

Review of Pharmacognostical and Pharmacological Activity of Hippophae Rhamnoides Linn

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Abstract

Hippophae rhamnoides L., commonly referred to as sea buckthorn, belongs to the family Elaeagnaceae. This deciduous shrub is native to the cold-temperate regions of Europe and Asia and is well recognized for its resilience in harsh climates. The plant has garnered significant attention due to its nutritional and medicinal potential, widely explored in traditional and modern pharmacology. *Hippophae rhamnoides* exhibits notable adaptability and thrives in varied ecosystems, including mountainous regions, coastal areas, and semi-arid landscapes. The plant plays an ecological role in preventing soil erosion, contributing to habitat restoration, and promoting biodiversity in challenging terrains. The genus *Hippophae* consists of multiple species, with *H. rhamnoides* being the most extensively studied. It falls within the Elaeagnaceae family, characterized by nitrogen-fixing capabilities via root nodules that engage in symbiosis with actinobacteria. *H. rhamnoides* L. contains a series of chemical compounds including carotenoids, tocopherols, sterols, flavonoids, lipids, ascorbic acid, tanins, etc. These compounds are of interest not only from the chemical point of view, but also because many of them possess biological and therapeutic activity including antioxidant, antitumoral, hepato-protective and immunomodulatory properties. Because of these effects, *H. rhamnoides* L. containing bioactive compounds is often used in traditional medicine. We can expect many scientific evidence supporting the benefits of the sea buckthorn to maintain health and to cure the diseases by rationalizing it in proper Ayurvedic dosages form for this plant.

Keywords- Hippophae rhamnoides, *Pharmacognosy*, *Traditional medicine*, *Anti-Urolithiatic*

Introduction

Hippophae rhamnoides L., commonly referred to as sea buckthorn, belongs to the family Elaeagnaceae. This deciduous shrub is native to the cold-temperate regions of Europe and Asia and is well recognized for its resilience in harsh climates. The plant has garnered significant attention due to its nutritional and medicinal potential, widely explored in traditional and modern pharmacology [1].

Hippophae rhamnoides exhibits notable adaptability and thrives in varied ecosystems, including mountainous regions,

coastal areas, and semi-arid landscapes. The plant plays an ecological role in preventing soil erosion, contributing to habitat restoration, and promoting biodiversity in challenging terrains [2]. The genus *Hippophae* consists of multiple species, with *H. rhamnoides* being the most extensively studied. It falls within the Elaeagnaceae family, characterized by nitrogen-fixing capabilities via root nodules that engage in symbiosis with actinobacteria [3].

Common name: Sea berry, Sea buckthorn or Sallowtho.



Figure 1: Sea Buckthorn leaves



Figure 2: Sea Buckthorn Fruit

Taxonomical classification of Hippophae rhamnoides Linn.[4]

Hippophae rhamnoides is in the family Elaeagnaceae of the order Rosales.

These subspecies vary in size, shape, number of main lateral veins in the leaves and quantity and color of stellate hairs. They also have different areas of

distribution and specific uses. The genus name Hippophae originates from the Greek word 'shippo' = "horse" and 'phaos' = "to shine" and is due to the ancient Greek use of sea buckthorn leaves as horse fodder to make their coats shine more. The species named rhamnoides derives from Rhamnus, referring to the buckthorn plant family

Kingdom	Plantae
Sub kingdom	Phanerogamia
Division	Angiospermae
Class	Dicotyledons
Subclass	Monochlamydae
Series	Daphnales
Family	Elaeagnaceae
Genus	Hippophae
Species	rhamnoides Linn.

Description and Biology:

Hippophae rhamnoides is a hardy, deciduous shrub that can grow between 2 and 4m high (between 7 and 13ft). It has a rough, brown or black bark and a thick, grayish-

green crown. The leaves are alternate, narrow and lanceolate, with silvery-green upper faces. It is dioecious, meaning that the male and female flowers grow on different shrubs. The sex of seedlings can

only be determined at the first flowering, which mostly occurs after three years. The male inflorescence is built up of four to six apetalous flowers, while the female inflorescence normally consists of only one apetalous flower and contains one ovary and one ovule. Fertilization occurs solely via wind pollination, so male plants need to be close to female plants to allow for fertilization and fruit production.[5,6]

The oval or lightly roundish fruits grow in compact grapes varying from pale yellow to dark orange. Individual fruits weigh between 270 and 480mg.

The plants have a developed and extensive root system, and the roots live in symbiosis with nitrogen-fixing Frankia bacteria. The roots also transform insoluble organic and mineral matters from the soil into more soluble states. Vegetative reproduction of the plants occurs rapidly via root suckers.

Distribution:

Hippophae rhamnoides is native to cold-temperate regions of Europe and Asia, between 27 and 69°N latitude and 7°E and 122°E longitude. These regions include the Baltic Coasts of Finland, Poland, Latvia, and Germany, the Gulf of Bothnia in Sweden, as well as coastal areas of the United Kingdom and the Netherlands. In Asia, *H. rhamnoides* can be found in the northern regions of China, throughout most of the Himalayan region, including India, Nepal and Bhutan, Pakistan and Afghanistan.

