Goji, goji berry or wolfberry

***Goji, goji berry** or **wolfberry** is the fruit of Lycium barbarum (Chinese: 寧夏枸杞 pinyin: Níngxià gǒuqǐ) and Lycium chinense (Chinese: 枸杞 pinyin: gǒuqǐ), two very closely related species of boxthorn in the family Solanaceae (which also includes the potato, tomato, eggplant, deadly nightshade, chili pepper, and tobacco). The two species are native to southeastern Europe and Asia.*

Description

Wolfberry species are deciduous woody perennial plants, growing 1–3 m high. L. chinense is grown in the south of China and tends to be somewhat shorter, while L. barbarum is grown in the north, primarily in the Ningxia Hui Autonomous Region, and tends to be somewhat taller.

Leaves and flower

Wolfberry leaves form on the shoot either in an alternating arrangement or in bundles of up to three, each having a shape that is either lanceolate (shaped like a spearhead longer than it is wide) or ovate (egg-like). Leaf dimensions are 7-cm wide by 3.5-cm broad with blunted or round tips.

The flowers grow in groups of one to three in the leaf axils. The calyx (eventually ruptured by the growing berry) consists of bell-shaped or tubular sepals forming short, triangular lobes. The corolla are lavender or light purple, 9–14 mm wide with five or six lobes shorter than the tube. The stamens are structured with filaments longer than the anthers. The anthers are longitudinally dehiscent.

In the northern hemisphere, flowering occurs from June through September and berry maturation from August to October, depending on the latitude, altitude, and climate.

Fruit

These species produce a bright orange-red, ellipsoid berry 1–2-cm deep. The number of seeds in each berry varies widely based on cultivar and fruit size, containing anywhere between 10–60 tiny yellow seeds that are compressed with a curved embryo. The berries ripen from July to October in the northern hemisphere.

Etymology

Lycium, the genus name, is derived from the ancient southern Anatolian region of Lycia(Λυκία). The fruit is known in pharmacological references as Lycii fructus, which is Latin for "Lycium fruit".

"Wolfberry", a commonly used English name, has unknown origin, perhaps resulting from confusion over the genus name, Lycium, which resembles "lycos", the Greek word for wolf.

In the English-speaking world, the name "goji berry" has been used since the early 21st century. The word "goji" is an approximation of the pronunciation of gǒuqǐ, the name for L. chinense in several Chinese dialects, including Hokkien and Shanghainese. This name possibly derives from the same roots as the Persian language term gojeh which means "plum/berry".

Significance

Since the early 21st century there has been rapidly growing attention for wolfberries for their nutrient value and antioxidant content. They have been termed a superfruit, which has led to a profusion of consumer products. In traditional medicine, the whole fruit or its extracts have numerous implied health effects which remain scientifically unconfirmed in 2013.

Cultivation

China

The majority of commercially produced wolfberries come from the Ningxia Hui Autonomous Region of north-central China and the Xinjiang Uyghur Autonomous Region of western China, where they are grown on plantations. In Zhongning County, Ningxia, wolfberry plantations typically range between 40 and 400 hectares (100–1000 acres or 500–6000 mu) in area. As of 2005, over 10 million mu have been planted with wolfberries in Ningxia.

Cultivated along the fertile aggradational floodplains of the Yellow River for more than 600 years, Ningxia wolfberries have earned a reputation throughout Asia for premium quality sometimes described commercially as "red diamonds". Government releases of annual wolfberry production, premium fruit grades, and export are based on yields from Ningxia, the region recognized with

- *The largest annual harvest in China, accounting for 42% (13 million kilograms, 2001) of the nation's total yield of wolfberries, estimated at approximately 33 million kilograms (72 million pounds) in 2001.*
- *Formation of an industrial association of growers, processors, marketers, and scholars of wolfberry cultivation to promote the berry's commercial and export potential.*
- *The nation's only source of therapeutic grade ("superior-grade") wolfberries used by practitioners of traditional Chinese medicine.*

In addition, commercial volumes of wolfberries grow in the Chinese regions of Inner Mongolia, Qinghai, Gansu, Shaanxi, Shanxi, and Hebei. When ripe, the oblong, red berries are tender and must be picked carefully or shaken from the vine into trays to avoid spoiling. The fruits are preserved by drying them in full sun on open trays or by mechanical dehydration employing a progressively increasing series of heat exposure over 48 hours.

