Sea buckthorn (Hippophae Rhamnoides-L)-A potential Nutraceuticals and Pharmaceuticals Source- Nature’s Gift to Ladakh

Mohammad Ishaq,
Assistant Professor
Deptt. of Chemistry,
Govt. Degree College, Kargil,
Jammu & Kashmir, India- 194103
Email—isackar440@gmail.com.

Abstract:
Typically when a plant grows under harsh environment develop therapeutic properties that help the human body to handle difficult condition on consuming it. In India mostly it is found in high altitude cold arid condition of Ladakh (Kargil and Leh) Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh. All parts of the plants viz berries, leaves, stem, seeds or pulp oil contains many bio-active compounds. They are rich of natural anti-oxidants, such as ascorbic acid (vitamin–C), tocopherols, carotenoids, flavonoids, vitamins, fatty acids mainly unsaturated fatty acids and minerals (Ca, P, Fe, K etc). Animal and human studies suggest that sea buckthorn have wide range of beneficial effects such as anti-carcinogenic, anti-bacterial, anti-viral, anti-inflammatory, cardio protective, anti-gastric ulcer, healing properties. Therefore, the purpose of this study is to highlight the importance of sea buckthorn as a source of nutraceuticals and pharmaceuticals, so that it should be used as an alternative nutritional source in the commercial market, thereby much to contribute to the livelihood of high mountainous people by utilizing this kind of hidden treasure of Ladakh.

Keywords: Sea buckthorn, Soil nutrition, Nutraceuticals, Pharmaceuticals, Antioxidants, Bioactive.

Introduction:
Ladakh region of Jammu and Kashmir covers about 90,000 sq. km. geographical area and is unique in many aspects due to its geo-climatic conditions like high elevation, extremely cold and dry weather, sloppy physiographic condition, thin soil profile with low fertility, low water holding capacity, scorching sunshine during sunny hours and topographically rugged with rocky terrains. The vegetations are known to respond to such extremes and harsh conditions by synthesizing phyto-chemicals, besides the morphological adaptation to fight the adversities for their survival and therefore plants surviving in Ladakh region may have unique chemical composition as compared to those grown elsewhere. Although Himalayan region is well known for its valuable herbal store from ancient time and Ladakh region of Jammu and Kashmir which seems barren and devoid of vegetation at the first sight is very much rich of herbal resource.

Sea buckthorn plants naturally growing in Ladakh regions (Kargil and Leh District) of Jammu and Kashmir and locally known as “Tsermang”. It is a deciduous thorny bush with orange-yellow berries. The fruit or berry contains a small single brownish-black seed. The parts of the plants viz berries, stems, leaves, seeds or pulp oil contains many bio active compounds. They are rich of natural anti-oxidants, such as
ascorbic acid (vitamin–C) tocopherols, carotenoids, flavonoids, vitamins, mainly unsaturated fatty acids and minerals (Ca, P, Fe, K etc). Recently, it has attracted considerable attention from researcher around the world mainly for its nutritional, medicinal and environmental values due to the fact, that it is found in ladakh region in its purely organic form. Tibetan, Mongolian and Chinese traditional medicines used this plant from more than one thousand years and this plant has become an important raw material of health products and cosmetics in China and Russia. (Alam zeb-2001,Xu et al., 1994).

**Distribution of Sea Buckthorn in India.**

In India, mostly it is found along the riverside, in high altitude cold arid condition of Ladakh (Kargil and Leh district) region of Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim and Arunachal Pradesh. Ladakh is the northern part of India situated at the altitudes ranging from 8,500 to 15,000 ft above the sea level. Hippophae Rhamnoides species is mostly dominant in the Ladakh region. The field research laboratory (FRL), Leh through recent satellite imaging and mapping technique has assessed that an area of about 11,500 hectares under sea buckthorn, indicating a tremendous potential for its cultivation in Ladakh region. The general characteristics and distributions of Hippophae Rhamnoides species in India is mentioned in the table -1

<table>
<thead>
<tr>
<th>Species (Local name)</th>
<th>Ladakh (Tsermang)</th>
<th>Himachal (Chhrma)</th>
<th>Uttarakhand (Chuk, chu)</th>
<th>North East (Tare)</th>
<th>Growing altitude (m)</th>
<th>Plant height (m)</th>
<th>Flowering time</th>
<th>Fruit ripening time</th>
</tr>
</thead>
</table>

**Present day Cultivation and Usage in ladakh:**

Hippophae Rhamnoides species is widely distributed in Ladakh, both Kargil and Leh districts. The environment in Ladakh region of Jammu and Kashmir provides remarkable potential for the growth and development of this wild bush and can grow naturally in every part in Ladakh region. Despite of wide occurrence, great medicinal value and tremendous market potential, its use in modern medicinal purposes and other products in Ladakh is very less so far. Traditional Ladakhi system of medical practice properly known as Amchi system of medicine follows the Tibetan system of medicine, using numerous herbs including sea buckthorn for various ailments since from the past and still now about 60% of population of Ladakh seeking after it.

