

Sea buckthorn – A Future Food Resource

Saurabh Naryal^[1] and Tanya Sharma^[2]

*Sher-e-Kashmir University of Agricultural Sciences and Technology, Jammu, J&K^[1]
University Institute of Agricultural Sciences, Chandigarh University, Punjab^[2]*

Corresponding author: naryalsaurabh50@gmail.com

ARTICLE ID: 015

Sea buckthorn (*Hippophae L.*) is a berry-bearing, hardy, deciduous shrub of Elaeagnaceae family. Generally called as Wonder Berry, Leh Berry or Ladakh Gold, it is drought resistant and tolerant to extreme temperatures from -40° C to 40° C. The shrub has an extensive root system which can fix atmospheric nitrogen and ideal for controlling soil erosion, land reclamation, farm stand protection and wildlife habitat enhancement. This future food is a storehouse of essential nutrients comprising a rich source of vitamins mainly fat-soluble Vitamins A, K, E and Vitamin B₂ and C; Carbohydrates; Organic acids mainly malic and quinic acid; 18 amino acids, of which half are essential amino acids; along with 24 chemical elements primarily N, P, Fe, Mn, B, Ca, Al and Si. The seeds of this berry are antioxidant-rich due to presence ascorbic acid, tocopherols, carotenoids, flavonoids, fatty acids and other bioactive compounds. Despite diverse uses of the other parts of the plant, the most important part which is gaining popularity is the berries and the juice extracted from the berries. After achieving a unique status as an exceptional plant source in the World including India, this plant species is becoming ecologically and economically very important.



Geographical Distribution

Sea buckthorn is mainly found in Asia and Europe where temperature and rainfall are less. It is believed to have originated in Himalayas. China has about 80 percent of Sea buckthorn resources which is highest in the world. It primarily grows in dry temperate regions of India covering around 15,200 hectares in Himachal Pradesh, Ladakh, Uttarakhand, Jammu & Kashmir and Sikkim with a production of about 20,800T berries. About 90% of world's Sea buckthorn is found in China, Russia, Mongolia, Canada and Northern Europe and worldwide acreage of Sea buckthorn is reported about 3.0MH (both wild and cultivated). In India, Ladakh holds the major site for natural Sea buckthorn (*Hippophae rhamnoides*) resource with over 70% of the total (13,000 ha) area in the country.

Nutritional Benefits

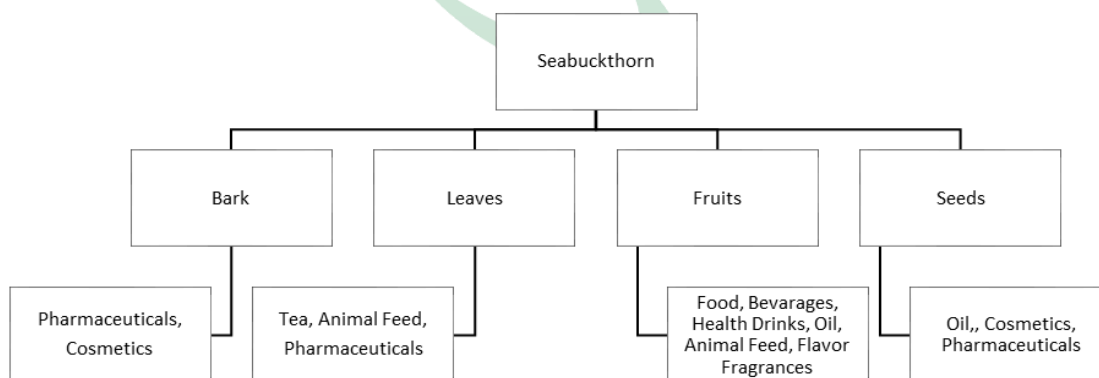
Benefits of this berry are no less than wonderful, indeed, Wonder Berry! It now has been considered as a high value functional food due to the abundance of bioactive compounds namely carotenoids, tocopherols, sterols, flavonoids, lipids, ascorbic acid, and tannins that yields remarkable effects on human health. One of the most outstanding traits of SB is high content of vitamin C.. Since antioxidants are crucial in protecting the cells of the immune system, Sea berry is also anti-inflammatory.

Table 1. Antioxidants in Sea Buckthorn berry juice.

Compound	Concentration (mg/l)
Vitamin C	1540
Flavonoids	1182
Vitamin E	13.5
Carotenoids	7.3

Source: Christaki (2012).

The extracted oil and the phenolic fraction of berry, also exhibits a robust antioxidant



activity; the oil because of the high carotenoid levels varying from 1.5 -18.5mg/100g and the berry because of the presence of about 76% to 89% of Alpha-Tocopherol which not only has the highest antioxidant activity but surprisingly is the most abundant tocopherol (tocopherols and tocotrienols in the fruit or seeds mutually called as Vitamin E, indicates its strong antioxidant activity). The antimicrobial effect comes from its phenolic content. Excellent flavonol content in its leaves, juice or fruit is noted for its anticarcinogenic and radioprotective effects.

