

BULLETIN No. 16—REVISED EDITION.

U. S. DEPARTMENT OF AGRICULTURE.
DIVISION OF BOTANY.

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AMERICAN GINSENG:

ITS

COMMERCIAL HISTORY, PROTECTION, AND CULTIVATION.

BY

GEORGE V. NASH.

REVISED AND EXTENDED

BY

MAURICE G. KAINS.



WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1898.

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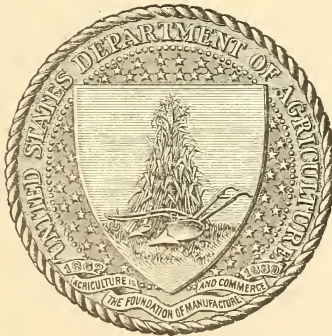
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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., January 26, 1898.

SIR: In the year 1895 the Division of Botany published a bulletin entitled, *American Ginseng: Its Commercial History, Protection, and Cultivation*, compiled by Mr. George V. Nash, under the direction of the Botanist, in which attention was called to the fact that the wholesale price of American ginseng had steadily increased from 52 cents per pound in 1858 to more than \$3 per pound in 1893, and that the value of the export for the preceding decade had amounted to between \$600,000 and \$1,000,000 per annum. The bulletin also pointed out that the supply of wild ginseng was rapidly decreasing and its ultimate commercial extermination probable. Experiments in the cultivation of ginseng had already been begun and the bulletin called attention to the evident practicability of cultivating the plant.

This second edition of the bulletin, brought up to date, has been prepared, in response to an increasing popular demand for information on this subject, by Mr. Maurice G. Kains, who is now engaged in investigating for the Division of Botany various plant products new or little known in the United States. During the past three years the price of ginseng has continued to increase, the best wild root bringing in the wholesale market for the season of 1897 from \$4 to \$4.75 per pound. A small amount of the cultivated product has meanwhile been put on the market. One lot brought the grower \$6 per pound, and in general the price paid for cultivated root has averaged \$1 to \$1.50 higher than the wild root. Our export for the year 1896, the last year for which published statistics are available, amounted to \$770,673. The demand for ginseng in China is steady and it is believed that our exports may be largely increased without overstocking the market.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

Hon. JAMES WILSON,
Secretary of Agriculture.

CONTENTS.

	Page.
History.....	5
Description.....	6
Range.....	9
Medicinal properties.....	10
Commercial value.....	12
Exportation.....	15
Protection.....	18
Cultivation.....	20
Improvement of the root.....	26
Chemical analysis.....	27
The cultivated root.....	27
Selection and preparation of the root.....	27
Profits.....	30
Adulteration and fraud.....	31

ILLUSTRATIONS.

Fig. 1. American ginseng.....	6
2. Fresh roots of ginseng from cultivated plant.....	7
3. Map showing the natural range of the ginseng plant in the United States.....	10
4. Ginseng growing under lath shed.....	23
5. Dried root of ginseng from wild plant.....	28



AMERICAN GINSENG: ITS COMMERCIAL HISTORY, PROTECTION, AND CULTIVATION.

HISTORY.

The American ginseng (*Panax quinquefolium*)¹ belongs to the natural order *Araliaceae*, a family of plants closely related to the parsley family, in which latter are included the parsnip, carrot, and celery. Our plant is a near relative of the ginseng of China and Korea, *Panax ginseng*, which is so highly prized by the Chinese. A report of the high estimation in which this plant was held in China reached Europe early in the eighteenth century, and led to inquiries as to whether it grew in the forests of North America. Father Lafitau, a missionary among the Iroquois Indians, after long search and inquiry among them, found a plant which answered well the description of the Chinese ginseng, as given by Father Jartoux, a missionary in China in the early part of the eighteenth century. This discovery was made near Montreal, Canada, in 1716.²

Soon afterwards the French began collecting it, through the agency of the Indians, for export to China. The demand thus created was so large that ginseng presently became an important article of commerce in Canada. The first consignments were very profitable to the traders, the root, valued at but 2 francs per pound in Quebec, selling as high as 25 francs in China. At that time the Company of the Indies controlled the trade with that country. At first they allowed the officers of their vessels to carry ginseng as a private speculation, supposing that the trade would amount to little. In 1751, however, perceiving that the commerce in the root was becoming extensive, they withdrew this privilege and assumed the trade themselves. Ginseng was at this time worth about 12 francs per pound in Canada, but the company soon paid 33 francs for it. The trade continued to advance until 1752, when, in the effort to meet an excessive demand from France, a poor lot of root was placed on the market. The merchants at Rochelle directed their agents in Quebec to purchase ginseng at any price. The agents accordingly caused a large amount to be collected out of season, and

¹ *Aralia quinquefolia* Decsne. & Planch.

² Lafitau, Joseph-François, *Memoire concernant la precieuse plante du ginseng*, p. 22. Nouvelle edition, Montreal, 1858.

this was improperly dried in ovens. Even the poor material thus obtained brought about 25 francs per pound in Quebec, and a quantity was shipped to Rochelle, amounting in value to 500,000 francs. A part of this was sent on to China, where the people refused to use it. The Canadian root thus acquired a bad reputation among the Chinese, so that by 1754 the trade was reduced to a value of 33,000 francs, and soon afterwards entirely ceased.¹

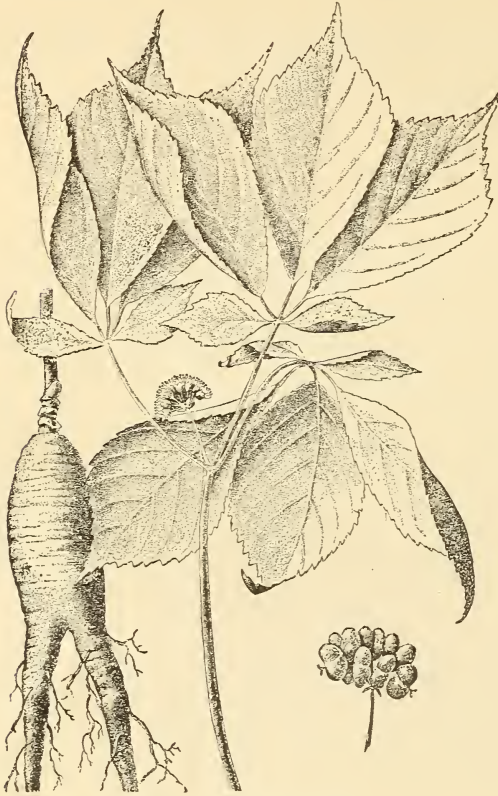


FIG. 1.—American ginseng.

About this time the existence of ginseng in the more southern colonies began to be recognized. In 1750 it was found in the western parts of New England generally,² and in 1751 it was discovered in central New York and at Stockbridge, Mass.³ It was found plentifully in Vermont at the time of the settlement of that State, and the parties who dug the root sold it in its crude form for about 2 shillings, or 34 cents, per pound.⁴

As population moved westward ginseng was met in abundance as far as the first tier of States beyond the Mississippi.

An export trade was eventually developed, which in Wisconsin is reported to have reached a value of \$40,000 in 1858 and \$80,000 in 1859. Large quantities have also been shipped from Minnesota.

DESCRIPTION.

In the forest, when the plant is old enough to produce fruit, it is rather conspicuous and is easily recognized, but until three or four years of age from the seed it is usually not specially prominent. In the State of New York the seedlings appear, generally, about the first of

¹ Lafitau, Joseph-François, loc. cit., pp. 5-8.

² Williams, Samuel, Natural and Civil History of Vermont, p. 70 (1794).

³ Speer, Rev. William, The Oldest and Newest Empire; China and the United States, p. 61 (1870).

⁴ Tholpson, Z., History of Vermont, Part I, p. 221 (1842).

May, occasionally even two weeks earlier. At first they somewhat resemble newly sprouted beans, in that they send up the two cotyledons, and from between them a stem with two minute leaves. These enlarge until the plant has attained its first season's growth (about 2 inches), forming, with the cotyledons, the only leaves of the season. The work of the plant during the first year is to develop the bud at the crown of the root which is to produce the next season's stem and leaves. In the autumn the stem dies and breaks off, leaving a scar, at the side of which is the solitary bud.

In the spring of the second year this bud produces a straight, erect stem, at the top of which the 1 to 3 branch-like stalks of the compound leaves appear. From 3 to 8 leaflets are developed, which rise usually not more than 4 inches from the ground. Occasionally a second or twin stem may be produced, but this is of rare occurrence except in the garden or in older plants. The third year from 8 to 15 leaflets may be put forth, and the plant may attain a height of 8 inches. In succeeding years the plant



FIG. 2.—Fresh roots of ginseng from cultivated plant. *a*, One year old; *b*, two years old; *c*, three years old; *d*, four years old; *e*, bud; *f*, leaf scar.

may produce 3, or sometimes 4, or even 5, leaf stalks, 3 or 4 inches long, each bearing 5 thin leaflets (sometimes 3 or 7), palmately arranged, 2 of them an inch or two long, the remainder 3 or 4 inches, egg-shaped in outline, with the broad end away from the stem, abruptly pointed and saw-toothed. Occasionally, in garden beds, specimens may be found with 5 leaf stalks and 25 or 30 leaflets, but this is unusual. The height attained is generally not more than 20 inches, although some specimens reach 30 inches.