The wild plant was not harvested in Ladakh till now because of lack of knowledge of its worth and market, lack of entrepreneurial ventures in its processing, lake of investment, and lack of government concern in developing it in to a big industry. An
Indian entrepreneur, D. K. Mittal who initiated to exploit this treasure of Ladakh first time in 2001 on large scale by establishing 4.8 crore of rupees investment in Ladakh Food Limited (LFL) in Leh, for pulping and processing of this fruit and named the product as “Leh Berry” and this marvelous plant started to be recognized by the leh berry in the market, but soon LFL in Leh shutdown.

Phytochemistry: Many study associated with the sea buckthorn claims its high nutritive value in term of sugar, amino acids, vitamins, Carotenoids, fatty acids (like Palmitic acid, Palmitoleic acid, linolenic acid, Steric acids), flavonoids, Phenolic contents (Gallic acids, Vanillic acid, Cinnamic acids, P-hydroxybenzoic acids), macro and micro nutrients (Ca, Mg, Fe, Zn, P, Na, k). [Zeb et al 2004]. Sea buckthorn berries are among the most nutritious of all fruits and have immense medicinal properties. Concentration of vitamins (B2, B3, B5, C, E) are several-fold higher than other fruits like apricot, banana, apple, peach [Stobdan et al 2010]. The various main nutrients of sea buckthorn is shown in table-2 [stobden et al -2011].

All parts of the plant contain bio-active compounds. The berries and seeds contain minerals, vitamin –C, E, carotenoides, fatty acids mainly unsaturated fatty acids, carbohydrates, organic acids especially malic acid, citric acid, tartaric acid, and flavonoids. [christaki, 2012] The leaves contain mainly phenolic contents in a significant quantity. It contains also sugar and significant concentration of vitamins and the pulp contain mainly carotenoids and vitamin B complex. Two type of oil can be extracted from the sea buckthorn, either from the seed or from the pulp.

Table-2: Main nutrients of sea buckthorn of Ladakh

<table>
<thead>
<tr>
<th>Constituents</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture %</td>
<td>83.94</td>
</tr>
<tr>
<td>Total sugar %</td>
<td>2.86</td>
</tr>
<tr>
<td>Carotenoids mg/100g</td>
<td>69.2-342.0</td>
</tr>
<tr>
<td>Tocopherols mg/100g</td>
<td>66.6-178.8</td>
</tr>
<tr>
<td>Calcium</td>
<td>176.6</td>
</tr>
<tr>
<td>Iron</td>
<td>30.9</td>
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<tr>
<td>Phosphorus</td>
<td>84.2</td>
</tr>
<tr>
<td>Potassium</td>
<td>647.2</td>
</tr>
<tr>
<td>Sodium</td>
<td>414.9</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>1.45</td>
</tr>
<tr>
<td>Niacin</td>
<td>68.4</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>1.12</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>275</td>
</tr>
<tr>
<td>Vitamin A IU/100g</td>
<td>432.4</td>
</tr>
<tr>
<td>Vitamin E</td>
<td>3.45</td>
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</tbody>
</table>

Medicinal implications:

Medicinal properties of sea buckthorn has been attributed due to its important phytochemicals, like flavonoids, carotenoids, fatty acids, phenolic contents, vitamins especially vitamin E and C, which are found in this plant in large quantity as compared to other plants. [Stobdan et al 2001]. The medicinal values of sea buckthorn are as follows:
**Anti cardiovascular:** Sea buckthorn oil is used as anti cardiovascular medicine. Some simple formulas based on sea buckthorn have been developed which is intended for use in treatment of coronary heart disease, heart attack and stoke through improving blood circulation and restoring cardiac function. It is a rich source of anti oxidants such as flavonoids and as well as poly unsaturated fatty acids are capable of improving the function of the cardiovascular system. [Zeb-2006]. It has been found that the juice of this plant affects the risk factors like plasma lipids, platelet aggregation for coronary heart disease in humans. (2-11)

**Anti Gastrointestinal Ulcers:** Gastric ulcers and duodenal ulcers are growing in human being, especially in developing countries including India due to unfavorable and unassessed diet, ignorance and carelessness. Traditionally sea buckthorn is used for the treatment of gastric ulcer and laboratory studies confirm the efficacy of seed oil of this plant for its application.[17]

Huff et. al., 2012 studied the efficacy of a commercial product containing the berries and pulp of sea buckthorn in the therapy and prevention of gastric ulcers in horse. Therefore, it can be used in the prevention of glandular ulcers in horses.

