

A COMPREHENSIVE REVIEW ON MAGICAL HERB: SEA BUCKTHORN

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Abstract:

People all across the world have been urged to switch to plant-based diets in recent years due to increased awareness of environmental sustainability, nutrition, and health. Interest in plants high in bioactive compounds and therapeutic qualities has surged as a result of these dietary changes. Sea buckthorn (*Hippophaë rhamnoides* L.), a hardy shrub that grows widely throughout Europe and Asia and is renowned for its remarkable nutritional and therapeutic value, is one such promising plant. A nutrient-dense functional food, sea buckthorn contains over 100 biologically active compounds. It is a great natural source of minerals (calcium, magnesium, potassium, iron, and zinc), vitamins (A, C, E, K, and B-complex), flavonoids, carotenoids, polyphenols, amino acids, and essential fatty acids (omega-3, 6, 7, and 9).

Antioxidant, anti-inflammatory, antimicrobial, cardioprotective, hepatoprotective, neuroprotective, wound-healing, and immunomodulatory qualities are just a few of the many pharmacological effects that these constituents support. Sea buckthorn has long been used extensively in Tibetan, Chinese, and Ayurvedic traditional medicine. For centuries, it has been used to treat fatigue, gastrointestinal disorders, respiratory disorders, and skin disorders. Many of these traditional uses are supported by contemporary scientific research, which has also found the plant to be an effective component in the prevention and treatment of lifestyle and diet-related diseases, including metabolic syndrome, diabetes, obesity, and cardiovascular disorders.

Keywords: *Hippophaë rhamnoides*; Sea buckthorn; Plant-based diet; Bioactive compounds; Nutraceutical; Functional food; Antioxidant activity; Anti-inflammatory; Phytochemicals; Health benefits; Traditional medicine; Dietary supplement; Therapeutic potential; Cosmetic applications; Nutritional value; Sustainable resource.

Introduction:

Sea buckthorn (*Hippophaë rhamnoides*) stands out as a promising dietary supplement with an array of potential effects which may be therapeutic. Centered Around its nutrient-dense berries rich in nutrients - vitamins (A, C, E & K), minerals and essential fatty acids - the source of its health benefits are formed. It is due to the plant's superior levels of vitamin C and flavonoids that it ends up being an abundant source of antioxidants, helping us cope with oxidative stress and keeping our cells safe from free radical harm. [1]

This adaptable plant also provides assistance in multiple ways in managing our health. Sea buckthorn is equipped with vitamin-filled constituents that have a positive effect on your immunity and overall well-being. Its omega fatty acids (specifically omega-7 & omega-3) show promise in cardiovascular health too by reducing inflammation, and facilitating wound Healing. [2]

In addition to the surface-level perks, there's been some investigation into sea buckthorn and its potential advantages in regards to gut health, as it shows some anti-inflammatory digestive properties. Sea buckthorn might also promote cancer cell death in amounts based on preliminary reports.[3] The phoenix-fruit has also recently been researched in connection with diabetes treatment, revealing potential blood sugar regulation and increased insulin sensitivity.

Buckthorn in the world of inflammation-based ailments may give you comfort during times of pain but probably not for arthritis. [4] Its rich mixture of bioactive compounds, including quercetin, catechins, and beta-carotene confer to its varied therapeutic properties. Still, further research is needed to fully understand the effects and potential side effects of Sea buckthorn supplementation.[5] It is advisable to refer with a healthcare professional before use especially for individuals with existing medical conditions or who take medication⁶ Sea buckthorn is associated with a number of potential health benefits like having;

- a. Sea buckthorn is Rich in antioxidants: can help the body fight free radicals and oxidative stress.
- b. Anti-inflammatory properties: Can prevent the body from spreading inflammation.
- c. Inhibiting Cancer Growth: Can limit the growth of cancer cells and prevent them from multiplying.
- d. Sea buckthorn is good for liver protection: May help in preventing liver disease.
- e. Cardiovascular benefits: Sea buckthorn can help reduce high blood pressure, cholesterol, and triglycerides, as well as prevent the occurrence of atherosclerosis.
- f. Sea buckthorn can help protect the eyes from various problems including irritation and infection.
- g. Improve Brain Function and Skin: You can also use it to enhance cognitive function and memory, repair damaged tissues and remove waste from the body.
- h. Sea buckthorn herb will also help aid in gastrointestinal diseases and slow bowel movement.



