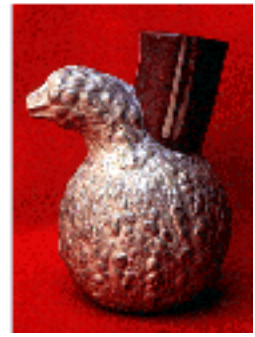




Ethnobotanical Leaflets



Ginkgo biloba

By Kelly Westall

The oldest known living fossil, more than 5,000 years old is native to China. Ginkgo, maidenhair tree, has an average life span of 1,000 years. The oldest trees are serving in the temples of the Chinese's and Japanese Buddhist monks. These trees are considered to be very sacred to their way of life. One of the traditions is the leaves and fruits have been used as a herbal medicine for over a thousand years. The female tree's fruit is a delicacy in food preparation also. Another reason for their stature in civilization is their ability to withstand many outside influences of nature. A tree in Hiroshima survived the atomic bomb of World War II in 1945 on the 6th of August. A 1 km distance from the center of explosion, it was the first to bud in September of the same year. The tree is now known as the "bearer of hope" for the people of Hiroshima. The temple was built around this mighty tree. The front stairs are divided in half to surround and protect the tree. "Engraved on it "No more Hiroshima" and people's prayers for peace." (1) Also in Japan, a shimenawa (cord of rice straw) is tied around the trunk of the tree to keep off evil spirits, showing how sacred these trees are to their civilization.

Ginkgoaceae is dated back to the Paleozoic era. That is over 200 million years ago. The highest diversity of gymnosperms took place during the Cretaceous. The ginkgo was at one point found in numerous places in the world. Fossil records show a decline in the trees around the Tertiary. This is thought to be because of the extinction of dinosaurs, which were the main distributors of the seeds. The first mention in Chinese herbal medicine was during the Ming dynasty in 1436. Ginkgo is recorded as being introduced to the U.S. in 1784. It is considered to be the sole living link between the ferns and conifers. However two species, *Ginkgoites* and *Baiera*, of the genera ginkgo are extinct. *Ginkgo biloba* is the only living species. Although, one of the species thought extinct was found in Vantage, Washington near the Columbia River Gorge. The *ginkgo beckii*, after George Beck, lives in the Ginkgo Petrified Forest State Park.

Structure

Ginkgo can grow to be 20 to 30 meters in height and 9 meters wide with a trunk size up to 4 meters. The branches are long and short with regular, lateral branching and irregular when older. It is sparsely branched, and upright. "Branching appears to be controlled by the distribution of auxin, a naturally

occurring plant hormone."(2) The trunk is grooved and on older plants has a corky texture. It prefers full to partial sun with moist, deep, sandy soil, but can adapt very well to about any given situation. It is also said to be resistant to disease, insect pest, fungus, fire, and air pollution. Growth rate is consider medium, yet provides excellent shade. Leaves are deciduous, falling either in 1 to 2 hours or in a few days. The color may vary depending on the type of ginkgo. Each individual leaf is fan shaped, bilobed, and dichotomously veined blade. They are about 3`` long with a pediole also the same length. The pedioles alternate along the terminal stem. However there are to leaves per pediole. The veins are slightly raised to give a ribbed appearance, also reducing the waterloss from evaporation. "Ginkgo also produces peg-like structures (chi-chi = nipples, sort of "aerial" lignotubers) along the trunk and branches that can grow into the ground and form roots as well as leafy branches above because of the embedded vegetative bud." (1) This has been connected to traumatic events, environmental stress and individual properties of a tree.

Ginkgo is dioecious, meaning the male and female reproductive structures are produced on separate trees. These structures are restricted to the spur branches. The fruits of the female tree are an oval tan-orange. The size range from 2.3-2.7x 1.9-2.3 cm with an apical scar. Seeds will mature in a single season. Fruits from the female tree have a foul smell and can cause a mess when they fall in September and October. The female tree does not reach maturity until after 20 years of growth. The male pollen grains are carried by the wind to the female. This tree is preferred because there is no foul smell or mess on the ground. However in China the female tree is preferred there because the fruits are roasted.

Reproduction

A complete reproductive cycle from the pollination to the production of seeds will take approximately 14 months. In the first year, pollination and the gametophytic phase occur but the embryo does not develop until the following spring of the next year. The strobilus, which produces the pollen, is a loose, pendulous, catkinlike structure with a main axis. To this is attached numerous appendages, each bearing tow microsporangia at its tip. In the cells of the microsporangia is the place were meiosis occurs producing numerous haploid microspores. Cell division takes place in the microspores, giving rise to a five-celled pollen grain. Arising on the axils of bud scales and foliage leaves of the spur branch are the ovuliferous structures. A spur branch may contain either 2 to 3 erect ovules. The ovule contains a seed coat, integument, surrounding the nucleus. Meiosis occurs in the mucellus of the ovule. This gives rise to four haploid megaspore cells. In this stage of development, pollen is released from the microsporangis of the male tree. Wind carries the pollen to its destination, the micropyle at the tip of the integument. The pollen grain is then retracted into the pollen chamber of the nucellus. Multi-branched pollen tubes are then developed.