Wolfberries are celebrated each August in Ningxia with an annual festival coinciding with the berry harvest. Originally held in Ningxia's capital, Yinchuan, the festival has been based since 2000 in Zhongning County, an important center of wolfberry cultivation for the region. As Ningxia's borders merge with three deserts, wolfberries are also planted to control erosion and reclaim irrigable soils from desertification.

China, the main supplier of wolfberry products in the world, had total exports generating US$120 million in 2004. This production derived from 82,000 hectares farmed nationwide, yielding 95,000 tons of wolfberries.

Pesticide and fungicide use

Organochlorine pesticides are conventionally used in commercial wolfberry cultivation to mitigate destruction of the delicate berries byinsects. Since the early 21st century, high levels of insecticide residues (including fenvalerate, cypermethrin, and acetamiprid) and fungicide residues (such as triadimenol and isoprothiolane), have been detected by the United States Food and Drug Administration in some imported wolfberries and wolfberry products of Chinese origin, leading to the seizure of these products.

China's Green Food Standard, administered by the Chinese Ministry of Agriculture's China Green Food Development Center, does permit some amount of pesticide and herbicide use. Agriculture in the Tibetan plateau (where many "Himalayan" or "Tibetan"-branded berries originate) conventionally uses fertilizers and pesticides, making organic claims for berries originating here dubious.

United Kingdom

On June 18, 2007, the FSA (UK Food Standards Agency) stated that there was a significant history of the fruit being consumed in Europe before 1997, and has removed it from the Novel Foods list. It is now legal to sell the wolfberry in the UK as a food as reported by the British Food Standards Agency, though with concerns over marketing claims over potential health benefits.

Importation of mature plants

Importation of wolfberry plants into the United Kingdom from most countries outside Europe is illegal, due to the possibility they could be vectors of diseases attacking Solanaceae crops, such as potato or tomato.

Canada and United States

During the first decade of the 21st Century, farmers in Canada and the United States began cultivating goji on a commercial scale to meet potential markets for fresh berries, juice and processed products.

Uses

Wolfberries are usually sold in open boxes and small packages in dried form.

Culinary

As a food, dried wolfberries are traditionally cooked before consumption. Dried wolfberries are often added to rice congee and almond jelly, as well as used in Chinese tonic soups, in combination with chicken or pork, vegetables, and other herbs such as wild yam, Astragalus membranaceus, Codonopsis pilosula, and licorice root. The berries are also boiled as a herbal tea, often along with chrysanthemum flowers and/or red jujubes, or with tea, particularly pu-erh tea, and packaged teas are also available.

Various wines containing wolfberries (called gǒuqǐ jiǔ) are also produced, including some that are a blend of grape wine and wolfberries.

Young wolfberry shoots and leaves are also grown commercially as a leaf vegetable.

Preliminary medical research

Marketing literature for wolfberry products including several "goji juices" suggest that wolfberry polysaccharides have biological effects and possible health benefits, although no such claims have been supported by peer-reviewed research or approved by any regulatory agency.

A 2008 pilot study indicated that parametric data did not show significant differences between subjects receiving Lycium barbarumberry juice and subjects receiving a placebo; the authors, nevertheless,

concluded that subjective measures had been affected. This study was subject to various criticisms concerning its experimental design and interpretations.

Published studies have also reported biological effects of Lycium barbarum in animal models, and speculated from this basic research that there may be potential benefits against cardiovascular and inflammatory diseases, vision-related diseases (such as age-related macular degeneration and glaucoma) or from neuroprotective, anticancer or immunomodulatory activity.

In Traditional Chinese Medicine, Lycium leaves may be used in a tea, together with the root bark. A glucopyranoside (namely (+)-Lyoniresinol-3α-O-β-d-glucopyranoside) and phenolic amides (dihydro-N-caffeoyltyramine, trans-N-feruloyloctopamine, trans-N-caffeoyltyramine and cis-N-caffeoyltyramine) isolated from wolfberry root bark have inhibitory activity in vitro against human pathogenicbacteria and fungi.

