

# goji berries

WOLF BERRIES

Goji berries (*Lycium barbarum*) grow on semi-erect, perennial vines. The fruit is native to northern China, where it was traditionally grown for leaves and fruit. In the 19th and 20th century, they were usually called wolf berries or matrimony vines. As interest in the fruit developed, Americans slowly adopted the name “goji” which is believed to be derived from the Chinese word for the plant.

Goji plants are native to China, where they grow from the subtropics in the south to the cold, dry climate of Inner Mongolia. Commercial fruit production is concentrated near Inner Mongolia. In addition to *L. barbarum*, other species being looked at for fruit quality are often confused with each other, including *L. chinensis* and the black goji (*L. ruthenicum*).

Gojis are one of the few members of the tomato family (Solanaceae) that produce dessert quality fruit. The fruit are red like a tomato, with a green calyx near the stem. Seeds are small and edible, similar to tomato

seeds. Flowers open a purple color which fades to yellow. Gojis are one of the few perennial fruits which have the ability to produce flowers and fruit on current season’s growth. The plants resemble poisonous perennial black nightshade vines and have the potential to become invasive weeds, due to their ability to spread via birds and because they are a perennial vine that can be difficult to remove or kill.



**Figure 23.** Goji plant with support structure.



**Figure 24.** Goji vines and flowers



**Figure 25.** Goji fruit

## HISTORY

Goji plants were first introduced into the United States in the 19th century by Chinese laborers who worked in the mines and railroads of the Intermountain West.<sup>34</sup> The Chinese primarily grew the plants for their leaves, which were used to make tea or to add to stews. In the early 20th century, the Chinese were tragically forced out of the Intermountain West, but the plants in certain mining areas slowly spread. Few people outside the Chinese community had learned to eat the plants, and naturalized “wolf berries” became classified as an invasive weed in Montana and Wyoming.<sup>35</sup>

Goji berries were first introduced to the broader American population as a juice with purported

health benefits in the early 2000s. The commercial success of the juice concentrate was followed by a number of imitators, and goji juice was added to a number of juices sold in large grocery stores. By 2010, several major food processors started adding dried goji berries from China to a variety of products, including tea and chocolate.

Most commercial production of goji berry occurs in the Ningxia province of China, which has a continental climate similar to Minnesota. Several producers across the U.S. tried to start their own goji plantations, but none have been able to profitably raise and sell goji berries. Goji production in the United States remains in the experimental stages.

## USES AND HEALTH BENEFITS

Goji berries can be consumed fresh, dried, or made into juice. In China, the plants are grown as much for their leaves as their fruit, and the leaves are put into teas and stews. In the U.S., goji berries are

primarily added to juices, chocolates, and pastries or consumed as dry fruit. Goji seeds are similar in size and texture to tomato seeds, and are barely noticeable when eaten. The berries can be eaten

<sup>34</sup> Thorogood, Rachel. “The Simple, Safe and Secure Way to Order Organic Goji Berries Online.” *Forgojiberries.com*. N.p. Web. 03 March 2017. <http://www.forgojiberries.com/>

<sup>35</sup> Karp, David. “Goji taunts North American farmers.” *Los Angeles Times*, 5 August 2009. Web. 03 March 2017 <http://www.latimes.com/food/la-fo-goji5-2009aug05-story.html>

fresh and have a pleasant flavor with a good sugar/acid balance that resembles no other fruit. The market for fresh goji berries has not been tested. Goji berries have been used in herbal remedies in Asia for nearly 2000 years to treat a variety of ailments, including diabetes and impaired vision. When used in herbal medicines, goji fruit was usually mixed in with other beneficial herbs. The orange and red color of the fruit is due to several different carotinoids, including zeaxanthin dipalmitate,

as well as lycopene. The carotinoids have been used to reverse age-related macular degeneration and other problems with the eyes. The berries contain an unusual polysaccharide-peptide complex that may promote the formation of T-cells and help the immune system.<sup>36</sup> Like all members of the nightshade family, goji leaves contain some alkaloid compounds which could be toxic if eaten in large amounts, but the toxicity of goji alkaloids has not been tested.<sup>37</sup>

## PROPAGATION AND PLANTING

Currently, there are only about four varieties of goji berries available in North America, including one that is being grown exclusively in Saskatchewan. One cultivar that was released for the 2016 growing season is rated for Zone 3.

Goji plants can be started by seed, softwood cuttings, or hardwood cuttings. Goji berries are related to tomatoes and although about 90% of tomato seedlings are identical to the parent plant, goji berry seedlings are too variable in growth form and fruit quality for commercial fruit production. People who want to grow goji berries for sale need to use plants that were vegetatively propagated from plants with known fruit quality.

Hardwood cuttings of some varieties root readily, while other varieties will not. Softwood cuttings are

more reliable. Green branches are clipped in the middle of summer and placed into a peat/perlite or sand medium. Dipping the cuttings in a rooting hormone is highly recommended. The cuttings are placed in either a closed plastic bag or a mist chamber for three weeks.

