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"Sea Buckthorn: The Miracle Plant of the Himalayas"

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ABSTRACT-
Sandthorn, Himalaya Berry, Sea Berry, and *Swallow Thorn* are other names for the sea buckthorn plant. It is also known as the Siberian pineapple in several places. *Chharma* is the indigenous name for sea buckthorn in Himachal Pradesh, India.*Acharya Bhavmishra* has described Sea Buckthorn *(Hippophaerhamnoides Linn.)* in his classical Ayurvedic text *Bhavaprakasha Nighantu*, which is one of the most important *Nighantu* (Ayurvedic Materia Medica).
The transforming potential of *seabuckthorn*, a rare thorny shrub indigenous to Ladakh and frigid climates, has not yet been completely realised. Its berries, which are among the healthiest fruits, are packed with advantages. The plant's promise for anti-aging and cancer treatment is further demonstrated by cell line investigations.The transforming potential of *seabuckthorn*, a rare thorny shrub indigenous to Ladakh and frigid climates, has not yet been completely realised Its berries, which are among the healthiest fruits, are packed with advantages. A valuable ingredient, the oil is an uncommon plant source of omega-3, omega-6, omega-7, and omega-9 fatty acids, making it a desirable element. Clinical studies have confirmed the well-established therapeutic benefits of seabuckthorn by demonstrating that formulations based on the shrub are helpful in lowering cardiovascular risk factors, obesity, and hypertension. Cell line studies further illustrate the plant's potential for cancer therapy and anti-aging. Seabuckthorn is a rare thorny bush that is native to Ladakh and cold climes, but its transformative potential has not yet been fully recognised.The plant is found gregariously growing along the river sides and moist patches of the cold desert of Himalayas at an altitude of 1600-2500 m.[1]

KEYWORDS-*sea buck thorn*, Himalayan berry,amleech, VitC berries, *Hippophae*

I. INTRODUCTION

The term "*seabuckthorn*" refers to its tendency to grow close to the "sea" and its profusion of "thorns," which are evocative of some "buckthorn" species (of the genus Rhamnus). The Latin terms "Hippo" (meaning horse) and "faos" (meaning shine) are the source of the scientific name, Hippophae. Thus, "shining horse" is the traditional Latin meaning of the generic name Hippophae. Alexander the Great's army is thought to have observed that giving seabuckthorn berries and leaves to ailing and damaged horses enhanced their health and lustrous coat.[2]

It's called tSer-Mang, tSer-Ta-Lu-Lu, and Shib-Shu-Lu-Lu in Ladakh, Amesh, Chuk, Amil, and Tarwar in Uttarakhand, and Chharma in Himachal Pradesh in India. It is known as *Amlich* or *Badriphal*, an Ayurvedic medicinal herb. Pineapple-like perfume and a pronounced sour flavour characterise the fruits. In fact, Russian pineapple is the name given to the fruit juice in Belarus. All seven of the Hippophae species are known as seabuckthorn. The most extensively distributed species is *H. rhamnoides*, whilst the other species are only found in small areas. With elevations ranging from a few meters to 5,200 meters, seabuckthorn is extensively dispersed in a variety of geographic regions.[3]

In Ayurveda-
Sea buckthorn is first mentioned in the ***Bhavaprakash Nighantu***, a classical 16th-century Ayurvedic materia medica composed by Acharya *Bhavamishra*. In this text, it is described under the *Amradi Varga* by the name *Āmlīcch (आम्लीच)*.promotes vitality, immunity, and longevity.Its antioxidant activity corresponds to "***Vayahsthapana***" (anti-aging) and *"**Vishaghna***" (detoxifying) actions.[4]

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Sea buckthorn *(Hippophaerhamnoides L.)* is a plant with various nutritional and medicinal properties. It contains vitamins, carotenoids, polyphenols, fatty acids, and phytosterols, which have antioxidant, anticancer, anti-hyperlipidemic, anti-obesity, anti-inflammatory, antimicrobial, antiviral, dermatological, neuroprotective, and hepatoprotective effects. Sea buckthorn can be used as a functional food or a dietary supplement for the prevention and treatment of chronic diseases. This review summarizes the phytochemistry, health benefits, and food applications of sea buckthorn, and highlights the potential and challenges for its further development and utilization.[5]

