



American Ginseng in Iowa: Ecology and History

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ISU FORESTRY EXTENSION

Ecology: American ginseng, *Panax quinquefolius*, is a perennial herbaceous species native to the forests of eastern North America. In the first year of growth, seedlings with three serrated leaflets develop on a two to four inch purple colored stem. Seedlings emerge in middle to late April, about the same time as mature ginseng plants. The above ground stem and leaves grow to their maximum size in early summer. This above ground portion dies back between August and October as the plant senesces for winter dormancy. In subsequent growing seasons, the plant's annual stem begins to fork and additional "prongs" develop with palmately compound leaves of three and then five leaflets. Leaflets are typically ovate in shape with the middle three being larger than the two basal leaflets. Additional leaves or leaflets do not develop within a season, but are added annually with a new season's growth (Davis 1997).



First year, two prong, three prong, and four prong mature ginseng plant with unripe green berry cluster (L to R). Photo by B. Beyfuss

The annual shoot of a ginseng plant develops from a bud on the end of a short rhizome attached to the root top. One year's growth adds a new internode and pair of aerial shoot buds to the rhizome. This series of sequential growth creates a distinct circular pattern of bud scale scars that can be used to age an individual plant relatively accurately. Occasionally, in years with stressful growing conditions plants remain dormant and will not produce an annual shoot. Variations in growing conditions greatly effect variation in plant development. Generally, ginseng plants grow taller with more leaves, leaflets and a larger root every year. Two year old seedlings average between 4 to 7 inches in height, while fully matured ginseng plants can reach from 20 to 24 inches in height. The overall size of the stem may not be a good indicator of a plant's age, but it can be used to roughly indicate the root size. A generalized description of prong development as described by Anderson *et al.* 2002 is as follows; 1st seedlings are trifoliolate, 2nd year plants have a single prong, 3 to 6 year plants have two prongs, 7 to 9 year plants have three prong and 10 to 11 year plants will have four prongs.

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Flower spike with green berries developing on a mature four prong ginseng plant. Photo by B. Beyfuss

At year three to five, a ginseng plant will develop its first flower spike at the tip of the stem. Perfect flowers with white petals begin to form in early May and can continue to develop through mid-August. Both self- and cross-pollination have been observed with no difference in plant growth resulting. The berries will be a green color when they first develop in a tight cluster and then turn a bright red as they begin to ripen in August. After the berries have ripened, they begin to drop while the parent plant goes dormant. These ripe berries are frequently eaten by a variety of wildlife that tends to be poor dispersers of seed. Most populations of wild ginseng grow in clusters with few plants found between widely spaced patches, suggesting that seeds stay in close proximity to the parent plant.

The species reproduces exclusively from the one to three seeds borne in each berry. Individual plants produce one or two berries in their first year of flowering and can produce as many as 20

berries when they mature. Ginseng seed requires an 18 to 20 month stratification period with warm followed by cool temperatures before they can germinate the second spring after berry ripening. Mortality of first year seedlings can be as high as 46%, but decreases greatly as plants age (Anderson *et al.* 2002). Although as long lived as over 100 years, few plants of this species survive for the three to five years that are needed before a plant is mature enough to produce berries and reproduce. This slow reproductive cycle along with poor seed dispersal, frequent pathogen problems, herbivory by animals and harvesting by humans have greatly reduced the wild populations of ginseng.

