



Review on Therapeutic Uses of Sea Buckthorn (*Hippophae*)

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ABSTRACT:

The sea buckthorn plant, *Elaeagnus rhamnoides* (L.), has many different parts, but the berries, also called Siberian pineapples or seaberries, are particularly noteworthy because they contain a special combination of bioactive substances, including phenolic compounds, phytosterols like beta-sitosterol, unsaturated fatty acids, and vitamins (especially vitamin C). These berries offer a variety of advantageous antioxidant, anti-inflammatory, and anticancer benefits, as do the jams, juices and oils derived from them. The therapeutic and dietary benefits of sea buckthorn have been proved by scientific studies and clinical trials conducted in the twenty-first century. The advantages of sea buckthorn for the treatment of cancer, diabetes, liver disease, gastrointestinal ulcers, and skin disorders are covered in this brief review.

KEY WORDS: *Hippophae*, *Elaeagnus rhamnoides*, sea buckthorn, medicinal importance, antioxidants, fatty acid, flavonoids.

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INTRODUCTION:

Elaeagnus rhamnoides (L.), sometimes known as sea buckthorn, belongs to the family Elaeagnaceae. Currently, it is produced on a large scale, mostly in Russia and China, and in an increasing number of variations across the world (i.e., Finland, Germany, and Estonia). This is found across Asia's temperate zone, including north India, Europe, and all throughout the subtropical zones,

particularly at high altitude. Some ancient plant-breeder cultivated this plant. Hardy shrub *Hippophae rhamnoides* can reach heights of 2 to 4 metres and is either deciduous or evergreen[1] (between 7 and 13 ft). [2] It has a broad, grayish-green crown and rugged, brown or black bark. [2] The leaves have upper surfaces that are silvery green and alternating, thin, and lanceolate. [3] The male and female flowers emerge on



separate plants since it is dioecious.[2] Only after the first flowering, which usually happens three years after the seedlings, can the sex of the plant be identified. [4] The female inflorescence usually contains single apetalous flower, single ovary, and single ovule, whereas the male inflorescence has four to six apetalous blooms.[2] Male and female plants must be close to one another for wind pollination to take place, which is the only kind of fertilisation that results in fertilisation and fruit development. [2]

The compact grapes with oval or softly rounded fruits range in colour from bright yellow to deep orange.[2] Fruits typically 270 to 480 milligrammes in weight each[5] and are rich in carotenoids, vitamins C, E, health-promoting fatty acids and flavonoids [6] in addition to having higher vitamin B12 concentrations than other fruits. [7]

Ancient Greek manuscripts attributed to Theophrastus and Dioskorid as well as traditional Tibetan medical texts, such as "the Rgyud Bzi" (The Four Books of Pharmacopoeia), dating to the Tang Dynasty, have allusions to the usage of sea buckthorn for therapeutic purposes (618-907 AD). The most typical uses of sea buckthorn-based herbal treatments are to treat digestive and skin conditions. The traditional usage of sea buckthorn seed oil to aid in the healing of skin disorders and injuries is in good agreement with the results of current clinical studies. The usage of sea buckthorn seed oil aids in the recovery of various skin problems, including burns, eczema, poorly recovering wounds, the sun's destructive effects, therapeutic radiation therapy, and cosmetic skin rejuvenation. The berry-derived preparations are also used to stop gum

bleeding and to aid in the recovery of the stomach and other organs' mucous membranes [8,9]. Health issues (such as cancer, stomach ulcers, skin conditions, cardiovascular symptoms, etc.) are on the rise worldwide, but notably in developing nations, and treatment with synthetic drugs can be highly expensive or have unwanted side effects. It is safe to treat these ailments with phytochemicals or other components derived from Hippophae or other medicinal plants. To have a better knowledge of the medicinal relevance of Hippophae for future research, the current study reviewed the research on some of the most important medicinal applications of this plant.

