many American researchers have been skeptical, however, about claims regarding the curative value of ginseng: the 25th edition, issued in 1955, of *The Dispensatory of the United States of America* dropped ginseng even as an unofficial drug (Osol and Farrar, 1955); the Food and Drug Administration has not approved ginseng for use in any drug or medicine (Anonymous, 1978) and the Health Insurance Institute claimed it can cause unspecified medical problems (Anonymous, 1980). Some medical authorities have attributed high blood pressure, menstrual irregularities, diarrhea, skin eruptions, and other side effects to the use of ginseng (Brekham and Dardymov, 1969; Sherman, 1984; Siegel, 1979; Vulto and Buurma, 1984). Legal action has been taken against dealers who openly claim the root can cure various diseases and act as a sexual stimulant (Anonymous, 1971, 1974, 1976; Emboden, 1973). Despite these doubts, health food stores, and mail order businesses witnessed large sales of ginseng and related products in the 1970s (Corr, 1979; Rodale, 1973). This was also true in Britain where many drugstores stocked Pharmaton, a Swiss-made capsule containing ginseng, and vitamins and minerals possessing ginseng (Massey, 1976).

In the United States, ginseng has been sold without medical prescriptions in

the forms of liquid extracts, capsules, chewing gum, teas, candy, and even cigarettes. Customers used it for treating rheumatism, anemia, insomnia, and various other problems. Some purchased the ginseng products for their alleged aphrodisiac properties. A ginseng cocktail was developed, as well as the commercial "Ginseng Rush," a soft drink. Ginseng fragrances have been used in cosmetics, soaps, aftershave cologne, and perfumes, including Jovan products and shampoo by Clairol (Carter, 1975). Most of the American ginseng marketed domestically is used in California. Several Hollywood stars reportedly used ginseng, which helped to create a ginseng fad (Speerstra, 1971). Increased immigration from the Far East in the 1970s contributed to the growth of Chinatowns and other Asian ethnic sectors of metropolitan centers and enlarged the domestic markets. An estimated 5–6 million Americans used ginseng products by the late 1970s (Siegel, 1979). A considerable amount of the processed ginseng used in the United States is, however, imported, mostly from South Korea, the People's Republic of China, the Soviet Union, and Hong Kong. None can be imported with claims of possessing medicinal value. Some is re-exported as foreign merchandise from the United States, for instance over 36,000 lb in 1980, nearly all to Mexico, United Kingdom, Hong Kong, and Canada.

The largest buyer and seller of cultivated ginseng in the United States is the Karlen Ginseng Company of Wausau (Hanousek, 1979), affiliated with the American Ginseng Company of Chicago, which has marketed a number of ginseng products. Hsu Ginseng Enterprise, Inc., is another large Marathon County firm. Buyers from Hong Kong, Taipei, Singapore, and other Oriental cities or their American representatives are commonly seen in the county in the fall. Beginning in October 1981, the first ginseng auction in the United States was held in Wausau where there was closed bidding in order to obtain better prices. Aware of growing world competition, the Wisconsin Ginseng Growers' Association disseminates published information today as other growers' associations had done earlier. The first national ginseng seminar was convened in Lexington, Kentucky, in 1979.

CONCLUSION

Ginseng was one of the earliest marketable herbs to be harvested on frontiers in the eastern United States. Largely because of a combination of human perseverance and success as well as optimal environmental conditions, ginseng cultivation became an important specialty crop in Marathon County, Wisconsin. The steady demand in the international markets for ginseng, largely in the Far East where it is used as a panacea, coupled in recent years with growing domestic consumption of ginseng products, has led to even greater production in Marathon County. It appears the county's ginseng connection with the Far East will continue to be important to Wisconsin's economy, especially with recently improved political relations with the People's Republic of China and rising discretionary incomes in Asia. Ginseng production is, however, not without risk, particularly from competition and maybe even from substitutes such as *Eleutherococcus senticosus* (Rupr. et Max.) Seem., a shrub that the Soviets claim has properties similar to those of ginseng (Baranov, 1966; Brekham and Dardymov, 1969; Fulder, 1980; Hou, 1978; Rodale, 1973). It is already commonly referred to as Siberian ginseng.

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Book Review

The Northwest European Pollen Flora, Volume 4 (Parts 29–37). W. Punt and G. C. S. Clarke (eds.). Reprinted from *Review of Palaeobotany and Palynology,* Volume 42, Elsevier Science Publishing Co., P.O. Box 1663, Grand Central Station, New York, NY 10163. 1984. 369 pp. $73.00.

This is the fourth in a series of volumes providing up-to-date, detailed pollen morphological data of plants in a group of selected families (Araliaceae, Berberidaceae, Cannabaceae, Moraceae, Urticaceae, Asteraceae: Lactuceae, Fagaceae, Hippocastanaceae, Menyanthaceae, Plumbaginaceae, and Apiaceae). Completed by expert palynologists, each treatment is abundantly illustrated with superb photographs (LM, SEM) of pollen along with comprehensive pollen descriptions and references to pertinent literature.

The current volume maintains the high standards set by its predecessors, and thereby the series continues as an indispensable resource for all aspects of palynology. Families already treated include: Volume 1—Caprifoliaceae, Primulaceae, Adoxaceae, Sparganiaceae, Typhaceae, Gentianaceae, and Clusiaceae; Volume 2—Solanaceae, Saxifragaceae, Boraginaceae, Escalloniaceae, Grossulariaceae, Hydrangeaceae, Parnassiaceae, Plantaginaceae, Valerianaceae, Aceraceae, Hippuridaceae, Haloragaceae, and Papaveraceae; and Volume 3—Dipsacaceae, Alistmataceae, Dioscoreaceae, Cabombaceae, Nymphaeaceae, Aquifoliaceae, Linaceae, and Convolvulaceae.

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