At the point where the leafstalks meet, the stem is continued into an erect flower stalk, from 2 to 5 inches long, bearing in early July, or in the garden in late June, an umbel of inconspicuous, yellowish green flowers. These are soon followed by the fruit, which develops rapidly, remaining green until the middle of August, when it begins to turn red, becoming scarlet in September, in the middle of which month it becomes fully ripe. The berries, which are edible and have the taste of the root, are about the size and shape of small wax beans, and contain two, or occasionally three, seeds each.

No seed is produced the first year, and only an occasional berry upon extra strong individual plants in the garden during the second season. It is only the third season that the plants produce seed in any quantity, plants in cultivated beds producing much more freely than those in the forest. In the garden from 40 to 60 seeds is the usual number produced in a head, and although as many as 100—it is said 152—have been gathered from a single head, in the forest the number of seeds in a head seldom exceeds 50.

The part of the plant commercially important is the root (figs. 1, 2, 5). This is composed of two parts, the rootstock and the root proper. The former is slender, rarely one-fourth of an inch in diameter, and is marked by a number of scars. These are left by the stems, which die down in autumn, so that each indicates a year in the life of the plant. As many as sixty-five of them have been found on a single rootstock. The size and value of the root, however, do not continue to increase in very old plants, but on the contrary diminish. The specimen referred to, which is in the museum of Mr. George Stanton,¹ is a small, much-shriveled, light root, scarcely more than a quarter of an inch in diameter, while many specimens of the young roots exceed three-quarters of an inch and weigh several ounces after being dried. After about ten years, under ordinary circumstances, the root tends gradually to decrease in size, rapidly losing weight from year to year, and also to become poorer in medicinal qualities, until it is a mere woody axis. At or even before this time new roots may form near the crown, which gradually assume the functions of the old root, the latter soon dying and sloughing off.

The root itself is spindle-shaped, simple at first, but when two or more years old frequently forked, or even having several large root-branches. In size it varies much with the food supply, the exposure, and other conditions under which it grows, but ranges in a general way from an eighth of an inch in diameter at 1 year old to an inch or even more when 5 or 6. As may be seen in the figures, it is marked with numerous transverse wrinkles.

In the forest ginseng does not spread by the root, but propagates only by the seed. When cultivated, however, it is not unusual to find on very vigorous plants two, three, and even four "stem" roots spring-

¹ Summit Station, Onondaga County, N. Y.

ing from the rootstock near the crown. If carefully removed and transplanted these can be made to grow and may develop into as good roots as if grown from the seed direct; moreover, they require less time to attain a marketable size.

It will be readily perceived that if the practice of gathering the wild roots before the seed has matured and fallen be persisted in, the natural supply will become exhausted and the plant ultimately exterminated. In this connection it is worth noting that dealers in ginseng say they are still able to obtain about the same quantity of the wild root as formerly, but that it is yearly shipped to them from more remote localities.

There is another reason why ginseng should not be dug in summer. At that time the plant is growing and the root is taxed to supply the required nutriment. Under these circumstances, of course, the root is in poor condition and unfit for the use for which it is sought. In the autumn, however, after the seed has fallen, the root will be in prime condition, having by that time laid up a store of nutriment for use in the spring, when the plant again begins to draw food from the soil. For this reason the root is heavier and firmer in the autumn, and will then shrink much less in drying. Accordingly, a given weight of green roots will yield a greater weight of dried product at this season, and consequently will realize more than if collected in the growing season.

RANGE.

The Chinese ginseng grows principally between the 39th and 47th degrees of north latitude, and between the 126th and 136th degrees of east longitude.¹ The American plant has about the same range of latitude, except that it extends farther south along the mountains. It grows in rich and damp but not wet or muddy soils, such as prevail in hardwood forests, and it is found in the following States:

Maine.	South Carolina (western).
New Hampshire.	Georgia (northern).
Vermont.	Alabama (northern).
Massachusetts.	Kentucky.
Rhode Island.	Tennessee.
Connecticut.	Arkansas.
New York.	Ohio.
New Jersey (northern).	Indiana.
Pennsylvania.	Illinois.
Delaware.	Michigan.
Maryland.	Wisconsin.
Virginia.	Minnesota.
West Virginia.	Iowa.
North Carolina (western).	Missouri.

¹Jartoux, Father, The Description of a Tartarian Plant Called Ginseng. From the Philosophical Transactions of the Royal Society of London, Vol. XXVIII, p. 240 (1714).

It formerly grew abundantly over large areas in these States, but it has been so energetically hunted, and at the same time the forest area has been so much diminished, that the supply is greatly reduced. In Canada it is pretty generally distributed throughout Ontario and Quebec, but it has now become rather scarce.

MEDICINAL PROPERTIES.

In this country ginseng is considered of little medicinal value. The root is mildly aromatic and slightly stimulant. The Chinese and Koreans, however, place a high value on it, and, indeed, regard it as a panacea. Father Jartoux, while making a map of Tartary under the orders of the Emperor of China, spent some time in Manchuria, where the most valued ginseng grows. The following is his description of the uses to which the Chinese put this root:¹

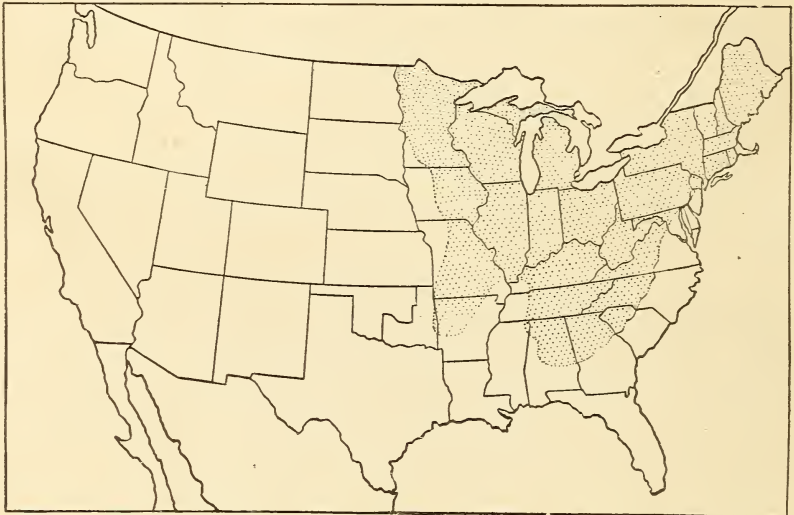


FIG. 3.—Map showing the natural range of the ginseng plant in the United States.

They affirm that it is a sovereign remedy for all weaknesses occasioned by excessive fatigues either of body or mind; that it dissolves pituitous humors; that it cures weakness of the lungs and the pleurisy; that it stops vomitings; that it strengthens the stomach and helps the appetite; that it disperses fumes or vapors; that it fortifies the breast, and is a remedy for short and weak breathing; that it strengthens the vital spirits, and increases lymph in the blood; in short, that it is good against dizziness of the head and dimness of sight, and that it prolongs life in old age.

Dr. F. P. Smith, a medical missionary of recent times, makes the following statement:²

This drug is prepared as an extract, or a decoction, in silver vessels as a rule. Its effects are apparently those of an alterative, tonic, stimulant, carminative, and

¹ Jartoux, Father, loc. cit., p. 238.

² Chinese Materia Medica, p. 103 (1871).

demulcent nature. It is prescribed in almost every description of disease of a severe character, with few exceptions, but with many reservations as to the stage of the disease in which it may be administered with the greatest benefit and safety. All forms of debility, spermatorrhea, the asthenic hemorrhages, the various forms of severe dyspepsia, the persistent vomiting of pregnant women, malarious affections of a chronic character, the typhoid stages of fever, especially of an epidemic character, are occasions on which the Chinese resort to this drug. Several cases in which life would seem to have been at least prolonged by the taking of doses of this drug, so as to allow of intelligent disposition of property, indicate that some positive efficacy of a sustaining character does really exist in this species of ivywort. The leaves are sold in bundles of the green, fragrant, excellently preserved foliage of the shrub. They are said to be emetic and expectorant in their effects.

In Korea the cultivated ginseng is smaller than the wild or "san-sam"—literally "mountain" ginseng—the root of which attains a length of a foot or more and a diameter of an inch and upward. It is said that when this wild root is administered (always at a single dose), the patient loses consciousness for a greater or less time, and for about a month is tortured by boils, eruptions, sleeplessness, and other ills. Rejuvenation then begins, the skin becomes clear, the body healthy, and the person will live, such is the belief, exempt from disease for many years. They think it acts as a preventive by toning up the system.

Mr. George C. Foulk remarks:¹

The extreme rarity of san-sam augments the superstitious repute in which it is held; as an intelligent Korean told me, much is said that is only words; nevertheless, he maintained that san-sam was a wonderful medicine in its strengthening effects.

It is apparent that the Chinese faith in ginseng rests largely on fanciful grounds, since they prefer roots which, in a measure, resemble the human form. A rude likeness of this kind is frequently discernible, which is said to be increased by manipulation. The name itself signifies "man plant." An analogous case is that of the mandrake of the Mediterranean region, long esteemed potent for a similar reason.

