NUTRITIONAL AND BIOLOGICAL POTENTIAL IN MODERN USE OF GOJI FRUITS

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Abstract: The paper represents a study of the biological and nutritional potentials of Goji fruits. In our country, Goji fruits aren't as well-known as sea buckthorns and rose hip cultures, that's why there should be performed a better study of them. The reason of such highlighted attention for these berries is well-known by 6000 years of exploitation by Chinese, Tibetan and Indian phytotherapists, though there wasn't made any scientific researches. This work contains bibliographic studies of Goji berries composition and nutritional effect. Those are consumed in row and dry form and are highly requested in our country and are imported from foreign ones. Although for a better understanding of the effect of these fruits there must be performed a detailed study of the composition and the quality of this product in relation to the national and international standards.

Keywords: Goji berries, constituents, nutritional potentials, antioxidant levels

Introduction

In the food pyramid, fruits and vegetables, together with cereals, are represented as the basis of balanced nutrition, calling them the "basis" for proper nutrition and health. This group of foods is considered as the main source of vitamins (provitamin A, vitamins of group B, C, E etc.) and minerals, carbohydrates in the form of simple sugars (glucose, fructose, sucrose), polysaccharides, hemicelluloses), gums and pectic substances, in varying proportions, food fibers, micro and macronutrients, but also high water content, up to 94%.

Due to the fact that fruits and vegetables have a seasonal character but also the chemical composition they present, fruits and vegetables have a high degree of alteration. For these reasons, it is necessary to conserve fruits and vegetables [1].

For the normal exercise of daily activity and health, the body needs a certain amount of energy and complete nutrients (proteins, carbohydrates, lipids, vitamins, minerals, water), so different technologies have been developed for their conservatism for as long as possible in different forms so that they are available throughout the year. The preservation of food products through certain techniques and processes has generated human ingenuity

Goji is known for over 2000 years in Tibet and used in traditional medicine because of the many benefits to curative. Locals who drink different forms - as dried fruit, juice, tea or as an ingredient in dishes - live longer, healthier more energetic and even over 100 years.

It has been statistically proven that in this region the number of people older than 100 years is 16 times higher than in other regions of the world!

Although so many years was known properties of goji berries have been recognized only recently modern medicine.

Scientific research confirms the truth known 2000 years. Introduced to the US

market in 2007 only very briefly becomes super fruit of consumption Madonna, Elizabeth Hurley, Mischa Barton and other stars.

Goji fruit is the red berry obtained from two closely related plants, *Lycium chinense* and *Lycium barbarum*, naturally occurring in Asia, primarily in northwest China. The fruits from these species are considered interchangeable, though larger fruits are preferred and are more often found on plants of *L. barbarum*. *Lycium* is in the Solanaceae family that yields numerous foods, including some that are yellow to red fruits, such as peppers, tomatoes, and the cape gooseberry (a Peruvian species of *Physalis*) [2].

The Chinese name for the lycium plant is *gouqi* and for the fruits is *gouqizi* (*zi* is used to describe small fruits); the common name "wolfberry" comes about because the character *gou* is related to the one that means dog or wolf. The spiny shrub has also been called matrimony vine, for reasons long lost. Carl Linnaeus provided the genus name *Lycium* in 1753. He is responsible for the species name *barbarum*, while botanist Philip Miller described *Lycium chinense* just 15 years later. Lycium is extensively cultivated, especially in Ningxia Province, a small autonomous region formerly part of Gansu, with several production projects initiated since 1987. China now produces over 5 million kilograms of dried lycium fruit each year, most of it for domestic use. The fruits are dried with or without sulfur to yield the market herb, or the fresh fruits may be squeezed for their juice that is then concentrated to preserve it for future use in making various beverages.