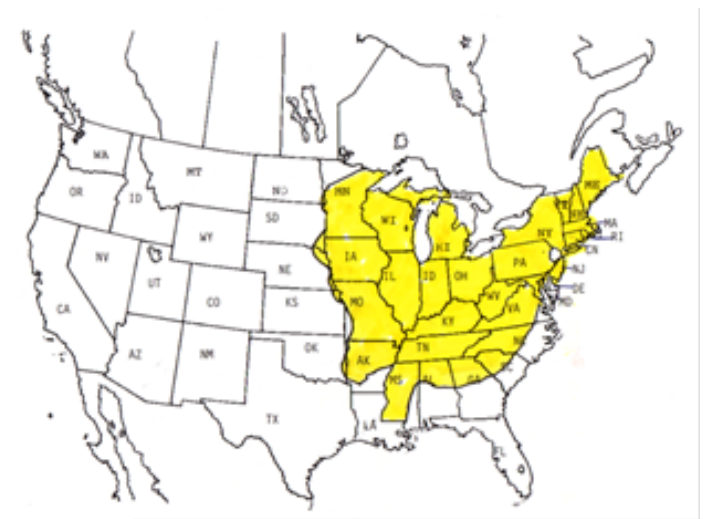
Wild American ginseng is known to prefer very specific growing conditions in primarily undisturbed forests. North to east slopes of 5-20% grade that are cool and moist with greater than 75% shade from hardwood or mixed hardwood-conifer forests are ideal. Ginseng requires moist yet well drained soils, to reduce the incidence of root rot diseases, and slightly acidic soils in the 5 to 6 pH range. Ginseng tends to avoid heavy clay soils with drainage issues, flat bottomlands that may flood, light sandy soils that dry frequently and steeper slopes with thin soils (Apsley and Carroll 2004). Ginseng favors loamy soils high in organic matter, which maintains moist but not saturated growing conditions. Sites characterized by soils with greater than 4,000 pounds per acre of available calcium and greater than 95 pounds per acre of phosphorus have been linked to healthy and highly productive ginseng stands (Beyfuss 1999 and Konsler 1990). In addition to calcium and phosphorus, low magnesium levels are frequently a limit to ginseng growth. The conditions described here are guidelines for finding optimal sights to grow ginseng in the forest.

Good sites for growing American ginseng can be indicated by the species of plants already living there. An overstory of mature sugar maple (*Acer sacharum*), basswood (*Tilia americana*), black walnut (*Juglans nigra*), red oak (*Quercus rubra*), or red elm (*Ulmus americana*) indicates an good source of shade and mulch. Herbaceous species can be good indicators of an undisturbed site with the rich, well drained soils that ginseng needs. Good herbaceous indicator species include; Maidenhair fern (*Adiantum pedatum*), Rattlesnake fern (*Botrychium virginianum*), Christmas fern (*Polystichum acrostichoides*), Trillium (*Trillium spp.*), May apple (*Podophyllum peltatum*), White baneberry (*Actaea pachypoda*), Goldenseal (*Hydrastis canadensis*), Hepatica (*Hepatica acutiloba*), Blue cohosh (*Caulophyllum thalictroides*), False Solomon's seal (*Smilacina racemosa*), Jack-in-pulpit (*Arisaema triphyllum*), Blood root (*Sanguinaria canadensis*), Wild ginger (*Asarum canadense*) and Ramps or Leeks, (*Allium tricoccum*) (Beyfuss undated).



Plant indicators of good ginseng growing sites include (T to B) maidenhair fern, blood root, and white trillium.

History: For over 4,000 years the root of an Asian species of ginseng, *Panax ginseng*, has been used in traditional Chinese medicine. The highly valued roots of ginseng are believed by the Chinese to provide a variety of benefits, but generally it is thought to prolong life while strengthening the human body and mind. Widespread use and trade of ginseng among the Chinese was known by Europeans as early as the 1200s, following the travels of Marco Polo. Knowledge of ginseng and its economic value was not fully appreciated in North America until missionaries described the plant and its extensive use in China during the early 1700s. In 1716 the Jesuit priest Joseph Francois Lafitau discovered a plant near Montreal, Canada that fit the description reported by his colleagues. Father Lafitau sent this plant gathered by the Mohawks to fellow missionaries in China and effectively began the trade of American ginseng. Harvesting of wild ginseng by Native Americans and European settlers spread quickly and was a readily traded commodity alongside furs (Carlson 1986).