Vitamin 'C' rich Berries-

One of the healthiest fruits is the seabuckthorn berry, which also has many therapeutic uses. According to Kalia et al. (2011),[6] it has the commercial standing of a new "Super-fruit." More than 100 distinct nutrients and bioactive compounds may be found in berries. The acidity of the fruit makes it unfit for direct consumption. It has a pH between 2.7 and 3.1 (Seglina et al., 2006).[7] One of the healthiest fruits is the seabuckthorn berry, which also has many therapeutic uses. According to Kalia et al. (2011),[6] it has the commercial standing of a new "Super-fruit." More than one hundred distinct nutrients and bioactive compounds may be found in berries. The acidity of the fruit makes it unfit for direct consumption. According to Seglina et al. (2006),[7]its pH range is 2.7–3.1.

Berries

Due to its high concentration, vitamin C is a nutrient of major relevance in seabuckthorn. Compared to orange and aonla, the vitamin C concentration is greater. Around the world, seabuckthorn berries have enough vitamin C to satisfy everyone's nutritional needs.[8]

The most valuable component of the berries is the oil. Two types of oil can be extracted: pulp oil and seed oil. Seed oil is commonly used in cosmetic preparations, such as facial creams.[9]

In India, seabuckthorn received much attention after the **Defence Institute of High-Altitude Research (DIHAR)** developed and commercialized the production of ready-to-serve beverages from the highly acidic fruit. The drink was introduced in the Indian market under the 'Leh Berry' brand. Due to the brand's popularity, seabuckthorn is often called the Leh Berry plant. Once considered a thorny menace, the shrub is now viewed as a means for sustainable development in mountain regions.

Description of the plant-

The *seabuckthorn*, or *H. rhamnoides*, is a tiny tree or shrub that can reach a height of 1-4 meters. In woodland regions, particularly near riverbanks, it can reach heights of 15–18 m.[3] However, H.

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salicifolia is tall and often reaches 4-5 m in height, whereas H. tibetana barely reaches 7-60 cm.

Life span- The natural lifespan of the seabuckthorn plant is 60-70 years. Fruit-bearing trees over 300 years old are also found in China.[3]

Flower -The majority of seabuckthorn is a species that have distinct male and female plants, or dioecious species. Between the first week of April and the first week of May, when the plants are completely leafless, they begin to flower. Male bloom, golden-dark brown

The blooms don't smell or have nectar. The pollination of the female flowers is mostly dependent on the wind. According to Mangla and Tandon (2014)[10], pollen may move up to 15 meters.

Dark brown male flower

Fruit- Seabuckthorn produces drupe-like fruit with a single seed encased in a fleshy hypanthium. The fruits are tiny, delicious, velvety, and delicate. The red, orange, or yellow fruits are spherical to slightly elongated and stay on the shrub all winter long. Late August to mid-September is when the fruit ripens.

Fruit

Seed-Seabuckthorn seeds measure 3-5 mm in length and 1.5-2.5 mm in thickness. They are firm and dark brown. According to Beveridge et al. (1999),[11] fresh seabuckthorn seed oil crystallises at 59°C, which is significantly lower than the temperatures of vegetable oils like canola (-43°C) and sunflower (-45°C).

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Seeds

Leaves-Seabuckthorn has silvery deciduous leaves. The leaves are alternate, 2-4 mm wide, with silver to graycolor on the upper side, and under the surface is covered with peltate hairs.[12]

Leaves

Root-The shrub can fix nitrogen from the atmosphere due to its large root system. According to Dwivedi et al. (2006),[13] a shrub that is 10–12 years old is perfect for soil binding since its horizontal roots reach up to 5.4 m and its vertical roots reach up to 1.3 m deep.