CHEMISTRY AND PHYTONUTRIENT:

With respect to location, environment, and extraction technique, sea buckthorn has a diverse chemical and phytonutrient composition[10]. The average pH of sea buckthorn juice was 3.13, and the average titratable acidity, which is malic acid, was 1.97 percent[11]. In general, Sea Buckthorn contains mineral elements[13–16], vitamin C[12–14], organic acids[14,16], monosaccharides sugars[9,14,17], free amino acids[15,16], volatile compounds[14,21], a significant amount of carotenoids and vitamin E[18–20], and different flavonoids, including quercetin, myricetin, and kaempferol [22]. It also contains fatty acids[23], triacyl glycerol, glycerophospholipids [24], phytosterols [25], zeaxanthin esters [26], alpha-tocopherol[27] and phenolic compounds[28]. Whole fresh berries, including seeds, ranged in oil content from 2 -11 percent, and seeds ranged from 4-17 percent. Only 10–20 percent of the oil is often found in the seeds, and this percentage



has never been higher than that of the oil found in the pulp [14,21,24]. In addition to being good for human health, sea buckthorn products also include a number of other crucial elements.

MEDICINAL USES OF HIPPOPHAE:

Important phytochemicals found in sea buckthorn, such as carotenoids, flavonoids, fatty acids, etc., have been linked to the plant's medicinal benefits. Beta-carotene[29,30], flavonoids, fatty acids, etc. have all been discovered to be significant therapeutic phytochemicals. It has been demonstrated that sea buckthorn has strong antioxidant properties[31,32]. There are numerous possible uses for sea buckthorn oils and flavonoids[2,9,32]. They have been used as a treatment for gastrointestinal ulcers, a long-term therapy to lower cardiovascular risk factors, an aid for cancer patients undergoing treatment, an internal and external treatment for various skin disease, a liver protector, and a treatment for liver fibrosis.

Liver diseases:

The immune system markers linked to liver inflammation and degeneration, as well as liver enzymes and serum bile acids, were brought back to normal by sea buckthorn extracts[33]. Sea buckthorn oil has also been found in laboratory trials to protect the liver from the detrimental effects of toxic chemicals[34]. Recent research has demonstrated that sea buckthorn is a rich source of precursors to vitamin A, such as carotene and unsaturated fatty acids[9,16]. According to Zhao et al. [35], sea buckthorn can shield the liver from damage caused by Carbon tetrachloride. In the treatment of chronic hepatitis B patients, combining sea

buckthorn with an antiviral medication may reduce the time needed for serum ALT to normalize[36].

Gastrointestinal ulcers:

Due to an unfavourable and unassessed diet, illiteracy, and negligence, gastric ulcers are rapidly increasing in prevalence in humans, especially in developing nations like India. Hippophae is traditionally used to cure gastric ulcers, and laboratory experiments have proven the seed oil's effectiveness[37,38]. Its activities may include restoring a normal level of stomach acid production and minimising inflammation by regulating pro-inflammatory mediators. On ulcer models generated by indomethacin and stress, a hexane extract from Hippophae rhamnoides was evaluated for its antiulcerogenic properties. Hexane extract from the Sea Buckthorn was therefore discovered to be effective in avoiding stomach ulcer[39–42].

Cancer therapy:

There are several phytopharmaceuticals, especially phenolic substances such curcumin, resveratrol and proanthocyanidins, have been reported to have important advantages in radiotherapy and chemotherapy for cancer [43–47]. Increased dietary phenolic chemical consumption, particularly flavonoids and procyanidins, have been linked to a lower risk of cancer for many years [43–45,48–55]. A wide spectrum of biological and therapeutical activities, including anticancer effects, are present in sea buckthorn. These compounds are recognised to occur in different organs and their products, including oil and juice, even though the molecular mechanisms underlying them are unknown [56].



Antioxidant substances, specifically phenolic compounds such as flavonoids like isorhamnetin, quercetin and kaempferol, and which shield cells from oxidative damage that can cause cancer and genetic mutation, are responsible for the anticancer properties of sea buckthorn [57].

Cardiovascular therapy:

Anticardiovascular medication is made from hippophae[58,59]. It reduced cholesterol levels and enhanced heart performance. By controlling inflammatory mediators, the mechanism of action may minimise stress on heart muscle[60]. Recently, certain straightforward formulae based on sea buckthorn were created with the goal of treating coronary heart disease as well as the after effects of heart attacks and stroke by enhancing circulation of blood and regaining function of heart. Total flavonoids of Sea Buckthorn were evaluated using an immunohistochemical technique for their ability to prevent NF-kappa-B activation caused by stretching cultured cardiac myocytes. The study found that using the total flavonoids of the Hippophae plant to treat hypertension and chronic cardiac insufficiency would be able to improve myocardial function by blocking the activation of NF-kappa-B[61]. According to recent research, lipid oxidation damage is one of the primary causes of atherosclerosis, and anti-oxidation therapy can considerably reduce the development of atherosclerosis and the risk of coronary heart disease[62]. In addition to polyunsaturated fatty acids, Hippophae provides a significant source of both lipophilic and aqueous antioxidants. The risk factors (LDL oxidation, plasma lipids, plasma soluble cell adhesion protein

concentration and platelet aggregation) for coronary heart disease in people were found to be affected by the antioxidant-rich sea buckthorn juice[63,64].

