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***Berberis* arista: Prospects for Canada**

Introduction

Berberis arista is a shrub that inhabits the temperate Himalayan climates, between 6,000 and 10,000 feet in altitude[i]. It is a multi-use plant that has long been utilized by local and indigenous populations. The fruit produced by these shrubs are succulent, sweet and sour berries that have a wide range of medicinal properties and health benefits. The barberries, or 'chutro,' have potential as an export crop from Nepal to Canada, specifically improving the lives of highland farmers.

Product Info and Benefits to Nepal

Growing Conditions and Harvesting:

Herbs and herbal products are showing great promise in Nepal, due to ideal growing conditions in hills and mountain regions. They tend to grow in "disturbed habitats" such as forest margins, open pastures at higher altitudes, and the edges of cultivated lands[ii]. Berberis arista shrubs grow in unfavorable conditions, and can be used as an inter-crop, making them especially optimum for farmers on hills or degraded land. The plants are rarely domesticated and instead of sowing seeds, they are often vegetatively propagated[iii]. An increased effort in cultivation and domestication could allow farmers a more steady income. As the shrubs rarely grow higher than 3m, the harvesting of berries is safe and is not labor intensive. An average-sized bush is found to yield 657 g of fruits in approximately 4 pickings[iv], indicating high fairly yields. The fruit can be harvested by hand, wooden tools or the use of "horticultural scissors"[v]. The adoption of tools presents an opportunity for improved efficiency, and less labor intensive harvesting.

Production Process:

These valuable fruits are under-utilized and farmers could benefit from value-adding activities at the local level[vi]. The fruit processing industries in Nepal for 'conventional' fruits, such as mangos and apples, and the processing of Barberries is limited to wine processing[vii]. The existence of wine processing industries means there is potential for production expansion. If the product is dried, farmers could participate in the production process. Sun drying is a low-input method, practiced among some communities; however, it takes several days, and can be risky due to weather[viii]. The use of basic heating technologies could speed this process up, and make it more efficient and economically profitable.

Indigenous Use:

People in rural Nepal collect significant amounts of wild food to meet nutritional and health needs, as well as for local trade[ix]. Medicinal plants are especially important to communities. In 1994, it was estimated that "80 per cent of rural Nepal relied on traditional remedies for treating ailments"[x]Another estimation declares that approximately 75% of rural population's in Asia use medicinal plants for their primary health care[xi]. One study found that the percentage of plants used as medicine increased with increasing altitude[xii]. The high prevalence and cultural value of medicinal crops makes Berberis arista a highly prospective and accommodating export crop for Nepalese farmers. The multi-use Berberis arista shrub has long been used for its medicinal properties, and nutritional benefits. The whole plant is traditionally used to assist in inflammation, wound healing, skin disease, jaundice, and skin disease, as it has anti-bacterial and anti-inflammatory properties[xiii]. Moreover, all part of plants are used for various extracts, teas, dyes, and jams[xiv].

Nutritional/medicinal properties

Berberis arista has potential as an export crop as it is also highly nutritious and has valuable medicinal properties. The berries are very high in vitamin C, containing almost as much as citrus fruits. They also contain valuable oil and fats, as well as a small amount of protein, and B-vitamins[xv]. The fruit contains the valuable alkaloid 'Berberin,' which is known for reduction of inflammation, and antimicrobial action[xvi]. Berberine has also been shown to inhibit the growth of bacteria in test tubes, and aid immune system functioning[xvii]. Drying the fruit may reduce nutrient availability; however, it can also be marketed as an extract, or concentrate. The medicinal and nutritional benefits of this product make it very a profitable export potential.

Environmental Sustainability:

Due to the lack of "organized, sustainable, and scientifically monitored" cultivation and harvesting techniques, the number of wild plants resources is decreasing[xviii]. Unsustainable harvesting, habitat degradation and deforestation are major threats to the sustainability of Berberis arista. However, this can be mediated with sustainable harvesting and the promotion of indigenous knowledge and management[xix]. An increased production of Berberis arista offers the potential to document and recognize indigenous knowledge. Berberis arista shrubs also have several environmental benefits, such as their use in agro-forestry. Amulya Ratna Tuladhar notes that agriculture in Nepal is sustained by 'forestry' and Nepal's subsistence agriculture is some kind of 'agro-forestry system'[xx]. The integration of wild crops and non-timber products into agriculture is an excellent opportunity to combat deforestation and the encourage biodiversity.

Export Potential:

Economics

The market for Berberis arista, or chutro, is promising. Karki et al, note that the global market is experiencing a "Herbal Craze"[xxi]. In 2008, the recorded value of exported medicinal plants was approximately USD 3 million[xxii]. Moreover, pharmaceutical companies are carrying out research into the value of Berberis and increasingly using it in studies, and commercial medicine [xxiii]. Due to potential of medicinal plants, the government is beginning to prioritize this sector with more funding and initiatives[xxiv].