Safety issues

Two published case reports described elderly women who experienced increased bleeding, expressed as an elevated INR, after drinking quantities of wolfberry tea. Further in vitro testing revealed that the tea inhibited warfarin metabolism, providing evidence for possible interaction between warfarin and undefined wolfberry phytochemicals.

Atropine, a toxic alkaloid found in other members of the Solanaceae family, occurs naturally in wolfberry fruit. The atropine concentrations of berries from China and Thailand was tested and found to be variable, with a maximum content of 19 ppb, well below a toxic level. However, misidentified or adulterated samples with higher atropine levels may explain earlier, much higher, measurements.

Potentially harmful interactions may occur if wolfberry is consumed while taking other medications, such as those metabolised by thecytochrome P450 liver enzymes. Such drugs include warfarin, or drugs for diabetes or hypertension.

Micronutrients and phytochemicals

Wolfberries contain many nutrients and phytochemicals including:

- *11 essential and 22 trace dietary minerals*
- *18 amino acids*
- *6 essential vitamins*
- *8 polysaccharides and 6 monosaccharides*
- *5 unsaturated fatty acids, including the essential fatty acids, linoleic acid and alpha-linolenic acid*
- *beta-sitosterol and other phytosterols*
- *5 carotenoids,including beta-carotene and zeaxanthin (below), lutein, lycopene and cryptoxanthin, a xanthophyll*
- *numerous phenolic pigments (phenols) associated with antioxidant properties*

Select examples given below are for 100 grams of dried berries.

- *Calcium. Wolfberries contain 112 mg per 100 gram serving, providing about 8–10% of the Dietary Reference Intake (DRI).*
- *Potassium. Wolfberries contain 1,132 mg per 100 grams dried fruit, giving about 24% of the DRI.*
- *Iron. Wolfberries have 9 mg iron per 100 grams (100% DRI).*
- *Zinc. 2 mg per 100 grams dried fruit (18% DRI).*
- *Selenium. 100 grams of dried wolfberries contain 50 micrograms (91% DRI)*
- *Riboflavin (vitamin B_2). At 1.3 mg, 100 grams of dried wolfberries provide 100% of DRI.*

- *Vitamin C. Vitamin C content in dried wolfberries has a wide range (from different sources) from 29 mg per 100 grams to as high as 148 mg per 100 grams (respectively, 32% and 163% DRI).*

Wolfberries also contain numerous phytochemicals for which there are no established DRI values. Examples:

- *Beta-carotene: 7 mg per 100 grams dried fruit.*
- *Zeaxanthin. Reported values for zeaxanthin content in dried wolfberries vary considerably, from 2.4 mg per 100 grams to 82.4 mg per 100 grams to 200 mg per 100 grams. The higher values would make wolfberry one of the richest edible plant sources known for zeaxanthin content. Up to 77% of total carotenoids present in wolfberry exist as zeaxanthin.*
- *Polysaccharides. Polysaccharides are a major constituent of wolfberries, representing up to 31% of pulp weight.*

Wolfberry polysaccharides

One study published in the Journal of Ethnopharmacology found that:

Endogenous lipid peroxidation, and decreased antioxidant activities, as assessed by superoxide dismutase (SOD), catalase (CAT),glutathione peroxidase (GSH-Px) and total antioxidant capacity (TAOC), and immune function were observed in aged mice and restored to normal levels in Lycium polysaccharide-treated groups. Antioxidant activities of Lycium barbarum polysaccharides were found to be comparable with normal antioxidant, vitamin C. Furthemore, adding vitamin C to the polysaccharide treatment further increased in vivo antioxidant activity of the polysaccharides.

Criticism

Marketers of some wolfberry products claim that polysaccharides have specific physiological roles mediated by specialized cellreceptors "master" control properties over other bioactive chemicals and cells. Characteristic spectral peaks are claimed to define one berry's geographic origin from another.