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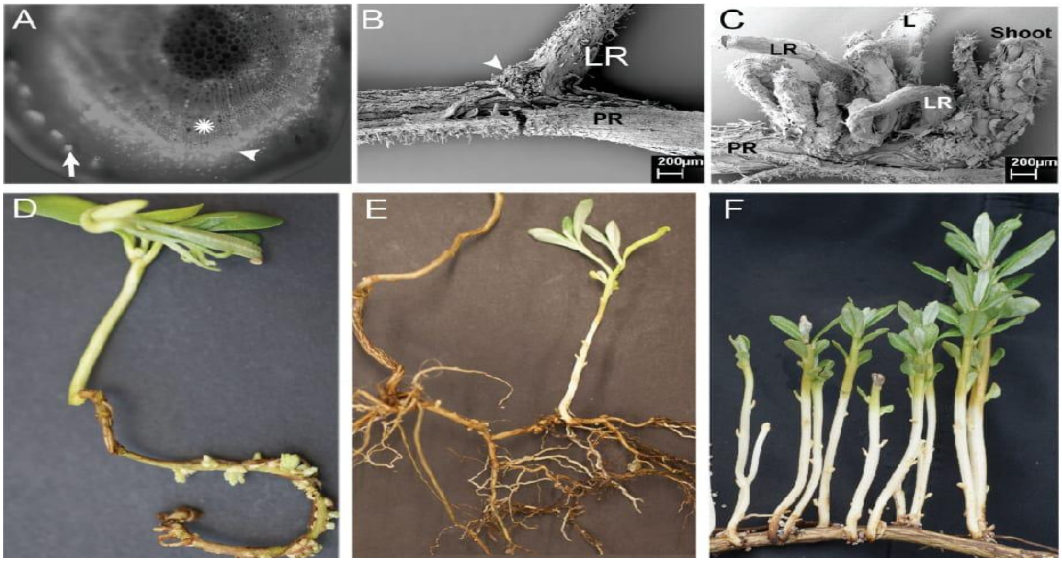

Root

Regional Distribution of Sea buck thorn-

Seabuckthorn is a common plant that thrives in regions with yearly mean temperatures between 2.7°C and 10.7°C. A total of 2.33 million hectares of seabuckthorn are found in 52 countries around the world. About 2.1 million hectares are in China, with the remainder being spread throughout other nations. Russia (60 hectares), India (14,500 hectares), Pakistan (5,700 hectares), Romania (15,000 hectares), and Mongolia (20,000 hectares) are the other main seabuckthorn-producing nations.[14] Afghanistan, Azerbaijan, Armenia, Belarus, Britain, Bhutan, Finland, France, Germany, Hungary, Italy, Kazakhstan, Nepal, Norway, Poland, Sweden, Switzerland, Ukraine, and Uzbekistan are among the other countries where the shrub may be found. North America has also been exposed to the plant.

Sea buck thorn is well adapted to different geographical and climate condition in China and can grow from 420-5,200 m above sea level[15]rhamnoides is found in Mongolia. The species covers about 20,000 hectares of land.[14]

In **India** Ladakh and isolated areas of Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh, the plant is abundantly found. There are around 14,500 hectares of seabuckthorn in all. At more than 64 percent of the nation's total seabuckthorn area, Ladakh continues to be the primary location for natural seabuckthorn resources.

Uttarakhand: H. salicifolia is commonly found between1,700-3,000 m elevations, particularly along rivers and tributaries originating from glaciers. It grows in Uttarkashi, Rudraprayag, Chamoli and Pithoragarh districts.[16]*H. tibetana* is found at an altitude of 3,300-4,500 m in Pithoragarh and Chamoli districts.[15] The total area covered by seabuckthorn is approximately 3,750 hectares.[16]

Himachal Pradesh: Three species' wild populations in the areas of Lahaul-Spiti and Kinnaur, three

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species of seabuckthorn—***H. rhamnoides, H. salicifolia, and H. tibetana***—have been identified. In the Chandra Valley (2,958-3,110 m) in Lahaul, it may be found sporadically in places such as Sissu, Khorpani, Raling, Khongsar, Gondhla, and Dalang. From Gemur to Darcha, a stand of *H. rhamnoides* may be found along the Bhaga River. The settlements of Tinu and Kardang are home to *H salicifilia*. Seabuckthorn grows in the Spiti Valley from upper Spiti (3,900 m) to Sumdo village (3,100 m). Higher elevations including Losar (4,100 m), Takcha (4,500 m), Kibbar (4,100 m), and Chicham (4,200 m) are home to *H. tibetana*.[15]