**Hepatoprotective effect:** The liver is often affected by the multitude of environmental pollutants and drugs, all of which place a burden on the vital organ which eventually can damage and weaken the liver and leads to hepatitis or cirrhosis. Resent laboratory studies reveals that sea buckthorn contains lot of vitamin A precursors, including carotene and unsaturated fatty acids that could protect the liver from hepatoxins like, ethanol, carbontetrachloride.[Zhao et al,Ramesbabu et al 2011] Flavonoids are mainly responsible for the prevention of liver fattening.

**Dermatological effects:** Palmitolic acid, an ingredient of the oil is a component of skin. It is considered a valuable topical agent in treating burns and healing wounds. The fatty acid can also nourish the skin. Therefore the oil of this plant is widely used for skin burn, scalds, ulceration and infections. Hippophae oil has UV-blocking action and helps in promoting regeneration of tissues. (8-10) Laboratory studies showed that the oil of this wonder plant has a role in tissue regeneration, magical effects in treating skin burns and scalds.

**Anti platelet aggregation:** Sea buckthorn is rich in fatty acids and flavonoids which has positive effects on platelets. The main function is the suppression of platelets aggregation induced by collagen, probably by the inhibition of the Thyrosine kinase activity. [Patel et al- 2012]

**Anti-diabetic:** One of the positive effects of sea buckthorn is the mitigation of the symptoms of diabetes mellitus. It can decrease the blood sugar concentration. Studies needed to be conducted the test and verify the effect on the symptoms in diabetic patients.

**Anti bacterial and anti viral:** The Phenolic contents of sea buckthorn characterize the main phytochemicals which exhibits antibacterial and antiviral effects. These compounds suppress gram –ve and gram +ve bacteria. (khan et al 2010,kumar Sagar 2007). A recent study shows that the extract of leaves and juice of berries of sea buckthorn is effective in inhibiting bacterial growth especially of E. colli. [christaki 2012]. It has also exhibit biological properties
against viral diseases like influenza and HIV infections. [Michel et al 2012]. Jain et. al. 2008, suggest that the sea buckthorn leaf extract has significant anti dengue activity and has a potential for the treatment of dengue fever.

**Nutritional Values:** The berry has a unique taste and can be used for the making of juice, jelly, jam, alcoholic and non alcoholic beverages, and dairy products (Bail et al 2012). Oil from the seeds and pulp may be used as ingredients in food supplements such as jelly, capsules and oral fluids.

Sea buckthorn is well of nutrients and bioactive substances. Juice from the berries is rich in sugar, organic acids, amino acids, essential fatty acids, flavonoids, carotenes, vitamins and minerals. The juice contains 24 minerals and 18 different amino acids. [stobdan et al 2013]. Sea buckthorn has long been used as an additive in animal nutrition for its favorable effects on animal health. Seeds cake and leaves are rich in proteins and minerals and represents a beneficial animal feed. Although information about its potential application of sea buckthorn and its product in animal nutrition is available, further research and knowledge in this area may significantly contribute to the extension of the sea buckthorn application.

**Other Properties like soil nutrition:** Sea buckthorn has an extensive and profuse root system, not only grow up and respire in soil but also suck up the moisture and nutrition materials through nitrogen fixation. It has been observed that there is a high concentration of different nutrients like N, P, and K in soil than those in farmland and grass land, thus sea buckthorn plantation have a role in enhancement of soil fertility.

**Summary:** Sea buckthorn plant is considered as gold of the cold desert due to its multipurpose properties, like pharmaceuticals, nutraceuticals and soil ameliorant. The present international market for sea buckthorn product including food stuff, beverages, medicines and cosmetics is valued over 500 billion a year. The local people are receiving a tiny proportion of its benefit, despite of having remarkable potential. It is the time that the people and government in particular to come forward and think about this resource for exploring all the possibilities of exploiting it, as there is ample opportunities to bring change in the socioeconomic of people of Ladakh region in particular by utilizing this hidden goldmine of Ladakh.
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