A SEARCH FOR GOJI BERRY-*LYCIUM BARBARUM* IN BHUTAN AND ITS RELATIVE

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Abstract

The Goji Berry flourished in the valleys of the Himalayas especially Tibet for thousands of years and have been the secret of longevities of the people who ate them. Some internet sources also report that wolfberries have been used in traditional Chinese Medicine for at least 2,000 years. Whatever it is, one thing is clear that the Goji Berry is known in Asia as an extremely nutritious food and have been extensively eaten raw, consumed as juice or wine, brewed into an herbal tea or prepared as a tincture, eaten as salads and used widely in other culinary preparations. Its leaves are made into tea. The berries are believed to enhance immune system function, improve eyesight, protect liver, boost sperm production and improve circulation, among other good health effects. Goji Berry root bark is also good for inflammation and some types of skin diseases. The Goji Berry was first reported to grow in Tibet but its habitat has been successfully duplicated and now it is propagated popularly in many countries like USA, Canada, Europe, Australia, Japan and primarily in Tibet and China. Since Bhutan also falls within Himalayan region, it was suspected that the same species must have been dwelling here too. Because the berry is highly nutritious, it comes with many medicinal uses, and has high economic value. ITMS looked for its possible whereabouts in Bhutan. The search, although didn't yield any positive findings, a close relative of Goji Berry was found growing in Punakha. This is called *Lycium armatum*. This paper discusses about the search for Goji Berry and its literature findings.

Keywords: *Bhutan, Goji Berry and Lycium armatum.*

Introduction

Lycium barbarum is known by many synonyms such as *Lycium intricatum* (Boiss.), *L. europeum* [E], *Jasminoides flaccida* Veill, *Lycium vulgare* Dunal and *Lycium halimifolium* Mill. It has also many common names like Matrimony Vine and Chinese Wolfberry. Although its original habitat is obscure (probably southeastern Europe to southwest Asia), wolfberry species are now grown around the world such as USA, Canada, Europe, Australia, Japan and primarily in Tibet and China.

Wolfberry species are deciduous woody perennial plants, growing 1-3 m high. Its 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 its width) or ovate (egg-like). One to

three flowers occur on stems 1-2 cm in length. In the northern hemisphere, flowering occurs from June through September and berry maturation occurs from August to October for a 4-5 years old plant, depending on latitude, altitude, and climate.

Division:	Magnoliophyta
Class:	Magnoliopsida
Order:	Solanales
Family:	Solanaceae
Genus:	*Lycium*
Species:	*barbarum*

History and Significance

Some of the first healers to recognize the power of the Goji Berry were the Himalayan people, who utilized the berries of the Goji vine which flourished in the valleys of the Himalayas for thousands of years. Some internet sources state that (its history unverified) a western tourist happened to visit one of the remote village in Tibet. He was amazed to find almost every body in that village lived more than 90 years. Wanting to know the reason behind their longevities, he associated himself with the culture of that locality and found that those people ate and lived on the Goji Berries. They have even an occasion dedicated to Goji Berry. Other sources state that wolfberries have been used in traditional Chinese medicine for at least 2000 years. Their undocumented legend, however, is considerably older, as wolfberries are often linked in Chinese lore to Shen Nung (Shennong), China's legendary First Emperor, mythical father of agriculture, and herbalist who lived circa 2,800 BC. Whatever it is, one thing is clear that the local people of Tibet or the healers of China shared their knowledge of the goji berry and its powerhouse nutritional properties with the herbalists of other countries where they continued to spread the word about their nutritional power.

There are many varieties of Goji Berry grown in many parts of the world. As the popularity of the berry continues to grow, more and more varieties will likely appear as the vine is cultivated for commercial purposes. But it is said that the most powerful and nutrient rich Goji Berries still come from the vines of Himalayan valleys. The major and important nutrient is the polysaccharides representing up to 31% of pulp weight of wolfberries and the scientists often

referred to it as the “Master molecules” due to their ability to control multiple functions of the body and its immune system. Other nutrients include Macronutrients and Micronutrients.

Macronutrients include carbohydrates, protein, fat and dietary fiber. 68% of the mass of dried wolfberries exists as carbohydrate, 12% as protein, and 10% each as fiber and fat, giving a total caloric value in a 100 gram serving of 370 (kilo) calories, of which 272 come from carbohydrates, and 90 of which come from fat.

Micronutrients include the following:

- 11 essential and 22 trace dietary minerals
- 18 amino acids
- 6 essential vitamins
- 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

It is reported that 100 grams of dried berries contain the following minerals:

- 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 B2). 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 like:

- Beta-carotene: 7 mg per 100 grams dried fruit.
- Zeaxanthin. Reported values for zeaxanthin content in dried wolfberries vary considerably, from 25 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.

Known in Asia as an extremely nutritious food, Goji Berry fruits have been extensively eaten raw, consumed as juice or wine, brewed into herbal tea or prepared as a tincture, eaten as salads and used widely in other culinary preparations. Its leaves are made into tea. Beside its uses in food and culinary, Wolfberries have long played important roles in traditional Chinese medicine

(TCM) where they are believed to enhance immune system function, improve eyesight, protect liver, boost sperm production and improve circulation, among other effects. The berries are also used in traditional Korean medicine, traditional Japanese medicine and traditional Tibetan medicine. Goji Berry root bark is used for treating inflammation and certian skin diseases.