A single megaspore in the ovule from meiosis will enlarge and undergo free nuclear divisions. No wall will form in this phase of the cycle, only after about 8,000 haploid nuclei are produced will a wall be synthesized. After it has become cellular, the archegonia will move towards the micropylar end of the ovule. Each ovule only contains one egg. At the basal end, the male gametophyte becomes suspended in a cavity above the fertilization chamber. The male gametophyte divides to produce two multiflagellated sperm. Contents of the pollen tube and sperm are released into the fertilization chamber. Approximately

1,000 sperms are released to swim to the archegonium where only one will fuse with the egg's nucleus. "Ginkgo and cycads are the only seed-producing plants that have motile sperm." (2)

The major part of the growth cycle takes place after the fall of the seed to the ground. A mature seed consists of dictyledonous embryo, nutritive tissue of the gametophyte, and a seed coat. The butyric acid, which decays the outer covering, emits a foul smell often described as rancid butter.

Medicine

Ginkgo has many claims of being a healer or enhancer of the human body. Its healing properties have been used since ancient times in Chinese herbal remedies. In traditional medicine, the fruit is considered more important than the leaves. Seeds are used to stop asthma, enuresis, and leucorrhea. Studies have shown that ginkgoic acid and ginnol inhibit certain bacteria and fungal infections. However, taken in large doses, it can become fatal or lead to skin disorders or mucous membrane irritation.

Today the standard extract amounts are 24% flavonoids and 6% terpenes. Out of the research it appears that basically there are three important effects of the extract on the human body: it improves blood flow to most tissues and organs, it protects against oxidative cell damage from free radicals, and blocks many of the effects of PAF (platelet-activating factor) that have been related to the development of a number of cardiovascular, renal, respiratory and CNS (central nervous system) disorders." (1)

Ginkgo biloba has also been tested for aid in Alzheimer's disease. The extract for this is taken from the leaves instead of the fruits. EGb 761 is the chemical used on this disease. It has improved memory, mood, and daily living skills. "Four double-blind, placebo-controlled studies (including one landmark U. S. study) have shown that 120-240 mg of the GBE extract EGb 761 improves quality of life in persons with mild to moderate Alzheimer's disease and vascular dementia." (3) The antioxidant activity in the brain and central nervous system may help prevent age-related decline in these areas of the body. Side effects have been shown to be devoid of anything serious. Another study done for Alzheimer shown ginkgo to boost the brain's energy metabolism of glucose and increase electrical activity. "More than 34 human studies on ginkgo have been published since 1975, showing among other things, that ginkgo can increase the body's production of the universal energy molecule adenosine triphosphate, commonly called ATP."(5)

A primary protective effect of the ginkgolides is their ability to inhibit platelet-activating factor (PAF). Cells release PAF, but too much of this can cause clumping of the platelets. High amounts of this can cause damage to nerve cells, poor blood flow to the CNS, inflammatory conditions, and bronchial constriction. Ginkgolides and bilobalide protect the nerve cells from damage during periods of low oxygen to the tissue. PAF is involved in various inflammatory, cardiovascular, and respiratory disorders. The ginkgolides have an anti-PAF action, helping to modulate various enzyme systems and ion pumps. This helps to explain the broad-spectrum of biological activity.(6)

Ginkgo is widely used for medication, but there is no government monitoring of the manufacture

product as a dietary supplement. "Nearly one quarter of the thirty brands tested did not have the expected levels of chemical marker compounds for GBE." (4) From the products tested, all had lower levels than was claimed on the label. Also potential interaction with other nutrients or drugs, particularly coumadin or aspirin, can produce some unwanted side effects such as nervousness, headache, and stomachache.

Usage

Ginkgo biloba has many uses to our world. It is used for medical purposes, environmental, and personal piece of mind. This wonderful tree can be grown in many different ways, for example, bonsai, shrub, naturally, and dwarf. One of the largest ginkgo plantations in the world is located in Sumter, South Carolina. Outside China, Virginia contains the largest ginkgo grove, holding 340 trees, planted in the early 1930's, both male and female trees.

For being a living fossil, how could we not appreciate this amazing species? The foul smell has caused most cities to use the male ginkgo trees along the sidewalks rather than the female. This is nice but to keep a species around for the next century, more female trees need to be planted. Think of it this way, you could have your own medicine shop in the back yard, or you could use the leaves for tea, or even roast the seeds to fit a perfect meal from a different culture than ours. Here is a recipe for you to try:

Sweet "clear soup" (Sugar Water)

Ingredients:

1/4 cup of longan pulp, 1/4 cup of red jujubes, 1/4 cup of lotus seeds, 1/4 cup of ginkgo fruits, 1/4 cup of lily petals, 1/4 -1 cup of rock sugar and 8 cups of water.

Procedure:

Wash longan pulp and red jujubes clean. Soak in water for 2 hours.

Wash lotus seeds if they are fresh, dried ones, soak for 2 hours and wash.

Shell ginkgo seeds and rinse.

If dried lily petals are used, soak overnight. Fresh ones, peel off the membrane skin.

Put all ingredients in a pot, bring to a boil, then simmer over a small flame for about an hour.

Can be served hot or cold.

From: <http://www.xs4all.nl/kwanten/usage.htm>

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