Traditional and modern uses

Lycium fruit is depicted by Chinese doctors as having the properties of nourishing the blood, enriching the yin, tonifying the kidney and liver, and moistening the lungs, but its action of nourishing the yin of the kidney, and thereby enriching the yin of the liver, is the dominant presentation. It is applied in the treatment of such conditions as consumptive disease accompanied by thirst (includes early-onset diabetes and tuberculosis), dizziness, diminished visual acuity, and chronic cough. As a folk remedy, lycium fruit is best known as an aid to vision, a longevity aid, and a remedy for diabetes. With the intensive research work done in recent years, reliance on descriptions of centuries-old use of the herb is less important than for many other Chinese herbs, since much is now known about the chemical constituents and their potential health benefits.

Constituents and Actions

The secret of longevity that gives goji fruit consists of its high content of vitamins and minerals. Among the vitamins that are found in goji berries include: vitamin C, in very large quantities; vitamin A, is an excellent source of vitamin A; Vitamin E, which is found rarely in fruits, with a strong antioxidant effect; vitamins B1 (thiamine), B2 (riboflavin) and B6 are vital metabolic processes and help convert food into energy.

Goji fruits contain high amounts of carotenoids, which have a strong antioxidant effect and solar photoprotection. The most important carotenoids that are found in goji berries are: beta carotene which form vitamin A carotene content is higher than any other food known to date zeaxanthin that protects the retina; lutein important for the regeneration of DNA and all cells;

Goji berries have in their composition important micronutrients such as iron, calcium, potassium, copper, magnesium, phosphorus and germanium.

They are rich in selenium, a mineral element that reduces the toxicity of the drug and has antioxidant. Clinical studies have shown that goji berries, selenium and germanium by content are particularly useful in cancers.

Goji berries contain amino acids and proteins, including 8 essential amino acids that can not be synthesized by the body when food prosecutors.

What effect have goji berries? Antioxidant – Goji berry is the most powerful antioxidant of all existing food in the world. Antioxidants are substances that protect the body from the damaging effects of molecules called "free radicals" that accumulates in the body. Free radicals are true "enemies" of the organization, are unstable molecules derived either from metabolic processes essential, normal occurring in body or body from exposure to X-rays, smoke, toxic gases resulting from combustion. Due to the unstable free radical attack on healthy cells of the body. The chemicals capable of neutralizing free radicals called antioxidants.

Level of Goji berry antioxidants measured ORAC scale (ability to absorb oxygen free radicals) is 30,500 units, almost 20 times more than the oranges. Antioxidants reduce the aging
process.

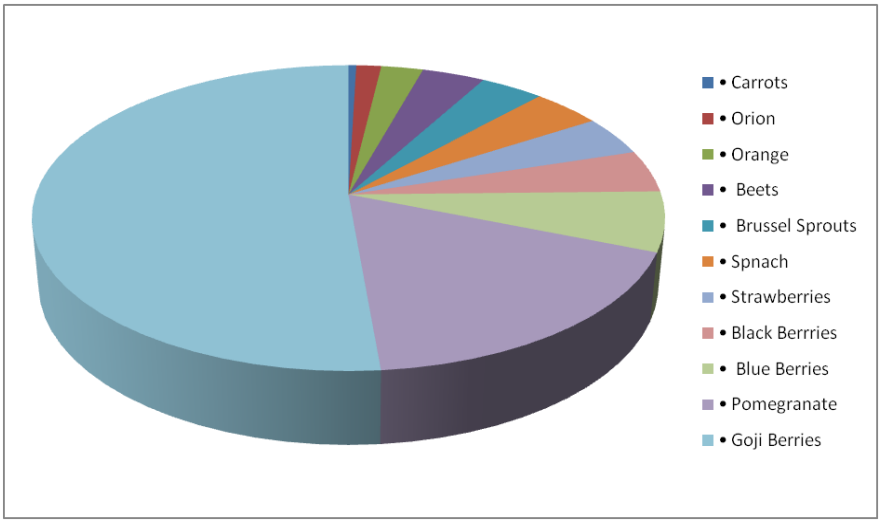

Fig. 1. *Food antioxidant levels*

Table 1. *Food antioxidant levels*

Nr. Ord.	Food type	Antioxidant levels
1.	**Carrots**	275
2.	**Orion**	875
3.	**Orange**	1475
4.	**Beets**	2210
5.	**Brussel Sprouts**	2225