Several sources indicated that there have been many research carried out in finding out its medicinal indications and many scientific papers on Goji Berry appears in the PubMed. Wolfberry polysaccharides were reported to have shown antioxidant activity *in vitro*. A glucopyranoside and phenolic amides isolated from wolfberry root bark have also been found to have an inhibitory activity in vitro against human pathogenic bacteria and fungi. A human supplementation trial showed that daily intake of wolfberries increased plasma levels of zeaxanthin. On the contrary, it is also reported in some literature that in the west, none of this research has been scientifically verified, confirmed in clinical studies, or accepted by regulatory authorities.

However, since the early 21st century, it has been gaining popularity in the United States and other developed countries for their nutrient richness and antioxidant qualities, with 89 new product introductions during 2006 to 2007 in eight retail market segments having $9.2 million in total sales. Weather it is a myth or not, this "super fruit" have become the highest overall ranking among a novel category of six exotic fruits.

Therefore, having known its market potential and habitat condition, it was felt worth exploring for its availability in Bhutan. A short literature search and a survey was done by the Institute of traditional Medicine with Mrs. Rebecca Pradhan to confirm its availability, described in the ensuing section.

Goji Berry: Is it available in Bhutan?

Literature review on the existing resources such as Flora of Bhutan, Thrung.pey and Internet Sources found that *Lycium barbarum* was not recorded in Bhutan. Although one Internet sources mentions that Goji Berry can be distributed in the regions like Bhutan, Nepal, India and Sikkim, not much literature has been seen on its defined distribution in these places. The concerned web could have assumed its distribution based on the logic that the Goji berry was first discovered from Tibet, which lies in the similar alpine Himalayan belt.

The collaborative work with the National Biodiversity Center, Serbithang and Forestry Department (Nature Conservation Division) also found out that *Lycium barbarum* had not been recorded in any of the inventories carried out till date by these two organizations. However, another close species called *Lycium armatum* with fruit and leaf similar to *Lycium barbarum* was recorded to have found in Punakha region. It is said that Bhutanese eat its fruits.

Gathering information on availability of similar berries in Bhutan, some informants claim that a plant very similar to Goji berry (locally known as bJi-gay) was seen in Kabesa area under Punakha Dzongkhag, Langthel under Trongsa Dzongkhag (locally known as chong-chong marib),

in some part of Bumthang and Zhemgang Dzongkhags (locally known as mertong marib). Since *Lycium barbarum* is an alpine vine, some believe that the similar berries found in Trongsa, Punakha and Zhemgang that falls under sub-tropical region may not be the said species but could possibly be *Lycium armatum*. However, some informant claim that the berry found in Bumthang area has larger and oval fruit compared to those found in the above mentioned (three) areas thereby closely resembling that of *Lycium barburum* berry.

This issue could be resolved and confirmed (if the claimed berries are *Lycium barbarum* species or not) by taxonomical studies involving the experienced taxonomists from the Forestry Department and National Biodiversity Centre of Bhutan based on the samples collected from these four areas.

Recent studies on Goji Berry in Bhutan by Rebecca Pradhan of NCD found that there are no such species in Bhutan. However, they have collected similar species of berry from Punakha, which was identified as *Lycium armatum*. Based on the literature review and the findings of the above study, ITMS in collaboration with the Medicinal and aromatic Section under Ministry of Agriculture have decided to buy the seeds and conduct trial cultivation in Bhutan. So to facilitate the cultivation trial, the habitat and climatic requirements for the Goji Berry cultivation was also explored through the internet.

Soil Requirement

The plant prefers light (sandy), medium (loamy), heavy (clay) and well-drained soil and can grow in nutritionally poor soil. The plant can grow well at varying pH of the soil whether, acidic, alkaline or neutal. It grows well in the Dappled Shade, Woodland and Sunny Edge. It requires moist soil. The plant can easily habitat hedges and can thrive in harsh climatic conditions like temperatures as down as -5°c.

Propagation

Sow the seeds in early spring in a greenhouse. Germination is usually good and fairly quick. Prick out the seedlings into individual pots when they are large enough to handle and grow them in the greenhouse for their first winter. Plant out in late spring or early summer. Pinch out the shoot tips of the young plants in order to encourage bushy growth.

Layering and Cuttings of half-ripe wood, 5-10cm with a heel if possible, July/August in individual pots in a frame has good percentage of success rate. High percentage of success rate (about 78%) of cultivation is achieved through Cuttings of mature wood of the current season's growth and planting them in autumn to late winter in a cold frame. Division of suckers in late winter has also good success rate of growing and is very easy since the suckers can be planted out direct into their permanent positions.

Conclusion

The review found that Goji berry has huge health benefits that attract good international markets. It was also concluded that this berry is not found in Bhutan. However, it could be easily cultivated in Bhutan since Bhutan has similar vegetation to that of Tibet and China. In fact, Goji berry seed suppliers were explored through Internet and about 7 addresses of the seed suppliers and dealers

of Goji Berry (based in USA, France and China) were short-listed. After corresponding so much, only two suppliers (Alive and Well, and B &T World Seeds) replied and of these two only one supplier (B & T World Seeds, Paguignan in France) agreed to supply us with the seeds of Goji Berry at the cost of Euros 238 per kilogram including the postage charges. All the payment method and bank details were also collected from this supplier and were forwarded to Mr. Tshitilla, Head of the MAP, MoA for necessary follow up and cultivation. They carried out the trial planting of Goji Berry at Renewable Natural Resource Research Centre, Yusipang and this trial cultivation was successful. However, there is a long way to make it commercially available in Bhutan.

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