It is found in a variety of locations: On hills and hillsides, valleys, riverbeds, along coastal regions, on islands, in small isolated or continuous pure stands, but also in mixed stands with other shrub and tree species. *H. rhamnoides* has also recently been planted in countries such as Canada, the United States, Bolivia, Chile, Japan and South Korea.[7]

The current total average of *H. rhamnoides* is about 3.0 million ha worldwide. This number includes both wild

and cultivated plants. These, approximately 2.5 million ha are situated in China (1.0 million ha of wild plants and 1.5 million ha in plantations), 20 000 ha in Mongolia, 12 000 ha in India and 3 000 ha in Pakistan. This makes China the largest agricultural producer of *H. rhamnoides*. Approximately 10 000 acres of the plant are planted in China each year for berry production as well as eco-environmental improvement. As of 2003, approximately 100 km of field shelterbelts were planted in Canada each year, and over 250 000 mature fruit-producing plants were grown on the Canadian prairies with an estimated annual fruit supply of 750 000 kg. Other countries that grow *H. rhamnoides* as an agricultural plant include for example Germany and France.[8]

Roots:

The root system is extensive and deep, which makes the plant highly effective at soil conservation. The roots are capable of nitrogen fixation, contributing to soil fertility, which is crucial for its growth in nutrient-deficient areas. [9]

Leaves: The leaves are simple, and alternately arranged, with a distinctive silvery-green color. This unique pigmentation is due to the presence of a waxy cuticle, which minimizes water loss and provides protection from intense sunlight. [9]

Flowers: The plant is dioecious, meaning that female flowers are borne on separate plants. The small, inconspicuous flowers emerge in early spring, with male flowers forming catkin-like structures, while female flowers grow in dense clusters.[9]

Fruits: The berries are globular, bright orange yellow in dense bunches. Rich in vitamins, essential fatty acids, and phytochemicals, the berries are the primary medicinal and nutritional part of the plant. [9]

Phytochemical analysis:

Phytochemical analysis of Hippophae rhamnoides, also known as sea buckthorn, has revealed that it contains a wide variety of compounds, including: [10]

• Flavonoids

The fruits of *H. rhamnoides* are rich in flavonoids, including glycosides of isorhamnetin, quercetin, and kaempferol.

• Carotenoids

The berries of *H. rhamnoides* contain five carotenoid compounds, including lutein, zeaxanthin, and β -carotene.

• Organic acids

H. rhamnoides contain organic acids such as quinic, malic, and citric acids in all its parts. The fruits also contain ascorbic acid.

• Ellagitannins

The leaves of *H. rhamnoides* contain ellagitannins such as hippophaenin B, stachyurin, and casuarinin.

• Gallic acid derivatives

The bark of *H. rhamnoides* is rich in various derivatives of gallic acid and catechin. Other compounds found in *H. rhamnoides* include polyunsaturated fatty acids, minerals, vitamins, and Omega 3, 6, 9, and Omega 7. *Rhamnoides L.* Chemical components such as the total content of phenolic compounds, vitamins and amino acids and the antioxidant activities of these compounds in cellular and cell-free systems were assessed. The results suggest that the extracts studied are rich in bioactive compounds with potent antioxidant properties. The leaves and berries of the sea buckthorn plant contain many bioactive substances, including vitamins A, C, and E, unsaturated fatty acids, phenolic compounds, and phytosterols. The vitamin C content is 5–10 times higher than other fruits and vegetables.

Hippophae rhamnoides, also known as sea buckthorn, is a plant with many medicinal and nutritional properties:

• Bioactive compounds

The leaves and berries of the sea buckthorn plant contain many bioactive substances, including vitamins A, C, and unsaturated fatty acids, phenolic compounds, and phytosterols. The vitamin C content is 5–10 times higher than other fruits and vegetables.

Pharmacological effects:

Sea buckthorn has many pharmacological effects, including: [11,12,13]

• Cardioprotective: Sea buckthorn has cardioprotective activity, including lowering blood pressure and cholesterol concentration, and inhibiting blood platelet activation.

• Anti-inflammatory: Sea buckthorn has anti-inflammatory properties.

• Antibacterial and antiviral: Sea buckthorn has antibacterial and antiviral properties.

• Antioxidant: Sea buckthorn has antioxidant activity.

• Antiulcerogenic: Sea buckthorn has antiulcerogenic effects.

• Radioprotective: Sea buckthorn has radioprotective effects.

Hepatoprotective: Sea buckthorn has hepatoprotective properties.

• Hypoglycemic and hypolipidemic: Sea buckthorn has hypoglycemic and hypolipidemic properties.

• Neuroprotective: Sea buckthorn has neuroprotective properties.

• Anti-tumor: Sea buckthorn has anti-tumor properties.

• Anti-obesity: Sea buckthorn has anti-obesity properties.

The leaves, fruits, and oils of the sea buckthorn plant are rich in bioactive

substances, including vitamins, unsaturated fatty acids, phenolic compounds, and phytosterols.

Uses: The berries of the sea buckthorn plant are edible and can be used in jellies, juices, pickles, and squash. The leaves can be used in the treatment of gastrointestinal and dermatological disorders. The bark can be used to treat diarrhea and tumors. The ash can be used in cosmetics and for healing.

Ethnomedicinal Uses: Hippophae rhamnoides has a long history in traditional medicine, especially in Tibetan and Mongolian systems. Ethnomedicinal practices have employed various parts of the plant, including the leaves, bark, roots, and berries, for their therapeutic effects.

Traditional Uses: The berries have been used to treat digestive disorders, and skin ailments. The oil extracted from the seeds and pulp is known for its wound-healing and anti-inflammatory properties. In Tibet, sea buckthorn is considered a potent remedy for altitude sickness and is used as a general tonic to enhance strength and immunity.

Summary: Sea buckthorn is a plant that has many uses and benefits for humans, animals, and the environment. It contains various essential fatty acids, antioxidants, vitamins, and other bioactive compounds that have been shown to have antioxidant, anti-inflammatory, immunomodulatory, anti-cancer, hepatoprotective, neuroprotective, and skin-protective effects. Sea buckthorn is also a potential source of functional foods, dietary supplements, and cosmeceuticals that can help prevent and treat various chronic diseases.

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