Nr. Ord.	Food type	Antioxidant levels
6.	**Spinach**	2450
7.	**Strawberries**	2475
8.	**Black Berries**	2650
9.	**Blue Berries**	3750
10.	**Pomegranate**	10450
11.	**Goji Berries**	30500

The color components of lycium fruit are a group of carotenoids, which make up only 0.03–0.5% of the dried fruit [3]. The predominant carotenoid is zeaxanthin (see structure below), which is present mainly as zeaxanthin dipalmitate (also called physalien or physalin), comprising about one-third to one-half of the total carotenoids. Lycium fruit is considered one of the best food sources of zeaxanthin.

Zeaxanthin is a yellow pigment (an isomer of lutein and a derivative of β-carotene) produced in plants. It contributes to the color of corn, oranges, mangoes, and egg yolks (from dietary carotenoids), and it is also the main pigment of another medicinal fruit recently popularized in China: sea buckthorn (hippophae). When ingested, zeaxanthin accumulates in fatty tissues, but especially in the macula, a region of the retina. It is believed that by having a good supply of this compound, the macula is protected from degeneration, which can be induced by excessive sun exposure (UV light) and by other "oxidative" processes (2–4). Lutein, another yellow carotenoid that accumulates in the macula and provides similar protection, is an ingredient of yellow chrysanthemum flowers (*juhua*) that are often combined with lycium fruits in traditional Chinese herb formulas to benefit the eyes, including deteriorating vision that occurs with aging and may, in some cases, correspond to macular degeneration. The effective daily dose of these two carotenoids, from food and supplements, has been estimated to be about 10 mg.

The red carotenoids of lycium have not been fully analyzed. It is believed that part is due to lycopene, the major red pigment in tomatoes and capsicum fruits. The red portion of lycium has been designated as renieratene; the red color overwhelms the yellow of zeaxanthin and the small amount of β-carotene, though the fruits often display an orange tinge due to the yellow components.

Benefits of carotenoid intake are thought to mainly arise from prolonged use. Therefore, lycium fruit, as a source of zeaxanthin and other carotenoids, would be consumed regularly to complement dietary sources, boosting the amount of these components available from fruits and vegetables and egg yolks.

Another component of lycium is polysaccharides, chains of sugar molecules with high molecular weight (several hundred sugar molecules per chain). It is estimated that 5-8% of the dried fruits are these polysaccharides, though measures of the active polysaccharides are difficult to undertake, since differentiating functional long chains versus non-functional short chains is challenging; this figure for polysaccharide content is likely on the high side. Studies of the polysaccharides have indicated that there are four groups of them, each group having slightly different structures and molecular weights. Although referred to as polysaccharides, the functional immune-regulating substance is actually a polysaccharide-peptide mixture; the amino acid chains maintain a critical

structure for the polysaccharide.

The immunological impacts of polysaccharides have been the primary focus of study (10). One of the primary mechanisms of action for these large molecules may be that they appear to the immune system as though they were cell surface components of microorganisms, promoting activation of a response cascade involving interleukins (such as IL-2) that impact immune cells (such as T-cells). Since the plant polysaccharides are not the same as the structures on particular pathogens, but have a more poorly defined quality, the response is non-specific. It is possible that repeated exposure to large amounts of polysaccharides might result in a lessened response, so that this method of therapy is probably best suited to relatively short duration (e.g., a few weeks). Low dosage exposure may result in no immunological responses, since these polysaccharides are present in several foods in small amounts, and the immune system would be protected from reacting to ordinary exposure levels.

