



Commercial Production of American Ginseng (*Panax quinquefolius* L.)

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ABSTRACT

Hsu's Ginseng Enterprises in Wausau, Wisconsin, provide properly stratified seeds to other commercial growers and roots to the herbal market 4 y after initial field-grown plantings. Woods-grown ginseng requires up to 8 y for production. Seeds of northern sources exhibit deep simple morphophysiological dormancy and must be carefully handled during harvest and immediately stratified for up to 18 mo. Successful germination, establishment, growth, and production require adequate shade, leaf litter, nutrition, and disease and pest prevention. Over 75% of all American ginseng production in the US occurs in Wisconsin. Currently, Hsu's Ginseng Enterprises include 405 ha (1000 ac) of land in production as cultivated fields and "woods-grown" beneath hardwood forests.

KEY WORDS: American ginseng, *Panax quinquefolius*, seed propagation, seed production, plant production, woods grown

NOMENCLATURE: (fungi) Farr and others (1989); (species of *Panax*) Wen and Zimmer (1996); (North American plants) ITIS (2001)

American ginseng (*Panax quinquefolius* L. [Araliaceae]) is native to the eastern half of North America from Georgia to Quebec and west to the Mississippi River from Alabama to Minnesota and western Iowa. It is an obligate shade plant that inhabits the understory of hardwood forests with well-drained, porous, and humus-rich soils and is commonly found on upland north- and east-facing slopes. It is also found in coniferous forests and/or on south-facing slopes in soils composed mostly of sand and clay. Shade and loamy soils are requirements for thriving wild populations.

The genus *Panax* is in the Aralia family (Araliaceae), which includes 6 species of herbaceous perennials found in North America and Asia. All species have thick roots and palmately compound leaves borne in whorls. The small, white flowers are borne in terminal umbels bearing a fleshy drupe containing 2 to 3 seeds after maturation.

The genus name is derived from the Greek word "pan-axos" meaning "all-healing." The common name "ginseng" comes from 2 Chinese words meaning "likeness of man," referring to the mature root that resembles a human figure. Two species are native to North America: American ginseng and the uncommon dwarf ginseng (*P. trifolius* L.).

HISTORY AND USES

About 4600 y ago, Huang Ti, the first ruler of China, described the medicinal properties of Asian ginseng (*P. ginseng* C.A. Meyer) in *Nei Ching Su Wen*, the first written text of internal Chinese medicine. Ginseng is used for stimulation, added energy, disease prevention, adjusting bodily systems, and increasing endurance. Active compounds known as ginsenosides are found in all species and are responsible for the medicinal effects. In Chinese medicine, American ginseng is a yin (cool) tonic for those who are yang (hot) in nature. It is a long-term tonic used in all seasons by both sexes and all ages.

Prior to European contact, American ginseng was widely used as a cure-all by many tribes of American Indians throughout the eastern half of North America. It was described by a French

Jesuit missionary in 1716 near Montreal, Quebec, and was later described from collections from New England in 1750. By the late 1700s, American ginseng was exported to China by the American Fur Trading Company. Ginseng roots and furs were the first American exports by colonists (NYSDEC 2001). Heavy collection from wild populations continued until the late 1800s. By the turn of the 20th century, American ginseng farming became quite common throughout eastern North America as wild populations became increasingly rare due to over-harvesting. As a result, American ginseng is a native North American plant intensively farmed as a horticultural crop. Hsu's Ginseng Enterprises include cultivation on large farms and under woods-grown conditions.

FARMING FOR SEED AND ROOT PRODUCTION

For 27 y, American ginseng has been commercially farmed for seed and root production at Hsu's Ginseng farms in Marathon County, Wisconsin. Seeds exhibit deep simple morphophysiological dormancy and take up to 2 y to germinate. High summer temperatures are required to break 1 type of physiological dormancy, and winter temperatures are required to break the second physiological dormancy. Morphological dormancy cannot be broken until high temperatures overcome the first physiological dormancy and seeds are subjected to autumn temperatures. Embryo growth occurs during winter (Baskin and Baskin 1998). During stratification, seeds are subjected to warm temperatures during late summer and autumn. Remaining dormancy is broken by cold stratification during winter. Northern seed sources require up to 18 mo of stratification with germination occurring the following May. Seed sources from the southern populations may germinate the first spring.

Drupes containing seeds are collected from mature field plants in late August and early September. Freshly harvested seeds are not allowed to dry out during extraction from the drupes and are immediately stratified. Seeds are buried by hand in pure mason sand at



Photo by Kas Dumroese

Figure 1 • Field-grown American ginseng plants emerging in spring in mulch-amended beds under 75% shade.