Nutritional value of sea buck thorn-

Berries from seabuckthorn are one of the healthiest fruits and offer several advantages. Vitamins, organic acids, amino acids, flavonoids, phytosterols, and mineral elements are among the many vital substances that are abundant in the fruit juice. Seabuckthorn lowers plasma cholesterol because it has 4–20 times more phytosterols than soybean oil. Seabuckthorn seed oil has a one-to-one ratio of omega-3 and omega-6 fatty acids, making it extremely useful for general health. The oils produced from seabuckthorn are extremely important. An omega-7 monounsaturated fatty acid that is rare in the kingdom of plants is palmitoleic acid. One of the few plants that has this fatty acid in the soft section of the berries is seabuckthorn, however. Human health and this fatty acid are closely related. Omega-9 fatty acid, often known as oleic acid, is abundant in seed and pulp oil.[17]

Vitamins:

Sea buckthorn is renowned for its exceptionally high concentration of vitamin C (ascorbic acid). However, the vitamin C content in the plant varies depending on several factors, including its origin, geographical location, stage of harvesting, and post-harvest processing methods. The ascorbic acid content in the berries is over one hundred times greater than that of fruits such as apples, apricots, bananas, and peaches. The berries have three times higher vitamin C than kiwi, six times higher than citrus, and eighty times higher than tomatoes.[18]Seabuckthorn berries are not just a rich source of vitamin C but also contain significant amounts of vitamin E (56-140 mg per kg),[9]Seabuckthorn pulp is also a rich source of riboflavin (1.45 mg per 100 g), niacin (68.4 mg per 100 g), pantothenic acid (0.85 mcg per 100 g), vitamin B-6 (1.12 mg per 100 g), and vitamin B-2 (5.4 mcg per100 g), surpassing the levels found in many other fruits.[19]

Carotenoids:

The color of seabuckthorn berries ranges from yellow to red shades. Their color depends on the carotenoid pigments. Up to 18 different carotenoids have been identified in seabuckthorn oil, with the carotenoids possessing provitamin A activity (β-carotene, y-carotene, β-zeacarotene, ß-cryptoxanthin, and sintexanthin) and lutein accounting for 48 and 14% of the total carotenoids, respectively.[20]

Flavonoids:

Flavonoids are phenolic compounds that have a potential role in managing chronic diseases such as diabetes, cardiovascular diseases, and cancer. Their concentration in seabuckthorn berries ranged from 1,680-8,590 mg per kg of fresh weight.[21]

Phytosterol

Sterol-rich seabuckthorn seeds may provide health advantages. The seed's total sterol content ranges from 1,200 to 1,800 mg/kg, with sistosterol accounting for 57–76% and isofucosterol for 13-21%. The percentages of stigmastanol, citrostadienol, and campesterol in total seed sterols are 1–5, 2–5, and 2-3%, respectively. Other sterols usually make up 1% to 2% of the total.[22]

Protein& Amino acids

The protein content of seabuckthorn berries ranged from 46-129 g per kg of dry weight,[23]Seabuckthorn is rich in various free amino acids; 18 kinds of free amino acids have been detected in the juice, of which eight (threonine, valine, methionine, leucine, lysine, tryptophan, isoleucine, phenyl alanine) are essential for the human body. [24]

Minerals

At least 24 minerals, including calcium, magnesium, phosphorus, iron, manganese, sodium, potassium, and boron, are present in seabuckthorn juice. The element that is most prevalent in the berries is potassium. High levels of potassium (647.2 mg), calcium (176.6 mg), iron (30.9 mg), magnesium (22.5 mg), phosphorous (84.2 mg), sodium (414.2 mg), zinc (1.4 mg), copper (0.7 mg), manganese (1.06 mg), and selenium (0.53 mg per 1) were found in the mineral composition of berries from the Ladakh region in the Indian trans-Himalayas.[19] Compared to mango, apricot, banana, orange, and peach, seabuckthorn has much greater levels of calcium, iron, sodium, zinc, and manganese. Due to increased electrolyte excretion, high altitude circumstances typically result in a higher mineral demand.

