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Sea Buckthorn: Review



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ABSTRACT

Sea buckthorn, a special superfruit, is one of the oldest known medicinal plants. It belongs to the Elaeagnaceae family and is known by the name Hippophae rhamnoides. It has been shown successful in treating a number of ailments, including various cancers. Sea buckthorn berries are well renowned for their exceptional range of minerals and antioxidant qualities. The history of sea buckthorn dates back 2,400 years. The deciduous shrub can grow up to 4 meters tall. The alternate, lanceolate, thin, dark green leaves of the sea buckthorn plant have a silver-grey undertone. The common sea buckthorns have large, stiff, and sharp branches. Alpha, beta, and gamma carotenes, lycopene, and zeaxanthin are all found in sea buckthorn pulp. The essential vitamins B1 (thiamine), B2 (riboflavin), B6, pyridoxine, Vitamin PP (nicotinamide, niacin, and vitamin B3), and folic acid make up the majority of the vitamin B group. A slow-drying oil makes up 12–13% of the seeds' weight. While immature leaves and shoots yield a blackish-brown dye, stems, roots, and foliage yield a yellow dye. Sea buckthorn produces wood that is strong, robust, long-lasting, and fine-grained; it is also used to make charcoal and fuel. Fruit wines, jams, lotions, and pies can all be made using this fruit. Other uses for juice or pulp in meals or drinks are possible. The leaves are exceptionally rich in nutrients and bioactive compounds, primarily phenolic. Burns can be treated using a cream made from sea buckthorn.

INTRODUCTION

Elaeagnaceae family of *Hippophae rhamnoides* (sea buckthorn) is a unique superfruit and it is the oldest form of medicine. It has been found to be effective in treating a variety of conditions, including several types of cancer. Sea buckthorn berries offer an outstanding amount of nutrients and antioxidant properties.^[1]



Synonyms:

In India, sea buckthorn is referred to by a variety of regional names, including satalulu, Shanti, dhurchuk, chummy, Tarawa, sirmaa, Leh berry, and chhurmak.

Table:1.1 Taxonomical classification: {16,17}

Kingdom	Plantae
Domain	Eukaryota
Kingdom	Plantae
Sub phylum	Angiospermae
Class	Dicotyledonae
Order	Elaegnales
Family	Elaeagnaceae
Genus	Hippophae
Species	Hippophaesalicifo lia H. rhamnoideslinn H.tibetanaSchlech t H.neurocarpa H.gyantsensislinn H.goniocarpa H.litagenesis

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Geographical distribution: [12]

China, India, Pakistan, Mongolia, Russia, northern Europe, Ukraine, and Canada make up more than 90% of the world's natural sea buckthorn habitat, or around 1,500,000 hectares.

Morphological characteristics:

Hippophae (genus of sea buckthorn) plants are beneficial, but the bark, berries (fruits), leaves, and roots are particularly rich sources of numerous physiologically active phytochemicals. Hippophae rhamnoides is by far the most widely distributed and grows with bordered, greener leaves and yellow berries.^[13,14]

Macroscopic studies:

Hippophaerhamnoides: In these species, the leaves are alternate, petiolate, linear, or linear-lanceolate, 2-8x0.2-0.8cm, narrowed at base, adaxially dark base, abaxially with white and brown stellate scales, margin revolute, apex sub obtuse.

Hippophaesalicifolia: In these species, the leaf blade is abaxially whitish with usually reddishbrown midrib and adaxially green, linear-oblong, 4.2-6.2x0.6-1.2cm, adaxially stellate-hairy, margin usually revolute.^[19]

Microscopic studies:

Two species of sea buckthorn- *H.rhamnoides* and *H.salicifolia* - were studied for their pharmacognostic character, i.e. the gross morphological character is based on their shape, size, and surface of leaves. The leaves were stained with phloroglucinol and hydrochloric acid to study their microscopic structures under a microscope.

A study of leaves of two different species of thistle has revealed the presence of trichomes, which are broken fragments of the epidermis with palisade cells, and broken xylem vessels.

Pharmacological activities/reported activities:

Sea buckthorn berries have been used by the inhabitants of Europe, Central Asia, and southeastern Asia in traditional medicine for a century. It is valued for its anti-oxidant,

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cardioprotective, antiatherogenic, immunomodulating, antibacterial, anti-inflammatory, and vasodilating effects. It also has positive effects on reducing the occurrence of ulcers, supporting wound healing, treating skin disorders, and reducing pain.^[11].

1) Antioxidant effects and immunomodulating properties:

The leaves stems, tubers, and roots of sea buckthorn contain a high content of ascorbic acid and carotenoids, polyphenols, flavonoids, alkaloids, chlorophyll derivatives, amino acids, amines, and other natural antioxidants. They can inhibit or delay the oxidation of other molecules by inhibiting the initiation or propagation of oxidizing chain reactions.^[13]

2) Cardioprotective effects:

Sea buckthorn exhibits beneficial benefits on coronary micro vessels and cardiovascular function. The two most significant flavonoids found in sea buckthorn are quercetin and isorhamnetin. They have been shown to have benefits in lowering blood sugar levels, absorbing free radicals, and decreasing low-density lipoprotein SNS susceptibility.^[5,6]

Antibacterial and antiviral effects:



3) Anti-diabetic effects:

Sea buckthorn oil can help reduce blood sugar levels by increasing insulin secretions and insulin sensitivity. This could protect against type-II diabetes mellitus as sea buckthorn fruit oil is rich in palmitoleic acid, which plays a huge role in metabolic processes. It also has positive effects on relieving symptoms such as fatigue, dry mouth and dry eye in non-diabetic diseases.