Fig no 1. Plant of sea buckthorn

Sea Buckthorn is used as a promising dietary supplement that can be taken in oil, powder, juice or capsules [7, 8] and can be used in products such as food items, jams, pies, drinks, and cosmetics. However more clinical trials are required to support the effectiveness. As a dietary supplement, sea buckthorn may be taken in oil, juice, powder, or capsule form [7, 8] and is an ingredient in various food products like pies, jams, and cosmetics. And Sea buckthorn may also interact with some medications and cause allergies, blood thinning, low sugar levels and other side effects. It is prudent to speak with a doctor before beginning supplementation. If you didn't already know, Sea Buckthorn is a very dense spiky shrub with bright yellow-orange berries. [9] Sea buckthorn is composed of many different species and sub-variants. Here are some of them:

- a. Hippophae rhamnoides: Most widespread and common places are where this type of buckthorn mainly grows Dry and cold Asia or Europe regions
- b. Hippophae rhamnoides a.k.a. Hippophae salicifolia: These shrubs are only found in Himalayan valleys at high altitudes. Their leaves are more of a dull green colour than the bright green leaves of H. rhamnoides

•c. Hippophae goniocarpa: Distribution in high-altitude areas like Nepal and China in mountainous environments at 2,650 and 3,700 meters above sea level it comes in 2 types Hip neurocarpa: Having narrow leaves and orange berries that grows mostly on rocky slopes and river banks in Tibet.

There are also some improved varieties of Sea Buckthorn, which have been specially bred¹⁰ for fruit quality and superior yield characteristics namely:

- A. Russian Orange: This is a thornless variety that produces large, high quality and sweet flavoured fruits.
- B. Sirola: A hardy and vigorous variety with fewer thorns than some of its siblings. Fruits are sweet and palatable.

C. Pollmix: These are male varieties used for pollination of female plants. They show different flowering times and thorniness levels. On 100g of Sea Buckthorn (*Hippophae rhamnoides*) dried berries, the Nutritional value is listed in Table 1.

Nutrient	Amount
Calories	275 kcal
Carbohydrates	55.4 g
Fiber	14.1 g
Sugar	5.4 g
Fat	7.1 g
Protein	3.7 g

Table: Nutrients value of the Sea Buckthorn (*Hippophae rhamnoides*).

Sea buckthorn is also a rich source of Vitamin C, Vitamin E, Beta-carotene, Lycopene, Iron and Calcium Sea Buckthorn oil extracted from the seeds or pulp of the berries is a good source of omega-7 fatty acids (palmitoleic acid), which have anti-inflammatory and skin protective properties. Sea buckthorn is consumed in the form of oil, juice, powder, Capsule or used in a variety of food and cosmetic products [12] but it is best to consult your doctor for the right dosage and safety [1]. Sea buckthorn may interact with certain drugs such as Blood Thinner, Blood sugar-lowering drugs and cyclosporine, and could cause allergic reactions in some people.