The root appears to be differently employed according to the source from which it is obtained, probably somewhat on real and somewhat on fictitious grounds. "The effects of the Manchurian and Korean ginseng are apparently those of an alterative, tonic, stimulant, and carminative nature, while the American and Japanese ginseng are used as demulcent and refrigerant agents."²

Mr. Horace N. Allen, minister resident and consul-general at Seoul, Korea, writes:³

There is certainly a difference in the effect produced by the use of these two roots [the American and Korean]. The American ginseng is considered by our medical authorities to be "inert." This can not be said of the Korean root. I have seen the latter produce suppuration in otherwise healthy wounds when surreptitiously given to hasten the slow process of healing. When the cause was discovered and removed the wounds gradually came into proper condition again. * * *

¹ Foreign Relations of the United States, 1885, p. 329.

² Edwin Stevens, United States Consular Reports, No. 46, Vol. XIV, p. 232 (1884).

³ United States Consular Reports, No. 53, advance sheets, March 5, 1898.

Quinine has been shown to be so much more efficacious in the treatment of the frequent malarial fevers of these countries that ginseng has lost some of its popularity in these cases; but whenever a tonic or a "heating medicine" is needed ginseng continues to be resorted to, and, by combination with quinine, its reputation will be enhanced rather than diminished.

The use of ginseng in different parts of the Empire seems to vary considerably. The following statement is made on this point:¹

In the north it is rarely taken except in cases of actual sickness, as the soil and climate are dry and cool, and there is comparatively little malaria. A few of the wealthy people occasionally take an infusion as a precautionary measure during the winter. * * * It is said to be more extensively used by Chinese in the south, owing to the heat and moisture of their soil and climate, being infused with most of their drinks and taken even with some of their solid food as a precautionary measure against sickness.

There are stated to be three ways of taking ginseng, viz, as pills, confection, and infusion. Its medicinal value is thought to be diminished by a steaming process to which it is frequently subjected for the improvement of its color. It appears to be given the character of a confection by steeping in honey or by the use of sugar.

It seems probable that what medicinal virtues the root possesses were discovered at a time when the attributes of more powerful drugs of similar officinal qualities were unknown, and that the conservatism of the Chinese, coupled with their belief in the occult, has maintained an exaggerated estimate of its efficacy. The western world, profiting by experiment and research in the province of medicine, has dropped the use of ginseng except as a demulcent, for which purpose many other medicines are more popular.

COMMERCIAL VALUE.

The wild ginseng of Manchuria is the most highly esteemed, now represented, according to Dr. Smith, by that coming from Shingking. This is and has long been an imperial monopoly. A passage from Father Jartoux,² describes the control exercised in his day:

The places where the ginseng grows are on every side separated from the province of Quan-tong (which in our old maps is called Leaotum) by a barrier of wooden stakes which encompasses the whole province, and about which guards continually patrol to hinder the Chinese from going out and looking after this root. Yet howsoever vigilant, their greediness after gain incites the Chinese to lurk about privately in these deserts, sometimes to the number of two or three thousand, at the hazard of losing their liberty and all the fruit of their labors if they are taken either as they go out of or come into the province.

The Emperor, having a mind that the Tartars should have the advantage that is to be made of this plant rather than the Chinese, gave orders this present year, 1709, to 10,000 Tartars to go and gather all that they could of the ginseng, upon condition that each person should give His Majesty 2 ounces of the best, and that

¹ J. J. F. Bandinel, United States Consular Reports, No. 46, Vol. XIV, p. 234 (1884).

² Loc. cit., p. 240.

the rest should be paid for according to its weight in fine silver. It was computed that by this means the Emperor would get this year about 20,000 Chinese pounds of it, which would not cost him above one-fourth part of its real value.

A recent consular authority¹ presents a classification, the first grade in which is named and described as follows:

“Imperial ginseng,” so called because it is raised or gathered under imperial protection in the parks or hunting grounds, where it is kept free from the profanation of the vulgar herd. This variety ranges from \$10 to \$200 per pound, and is largely taken up by the wealthy classes in Peking and vicinity, as far as I can learn. It is fine in its appearance, quite in the desired form, and of course very scarce in trade.

Although only an imaginary line divides the Korean Peninsula from Manchuria, the ginseng grown in the former place seems to take rank after the Manchurian article. It is said to possess about the same qualities as the Manchurian, and the supposed differences are probably fanciful. Being much cheaper it is more extensively used. The price paid for it ranges from \$15 to \$35 a pound.

Cultivated ginseng in Korea is a common marketable article, and is produced in large quantities. As in the case of the Manchurian article, its sale has long been a government monopoly, the funds derived from it belonging to the King. But in spite of the death penalty for its private disposal large quantities are smuggled across the Yellow Sea in junks from the western coast of the peninsula to the mainland, and also across the northwestern borders into China, where it always commands a ready market and good price.

According to the authority last cited, “the third grade, called native ginseng, is grown in China near the borders of Korea. This is mostly used to adulterate the Korean article, and is valued at from \$1 to \$10 per pound.” To this may correspond in some measure a native product noted by Dr. Smith, consisting of the roots of species of *Campanula* and *Adenophora*, used as a substitute for ginseng and called by its name.

Regarding further grades, the above consular authority says:

American ginseng is generally regarded as next in classification, but from all I can learn of it I think it belongs rather to the third class, and the last as fourth. When crude it averages about \$2 per pound; when clarified, from \$4 to \$6, and when reclarified, from \$6 to \$8 per pound. What the clarifying may be I have no absolute information. Some maintain it is only washing and clearing the roots from earth and fibers, and some that it is a process of steeping with honey, which is only done with the best selected specimens.

As stated by the same writer, “The last and poorest quality is the Japanese ginseng, which, like the native product, is used for the adulteration of the Korean supply and other better grades.” Its value is correspondent to that of the native article, i. e., \$1 to \$10 per pound. According to Dr. Smith, the Japanese ginseng is often adulterated with the roots of *Campanula glauca* and other plants.

¹I. F. Shephard, United States Consular Reports, No. 46, Vol. XIV, p. 228 (1884).

Another consular writer,¹ who notes that ginseng is classified as clarified and crude, speaks as follows of the American export:

The root is sorted previous to shipment to China, and comprises various grades, differing from each other in value from \$50 to \$100 per picul. The average prices for crude (which forms the bulk of the shipments), according to the following classifications, are: Superior selected root, \$450; large and selected, \$380; good ordinary, \$300; medium good, \$270; fair, \$250. Some very choice, large roots have brought \$600 to \$700, and extra choicest, large and heavy, sometimes command fancy prices, up to \$1,000 per picul.

It is elsewhere stated² that "an old root resembling the body of a man with head and limbs is supposed to be one or two hundred years old, and fetches an enormous price—from 200 to 400 taels per ounce weight."³ Presumably none but the Manchurian article would attain this valuation.

Something will be said upon "clarification," under the topic of "Selection and preparation of the root." It seems evident that the term is used in two senses.

The collector or grower of ginseng will be particularly interested to know the prices obtainable in this country. Messrs. Samuel Wells & Co., of Cincinnati, Ohio, large dealers in ginseng root, have furnished the following table of prices paid for it by wholesale buyers during the past eight years:

Prices per pound paid for ginseng in the United States in the eight years from 1889 to 1896.

Year.	Fair.	Choice.	Year.	Fair.	Choice.
1889	\$2.40	\$3.40	1893	\$2.25	\$3.50
1890	2.75	4.00	1894	2.42	3.65
1891	2.50	3.50	1895	2.68	3.75
1892	2.50	3.50	1896	2.97	3.96

Although these figures give a good general idea of the prices obtained, they take no account of the locality from which the root is derived. The territory in which ginseng is dug is divided by the various dealers into a number of sections, which differ in their boundaries from State lines to such an extent that the average price paid by the different merchants in any one State can not be accurately ascertained. These divisions seem to follow a general plan, which appears to be founded as much upon the distance from market as upon actual quality of root, ginseng produced near the market commanding a higher figure than that from a distance. It is believed in presenting the following figures, which have been furnished by Mr. H. L. Pence, of New York, that a better idea is given of the range in prices for the various parts

¹ F. D. Cheshire, United States Consular Reports, loc. cit., p. 227. The picul equals about 133½ pounds.

² J. J. F. Bandinel, United States Consular Reports, loc. cit., p. 233.

³ A tael at the time of this report was worth about \$1.05 in gold.

of the ginseng area than could be conveyed by a table of average prices for the various States. The table presents the highest and lowest figures paid by them for fall-dug ginseng in 1897.

Range of prices paid for fall-dug ginseng in 1897.

