



Medicinal Herb Production Guide

Jackie Greenfield, M.S.
Jeanine M. Davis, Ph.D.

***Ginkgo* (*Ginkgo biloba* L.)**

Introduction

Botanical Information

Ginkgo biloba L., commonly called ginkgo or maidenhair tree, is a long-lived, deciduous, shade tree from China that can reach a mature height over one hundred feet and is the only genus and species of the Ginkgoaceae family existing today. Known for its three-inch wide, fan-shaped leaves that turn golden yellow in autumn, the ginkgo tree can be found all over the world and is one of the oldest species of trees in existence today. Individual ginkgo trees have been known to live as long as 1,000 years. The trees, which are dioecious (bearing male flowers on one tree and female flowers on another), may not flower until they are twenty to thirty years old. The female trees produce a one to one-half-inch, plum-shaped, orange fruit. Male trees are more desirable for cultivation, as the female trees produce an unpleasant odor from the ripened outer coating of the seeds. It is the leaves that are harvested for medicinal purposes.

Bioactive Components

The main bioactive components of ginkgo leaves are flavonoids, biflavonoids, proanthocyanidins, and triarctonic diterpenes, which include the ginkgolides A, B & C. Ginkgolide B has been shown to inhibit platelets in the blood from coagulating. The flavonoids in ginkgo have demonstrated very strong antioxidant effects.

Uses and Treatments

Ginkgo has been used for medicinal purposes for almost 5,000 years. In Chinese traditional medicine, it is used to treat asthma, bronchitis, and various brain disorders. In Asia, the seeds of the ginkgo tree are used to aid digestion and to reduce the intoxicating effects of alcohol. In Europe and North America, ginkgo extract is used for the treatment of circulatory problems, immune system dysfunction and cognitive disorders, including memory loss. There are currently no approved treatments involving the use of ginkgo extracts in North America. However, the FDA regards ginkgo extracts as "probably safe". Germany's Commission E. has approved ginkgo extract for the treatment of intermittent claudication, vascular vertigo, and vascular tinnitus. Some of the uses of ginkgo are listed in Table 1.

Table 1. Modern and traditional uses of *Ginkgo biloba*.

<u>Modern Uses</u>	<u>Traditional/Folk Uses</u>
- Loss of cognitive ability	- Brain disorders
- Poor circulation	- Asthma and bronchitis
- Vision and hearing problems	- Increase life span and sexual potency

Cultivation Practices

Site Selection

Ginkgo grows best in deep, moist, sandy soil and prefers full to partial sun in zones four to eight. It will tolerate poor and compacted soils except permanently wet soils. Ginkgo will grow in a wide range of soil pH and can tolerate heat and drought once the trees get established. For a tree crop, preparation of the soil is just as important as a field crop.

Planting

Propagation can be done by seed, cuttings, or grafting. Cuttings are the preferred method of propagating ginkgo to assure planting of only male flowering trees. Seeds can be planted in the spring or fall. Tim Blakley, co-author of *Medicinal Herbs in the Garden, Field, and Marketplace*, recommends stratifying the seed for four to six weeks if planting in the spring. Blakley sows his ginkgo seeds in one to five gallon pots, then transplants seedlings to the field, spacing them ten to twenty feet apart. Mulching the plants will keep weeds down. Ginkgo can grow twelve to eighteen inches a year. Blakley states the trees should reach a height of six to eight feet before beginning to harvest.

Insects and Diseases

Ginkgo trees have developed an amazing resistance to disease and pests. The *Index of Plant Diseases in the United States* lists the following diseases for *Ginkgo biloba*: leaf spots, *Glomerella cingulata* (anthracnose) and *Phyllosticta ginkgo*; sapwood or wound rot, *Fomes conatus*, *Oxyporus populinus*, and *Polyporus* spp. (sometimes found on living trees following injuries); root knot nematodes, *Heterodera marioni* and *Meloidogyne* sp.; root rot, *Phymatotrichum omnivorum*; and a seed rot, *Xylaria longeana*.