2. Traditional and modern day uses

Sea Buckthorn (*Hippophae rhamnoides*) is a plant with a multitude of applications, for health Sea Buckthorn has been used in traditional medicine for thousands of years, especially in China, Mongolia and Russia. It is believed to have some possible attributes such as anti-inflammatory, antioxidant, antimicrobial, [13] antitumor, immunity enhancement etc....Sea buckthorn oil is extracted from the seeds and pulp and is used in a lot of beauty and cosmetic applications. Sea buckthorn oil is rich in essential fatty acids, vitamins and antioxidants which can nourish, hydrate, protect and heal your skin Sea Buckthorn Oil is useful for skin conditions including acne, rosacea, sunburn, scars, wrinkles, dryness and skin infections. Sea Buckthorn fruits are edible and very sour and tangy in taste [15]. High in Vitamin C, Vitamin E, carotenoids, flavonoids and other health promising phytochemicals. They can be eaten fresh or processed to make juices, jams, syrups, wines, teas, candies etc. [16] They can also be used in sweet and savoury foods as a flavouring or garnish. Sea Buckthorn Oil can be used internally (oral) or externally (topical). The fruit of the Sea Buckthorn Plant is a dietary source of Bioactive Compounds which may provide Antiviral effects and additional Health Benefits; however, this does not replace medical care/treatment. Consult with your physician prior to adding Sea Buckthorn or any other Supplement to your diet if you have a Medical Conditions.

Bioactive compounds of sea buckthorn:

Physical and chemical parameters of *Hippophae rhamnoides* Linn. [63, 64]

Colour	Yellow,orange
Shape	Round,Oval,ovoid
Fruit weight	10-16gm/100 berries
Fruit juice extraction rate	64-75%
Vitamin C in fruit juice	1161.1-1302.5mg/100gm
Vitamin A in fruit juice	0.75mg/100gm
Carotenoids in fruit juice	7.2-7.4mg/100g
Soluble solids in fruit juice	15.92-17.66
Carotenoid in fruit residue oil	1570mg/100g
Total flavone in fruit juice	365-885mg/100g
Total flavone in fresh fruit	354mg/100g
Protein in fruit	34.6%
Total sugar	6.29%
Organic acid	4.35%
Sodium	41.28 mg/kg fruit
Potassium	1499.96 mg/kg fruit
Calcium	383 mg/kg fruit
Iron	11.68 mg/kg fruit
Magnesium	47.7 mg/kg fruit



Fig no 3: Chemical parameters of sea buckthorn

Research Through Innovation



Fig no 2: The power of Sea Buckthorn

Pharmacological uses:

1] Antioxidant properties

By preventing oxidative chain reactions from starting or spreading, these substances prevent or postpone the oxidation of other molecules. The term "antioxidant effect" describes the increase in antioxidant enzyme activity and the suppression of oxidase-related activities. Iron and copper transition metal redox and peroxide ions can produce free radicals. In order to achieve a good antioxidant effect, oxidase and metal ion formation can be decreased, and the production of antioxidant enzymes is encouraged.[65]

2] Cardiovascular disease

Flavonoids are polyphenols that occur naturally in sea buckthorn and other fruits and vegetables. The flavonoids found in sea buckthorn fruit and leaves are most abundant in isorhamnetin and quercetin. [66] In According to reports, the antioxidant properties of flavanols lower the risk of cardiovascular diseases. Flavonoids found in total sea buckthorn ward off oxidative damage, tumors, heart ischemia and reperfusion, and aging. [67]

3] Diabetes

Diabetes is a metabolic disease of the endocrine system. Blood glucose levels rise as a result of people's inability to produce and use insulin in the body as it should. [68] Numerous researchers have examined the potential benefits of sea buckthorn in the treatment of diabetes. In one example, the effects of an aqueous extract of sea buckthorn seed residues on antioxidant parameters, lipid profiles, and serum glucose in diabetics induced by streptozotocin were examined.rats. Rats were divided into four groups for analysis: a diabetic group supplemented with 400 mg/kg body weight of sea buckthorn seed residue extract, a diabetic group supplemented with 5 mg/kg body weight of the reference medication glibenclamide, and a normal control group. In diabetic rats, the extract dramatically reduced the levels of nitric oxide, triglycerides, and serum glucose. [69, 70]

4] Antitumor effect

The anticancer activity of sea buckthorn extract was demonstrated using a promoter (12-O-tetradecanoylphorbol-13-acetate (TPA)) and an initiator (7, 12-dimethylbenz[a]anthracene) of mouse carcinogenesis. It has been shown that three phenolic components (catechin, gallic acid, and epigallocatechin) and a triterpenoid (ursolic acid) isolated from sea buckthorn prevent inflammation brought on by TPA. [71]