Divisions.	Lowest.	Highest.
New York, Vermont, and Canada	\$3.00	\$4.75
Northern Pennsylvania and northern Ohio	2.80	4.50
Northern Indiana and northern Illinois	2.75	4.25
Michigan and Wisconsin	2.60	4.00
Iowa and Minnesota	2.50	3.75
Western Pennsylvania and eastern Ohio	2.70	4.00
West Virginia and southern Ohio	2.60	4.00
Southern Indiana and southern Illinois	2.50	3.75
Missouri and Arkansas	2.50	3.75
Virginia and North Carolina	2.40	3.50
Kentucky and Tennessee	2.25	3.25
Georgia and Alabama	2.25	3.25

It is obvious from both the Chinese and the American figures that quality is a highly important consideration. At present the ginseng which comes from New York, the New England States, Canada, and northern Pennsylvania is considered best and obtains the highest price. That gathered in the Central and Northwestern States brings, upon the average, from 50 to 75 cents less per pound than that from the above-named States, and that from the Southern States ranks from 80 cents to \$1 less.¹

EXPORTATION.

The greater part of the ginseng exported from this country enters China by the way of Hongkong. According to Mr. Cheshire,¹ the receipts at that port from 1860 to 1883, inclusive, averaged about 417,500 pounds per annum. Half the amount, he states, "comes direct to native importers and others through agents in New York and San Francisco, and the other half to an American firm from Western America."

The following general table (p. 16), compiled from the official commerce reports published by the Bureau of Statistics of the Treasury Department, represents the American trade in ginseng with all countries for the past thirty-nine years.

¹The following is a list of the dealers in ginseng with whom the Division has had correspondence and to whom we are indebted for information as to the ginseng markets: New York: J. Struck & Co., 462 West Broadway; Otto Wagner, 90 Prince street; Hennessy, Adams & Co., 147 Spring street; J. L. Prouty, 382 West Broadway; T. A. Bronson, 54 Cedar street; H. L. Pence, 4 Bond street; William Eisenhauer & Co., 378 West Broadway; J. L. Cilley, 101 Gold street; Belt, Butler & Co., 83 Spring street; Kann & Co., 17 West Houston street; Hirsch & Lowenstein, 176 Chambers street. Fort Wayne, Ind.: Weil Bros. & Co., 92 East Columbia street. Cincinnati, Ohio: Samuel Wells & Co., 67 Vine street.

¹Loc. cit., p. 226.

Exports of ginseng from the United States to various countries from 1858 to 1896.

Year.	Country to which exported.	Pounds.	Total pounds.	Price per pound.	Average price per pound.	Amount.	Total amount.
1858	China		366,053		\$0.52		\$193,736
1859	do		110,426		.49		54,204
1860	do		395,909		.74		295,766
1861	do		347,577		.84		292,899
1862	China and Japan	622,761		\$0.64		\$403,058	
	Holland and all Dutch colonial possessions	1,206		.66		800	
	Liberia and other African ports	6,747		.70		4,732	
1863	China and Japan		630,714		.64		408,590
1864	do		372,945		.79		295,120
1865	China	464,357	360,950		1.31	547,378	474,920
	Germany	150		1.17		275	
			464,507		1.17		547,653
1866	China		444,398		.86		382,870
1867	do		479,974		1.11		535,883
1868	do		370,066		1.02		380,454
1869	do		282,405		1.02		288,054
1870	do		474,310		.95		455,097
1871	do	111,221		1.05		117,585	
	Japan	3,000	114,221	.60	1.04	1,800	119,385
1872	China	399,710		.85		340,686	
	Japan	1,550		.60		930	
			401,260		.85		341,616
1873	China	274,861		.96		264,605	
	England	42,580		1.26		53,764	
	Japan	32,700		.69		22,775	
			350,141		.97		341,144
1874	China	315,523		1.03		326,253	
	England	84,596		1.12		121,941	
	Japan	500		1.13		566	
			400,619		1.12		448,760
1875	China	446,679		1.29		577,382	
	England	43,908		1.71		75,454	
	Japan	6,900		.88	1.32	6,090	658,926
1876	China	477,018	497,487	1.15		551,012	
	England	65,878		1.32		87,336	
	Japan	7,733		1.11		8,606	
			550,624		1.17		646,954
1877	China	363,686		1.26		460,330	
	England	76,480		1.32		101,598	
	Japan	240		1.41		340	
			440,406		1.32		562,268
1878	China	387,153		1.17		454,037	
	England	27,802		1.25		34,950	
	Japan	3,427		1.24		4,260	
	United States of Colombia	3,013		1.32		4,000	
			421,395		1.18		497,247
1879	China	360,436		1.18		427,327	
	England	24,948		1.24		31,124	
	Japan	5,880		1.21		7,160	
			391,264		1.24		465,611
1880	China	371,016		1.35		503,727	
	England	20,067		1.46		29,315	
			391,083		1.36		533,042
1881	China	325,070		1.64		536,308	
	England	13,771		1.83		25,237	
			338,841		1.65		561,545
1882	China	261,577		1.83		480,912	
	England	1,151		1.96		2,259	
			262,728		1.83		483,171
1883	China	411,957		2.05		845,346	
	England	1,648		1.29		2,135	
	Japan	418		2.18		912	
			414,023		2.04		848,393
1884	China	295,204		2.08		614,935	
	Hawaiian Islands	38		1.57		60	
			295,242		2.08		614,995
1885	China		377,345		1.99		751,168
1886	do		467,608		2.13		998,332
1887	do		330,831		2.08		689,735
1888	do	308,231		2.13		657,062	
	Japan	134		2.20		296	
			308,365		2.13		657,358
1889	China		271,228		2.33		634,091
1890	do		223,113		2.71		605,233

a Estimated from total amount.

Exports of ginseng from the United States to various countries—Continued.

Year.	Country to which exported.	Pounds.	Total pounds.	Price per pound.	Average price per pound.	Amount.	Total amount.
1891....	China		283, 000		\$3. 39		\$959, 992
1892....	do		228, 916		3. 51		803, 529
1893....	do		251, 205		3. 15		792, 928
1894....	do		194, 564		3. 18		619, 114
1895....	do	232, 808			} 3. 54	} \$825, 216	
	Canada	428					
			233, 236				826, 713
1896....	China	199, 193		\$2. 31		770, 091	
	Japan	243		3. 88		582	
			199, 436		3. 86		770, 673
	Total		13, 738, 415		1. 51		20, 837, 169

Recapitulation, showing advance in price.

	Total pounds.	Average price per pound.	Total amount.
Exports for 11 years, 1858-1868.....	4, 343, 519	\$0. 88	\$3, 862, 095
Exports for 10 years, 1869-1878.....	3, 932, 868	1. 10	4, 359, 451
Exports for 10 years, 1879-1888.....	3, 577, 330	1. 84	6, 603, 350
Exports for 8 years, 1889-1896.....	1, 884, 698	3. 18	6, 012, 273
Total	13, 738, 415		20, 837, 169

Recapitulation, by countries, showing number of pounds exported to each, from 1858 to 1896.

	Pounds.
China and Japan	13, 324, 009
England.....	402, 824
Liberia and other African ports	6, 747
United States of Colombia	3, 013
Holland and all Dutch colonial possessions	1, 206
Germany	150
Hawaiian Islands.....	38

From the above it will be seen that China takes practically all the ginseng exported from this country, for that which went to England undoubtedly was used in her trade with China.

An examination of the first table will show that, while there has been a decrease in the quantity exported annually, there has been a much more rapid increase in the price. These changes are owing to the greatly increased demand for the American root in China and the diminishing supply of our wild product. Summarizing for two periods of five years each, we have—

	Pounds.	Price.	Amount.
From 1858 to 1862.....	1, 850, 679	\$0. 67	\$1, 245, 195
From 1892 to 1896.....	1, 106, 929	3. 44	3, 811, 490

Thus the number of pounds exported during the last five years has been only about three-fifths as great as, but the price per pound slightly more than five times greater than, during the five years from 1858 to

1862. It thus appears that a considerably larger supply than we possess could be sold at the present time within the limits of profit. The continuance of the demand may be argued from the conservative character of the Chinese. They have used ginseng for many centuries and will doubtless continue to use it for a long time to come. It becomes a practical question, then, how we can maintain and perhaps increase our supply. The two obvious means to this end are the protection of the wild crop from abuse by an appeal to reason and by law, and the enlargement of the yield, if possible, by artificial plantations.

PROTECTION.

The reduction of our forest areas and the pasturing of those which remain contribute seriously to the failure of the wild crop. The importance of ginseng is hardly sufficient to have much bearing on the forest question; but, so far as our forests shall be preserved for other reasons, there are two lines along which the law may act toward the preservation of the ginseng supply. The first of these lies in the direction of limiting the time of digging the root. The close season should extend at least from the time the plant starts in the spring until the seed is fully ripe in the fall; for, as we have already seen, ginseng has no means of reproduction except its seed, while at the same time the root is not in good condition during the growing period. It might be wise to make the open season still shorter than this would imply, in order still further to reduce the collection. The question may be raised, also, whether the destruction of undergrown roots might not be prohibited, as in the case of small trout and lobsters in some States. If this provision were somewhat difficult to enforce, it would at least call attention to the wastefulness of killing the young plant.

The State of Virginia already has a law limiting the time of collecting, of which the text is as follows:¹

AN ACT for the protection of ginseng in the counties of the State.

SEC. 1. *Be it enacted by the general assembly of Virginia*, If any person shall dig any ginseng from the 15th day of March till the 15th day of September, such person, on conviction before a justice of the peace, shall be fined not less than five nor more than ten dollars and costs for each offense.