4) Anti-atherogenic effects:

When taken as a food supplement, sea buckthorn seed oil is most effective in lowering total cholesterol, triglycerides and LDL cholesterol while increasing HDL cholesterol levels. The seed oil of these berries has an anti-atherogenic and cardioprotective effect.

5) Anti-inflammatory effects:

The oil and leaves of sea buckthorn support the regeneration of skin wounds and the treatment of skin disorders. Palmitoleic acid, a component of skin fat, can be used in the topical treatment of cellular tissue and wounds. Sea buckthorn has anti-inflammatory effects in the treatment of stomach ulcers.

Anticarcinogenic effects:

The oil of sea buckthorn has been found to enhance non-specific immunity and to provide antitumor effects in cancer therapy. The use of this *hippophae* oil can protect the bone marrow from damage due to radiation, which might also help in the fast recovery of bone marrow cells. The berries of sea buckthorn contain one of the main components, quercetin, which induces apoptosis in cancer cells.

6) Hepatoprotective effects:

Sea buckthorn contains substances such as unsaturated fatty acids, alpha-tocopherol, or betacarotene to protect the hepatic cells against damage by hepatotoxins. It might also contribute to the prevention of liver cirrhosis in the future.

7) Dermatological effects:

Sea buckthorn can be used to treat a range of skin diseases, such as atopic eczema and dermatological diseases, and the extracts can support the treatment of skin disorders such as melanosis, chloasma, xeroderma, and recurrent dermatitis.

8) Platelet aggregation:

Sea buckthorn contains flavonoids and fatty acids, which show positive effects on platelets, and their main function is to suppress platelet aggregation. Platelet aggregation is induced by collagen, probably by inhibition of the tyrosine kinase activity. Sitosterol is another substance that significantly contributes to platelet aggregation.

9) Gastrointestinal effects:

Gastric ulcers are one of the most commonly caused diseases in humans, especially in developing countries like Pakistan. The use of sea buckthorn oil can normalize the output of gastric acid and reduce inflammation. Sea buckthorn oil can also treat liver diseases by normalizing the liver enzymes, serum bile acids, and immune system markers involved in liver inflammation and degeneration.

Applications:

The seeds have a slow-drying oil content of 12-13%. The bark and leaves have been used to cure diarrhea and dermatological problems. The sea buckthorn fruit is used in Indian, Chinese, and Tibetan medicine to treat respiratory, gastrointestinal, cardiac, blood, and metabolic diseases. This fruit may be used to produce pies, jams, lotions, and fruit wines.^[7]

Manufacturing techniques:

1) Soil and climate requirements:

H. rhamnoides can be found flourishing in nature on a wide variety of soil types, but it thrives best in soils with a light organic structure, plenty of nutrient compounds, and a pH close to neutral (pH 6.5–7.5). Deep, well-drained, sandy loam with plenty of organic matter supports the simplest development. Clayey soils, which tend to be dense and retain water, are also undesirable.^[4]

2) Planting:

Hippophae rhamnoides require 4 to 5 years from the appearance of the seeds to the beginning of fruit production. With periodic pruning, it can continue to be productive for 30 years. Per hectare, an orchard planting can produce 10 tons of berries. South-east sloping terrain is advised to facilitate the most sunlight exposure.^[5]

3) Pruning:

The purpose of pruning *H. rhamnoides* is to coach branches, promote growth and facilitate harvesting. Moderate pruning will increase the yield and fruiting lifetime of the plants. Mature fruiting plants should be pruned to permit more light penetration. Pruning should be started the year trees are planted; late winter pruning is the best time.^[7,8]

4) Propagation:

Seed propagation isn't commonly utilized in orchards because the species is dioecious, therefore the sex cannot be determined within the seed, or before 3 to 4 years of growth. If seedlings of unknown sex are planted, it should lead to an uneven distribution of male and feminine plants. The ratio and distance of male-to-female plants are vital because the number of female trees in each planting directly affects the overall yield.

5) Breeding:

Some of the most important characteristics that require improvement is yield, fruit size, winter hardness, thornlessness, fruit and pollen quality, and early maturity. Large morphological diversity may be a good indication of opportunities in the selection of desired characteristics for a given region. Mass selection remains practiced in many areas, although it's gradually replaced by hybridization and polyploidy breeding.

Harvesting and challenges in mechanization:

Good plants will produce up to 7 kilograms (15 lb) annually. The fruits ripen within the fall and often cling to the shrub until the subsequent March/April. Fruit harvest is the most time-consuming operation in growing *H. rhamnoides*. Different mechanical harvest methods were

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developed within the late 20th century but with the disadvantages of fruit and bark damage and low efficiency.^[10]

Conclusion and future scope:

In many regions of the world, sea buckthorn is a rare and important plant species that has been domesticated. The species has been utilized for conservation plantings in North America to a limited extent, but the application of food and nonfood sea buckthorn products has not been pursued. The plants are easily propagated, yields are quite high, and production is consistent, with a prospective market centered mostly in Europe. Harvesting is the major limitation of large-scale fruit production in North America. This issue is being addressed through breeding programs and the creation of technology. The majority of sea buckthorn research has taken place in Asia and Europe, specifically in China, Russia, and Germany. Recently, there has been a rise in interest in Western Europe and Canada, and significant research initiatives are ongoing.

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