These assertions are an important marketing message for wolfberry products branded as Tibetan Goji Berries or Himalayan Goji Juice. Such statements, however, have no scientific evidence published under peer-review and are not compliant with regulatory guidelines for marketing natural food products (see below, Marketing claims under scrutiny in Europe, Canada and the United States).

Functional food and beverage applications

It is often cultivated for a variety of food and beverage applications within China, but increasingly today for export as dried berries, juice, and pulp or grounds. Wolfberries are prized for their versatility of color and nut-like taste in common meals, snacks, beverages, and medicinal applications. A major effort is underway in Ningxia, China to process wolfberries for "functional" wine.

Marketing

Since the early 21st century, the dried fruit has been marketed in the West as a health food (typically under the name "Tibetan goji berry"), often accompanied by scientifically unsupported claims regarding its purported health benefits.

Its most claimed nutritional attribute is an exceptional level of vitamin C, to be among the highest in natural plants. However, it was demonstrated by independent assays on dried berries to be quite variable, in a range of 29–148 mg per 100 grams of fruit. This level is comparable to many citrus fruits and strawberries as well as numerous other fruits and berries.

Companies marketing the berries often also include the unsupported myth that a Chinese man named Li Qing Yuen, who was said to have consumed wolfberries daily, lived to the age of 256 years (1677–1933).

Commercial products marketed outside Asia

Typical of many exotic fruits being introduced into western food and beverage commerce, wolfberry is best known as a juice marketed over the Internet since 2002, often via multi-level marketing that asserts its health benefits. There is an increasing presence of wolfberry in health food stores and grocery markets in the United Kingdom and other countries.

While juice prepared entirely from fresh wolfberries is rare, blends containing several other berry and fruit juices are used for nearly all "wolfberry" juice products, many of which are nevertheless labeled as "goji juice". The percentage of wolfberry contained in these juices is generally not stated on the labels of such products.

Other wolfberry consumer applications are

- *Dried berries (pictured above)*
- *Berry pieces in granola bars*
- *Skin soap (made from seed oils)*
- *Yogurt products*

Commercial suppliers have processed wolfberry as

- *An additive for manufacturing*
- *Juice concentrate*
- *Whole fruit purée*
- *Powders from juice or juice concentrate made from spray drying*
- *Pulp powders*
- *Whole or ground seeds*
- *Seed oils (as with grape seed oil), and essential oils derived from seeds).*

Marketing claims under scrutiny in Europe

In February 2007, the Food Standards Agency (FSA) of the United Kingdom, an advisor for food safety to the European Food Safety Authority of the European Union (EU), published an inquiry to retailers and health food stores requesting evidence of significant use of wolfberries in Europe before 1997. Information from this period would document a safety history and evaluate how "novel" the berries are in the EU, affecting their authorization status for sale.

Proponents hoped this review would provide important safeguards for consumers by checking whether new foods are suitable for the whole population, including people with food allergies. Opponents on the other hand feared it would limit consumer choice and protect monopolistic interests rather than the public. Food safety in the EU relies importantly on a scientific basis for label information on foods like wolfberries that may be claimed to furnish health benefits.

In June 2007, the FSA announced its decision that wolfberries indeed had a history of use in Great Britain before 1997. Accordingly, wolfberries do not require registration as a novel food.

Marketing claims under scrutiny in Canada and the United States

In January 2007, marketing statements for a goji juice product were subject of an investigative report by CBC Television's consumer advocacy program Marketplace.

By one specific example in the CBC interview, Earl Mindell (then working for direct-marketing company FreeLife International, Inc.) falsely claimed the Memorial Sloan-Kettering Cancer Center in New York had completed clinical studies showing that use of wolfberry juice would prevent 75% of human breast cancer cases. There are preliminary laboratory studies and one Chinese clinical trial.

During 2006, the U.S. Food and Drug Administration (FDA) placed two goji juice distributors on notice with warning letters about marketing claims. These statements were in violation of the United States Food, Drug and Cosmetic Act [21 USC/321 (g)(1)] because they "establish the product as a drug intended for use in the cure, mitigation, treatment, or prevention of disease" when wolfberries or juice have had no such scientific evaluation. Additionally stated by the FDA, the goji juice was "not generally recognized as safe and effective for the referenced conditions" and therefore must be treated as a "new drug" under Section 21(p) of the Act. New drugs may not be legally marketed in the United States without prior approval of the FDA.