5] Gastrointestinal effect

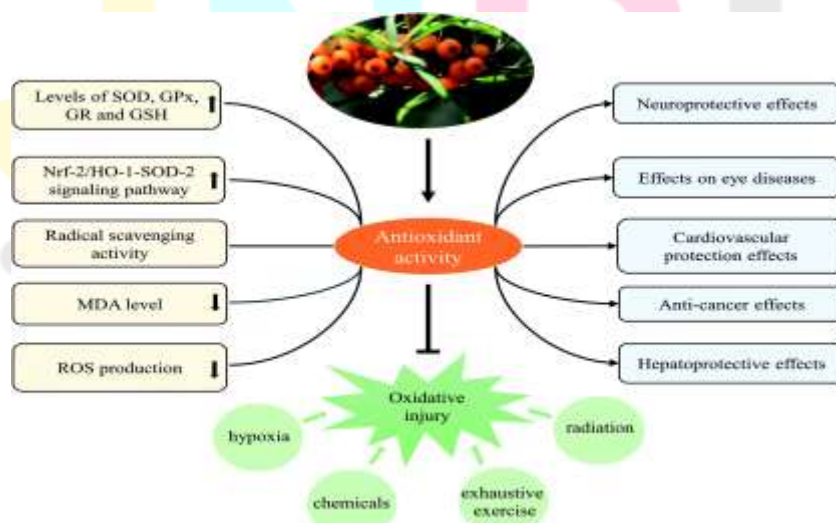
Sea buckthorn's potential as a treatment for gastrointestinal issues has been investigated. [72] Rat groups that had artificially created stomach ulcers were given CO₂-extracted seed and pulp oil orally as a pre-trial treatment. The medicinal and prophylactic properties of sea buckthorn oils were examined. It has been demonstrated that consuming sea buckthorn oil speeds up the healing process for stomach ulcers caused by acetic acid. [68]

6] Wound Healing

In modern medicine, sea buckthorn has replaced its historical use for skin regeneration. The fruit and seed oil of sea buckthorn are rich in carotenoids, phytosterols, natural antioxidants, omega-3, omega-6, and omega-7 beneficial unsaturated fatty acids, and vitamins E and K. These compounds combine to protect cell membranes and promote cell renewal. Burns can be treated and wounds can heal with palmitoleic acid, which is found in the skin. Sea buckthorn oil has been reported to prevent and treat atopic dermatitis, chronic cervicitis, and various types of stomach ulcers. [73]

7] Antimicrobial and Antiviral Properties

Sea buckthorn has both antibacterial and antiviral properties. Chaman and associates looked into the antibacterial properties of sea buckthorn berry extracts. [68] By means of the hole-plate diffusion method. The results showed that while other extracts only produced a modest zone of inhibition against all of the tested microorganisms, methanol extract (100 mg/mL) produced a fairly strong antibacterial response. Sea buckthorn also exhibits an antiviral response when infected with the Dengue virus. Dengue fever is a dangerous infection for which there is no direct treatment. *H. rhamnoides* leaf extract was tested in human blood-derived macrophages infected with Dengue virus type-2 and contrasted with the commonly used antiviral drug Ribavirin. Since *H. rhamnoides* leaf extract was just as effective as ribavirin at maintaining the viability of dengue-infected cells, it may have potent anti-dengue properties and be used to treat dengue fever. [74]



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Fig no 3. Anti-oxidant activity of Sea Buckthorn

Status of Current Use of Sea Buckthorn:

The Sea Buckthorn Plant is beneficial for humans, animals, and the environment. The Sea Buckthorn Plant thrives in Dry/Cold Environments, i.e., the Himalayas and Central Asia. The Fruits, Leaves, and Oil of the Sea Buckthorn Plant contain Vitamins, Antioxidants, and Omega Fatty Acids. These compounds have been studied and used to treat a variety of ailments including Eczema, Inflammation, Ulcers, and Cardiovascular Diseases. Supplements of Sea Buckthorn are produced in capsule/tablet/powder/juice forms. [16, 34] Sea Buckthorn Oil is a Moisturizer/Anti-Aging/Hepaling Agent on the skin and will protect the Skin from Sun Damage/Infection. Sea Buckthorn Oil is used as a component in Cream/Lotion/Serum/Mask formulations. Sea Buckthorn Berries are Acidic/Tart in nature and can be used to prepare Jams/Pies/Sauces/Drinks. Sea Buckthorn Berries can also be eaten Fresh/Dried as a Snack. Sea Buckthorn Tea can be prepared using the Leaves and has a Mild Flavor. Sea Buckthorn is a Drought Resistant/High Altitude Plant and is able to thrive in Poor/Degraded Soils. The Root System of the Sea Buckthorn Plant is deep and is capable of Fixing Nitrogen and Preventing Soil Erosion/Desertification. [43] Sea Buckthorn provides a Habitat/Food Source for Many Birds/Animals in Cold Deserts. Promoting the development of Sea Buckthorn Plantations is being promoted as a means to Improve Livelihoods/Ecology in High Altitude Regions.

Sea buckthorn is a valuable and adaptable plant with a wide range of present and future applications. Because of its incredible advantages, it is also referred to as the "wonder berry" or the "Ladakh gold." Sea buckthorn can thrive in poor and degraded soils because it is a hardy and drought-resistant plant. It can fix nitrogen and stop soil erosion thanks to its deep root system. Additionally, it yields delicious and nutritious berries that can be used as food or medicine. [44] You must take into account the following elements when growing sea buckthorn at home.

You will need to consider this factors:

- a. Sunlight: For best growth and fruit production, sea buckthorn plants need a sunny spot. At any stage of development, they are unable to withstand shade.
- b. Soil: A range of soil types, including rocky, sandy, and salty ones, are suitable for sea buckthorn plant growth. They do not, however, flourish in swampy environments and require adequate drainage.
- c. Water: Once established, sea buckthorn plants require little water because they can withstand drought. However, during the first year of planting and during dry spells, they require frequent watering.
- d. Fertilizer: Because sea buckthorn plants fix nitrogen, they require little fertilizer. However, adding compost or other organic matter to the soil prior to planting might help them.
- e. Pollination: Because sea buckthorn plants are dioecious, their male and female plants are distinct. TS.45 Berries are only produced by female plants, and pollination requires a male plant close by. For every six female plants, one male plant should be planted.
- f. Propagation: Cuttings or seeds can be used to grow sea buckthorn plants. Scarified seeds can be sown indoors following cold stratification or outdoors in the fall or early spring. Cuttings from dormant plants can be potted and moved outside after being soaked in water until roots form.
- G. Pruning: Sea buckthorn plants have prickly branches and can reach a height of 20 feet. Pruning can help shape the plants and enhance the quality of the fruit, but it is not required. Before the new growth begins, pruning can be done in late winter or early spring.

Conclusion:

Sea buckthorn is a plant that provides numerous uses and benefits to humans, animals, and the environment. It contains a variety of essential fatty acids, antioxidants, vitamins, and other bioactive compounds that have been shown to have anti-inflammatory, immunomodulatory, anti-cancer, hepatoprotective, neuroprotective, and skin-protective properties. Sea buckthorn may also be used to make functional foods, dietary supplements, and cosmetics that can aid in the prevention and treatment of a variety of chronic diseases. Sea buckthorn is a promising plant that requires additional research and development. The plant known as sea buckthorn has many

applications and advantages for people, animals, and the environment. Numerous essential fatty acids, vitamins, antioxidants, and other bioactive substances are present in it. These substances have been demonstrated to possess anti-inflammatory, immunomodulatory, anti-cancer, hepatoprotective, neuroprotective, and skin-protective qualities. Additionally, sea buckthorn can be used to create cosmetics, dietary supplements, and functional foods that can help prevent and treat a number of chronic illnesses. Although sea buckthorn is a promising plant, more study and development are needed.

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