Harvesting, Cleaning, and Drying

The leaves from a ginkgo tree are harvested in fall, as the leaves are turning yellow. Blakley's method of harvesting is to cut the branches with pruning shears, and then pull the leaves off of the branches. He recommends placing the leaves on racks in a dryer designed for herbs, and turning the leaves several times during the drying process to avoid matting. Ed Fletcher, Strategic Sourcing, Inc, suggests setting the dryer temperature at 105°-110°F. Drying time averages from twelve to fourteen hours but may increase or decrease depending on the humidity in the air. When adequately dried, the leaves should have a crinkly and crumbly feel. Fletcher states that there should be no flexibility in the leaf without breaking. When the midrib is dry, the leaf will also be dry. Package the dried leaves in woven poly bags that are light proof or in corrugated boxes, and store in a cool, dry, dark location.

Marketing and Economics

Annual Consumption and Dollar Value

In 2001, between 4.5 million pounds and 5.1 million pounds of dried ginkgo leaves were consumed. This was 34% higher than the amount in 1997 and about 5% higher than the amount in 2000. The dollar value in 2001 was about \$25 million, which was 40% greater than the dollar value in 1997.

Supply and Demand

Historically, positive clinical support propels demand for this botanical. Clinical trials are being done on *Ginkgo biloba* as a treatment option for Alzheimer's disease. An aging population base in North America and Europe has increased demand, due to ginkgo's anti-aging actions. European functional food manufacturers are also incorporating this material into more nutritional supplements and beverages.

Supply and demand for ginkgo has reached equilibrium with a very stable market. Supplies come almost exclusively from large-scale cultivation. Large-scale cultivation is occurring worldwide. A small number of growers produce over 95% of the world's supply. Large commercial plantations exist in South Carolina (US), Japan, Korea, France and China. Sumter County, South Carolina, is home to the largest ginkgo plantation in North America.

Since the supply of ginkgo comes exclusively from cultivated sources, little variation exists in bioactive components among individual harvests. Customers are primarily concerned with a lack of chemical residue on the material. Typical bioactive percentages are 24% ginkgo flavoglycosides and 6% terpene lactones.

Pricing

Ginkgo trades in a low, narrow, price band. In 2001, prices ranged from \$4.00 to \$6.00 per pound for dried leaf.

Distribution Channels

Distribution channels for ginkgo are highly structured. The maturity of this market has resulted in all material flowing through large, vertically integrated companies. Most organizations are located in Europe and draw on imported raw material sources from all over the world.

Commercial Visibility

Ginkgo enjoys a great deal of visibility around the world. It is the main ingredient in a number of herbal products, including "Tanakan", "Tebonin", and "Rokin". In 2001, the most well defined extract of ginkgo, Egb 761, was one of the top-five prescription medicines in Germany. It is available in the United Kingdom, the United States, and Canada as an over-the-counter food supplement. Of the top nutraceutical/botanical companies in North America and Europe, 51% offer ginkgo as a stand-alone product and 78% offer this material as a stand-alone product or as part of a multi-constituent supplement.

In 2001, a report came out on a study concluding that there was no validity to claims that ginkgo improves memory or related cognitive abilities. This question may finally be answered by a \$15 million dollar financed by the National Institutes of Health. The results of this study are not expected until 2006.

This Medicinal Herb Production Guide includes excerpts from, Analysis of the economic viability of cultivating selected botanicals in North Carolina. Strategic Reports. 2002.

References

Dirr, Michael A. 1997. *Dirr's Hardy Trees and Shrubs*. Timber Press, Portland, Oregon. 493 pp.

Fernald, M. L. 1970. *Gray's Manual of Botany*. D. Van Nostrand Company, New York, NY. 1632 pp.

Fletcher, Edward J. 2004. Personal communication.

Leung, Albert Y., and Steven Foster. 1996. *Encyclopedia of Common Natural Ingredients Used in Food, Drugs, and Cosmetics*, second edition. John Wiley & Sons, Inc. New York, NY. 649 pp.

Michigan State University Extension. 1999.
<http://www.msue.msu.edu/msue/imp/modzz/00000667.html>

Ohio State University. http://www.hcs.ohio-state.edu/hcs/TMI/Plantlist/gi_iloba.html

Sturdivant, Lee, and Tim Blakley. 1999. *Medicinal Herbs in the Garden, Field, and Marketplace*. San Juan Naturals. Friday Harbor, Washington. 323 pp.

US Department of Agriculture, Crops Research Division Agricultural Research Service. 1960. *Index of Plant Diseases in the United States*, Agriculture Handbook No. 165. Washington, DC. 531pp.

Walters, Dirk R., and David J. Keil. 1996. *Vascular Plant Taxonomy*, 4th edition. Kendall/Hunt Publishing Co, Dubuque, Iowa.