Goji berries grow best in a sandy loam or a sandy soil, and they tend to be tolerant of drought. Most varieties are a type of vine, and the plants need some type of support structure.

Goji plants are related to tomatoes, peppers, eggplant, and potatoes; and are susceptible to some of the same diseases, so growers may want to plant gojis twenty or more yards away from these plants. Always avoid planting goji in areas that have been previously planted into these related species.

## PRODUCTION PROBLEMS

Goji plants are susceptible to *Alternaria*, which is a fungus that can kill leaves and young shoots. In tomatoes, *Alternaria* is usually called early blight, and goji plants appear to be more resistant than tomatoes. In a test block, only half of the seedlings were damaged by *Alternaria*.

Goji berries are bright red when fully ripe, have soft skins, and ripen in the middle of summer. All of these traits are attractive to Spotted Wing Drosophila which means that the fruit will almost certainly be susceptible to attack.

<sup>36</sup> Dharmananda, Subhuti. Lycium Fruit: Food and Medicine. *Institute for Traditional Medicine*, August 2007. Web. 03 March 2017. <http://www.itmonline.org/arts/lycium.htm>

<sup>37</sup> Goji Berry Uses, Benefits & Dosage – Drugs.com Herbal Database. Web. 06 Apr. 2017. <https://www.drugs.com/npp/goji-berry.html>.

# COMMERCIAL POTENTIAL IN MINNESOTA

Goji plants can grow in Minnesota. Growers interested in gojis should either look for cold hardy varieties or develop new productive varieties from seedlings. Due to potential problems with Spotted Wing *Drosophila* and *Alternaria*/early blight, organic production may be difficult.

The commercial potential for gojis is unknown. Goji consumption in the U.S. is increasing rapidly, but nearly all the goji products are imported from

China. Minnesota growers interested in producing goji berries must find niches that can compete economically with Chinese imports. Due to higher labor costs, Minnesotan-grown goji may be unable to compete in the Chinese import market. Once varieties are found that are suitable for Minnesota's climate, concentration will have to be on locally made products such as juice or the fresh market. (See Marketing of Perennial Fruits chapter.)

## EDIBLE LANDSCAPING

Goji berry plants can grow on arbors like *Actinidia*, but otherwise have marginal ornamental value. The flowers are pretty but small, and the plant has a

drab, gray color with an excessive number of small twigs in the winters. Goji plants could be trained to fences to provide support for the plants.

## MINNESOTA AND REGIONAL EXPERIENCES

In 2008, a consortium in Saskatchewan tried to start a goji berry business, but the venture failed about three years later.<sup>38</sup>

The Minnesota Department of Agriculture sponsored a project looking at the feasibility of goji berries in Chisago County, northeast of the Twin Cities metro area, through its Sustainable Agriculture Demonstration Grant<sup>39</sup>. Instead of testing known cultivars, the growers started all their plants from seed. The original goal of assessing the viability of goji plants turned into a project more like a breeding program similar to tree fruit like apples and pears. People who breed apples and other tree fruit must sort through hundreds of seedlings before finding one that has commercial potential. The goji seedlings in the project had more variability than apple seedlings. Growth rates the first year varied from 1 foot to 8 feet. Winter hardiness appeared to be a minor concern, with nearly all seedlings surviving the first winter. The fungal disease

*Alternaria* was a bigger concern than winter hardiness, with half the plants losing leaves to *Alternaria* in June. Most seedlings flowered and set fruit during the first growing season, which is unusual for a perennial fruiting plant. Fruit quality varied from yellow, bitter fruit to red berries with good flavor. Many of the weakest plants had the poorest quality fruit. Out of 70 seedlings, one appeared to have the vigor, disease resistance and fruit quality acceptable for commercial production (the plant in Figures 23-25), but the project was discontinued before the plant could be tested for yields and propagated.<sup>40</sup>

The project demonstrated that goji plants can grow and produce fruit in Minnesota, but the first step is to develop or find varieties with acceptable fruit quality, high yields, disease resistances and cold hardiness. There should be seedlings suitable for Minnesota within any large population of seedlings.

<sup>38</sup> Mintenko. A., personal communication.

<sup>39</sup> Minnesota Department of Agriculture, Sustainable Agriculture Demonstration Grant Program. <http://www.mda.state.mn.us/grants/grants/demogrant.aspx>

<sup>40</sup> Vang, Koua, and Cingie Kong. 2010. Growing the Goji Berry in Minnesota. *Greenbook*. Minnesota Department of Agriculture. Web. [http://www.mda.state.mn.us/protecting/sustainable/greenbook/~/\\_media/Files/protecting/sustainable/greenbook2010/gb2010-vangkong.ashx](http://www.mda.state.mn.us/protecting/sustainable/greenbook/~/_media/Files/protecting/sustainable/greenbook2010/gb2010-vangkong.ashx).