Skin diseases:

It is regarded as a beneficial topical medication for the treatment of burns and the healing of wounds. If enough sea buckthorn or its oil is consumed, this fatty acid can also nourish the skin when taken through buccal cavity; this is an efficient way to treat skin conditions that are systemic like atopic skin irritation. For burns, scalds, ulcerations, and infections, topically applied hippophae oil is already widely used, either alone or combined with other therapies. It is a component of sunscreen. Hippophae oil aids in encouraging tissue regeneration since it possesses emollient and UV-blocking properties[65,66]. The amount of linolenic acid and neutral lipids and total n-3 fatty acids in plasma phospholipids increases due to the seed oil of this plant. In both neutral lipids and plasma phospholipids, the pulp oil treatment raised the amount of palmitoleic acid and decreased the proportion of pentadecanoic acid. Skin glycerophospholipids after seed oil treatment had somewhat lower levels of palmitic acid (16:0) and higher levels of docosa Pentaenoic acid (22:5 n-3) [67–70].

Diabetes:

In mice, the flavonoids in sea buckthorn seed and fruit extracts prevented glucose metabolism and decreased serum cholesterol, serum glucose, and serum triglycerides[71]. It has been shown in vitro and in a type 2 diabetic mice model that hippophae fruit oil extract may enhance sensitivity to insulin, lower blood sugar,



protect against glucose hepatotoxicity and promote hepatic glycogenesis. Effects on blood sugar were associated with a dose-dependent relationship. The PI3K/Akt pathway, where enhanced protein and gene expression occurred, mediates amelioration of insulin resistance[72].

SIDE EFFECTS:

Consuming sea buckthorn fruit in quantities normally found in food is probably safe. The fruit is probably secure when used for therapeutic purposes.

Using sea buckthorn topically or orally has not been associated with many adverse effects.

After consuming 3 grammes (g) of sea buckthorn oil for three months, about 10% of participants in a small human trial reported experiencing gastrointestinal symptoms[73].

INTERACTIONS:

Blood coagulation may be decreased by sea buckthorn, which could result in more bleeding.

Sea buckthorn use should be avoided by those who are using blood thinners as it may increase bleeding risk[74].

If you have diabetes or are using blood sugar-lowering medication, you should discuss whether sea buckthorn is a safe supplement to use with your doctor. This is due to some evidence supporting sea buckthorn's blood sugar-lowering properties[74].

When using sea buckthorn and a blood sugar-lowering medicine together, blood sugar levels could drop too low.

PRECAUTIONS:

Not everyone should use sea buckthorn supplements, ointments, or cosmetics because it may not be suitable for everyone.

Before using sea buckthorn on children, it's extremely crucial to have medical guidance. Sea buckthorn may be safe to give to children, but the research is not strong enough to prove it.

Additionally, before taking sea buckthorn supplementation, consult a medical professional if you:

- Have low blood pressure
- Have bleeding disorder
- Have an upcoming surgery
- Are taking any medications
- Are pregnant or breastfeeding
- Have diabetes

Once again, a lot of studies on sea buckthorn have been conducted on animals or on extremely tiny populations of people. As a result, we are yet unsure of all the possible safety measures to take when using sea buckthorn.

CONCLUSION:

Numerous components and bioactive compounds from Hippophae have a wealth of experimental data supporting their significant effects, and this amount is growing at a rapid rate. We can draw the conclusion that Hippophae is a important plant with a wide range of nutritional and therapeutic ingredients that may be helpful for human health. Therefore, there is still more work to be done in these fields in order to determine whether these Hippophae compound-derived chemicals are genuinely capable of positively influencing the occurrence and development of many long term diseases at the cellular and molecular level. This includes (I) additional studies on the metabolism of hippophae's bioactive compounds in human being, (II) examination of the variables affecting pharmacokinetic,



including reaction with other dietary components, (III) nutritional differences among and between populations, and (IV) therapeutic molecular or cellular mechanisms.

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