Extraction and isolation of polysaccharides in low concentration is simple, as they are soluble in hot water that is used as an extracting agent. Getting a high concentration of polysaccharides is a more significant task. The easiest method is to first produce a hot water extract of the herb (using more than one extraction to get most of the polysaccharides into solution), and then force the polysaccharides out of solution by adding alcohol, in which they are not soluble; then, the liquid is separated off and the residue is dried to produce the finished polysaccharide product. This method will also condense other large molecules. Although small amounts of highly purified polysaccharides can be produced for laboratory and clinical studies, at this time, commercial extracts containing 40% polysaccharides represent the highest concentration available, while 10–15% polysaccharide content from simple hot water extraction is more common.

A third constituent of interest is the amino-acid like substance betaine, which is related to the nutrient choline (betaine is an oxidized form of choline and is converted back to choline by the liver when it is ingested). Betaine was shown to protect the livers of laboratory animals from the impact of toxic chemicals; other pharmacologic studies have shown that it is an anticonvulsant, sedative, and vasodilator. It has been suggested that betaine could aid the treatment of various chronic liver diseases, such as non-alcoholic fatty liver disease. Betaine is found also in capsicum, silybum (the source of the liver-protective flavonoid silymarin), and beets (*Beta vulgaris*, from which betaine gets its name). The amount of betaine in lycium fruit, is about 1% (10), so to get a significant amount, a large dose of lycium fruit would need to be consumed (e.g., 20–30 grams).

The mild fragrance of the fruits is attributed to a small amount of volatile oils, mainly two sesquiterpenes: cyperone and solavetivone. The amount present does not have significant pharmacological functions when lycium is consumed in ordinary amounts. The fruit also contains about 0.15% flavonoids, including rutin and chlorogenic acid.

Typical Dosing of Lycium Fruit

Lycium fruit is most often incorporated into complex herb formulas, in which its dose is in the range of 6–18 grams. Since other herbs in the formula could contribute significant amounts of compounds such as carotenoids and polysaccharides, this dose may be insufficient if lycium is used as a single herb remedy instead. There have been a few reports of using lycium fruit as a single herb or as a major component in a small

recipe. For example, in the treatment of atrophic gastritis, one of the recommended therapies is to consume lycium fruits, 10 grams each time, twice daily. In folk medicine, for diabetes it is recommended to consume 10 grams each time, two or three times daily [4]. As a food therapy for strengthening the elderly or debilitated, it is cooked with lean pork, bamboo shoots, and typical Chinese flavorings, and the daily dose would be 15–30 grams . As a dietary supplement for eye health [3] a dose of 15 grams per day was deemed beneficial in supplying adequate zeaxanthin (estimated at 3 mg/day). A simple tea for decreased visual perception is made from 20 grams lycium fruit as a daily dose. Thus, the dose in complex formulas of 6–18 grams shifts to a dose of 15–30 grams when it is the main herb, or about a 2.5-fold increase in the dose.

Comparing this juice to the lycium fruit described in traditional Chinese medicine is somewhat difficult. The manufacturer indicates: "One liter of Himalayan Goji Juice contains the polysaccharides equivalent of 2.2 pounds [1 kg] of fresh goji berries." Typically, a dried berry is about one-sixth the weight of a fresh berry (that is, the moisture content of the fresh fruit is about 83%), so a dose of 2–4 ounces of the juice would correspond to 10–20 grams of the dried fruit, which is in the correct dosage range in accordance with traditional recommendations, though higher doses have been used in some applications. Dried lycium fruit can be eaten whole (sold most in one pound bags, about 23–46 doses of 10–20 grams), and can be obtained at a lower cost because it is in crude form. The makers of this juice, and other similar products, proclaim unique benefits to the juice, mainly because of specific selection of berries, compared to the dried lycium fruits readily available from Chinese herb and grocery stores. The juice is a convenient form of administration and also provides other juices (that yield a more acceptable flavor), so the extra expense may be considered worthwhile, while there is little evidence that would support a contention of differing therapeutic effect if similar amounts of the lycium fruit are obtained from drinking the juice or from eating the dried fruits or taking supplements made from lycium extracts.

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