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Fiber

Dietary fiber is recognized for its health benefits. Soluble and insoluble fibers make up the two basic categories of dietary fibre. Cellulose, hemicellulose, and lignin are not soluble in water, whereas pectins, gums, and mucilages become gummy in water. Seabuckthorn is high in fiber content and contains 62 g fiber per kg of dry weight.[25] The berries contain 3.9-8.3 g of dietary fiber per kg.[26]

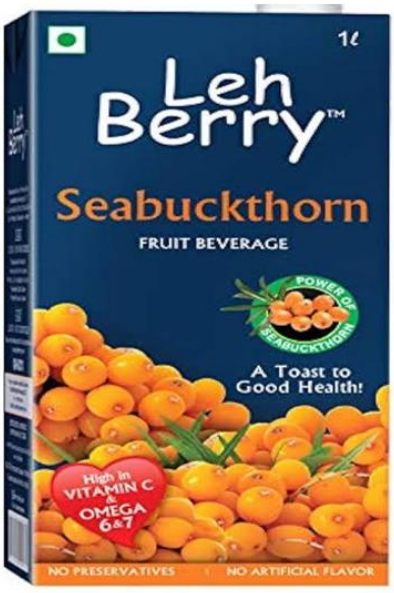
Therapeutic uses

Seabuckthorn has been utilised in traditional medicine for ages due to its many therapeutic benefits. Its use is described in ancient Ayurvedic, Chinese, Tibetan, and Mongolian scriptures. The medicinal benefits of the herb have now been established by science.The berries oil extracts are used topically to stop bleeding and are used to treat liver illnesses, inflammation, and gastrointestinal absorption issues.[27]Inflammatory illnesses, lupus erythematosus, eczema, erosion of the cervix uteri, burns, and frozen body parts are among the conditions that the oil is used to treat.[28] Additionally, berry oil relieves thrombosis [29] and skin conditions.[30] In the Ladakh region, Amchi (traditional doctors) still prescribe preparations made from seabuckthorn to treat common health issues such as indigestion, throat infections, gynaecological problems, ulcers, gastritis, bronchitis, acidity, diarrhea, hypertension, blood disorders, fever, tumors, gallstones, coughs, colds, and food poisoning.

Sea buck thorn exhibits the following properties:

1.Cardiovascular properties.
2.Hepatoprotective properties.
3.Burn healing.
4.Beneficial effects on vaginal atrophy in postmenopausal women.
5.Atopic dermatitis.
6.Reduce hyperpigmentation.
7.Anti-obesity.
8.Dry eye.
9.Blood clotting.
10.Anti stress and adaptogenic activity.
11.Cardioprotactive effect.
12.Anti-psoriatic activity.
13.Antiulcer activity.

Defence Institute of High-Altitude Research (DIHAR) has been working on Seabuckthorn since early nineties and has developed various Seabuckthorn based products. Some of the products such as beverage and herbal tea are very popular in Indian market.



BEVERAGES

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FIRST FRESH JUICE IN THESPACE

According to Letchamo et al. (2007),[31]*seabuckthorn* is recognised as one of the elements that helped the Mongolian Genghis Khan conquer a significant portion of the world in the 12th and 13th centuries. During the 1988 Olympic Games in Seoul, Chinese competitors were required to drink seabuckthom.[15]

With the creation of cultivars for big commercial farms, seabuckthorn was first grown commercially in Russia in the 1920s. Since 1940, Russia has had a thriving seabuckthorn industry. During the space competition in the 1960s and 1970s, the Russian space program kept the creation of superior seabuckthorn cultivars a secret.Since 1940, Russia has had a thriving seabuckthorn industry. During the space competition in the 1960s and 1970s, the Russian space program kept the creation of superior seabuckthorn cultivars a secret.[31,32]**Seabuckthorn drinks were given to Russian cosmonauts to improve their well-being and stress tolerance**. [15]**It was the first fruit juice in space. Seabuckthorn oil was utilised by Russian cosmonauts as a radiation shield.**

II. CONCLUSION

A plant with numerous applications and advantages for people, animals, and the sea buckthorn. The antioxidant, anti-inflammatory, immunomodulatory, anti-cancer, hepatoprotective, neuroprotective, and skin-protective properties of the numerous essential fatty acids, vitamins, and other bioactive chemicals it contains have been demonstrated. Additionally, sea buckthorn may yield nutritional supplements, cosmeceuticals, and functional foods that aid in the prevention and treatment of several chronic illnesses. Sea buckthorn is a promising plant that deserves further research and development.

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