SEC. 2. *Be it further enacted*, That on the conviction of anyone of such offense the informant shall be entitled to one-half the fine, the remaining half going to the Commonwealth.

SEC. 3. This act shall be in force from its passage.

In the same line, but more stringent, is a law passed by the legislature of Ontario, Canada, in 1891:²

SEC. 1. Except for the purpose of clearing or bringing land into cultivation, no person shall, between the first day of January and the first day of September in any year, cut, root up, gather, or destroy the plant known by the name of ginseng whenever such plant may be found growing in a wild or uncultivated state.

¹ Acts and Joint Resolutions of Virginia, 1875-76, chap. 90.

² Statutes of the Province of Ontario, 1891, chap. 52.

SEC. 2. Any person who contravenes the provision of this act shall, for every such offense, upon summary conviction before any justice of the peace, be subject to a penalty of not less than five dollars or more than twenty dollars, together with costs for prosecution, and one-half of the penalty shall be paid to the prosecutor, unless otherwise ordered by the said justice convicting.

On May 27, 1893, the following amendment to the above law was passed:¹

AN ACT to further provide against the extermination of the plant called ginseng.

SEC. 1. Proof of the purchase or sale of ginseng between the first day of January and the first day of September in any year shall be prima facie evidence of a contravention of this act.

SEC. 2. Any person who purchases ginseng, knowing the same to have been cut, rooted up, or gathered between the first day of January and the first day of September, shall be guilty of a contravention of this act.

SEC. 3. In any prosecution under the preceding section proof that the ginseng purchased has been illegally obtained by the vendor shall be prima facie evidence of a contravention of this act by the purchaser.

SEC. 4. This act shall be read as part of the act to prevent the extermination of the plant called ginseng.

From the foregoing it will be seen that the season in Virginia opens half a month later than in Ontario, which is right in view of the difference of latitude. On the other hand, the open season is six months long in Virginia, while in Ontario it is but four months long, and the digging must practically cease with the fall of snow. Considering the comparative mildness of the Virginia winter, a six month's close seems rather short.

A second method of securing protection consists in defending the rights of individual landowners; that is, by prohibiting digging on any land but one's own. The legislature of West Virginia has enacted a law of this purport. It covers the case of other medicinal roots as well as ginseng. The text is as follows:²

SEC. 1. It shall be unlawful for any person to dig ginseng or other medicinal roots, or prospect for the same, on the land of another, in the counties of Pocahontas, Greenbrier, and Webster, without the consent of the owner or owners thereof first had and obtained.

SEC. 2. The provisions of this act shall extend to all the counties of the State: *Provided*, That the county court of any county may, upon the petition of one hundred voters of the county, direct to have the same enforced in their said county or any district or districts thereof.

SEC. 3. Any person violating this act shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be fined not more than fifty dollars, and be confined in the county jail not exceeding two months.

SEC. 4. This act shall be in force from and after the passage thereof.

While a law of this kind does not prevent a man from exterminating ginseng on his own land, it may be assumed that, where the crop is valued, every individual will be prudent enough to husband his own resources. A wanton destruction is most likely to take place on land

¹ Statutes of the Province of Ontario, 1893, chap. 43.

² Acts of West Virginia, 11th session, 1872-73, chap. 158.

which is practically public, where no one is sure of anything but what he seizes at once. Nevertheless, in a State having large areas of mountainous and thinly settled territory landowners in many cases either could not or would not care to secure the enforcement of the law; at any rate, would do no more than secure payment for the right of digging, and some further provision would be required. A suitable close season might be established to affect at least the lands not guarded by their owners.

Ginseng under cultivation would naturally enjoy the same protection as any other planted crop. Since plantations would generally be made in woodlands, some special provision may be needed, particularly where the digging of the wild plant on the lands of others is not forbidden. The owner of the plantation might be required to post a prohibitory notice.

Other States than those mentioned do not appear to have legislated in behalf of ginseng.

CULTIVATION.

In Korea the cultivation of ginseng is well understood. Mr. George C. Foulk thus describes the farms and methods of growing:¹

Each farm is a rectangular compound, one part containing the buildings inclosed by walls, the rest by hedges. The buildings, though built as usual of mud, stones, earthenware, and untrimmed timbers, and thatched, are strikingly superior to the other houses of the Korean people. They are built in right lines, interiors neatly arranged, and walks and hedges in good order. In each compound are one or more tall little watch towers, in which a regular lookout is held over the farm to prevent raids of thieves, who might make off with paying amounts in handfuls of ginseng.

Beyond the buildings and occupying the remaining space in the compound are parallel rows of low, dark mat sheds, with roofs sloping downward toward the south or southwest. These rows are from 75 to 200 feet long and 4 feet apart, and the mat sheds about 4 feet high at their front (north) sides, which are closed by mats which swing from the top, thus giving access to the farmer in his care of the plants. Within the sheds are beds about 8 inches high for the growing ginseng plants, which are in rows extending across the beds, about 2 feet long.

The row (or shed) nearest the houses is the seed bed for all the plants grown on the farm. * * * In the Korean ninth month (September-October) the seeds are stuck quite thickly in the seed bed to a depth of three inches in little watering trenches about three inches apart. Once in each three days' interval during its whole life the plant is watered, and the bed carefully inspected to prevent crowding, decay, and the ravages of worms and insects. The mat shed is kept closely shut, for ginseng will only grow in the dark or a very weak light.

The mats of the sheds are made of round, brown reeds and vines closely stitched together, admitting only the faintest light.

In the second month of the second year after planting (February) the root is regarded as formed and the general shape of the plant above ground attained. * * * The shape is nearly that of the matured plant. * * * In the following February (of the third year) the seed plants are transplanted to the adjoining beds, five or six to each cross row, the watering trenches being here between the plant rows. In this second bed the plants remain one year, and are then transplanted to the third bed, and planted still farther apart in their respective rows. A year later they are

¹ Foreign Relations of the United States, 1885, pp. 329, 330.

again transplanted, this time to their final beds, where they remain two and a half or three years. Generally speaking, seven years are required from the time of planting until the plant is matured. After its life in the seed bed, exacting care in keeping out the light is not so necessary, and I noticed the swinging mat was removed entirely from the fronts of sheds of plants in the final beds.

Another writer, speaking of the Korean method, states:

The seeds are sown in the spring in beds of fine leaf mold, no manure being used. The beds are raised about a foot and a half, are protected from the north winds, and screened at night with mats, an awning of mats being placed over the bed during the fierce heat of summer. At the end of the first year the plants are set out, and it takes five or six years for them to reach maturity. The yearly range of temperature at Songdo is wide, say from zero to 90° F.¹

The following facts are contained in a letter from Mr. Nicholas Pike, formerly United States consul at Port Louis, Mauritius:

Two methods of cultivating ginseng are followed by the Chinese, viz, growing from seed, and transplanting young plants found in the wild state. A spot is selected in the dark, damp woods, generally where the soil is rich and loamy. The seeds are gathered when they drop from the plant to the ground. After the soil is dug over, these seeds are sown broadcast, and covered with dead leaves partially decomposed. This plantation they call their nursery. In from fifteen to eighteen months the young shoots appear above the ground, and as soon as they are 2 or 3 inches high they are removed to the permanent plantation, and in three years more the roots are ready for the market. Whenever a root is taken from the ground a young plant is set in its place, so that a plantation once formed is producing all the time.

Another authority² makes the following statement concerning the cultivation of ginseng in North China:

It grows best in sandy soil. The seed is sown in spring; the roots are taken up in autumn, stored in a room, the temperature of which is above freezing point, and covered with dry earth. Next spring they are planted out, and again lifted and stored in autumn, and this process is annually repeated until the ginseng (sometimes in the fourth year, sometimes in the fifth) has attained its full growth.

Although the cultivation of ginseng has frequently been attempted in this country, it has never until recently met with success.³

One of the successful growers of the root is Mr. George Stanton, who has experimented largely for the past ten or twelve years with this crop. During a recent visit to his plantations he furnished the data from which the following account of his methods is compiled:

Mr. Stanton starts his plantations either by sowing the seed or by transplanting the wild roots. By the former method from four to seven years are necessary to produce the first crop of marketable roots. During this time the land yields no income. When wild roots are transplanted, much less time is required. The roots are gathered in the autumn, the seed of the plants being collected and stored, as will be described later. The seed of the transplanted plants is gathered at the close of the following season; but the transplanted roots are not

¹Bulletin of Miscellaneous Information, Royal Gardens, Kew, No. 64, p. 107 (1892).

²J. J. F. Bandinel, United States Consular Reports, loc. cit., p. 233.

³The following is a list of all the ginseng growers with whom the Division of Botany has had correspondence: George Stanton, Summit Station, N. Y.; J. W. Sears, Somerset, Ky.; H. P. Kelsey, Kawana, N. C.; Wayne Parrish, Nellwood, Ga.

dug until four or five years from time of setting, when the marketable ones are removed and dried, and all undersized ones are replanted. The woods are searched each season for new roots, which are transplanted as before. This method of selecting, culling, and transplanting is repeated every autumn with successive beds, until the roots raised from the seed sown each succeeding fall insure a regular annual harvest. By that time the collecting and transplanting of wild roots will have become unnecessary, the constantly enlarging beds furnishing a plentiful supply of seed in addition to their crop of roots. It is important that a sowing be made each season, since the neglect of a single seeding will show itself in the partial failure of a crop in some future year.