Marketing

A recent report notes that the term "super fruit" is a very successful marketing technique, and is responsible for the success of many berries such as acaii, and goji[xxv]. Chutro should be marketed as a 'super fruit,' as contains anti-oxidants and other nutritional benefits that are in demand by the North American market[xxvi]. The dried barberries should be marketed as a super fruit to ensure their success.

Limitations

The production of barberries has the potential to help hillside farmers. However the trade and export of the crop requires accessible transportation, which is lacking on the high altitudes of the Himalaya[xxvii]. This is poses a major problem for the success of this crop. Moreover, the government currently has some trade barriers for medicinal plants; however, this may not be an issue if the export product is the dried berry[xxviii].

Potential Importers:

The dried berries would be successful at health food stores, and grocery chains.

- Goodness Me!→ 606 West St, Brantford, ON N3R 7C5
- Whole Foods Market→ 640 North La Salle Street, suite 300. Chicago, IL
- Various Health food stores, for example→ Noah's Health Food Store, 2395

Young St. Toronto, ON M4P 3E7

Conclusion:

Berberis arista, or chutro, has the potential to be a unique and profitable product for Canadian markets. It is widely used and valued by local communities, yet it has not reached its trade potential due to a lack of processing, and transportation barriers. It also requires better management, and cultivation. Resolving these environmental and market challenges would improve the livelihoods of hillside farmers in Nepal.

End Notes

[i] Adhikari B, et al,. (2012). A Revision of Berberis S.S (Berberindaceae) in Nepal. *Edinburgh Journal of Botany*, 69, 447-522.
[ii] Adhikari et al., 2012
[iii] Ali, M., Malik, A.R., Sharma, K.R. (2008). Vegetative Propagation of *Berberis aristata* DC. An Endangered Himalayan Shrub. *Journal of Medicinal Plants Research*, 2 (12), 374-377.
[iv] Parmar, C. and M.K. Kaushal. 1982. Berberis aristata. In *Wild Fruits*. Kalyani Publishers: New Delhi, India, 10-14.
[v] Alemardan Ali et al. (2013). Cultivation of Iranian Seedless Barberry (*Berberis integerrima)* 'Bidaneh': A Medicinal Shrub. *Industrial Crops and Products*, (50). 276-287
[vi] Bhattarai, S., Chaudhary, R. P., & Taylor, R. S. L. (2009). Wild edible plants used by the people of Manang District, Central Nepal. *Ecology of Food and Nutrition*, *48*(1), 1-20.
[vii] Shakya, D.B. (2002). Status report of processing and marketing of underutilized fruits in Nepal. In N. Haq and A. Hughes (Eds.), *Fruits for the Future of Asia* (pp. 155-179). Southampton, UK: International Centre for Underutilized Crops. Retrieved from http://www.cropsforthefuture.org/publication/proceeding/Fruits_for _the _Future_in_Asia.pdf
[viii] Alemardan Ali et al., 2013
[ix] Bhattarai, S., et al 2009.
[x] UNEP (2012), Green Economy Sectoral Study: BioTrade-Harnessing the Potential for Transitioning to a Green Economy-The Case of Medicinal and Aromatic Plants in Nepal. Retrieved from: http://www.unep.org/greeneconomy/Portals/88/documents/research_products/Bio%20Trade%20Medicinal%20and%20Aromatic%20Plants%20in%20Nepal.pdf
[xi] Gewali B. M. (2008). *Aspects of Traditional Medicine in Nepal* .Japan: Institute of Natural Medicine, University of Toyama.
[xii] Kunwar, R. M., & Bussmann, R. W. (2008). Ethnobotany in the Nepal Himalaya. *Journal of Ethnobiology and Ethnomedicine 4*(24). 4-24.
[xiii] Tiwari, A et al., (2014) Preliminary Pharmacognostic and Phytochemical analysis of *Berberis arista. Journal of Chemical and Pharmaceutical Research 6* (11). 764-77
[xiv] Parmar, C. et al., 1982
[xv] Adhikari B, et al,. 2012
[xvi] Birdsall T, Kelly G. (1997). Berberine: Therapeutic Potential of an Alkaloid found in Several Medicinal Plants. *Alt Med Rev 2*(2). 94-103.
[xvii] Birdsall et al.,1997

[xviii] Kunwar, R. M., Mahat, L., Acharya, R. P., & Bussmann, R. W. (2013). Medicinal Plants, Traditional Medicine, Markets and Management in far-west Nepal. *Journal of Ethnobiology and Ethnomedicine 9*. 24-30.
[xix] UNEP, 2012
[xx] Tuladhar, Amulya Ratna (1991). Agroforestry in Nepal. In *Agroforestry the Asia and the Pacific*. Bangkok: Winrock International Institute for Agricultural Development, 96-106.
[xxi] Gewali, 2008
[xxii] UNEP, 2012
[xxiii] Birdall et al., 1997
[xxiv] UNEP, 2012
[xxv] (2008). *Berries in the World: Introduction to the International Markets of Berries*. Report by Invenire Market Intelligence. Retrieved from http://www. invenire.fi.
[xxvi] (2008). *Berries in the World*
[xxvii] Shakya, D.B. et al,. 2002
[xxviii] UNEP 2012