Native range of wild ginseng. Figure courtesy of USDA Center for Agroforestry

Widespread harvesting began in Canada and moved south as ginseng was discovered in New England in 1750. Daniel Boone reportedly traded ginseng in the 1780s and lost over 30,000 pounds of wild root when a boat sank in the Ohio River bound for export from Philadelphia. From 1821 to 1899 the U.S. Treasury reported that exports of wild ginseng roots averaged 381,000 pounds a year. Most of this ginseng was sent to China and Hong Kong from the major ports of San Francisco, New York and Washington State's Puget Sound. More than a century of unregulated overharvesting and land clearing diminished wild populations as the plant became increasingly difficult to find. States responded and began protecting ginseng by prohibiting harvesting in the spring and summer months. Exports of wild ginseng saw a significant decline in the 1890s, during the same time that successful cultivation of American ginseng had begun.



Modern ginseng cultivation under artificial shade cloth in raised planting beds. Photo by B. Beyfuss.

The U.S. Department of Agriculture started promoting ginseng cultivation as a supplemental farm income in 1898. Cultivation of ginseng expanded rapidly among growers who thought it an easy opportunity to wealth. Farmers openly shared information in newspapers, private pamphlets, farmer's bulletins and journals such as *Specialty Crops* and *Ginseng Journal*. The first of numerous ginseng growers association was formed in New York in 1902 and insurance policies against crop theft soon became available. Prices for cultivated ginseng were initially higher than those of wild ginseng, but this trend quickly reverted and epidemics of disease drove many early producers out of business. Prices and grower numbers have fluctuated since, with a major decrease when World War II left the major Chinese and Hong Kong markets inaccessible.

In 1975 American ginseng was listed as a threatened species by The Convention for International Trade in Endangered Species. The resulting regulations on wild ginseng created concerns for harvesters while also renewing interest in cultivating ginseng. Recently though, many growers have closed or decreased the size of their production due to declining profit from high production costs and low market prices. Today most of the ginseng is cultivated in Wisconsin with an estimated 90% of U.S. production coming from Marathon County.

Except for a brief period at the beginning of U.S. ginseng cultivation, wild roots have always demanded a higher market price. It is believed that these gnarled and forked wild roots have stronger medicinal properties and are easily distinguished from those of cultivated plants (Hankins 2009). Centuries of deforestation and over harvesting of ginseng in China have increased the demand for American ginseng, especially the wild grown roots. The long history and close cultural ties to the ginseng root in China were the initial driving force behind the export of ginseng and continue to dominate. Over 80% of today's North American ginseng is exported to the markets of Hong Kong. This demand will undoubtedly continue as long as a sustained harvest of American ginseng can be found.



Cultivate ginseng root on the right vs. a wild / wild simulated ginseng root on the left. Photo by B. Beyfuss.

References:

- Anderson, R.C., M.B. Anderson, and G. Houseman. 2002. *Wild American Ginseng*. *Native Plants Journal* 3(2):93-105.
- Beyfuss, R.L. Undated. *The Practical Guide to Growing*. Ginseng. Robert Befuss RR 1, Box 126 N, Freehold NY 12431.
- Beyfuss, R. L. 1997. *Ginseng Soil Characterization and Ecology Study*. Cornell Cooperative Extension of Greene County, HCR 3, Box 906, Cairo, New York 12413.
- Carroll, C., & D. Apsley. 2004. *Growing American Ginseng in Ohio: Selecting a Site*. OSU Extension Fact Sheet F-58-04. Columbus: The Ohio State University.
- Carlson, A. W. 1986. *Ginseng: America's Botanical Drug Connection to the Orient*. *Economic Botany* 40(2):233-249.
- Davis, J.M. 1997. *Ginseng: A Production Guide for North Carolina*. North Carolina Cooperative Extension Service. AG-323.
- Hankins, A. 2009. *Producing and Marketing Wild Simulated Ginseng in Forest and Agroforestry Systems*. Virginia Cooperative Extension Publication 354-312.
- Konsler, T. 1990. *Lime and Phosphorus Effects on American Ginseng: I. Growth, Soil Fertility, and Root Tissue Nutrient Status Response*. *Journal of American Society for Horticultural Science*. 115: 570-574
- Persons, W. S., & Davis, J. 2005. *Growing and Marketing Ginseng, Goldenseal and Other Woodland Medicinals*. Asheville, NC: Bright Mountain Books Inc.