Ginseng may be cultivated in the forest, in the garden, or in the orchard. In the forest the seed may be sown in any secluded place without elaborate preparation, and it may be left to nature and time to produce a crop of roots; but this is a slow process and more or less precarious on account of the danger of the seed drying. It is better to sow in a bed prepared in the woods, to furnish protection from the browsing and trampling of stock, and to transplant from this bed to other forest beds or to plats prepared in the home acre. In this way the plants will be given a natural environment during their infancy, at which period they are most liable to injury, especially in the cultivated plantation. It is perhaps needless to say that all the forest beds should be so located as to prevent the accidental or intentional digging of the roots by ginseng hunters.

In the preparation of forest beds it is important that all tree roots be destroyed and that each year their encroachment upon the beds be prevented by cutting around the bed with a sharp spade. It is also advantageous to make an application of potash and phosphoric acid, the former as the sulphate or the muriate or in wood ashes, the latter as ground bone, superphosphate, or other phosphatic fertilizer.

Suitable woods not being available, any light, friable garden soil will answer the purpose provided ample shade can be obtained. In the absence of trees a very good shade may be formed by erecting lath roofs over the beds. For the sake of economy and for convenience in handling, these may be made in square sections as wide as the length of a lath, leaving slits about half an inch wide for the passage of light between the slats. The sections may be made very firm by clinching the nails. In the month of May before the sun becomes too strong these sections should be tied to a framework of light scantling, such as is represented in the drawing (fig. 4). In the autumn the sections may be easily removed and stored in a dry shed. Their removal is necessary where the snowfall is very heavy, since the screens will break with the weight of snow they would often be obliged to carry. In regions of light snowfall their removal is not absolutely necessary, but they will last longer if thus protected.

In the preparation of the soil for the bed, well-rotted horse manure may be used to advantage, in the proportion of about one wheelbarrow load to an area of 3 by 16 feet, less if the soil be very rich, more if rather poor; although poor soil should be avoided if possible.

Light, sandy soils will require a heavier dressing than the denser, more retentive soils. Ginseng, in its native haunts, is well supplied with the humus of decaying leaves. Hence, this constituent of soils must be furnished in liberal quantities. Nothing is better for this purpose than the natural leaf mold of the woods, next to which is, perhaps, well-decayed, strawy litter. When obtainable, the former should be given the preference.

For convenience in manipulation, the beds should be parallel and be separated by narrow walks, at intervals of about 4 feet. In fact, since

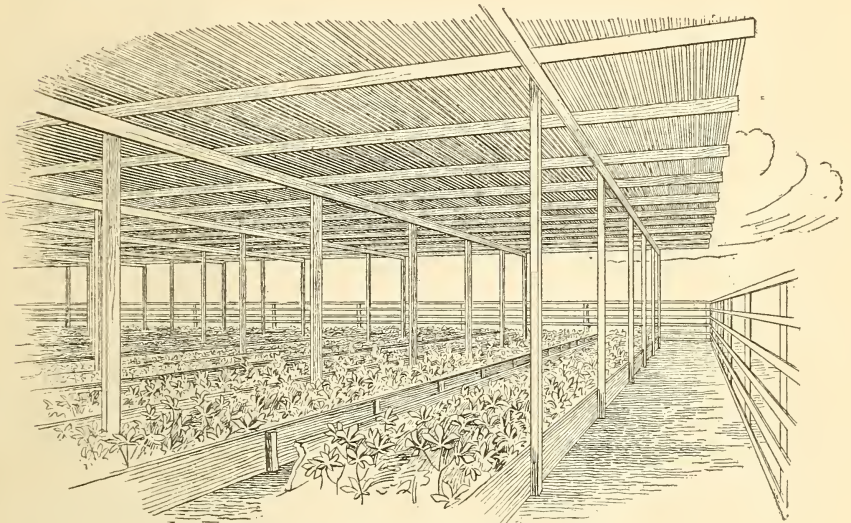


FIG. 4.—Ginseng growing under lath shed.

ginseng culture will not admit of power cultivation, but is dependent entirely upon hand work, considerable inconvenience may be experienced in weeding the centers of the beds if a greater width be employed.

Either roots or seed may be planted in beds such as those described. If roots, they should be set at greater or less distances, according to their age and size at the time of transplanting, roots of 2 or 3 years being set from 4 to 6 inches apart each way, and older ones farther. When the plants are from 4 to 7 years old they may, after the seed harvest, be dug, sorted, and disposed of in the manner already explained. In digging, great care should be exercised not to mutilate their roots, as their value is increased in proportion to their freedom from blemishes.

The seed may be either sown at once or stored. If sown, it is permanently disposed of; but since it lies inert for eighteen months there is often great risk of its drying out, to prevent which the ground must

be carefully mulched and shaded during the hot months of summer in addition to the usual mulching with leaves during the winter. Freshly gathered ginseng seeds planted in the autumn of 1897 may be expected to germinate in the spring of 1899. If, on the other hand, the seed be stored, as great care must be taken to prevent drying as if it were planted directly, since ginseng seed once dried is ruined. The best method of storing is to stratify the seed in a mixture of carefully sifted loam and leaf mold. If not finely sifted before stratification, considerable difficulty may be experienced in separating the seed from the earth. The box of soil and seed should be kept covered and in a place where it can not become dry. Since the seeds will stand freezing, a cold cellar or the north side of a barn would be a good place to winter them. In the summer the box may be buried in the soil in a cool and shady place where the ground is not likely to dry out. When stored in this way the seed is sown in the autumn one year after being gathered. It will then sprout the following spring.

The seed should be sown in drills 2 or 3 inches apart, the seeds being set singly at distances of about an inch below the surface. An area of about 12 square feet is ample for sowing an ounce of seed. After sowing, the bed should be covered with a muck or leaf-mold mulch to the depth of perhaps an inch and this strewn with brush to catch leaves, which will act as a protection during the winter. In the spring the brush may be removed.

The beds will not demand any special care beyond the removal of the weeds and the application of a top dressing of well-rotted horse manure in the autumn after the tops have died down. No stirring of the soil or other cultivation is practiced. The seed bed is used merely as a nursery in which the plants remain two seasons and from which all the other beds are stocked in the autumn when the roots in older beds are harvested.

In the orchard the beds may be managed in about the same manner as in the garden. The roots do well under apple but, for some reason not understood, poorly under cherry trees. It has been found better to avoid locating the beds under summer apple trees, since the numerous early windfalls are liable to injure the growing ginseng plants. By the time the winter apples begin to drop the ginseng plants have attained their growth for the season.

Mr. H. P. Kelsey, of Kawana, N. C., who also cultivates ginseng, pursues essentially the same methods as those followed by Mr. Stanton.

Mr. J. W. Sears, of Somerset, Ky., another grower of ginseng, has kindly furnished the information from which the following is compiled:

He had on his farm a rich north hillside, well timbered, from which all the undergrowth was grubbed up and the saplings and large timber thinned out, enough being left for shade. The ground was then cleared of all weeds and dry leaves, and made mellow by spading, the resultant soil being a loose, rich humus. The beds were 2 feet wide with a walk

of 1 foot between them. Roots and seeds were planted 4 inches apart in cross rows, very large roots farther apart, the distance between the rows being 9 inches. The seeds were planted in the autumn, while fresh, and before the falling of the leaves, in order that the latter might act as a mulch, and protect the bed from freezing. He also has similar beds prepared on open lands. Their surface is covered with about 2 inches of humus. After the seeds and roots are planted, the beds are covered with leaves and brush for winter protection. In the spring frames are placed over them, on which a lot of brush is thrown. This allows the rain to fall through and yet affords the requisite shade.

The following is an extract from an article on the Cultivation of Ginseng, by Mr. A. S. Fuller, which appeared in the *American Agriculturist* for December, 1890 (p. 645):

It appears to thrive best in loamy soils, such as are usually found in sugar maple and oak forests at the North. Shade seems also to be essential, for when the plants are exposed to the direct rays of the sun they soon die out, and for this reason open field or garden cultivation of the plants has rarely or never been attended with success. The proper way to start a plantation is to select a piece of land at the edge of some forest where the plants are found growing wild. Then clear out all the underbrush and small trees, leaving just enough of the large ones to afford the shade required. This should be done in spring or during the summer. Then break up the surface of the soil with a harrow, steel rakes, hoes, or other implements, to the depth of 2 or 3 inches, removing all weeds, grasses, and their roots. The bed thus prepared will be ready for the reception of seeds and small unsalable roots as collected in the autumn, the season of ripening depending somewhat upon latitude.