Comprehensively Hippophae symbols an ideal natural vegetable source to obtain essential and unsaturated fatty acids, both being imperative for human heart health. Its omega-7 fatty acids group is notably superior among other plants. Oil obtained from seed is rich in omega-3 and omega-6 fatty acids while within the pulp, oils are predominantly fatty acids omega-7 group. Since these fatty acids play an indispensable role in several metabolic and structural functions, it's this berry among very few that possess it. The efficacy of Sea buckthorn for its medicinal properties for treatment of oral or vaginal mucositis, cervical erosion, duodenal or skin ulcers, cancer, stomach malfunctioning, improper digestion, thrombosis, neoplasia, tendon or ligament injuries etc. can be traced from the modern-day technology and clinical trials.

Sea buckthorn - a Covid therapy

Sea buckthorn can be used as an immunity booster and a drug to combat coronavirus. According to South Korean scientists, the lactic acid bacteria present in the berry can suppress the growth of new corona virus by inhibiting the purine activity. The probiotic bacteria extracted from the fermented berry contain numerous *Lactobacillus gasseri* (*L. gasseri*) which represses the activation of purine, the energy source required for the mutation of novel corona virus. It will work as a supplementary drug in the treatment of COVID-19 virus. In India, DRDO and other research organizations are conducting clinical trials of drugs made from sea buckthorn on humans against Covid-19.

Sea buckthorn - Bringing an Economic Transformation

In Himachal Pradesh, Seabuckthorn is locally known as 'Driblu' and 'Chharma'. The locals have utilised its nutritive properties since centuries and continue to do so till date. In Lahaul and Spiti, earlier with insufficient scope of sustainable livelihood and limited source

of income due to heavy snowfall every year for six months, all has changed after the discovery of this Wonder plant as nutritional and medicinal which could be a magic recipe for healthy life. In 2010, under the national initiative for Seabuckthorn cultivation in cold desert ecosystem by Ministry of Environment & Forest and Defence Research & Development Organisation, a majority of women self-help groups, local youth and families began its cultivation and processing and lead to the development of various products like Beverages, Jam, Jelly, Herbal Tea, Animal feed, oils etc. A significant appraisal in the price of fresh berry has been recorded as Rs 45/kg in 2017 which was earlier just Rs.8/kg in 2001.

Consumer Value Added Products

Processing of the berries include extraction of the juice preferably through high temperature and short time processing (HTST) method whereas extraction of the seed oil rich in omega fatty acids occur using the supercritical CO₂ extraction method. Defence Institute of High-Altitude Research, Leh advanced several antioxidant-rich products to combat high altitude-related oxidative damage. Fig 3 shows some of the developed products. Relatively, products developed by the Defence Food Research Laboratory, Mysore (fig. 4) include bakery products, jelly, wine, healthy drinks, food colourant, animal feed, yogurt etc. The biscuits made from pulp and leaves are enriched with dietary fibre, flavonoids and other phytochemicals. The mixed fruit jelly made by blending Sea buckthorn with papaya, watermelon and grapes offer an attractive glossy colour with a pleasant flavour. Various healthy drinks such as spiced squash, fruit blended squash and wine from pulp with the grapes is also developed. After extraction of the pulp the residue traces a yellow food colourant and the leftover after extraction of colourant is used as an animal feed which thus is a rich source of proteins, fats and micronutrients. Additionally, yogurt comprising Sea buckthorn as major constituent along with milk and probiotics is also produced. Many such products have been developed worldwide pertaining to multiple demands.

Product	Part Used
Seabuckthorn beverage	Berry
Seapricot beverage	Berry
Herbal tea	Leaf
Oil capsule	Seed
Seabuckthorn jam	Berry
Antioxidant herbal supplement	Berry
Adaptogenic appetizer	Berry
UV protective oil	Seed
UV protective cream	Seed
Feed supplement	Leaf, berry



Conclusion and future prospects

Sea buckthorn berries are amongst the most nutritious of all fruits. From having an impressive phytochemical profile to being heavily laden with numerous bioactive compounds with exceptional biological and functional values, it is profoundly designed as “Superfoods”. Superfoods are constantly in radar of the consumers who enjoy natural products with functional properties be it as a skin ingredient for skin enthusiasts or health supplements, Sea buckthorn emerges as an exceptional plant source. It definitely beholds the state-of-the-art potential but there lies a great hedonic barrier to its multifield bio-industrial use. Defiantly, what still remains unexplored is its formulation of new avenues in the pursuit of modern light despite being a profitable research. However, being scarcely produced there lies a vast potential of Sea buckthorn in boosting the local economy along with sustainability which can have serious ramifications on the socio-economic system. Having stated this, its unrestrained exploitation can even lead to loss in its diversification and extinction. Therefore, there is a necessity to conserve the wild genotypes in order to avail them as a source for breeding of new plant varieties in future. Judicious management and meticulous utilization of wild species can prove much more profitable.