1.2 cm (0.5 in) sowing depth in cedar boxes 20 to 30 cm (8 to 12 in) deep and 0.9 m X 2.4 m (3 X 8 ft) in dimension with screen bottoms. Screens are also placed over the top of the stratification boxes to prevent rodent, bird, and slug damage. Boxes are placed in lath houses with 75% shade and are left until the following September. Seeds are then excavated from the stratification boxes and are washed and floated prior to packaging. Properly stratified seeds are sold to other commercial growers. Seeds are relatively large, 13,225 to 14,300 seeds/kg (6000 to 6500 seeds/lb).

For field production of roots, properly stratified seeds are sown by a mechanical seeder at the rate of 113 to 135 kg/ha (100 to 120 lb/ac) into 1.8-m-wide (6-ft) field beds for ease of cultivation and harvesting. Seed coats are cracked at this stage but the epicotyl is not yet present. After sowing, field beds are mulched with oat straw and undergo the second-year cold stratification

during winter. Oat straw provides a source of organic matter to the soil, acts as a mulch for moisture retention, and minimizes frost heaving and damage during early spring. Germination usually occurs the first week of May in Wisconsin. Root growth and incidence of diseases are strongly influenced by plant spacing. The desired plant density on emergence is 50 to 66 plants/m² (15 to 20 plants/ft²).

Seedlings develop 1 to 3 leaflets, form a terminal vegetative bud by July,



Photo by Kas Dumroese

Figure 2 • Computer models use weather data to predict when fungicide applications are necessary.

Photo by Kas Dumroese



Figure 3 • “Woods-grown” ginseng emerging from raised beds of mulch under an existing forest canopy.

and are 7.5 to 10 cm tall (3 to 4 in) by the end of the growing season. During the second year of growth, plants remain vegetative and have at least 2 prongs of leaflets. During the third year, plants have formed 3 prongs of leaflets and reach flowering maturity. Flowering occurs in mid June, and seeds are harvested by late August and early September. Roots are harvested for the herbal market during the fourth year.

American ginseng farming is labor intensive and requires high initial investment in capital that includes labor, land, and growing structures (Figure 1). All seeds and roots are harvested by hand. Vinyl netting or wooden lath must be used to provide 75% shading over field beds. American ginseng grows best in well-drained, porous soils rich in humus from leaf litter. Desired fields should have a pH of 6 to 6.5 and adequate calcium levels. Fertilizers are applied as a topdressing during spring and fall when soil tests indicate deficiencies. The spring topdressing usually includes a fertilizer of 10N:10P₂O₅:10K₂O. Fall topdressings are restricted to an analysis of 3N:3P₂O₅:8K₂O.

The most common pests associated with ginseng farming are slugs and fun-

gal diseases. Slugs eat seeds, seedlings, or mature plants and are controlled by commercially approved molluscicides. Fungal diseases are controlled by proper cultivation, providing for adequate air movement between plants, and by commercially approved fungicides (Figure 2). Diseases include damping-off disease (*Fusarium* Link:Fr. and *Rhizoctonia* DC. spp.) and root rot (*Phytophthora cactorum* (Lebert & Cohn) J. Schrot.), which are controlled by Bravo fungicide (chlorothalonil). Leaf and stem blight (*Alternaria panax* Whetzel) is controlled by Alleitte fungicide (aluminum tris).

Woods-Grown Ginseng

Another method we use to cultivate American ginseng is known as “woods-grown” ginseng (Figure 3). Woodlots of maple and oak (*Acer* L. [Aceraceae] and *Quercus* L. [Fagaceae] species) are selected based on canopy cover for providing proper shade conditions. Woodlot preparation generally takes 3 y. Underbrush and dead trees are removed the first year. Understory beds are prepared during the second year by adding about a 45-cm-deep (18 in) layer of composted leaf litter to the soil surface. Any remaining underbrush is also removed. Woods-grown beds are sown

with stratified seeds by a mechanical seeder at the same rate and desired density as with field production in August of the 3 y. Seeds are mulched with oat straw after sowing. Woods-grown American ginseng roots are produced for high quality and character and take 8 y from initial sowing to harvest.

SUMMARY

Cultivated American ginseng has been exported to foreign markets for over 100 y. It is one of the most well-known herbal medicines and is widely consumed in Asia, North America, and Europe. Currently, over 75% of all American ginseng production in the US occurs in Wisconsin. Ginseng can be propagated in fields or under existing forest canopies if the proper level of shade, high levels of organic matter, appropriate soil pH and nutrition, and sufficient plant spacings are provided. Ginseng plantations provide seeds for other commercial growers and roots for the herbal market.

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