Ginseng berries are of a crimson [scarlet] color when ripe, each containing two seeds, and are produced in small clusters at the top of a central peduncle, elevated above the principal leaves. When gathering the seed the roots may also be dug up, and all small and unsalable ones preserved and replanted in the prepared bed. The seed should be rubbed from the pulp very carefully with the hand, and then sown, or better, pressed into the ground with the fingers, about half an inch deep, and one every 6 inches along the row. The rows should be from 1 to 2 feet apart for convenience of removing weeds, should they appear. Both seed and plants should be in the ground before hard frosts occur in autumn, for when these come the leaves of the large trees will fall on the bed and give the natural protection required.

The following season no cultivation will be needed—if the bed is thinly covered with leaves—except to cut out sprouts and remove any large coarse weeds which may spring up from seeds or roots left in the ground. If winds blow away the leaves needed as a mulch, a few old dead branches of trees may be scattered about to hold the mulch in place. At the end of the third season the roots will have reached a marketable size and may then be dug, and the same bed worked over and restocked with seeds or small plants.

These different instructions for the cultivation of the American root harmonize in the main, and a method of ginseng culture for this country may be said to be pretty well worked out.

The results of the experiments on the native plant do not seem wholly to agree with the oriental method of cultivation. The Koreans, and in some cases the Chinese, would seem to plant seed in the spring, which is not generally advisable in this country. Indoor storage of the roots seems hardly called for in case of a plant which endures the

severity of a Canadian winter. Yet we must remember that under its natural conditions it is heavily protected by standing forests, fallen leaves, and a thick blanket of snow. If grown on exposed ground, therefore, it will at least need the covering of leaves advised by the American growers.

IMPROVEMENT OF THE ROOT.

Mr. Stanton's method of cultivation and handling seems well adapted to secure immediate results. It will be seen, however, that no provision is made in his system for the improvement of the stock, and this is a point which should be considered by some, at least, of those who raise seed for the market. It is to be presumed that ginseng will respond to the methods used for the improvement of other cultivated plants.

In the amelioration of any plant the originator selects for propagating purposes only such individuals as to a greater or less degree approach a definite form which he has in mind. He sows the seed produced by these plants and among the hundreds of seedlings obtained may be so fortunate as to discover one or two specimens which still more closely approach his ideal. These are carefully saved and propagated from as before, all others being discarded. This process of selection is continued, the proportion of "improved" specimens constantly increasing, until at length the seed "comes true," or, as plant breeders term it, the "type is fixed."

So in the case of ginseng, if the very best specimens be kept in a bed by themselves and given a little extra attention, the seed saved from them planted separately, and the process of selection already described rigidly adhered to, not only should the size of the roots be increased and the quality improved, but the proportion of inferior specimens should be reduced and the time required to produce a marketable article be diminished. On the other hand, if the large roots be constantly removed and only the small ones retained, the seed produced by these inferior grades will tend constantly to diminish the proportion of large roots and the size attained by individual specimens will gradually become less, while the time required to produce roots of a marketable size will become greater and greater as the years advance.

It is perhaps needless to add that the seed produced by inferior roots should be kept separate from the "pedigreed" seed.

CHEMICAL ANALYSIS.

The following fertilizer analysis¹ of ginseng root may be of value to anyone experimenting with ginseng fertilizers:

Substance.	In the dried root.	In the ash.
	<i>Per cent.</i>	<i>Per cent.</i>
Crude ash.....	5.278
Nitrogen.....	1.660
Lime.....	.856	16.22
Phosphoric acid.....	.535	10.14
Potash.....	.776	14.70

According to the United States Dispensatory, "Mr. S. S. Garrigues obtained from ginseng a peculiar substance, which he named panaquilon, and gave the formula $C_{12}H_{25}O_9$."²

THE CULTIVATED ROOT.

The ginseng most in demand for exportation is large and heavy. Except in case of specimens resembling the human form, the less the root is branched the better. These three attributes—size, weight, and smoothness—are most frequently attained in the cultivated beds, where, on account of the frequent transplanting, the seedlings produce comparatively few branching roots, but have great numbers of minute fibrous rootlets which rub off during the washing and drying processes with no appreciable defacement of the main root. In drying, the cultivated roots require less time and shrink less than the roots from the forest. On account of their better appearance they command a higher figure in the market. One grower sold his 1897 crop of cultivated roots for \$1.50 more than the market quotations upon the best quality of New York wild root. Although this is unusual, it is common for the ginseng dealers to give better prices for superior root, and the cultivated as a rule obtains this advanced figure.

SELECTION AND PREPARATION OF THE ROOT.

In the selection of the roots for market the grower will do well, aside from the question of improving stock, to follow the plan of drying only the well-grown roots and transplanting others. By this practice he will have less work to do in the washing and drying processes; his roots will shrink less in the course of drying; his product will command a higher price in the market, and he will gain the confidence of the wholesaler to whom he ships.

The preparation of the root for the market is a very important matter. Large amounts of good roots are materially injured by improper treatment after they are taken from the ground. To prepare them properly,

¹ Prof. Alfred M. Peter, Report of Kentucky Agricultural Experiment Station, 1892, p. 19.

² U. S. Dispensatory, 17th ed., 1896, p. 1712.

they must be washed clean in water with a broom or brush. If there is a large amount to prepare at one time, place the roots in a tub with plenty of water, and with a stiff broom wash thoroughly, changing the water several times. Any roots which are not then thoroughly cleaned should be finished with a hand brush.

They are now ready to be dried, and great care must be used in doing this not to burn them. The drying may be done in the sun or by a moderate artificial heat, and the quicker it can be accomplished with-

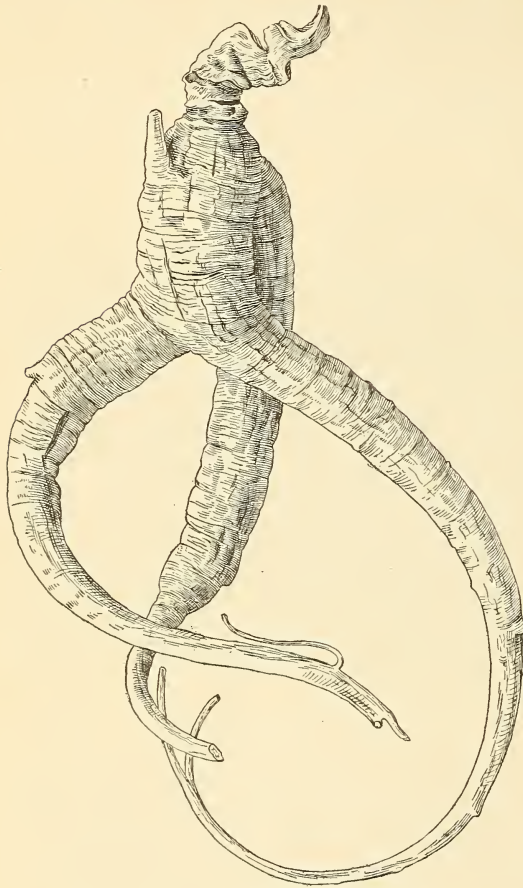


FIG. 5.—Dried root of ginseng from wild plant.

out overheating the better will be the appearance of the root. As the demand is for entire and perfect roots, cutting or splitting must never be resorted to in order to hasten the drying. The root shrinks considerably during the process, losing about two-thirds in weight. The cultivated root does not shrink so much in drying as the wild, and is consequently the more profitable to cure.

Although ginseng is often dried in pans over a stove or in an oven, it is better to employ a more gentle heat. Mr. Stanton, who has tried all kinds of drying, finds that the root dries best in a current of warm air. A simple and efficient drier may be made out of a packing case placed in an upstairs room, the heat being supplied by the pipe from a stove in the room below. Galvanized iron trays with wire netting bottoms may be made to slide like drawers into the case. A draft of air may be admitted at the bottom near the pipe, pass through the trays of roots, and out at the top away from the pipe. Such a drier having 20 trays with a surface of about 200 square inches each will hold about 40 pounds of green roots. The one built upon this pattern has given satisfaction and cost less than \$10 for time and materials.

It is impossible to give the time required for drying, since the roots dry very unevenly, the cultivated quicker than the wild ones, the solid more rapidly than the spongy.

As soon as the fibrous matter is brittle the roots should be trimmed. The trimming consists in removing the hair-like rootlets by hand. These fibers are usually more abundant upon the cultivated than upon the wild roots, but the difference is more than offset by the much larger size of the former. After trimming, the stripped root is returned to the drier to be finished. The small rootlets or trimmings are sold at a nominal figure for local drug trade. The large ones, when thoroughly dry, are put in paper sacks or clean boxes to keep them free from dust and vermin, and are then ready for shipment to the wholesale buyers for exportation.

A process employed by the Chinese to produce a yellowish translucent appearance in the root, which adds to its value in their estimation, is thus described by Father Jartoux:¹

They take care to wash it well and cleanse it with a brush from all extraneous matter. Then they dip it into scalding water, and prepare it in the fume of a sort of yellow millet, which communicates to it a part of its color. The millet is put into a vessel with a little water, and boils over a gentle fire; the roots are laid upon small transverse pieces of wood over the vessel, and are thus prepared, being covered with a linen cloth or some other vessel placed over them. They may also be dried in the sun or by the fire: but then, though they retain their virtue well enough, yet they have not that yellow color which the Chinese so much admire. When the roots are dried, they must be kept close in some very dry place; otherwise they are in danger of corrupting or being eaten by worms.