On May 29, 2009, a class action lawsuit was filed against FreeLife in the United States District Court of Arizona. This lawsuit alleges false claims, misrepresentations, false and deceptive advertising and other issues regarding FreeLife's Himalayan Goji Juice, GoChi, and TaiSlim products. This lawsuit seeks remedies for consumers who have purchased these products over the past several years.

Дереза обыкновенная

Дереза́ обыкнове́нная, *или* ***Дереза бербе́ров*** *(лат. Lýcium bárbarum)* — *виддеревянистых растений рода Дереза (Lycium) семейства Паслёновые(Solanaceae). Применяется в народной медицине.*

Название

Народное название ***Волчья ягода*** *достаточно распространено, и нередко относится к разным видам растений. Вопреки распространенному мнению, волчьи ягоды — собирательное название ряда растений, не все из которых имеют токсические свойства. Дереза обыкновенная (Lycium barbarum) не ядовита, её плоды могут служить ценным источником витамина С.*

Растение известно под названием ***годжи*** *и* ***годжи Нинся*** *кит. трад.* 寧夏枸杞*, пиньинь: Níngxià gǒuqǐ, буквально: «годжи района Нинся».*

Другие названия на иностранных языках: англ. Barbary matrimony-vine, Duke of Argyll's teatree, Matrimony-vine, Goji-berry, Wolfberry, кит. ning xia gou qi, нем. Bocksdorn.

Распространение

Китай: Ганьсу, Хэбэй, Внутренняя Монголия, Шаньси, Сычуань, Синьцзян. Культивируется повсеместно, в том числе в России. Часто дичает. Культурно произрастает на севере центральной части Китая в районе Нинся, в Тибете и Гималаях.

Ботаническое описание

Кустарник до 3,5 м высотой Ветви покрыты тонкими колючками, листья, простые цельнокрайные, эллиптические. Цветки лилового (фиолетово-розового) цвета, колокольчатые. Растение плодоносит, в разных регионах, с мая по сентябрь или с июля по октябрь. За это время собирается 13 урожаев, из которых самые ценные в августе. Плод — маленькая кораллово-красная ягода известная, как фрукт дерезы, используемый в медицине.

Обладателями наиболее выраженных полезных свойств, по праву, считаются плоды Годжи, растущие на плоскогорье района Нинся. Местная щелочная почва чрезвычайно богата минеральными солями, которыми её наполняет протекающая в этой местности река Хуанхэ. Воды реки приносят с собой лесс. Эта горная порода в виде желтой пыли оседает на земле и естественным образом удобряет почву, обогащая её уникальными питательными веществами.

Хозяйственное значение и применение.

Цветки дерезы обыкновенной охотно, особенно утром и под вечер, посещают пчёлы, собирая нектар и пыльцу.

Согласно фармакопее Китая, сухие плоды (лат. Fructus Lycii) используются для лечения поллюций, болей в нижней части тела, головокружения и амблиопии.

В описаниях полезных свойств ягод их также нередко называют: Райская ягода, Ягода долголетия, Красный алмаз. На протяжении многих веков ягоды годжи используются в традиционной азиатской медицине как общеукрепляющее средство.

Плоды также являются огромным источником витамина С 2500 мг на 100 гр

В Японии и Китае используется для приготовления напитка «годжи».

Маркетинг в Канаде и США

В Канаде и США некоторые маркетинговые заявления находились под пристальным вниманием. В январе 2007 года телеканал CBC в рамках защиты прав потребителей провёл собственное расследование маркетинговых заявлений о «соке годжи». При этом было установлено, что заявление Эрла Минделла (в то время он работал директором по маркетингу в компании FreeLife International, Inc) о том, что результаты клинических исследований в Мемориальном раковом центре

Слоун-Кеттеринг в Нью-Йорке показали, будто употребление сока годжи предотвращает в 75 % случаев заболевания человека раком молочной железы, не соответствовало действительности. Были только предварительные лабораторные исследования и одно китайское клиническое испытание.