According to Mr. Pike, the ginseng now grown in northern China under Government supervision is somewhat peculiarly treated, "being washed and dried by steam, which makes it very white" and secures for it a large price; "but the Chinese consider that this treatment deteriorates it medicinally."

Mr. Pike elsewhere states² that this process is applied to the root immediately after it is dug and washed, and that it makes it more transparent.

Another authority,³ referring apparently to the same Chinese article, states: "It is cured by steaming in a steaming basket. If intended for use in the south, sugar is added; if for use in the north, no sugar."

The clarifying process is thus described by Mr. Foulk:⁴

Soon after the seeds have been gathered in October the plants and roots intact are carefully taken from the earth. The stems are readily broken off, the roots washed, placed in small baskets with large meshes, and at once taken to the steaming house. Here are flat, shallow iron boilers over fireplaces, over which are earthenware vessels, 2 feet in diameter and as many high, with close-fitting lids. In the bottoms of the earthenware vessels are five holes 2 inches in diameter. Water is boiled in the iron vessels, the steam rising and filling the upper vessels through these holes.

¹ Jartoux, Father, loc. cit., p. 246.

² Scientific American, Vol. LXIV, p. 69 (1891).

³ J. J. F. Bandinel, United States Consular Reports, loc. cit., p. 234.

⁴ Foreign Relations of U. S., p. 330.

The small baskets containing the roots having been placed in the earthen vessel and the latter tightly closed, the steaming process goes on for from one and a half to four hours, when the roots are removed and taken to the drying house. This is a long building containing racks of bamboo poles, on which in rows are placed flat drying baskets. Under the floor of the house, at intervals of 3 or 4 feet, are fire-places, the smoke from which passes out of small holes in the back of the house under the floor level. In the baskets of the drying house the roots are spread and the fires kept going constantly for about ten days, when the roots are supposed to be cured. From here they are packed for the market in rectangular willow baskets closely lined with paper to exclude moisture.

During this process the roots become very toughly hard, and their color changes from carrotly white to nearly a cherrywood red. They break hard but crisply, exhibiting a shiny, glassy fracture, translucent, dark red. The ginseng resulting from this process is called hong-sam (red ginseng), and is the article prohibited from export from Korea in all the treaties made by Korea with the western powers. It is the most common ginseng seen in Korea, and by far the majority of it is produced in the Songto section.

It is evident from a comparison of the above statements that the term "clarification" is of loose application, being used in some instances to denote a process merely of cleaning and selection. Thus in Mr. Shepard's report (see p. 13) the root is said to average when crude about \$2 per pound; when clarified, from \$4 to \$6; when reclarified, from \$6 to \$8. Comparing this statement with Mr. Cheshire's graded valuation (see p. 14), it seems clear that Mr. Shepard's clarified and reclarified are both included in Mr. Cheshire's crude, which is said to constitute the bulk of American shipments. Mr. Cheshire's report intimates that a small portion of the American import is clarified in the proper sense.

The treatment last described is doubtless that which is most properly called "clarification," since specimens purchased in Korea, through the Department of State and now in the pharmacological collection of the Division of Botany, answer the description given by Mr. Foulk. Similar specimens were also seen in Mr. Stanton's museum. Doubtless American skill can produce an article by some such method which would be acceptable to the Chinese, but it would hardly be wise to undertake steaming on a large scale without fuller information or careful experiment.

PROFITS.

The following extract will give some idea of the profits which may be hoped for by a judicious grower of ginseng. Mr. George Stanton says:¹

My grounds have produced, up to January 1, 1895, 95 pounds dry root, which sold for \$465. This season's crop will be about 32 pounds, value \$165, making a total product of 127 pounds, value \$630, in eleven years. * * * In 1895, from 7½ beds 3 by 16 feet each, were taken 2,545 roots, weight, 148½⁵/₁₆ pounds. From these were taken out for replanting 2,312 roots, weight 59¼⁴/₁₆ pounds, leaving 88¾⁷/₁₆ pounds to be dried for market, making 30¼ pounds dry, which sold for \$161. Six of the beds also produced 2,408 seedling roots, weight 19 pounds. In 1896, from 3 by 28 feet of ground, 587 roots, weight 46 pounds, were taken, and 491 roots, weight 13 pounds, taken out for replanting, leaving 33 pounds to be dried, making 11 pounds dry,

¹Rural New Yorker, Jan. 8, 1898.

which sold for \$60. There were also 704 seedling roots, weight, $4\frac{9}{16}$ pounds. In 1897, from $8\frac{1}{2}$ beds 3 by 16 feet each, 2,270 roots, weight $126\frac{3}{16}$ pounds were taken; 1,582 taken out for replanting, weight $29\frac{1}{8}$ pounds, leaving $96\frac{3}{16}$ pounds to be dried, which made 32 pounds dry, value \$165. There were also 1,505 seedling roots, weight $8\frac{1}{8}$ pounds. Had the entire product of marketable roots from the 18 beds—320 pounds—been dried, it would have made about 106 pounds dry, which would have sold for \$575. This will do very well for $4\frac{1}{2}$ square rods with five years' cultivation. I do not need to add the value of seed produced during cultivation or the value of the 4,617 seedling roots.

It may be further stated that the seed is worth about \$1 per ounce, and that an ounce contains about 500 seeds. The sale of seed might in some cases be an item worth taking into account.

This somewhat remarkable showing makes it evident that money can be made in growing ginseng. But those who, inspired by this example, feel inclined to enter the business should remember that Mr. Stanton's success was attained through more than a decade of study and experiment. Though the results secured by him and others can be utilized by the beginner, success will still depend on patient and intelligent effort, not to say on a natural aptness peculiar to the man. To rush without experience into the business on a large scale may easily entail disappointment and loss.

The ginseng industry seems to be a promising one, but it must be borne in mind that it may be easily overdone. The consumption of ginseng, though large, is at best limited, and the market may be easily glutted, as, indeed, it sometimes has been already. On the other hand, the cultivated beds are not being extended fast enough to supply the deficiency in the wild root. The crop is one which can be grown incidentally to general farming without any great outlay of capital, and further, if there should be a temporary decline in price, the grower can leave his roots in the ground, knowing that they are improving in quality. It is to be considered, too, that the novel and still somewhat experimental character of ginseng culture will tend to prevent any general rush into it, while many who undertake it without sufficient care or patience will fail.

ADULTERATION AND FRAUD.

In the sale of ginseng in China various frauds are perpetrated, consisting of the mixture of lower grades with the higher and the substitution of other kinds of roots.

The Korean root, which ranks after the Manchurian, constitutes the only available supply of native root in the hands of traders. This root is frequently sophisticated; Japanese ginseng, which is itself often adulterated with the roots of *Campanula glauca*, being often found mixed with it. Other species of Campanulaceæ belonging to the genera *Adenophora* and *Platycodon* are frequently used to adulterate and replace the genuine root, and it has even been stated that Japanese ginger has been found in some samples.

It has been claimed by Messrs. Hirsch & Lowenstein, of New York, that Japanese ginseng has been imported into the United States, shipped to the interior of the ginseng country, sold to country merchants in small quantities, and resold by them to the wholesalers, who export it as American ginseng. Upon learning of this alleged fraud, authentic specimens of American and Japanese root, the latter imported by the Department of Agriculture from Japan, were examined by Mr. A. J. Pieters of the Division of Botany. He found upon careful microscopical study of cross and longitudinal sections that no characters can be found in the Japanese roots which are not also observed in the American. It is stated by one ginseng dealer that when the Japanese root is broken in two the surfaces of the fracture differ from similar surfaces in broken American root in much the same way that the fractured surfaces of the hard wheats differ from similar surfaces in the soft wheats. It has been noticed, however, that some specimens of American root have the same kind of fracture as the Japanese, and the difference may be merely an incidental variation due to different methods in drying; roots dried in mild heat exposing a different fracture from roots dried more quickly in a more intense heat. This test is, however, not sufficiently constant to be of general application.

Unless Japanese ginseng could be laid down in New York in wholesale quantities by sailing vessels it would cost too much to distribute the root in small lots to the country dealers for mixing and reshipment. If it were imported in any considerable quantity, it seems more likely that the adulteration would be practiced in the New York market by the wholesalers themselves. It is believed, however, that no adulteration with the Japanese article worthy of extended notice is practiced, since the imports of Japanese ginseng into the United States for the years 1895 and 1896 were \$846.60 and \$358.19 respectively. Even if the whole of this imported ginseng were used for sophistication of American roots, it would form but a very small percentage of the actual output, which amounted in 1896 to \$770,673; but it is believed that this Japanese root found its way to the States upon the Pacific Coast, there to be used not to adulterate the American article, but to supply the demand of the resident Chinese and Japanese.

Apart from adulteration there is little fraud practiced except by a few collectors, who load the root with nails, screws, lead, and other heavy substances to make the sample "weigh up well." These foreign substances may be inserted while the root is soft with comparative ease. Upon drying, the shrinking of the root generally exposes the metal. Little loss is sustained, however, through this fraud, since the wholesaler refuses such roots as have been plugged, and the country merchant is supposed to shift his prices when bartering groceries and dry goods for ginseng roots.

