A review on pharmacognostic, phytochemical and pharmacological data of various species of *Hippophae* (Sea buckthorn)

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Abstract

*Hippophae* (Elaeagnaceae) widely known as “Sea buckthorn” is a wonderful plant found in the Himalayan region with multiple pharmacological and commercial benefits. Sea buckthorn plant exhibits a broad range of therapeutic uses as an effective natural remedy for cancer, inflammation, central nervous system diseases, wound healing, microbial infections, and many more medical conditions. Common constituents of *Hippophae* species are flavonoids, unsaturated, and saturated fatty acids. Presently, research work is going on various sea buckthorn based products which are available in the market for medicinal, nutraceutical, and cosmeceutical applications. This review summarizes the existing information for comparison between the different species of *Hippophae* in relation to their pharmacognostic properties, phytochemistry, ethanopharmacology and pharmacological activities reported for sea buckthorn plant published in scientific journals, books, and scientific reports.

Key words: Cosmeceutical, *Hippophae*, *Hippophae* rhamnoides, *Hippophae* salicifolia, *Hippophae* tibetana, nutraceutical, sea buckthorn

INTRODUCTION

*Hippophae* L. contains the nutritional content and qualities which have given it the commercial status of a novel “super-fruit” found in the Himalayan region.[1] The word *Hippophae* is derived from the Latin word Hippo means horse and Phaos means shine as it was used in ancient Greece as horse’s fodder that increased their weight and made their coat shiny.[2] Sea buckthorn is the general English term given to genus *Hippophae*. It was classified in 1753 in “Species Plantarum” by Karl von Linné at the position 1023.[3] Based on these taxonomical studies, new taxonomic system includes seven species and eleven subspecies of *Hippopha*, which was also given in Species Records of *Hippophae*, Germplasm Resource Information Network.[4,5]

Various species and subspecies of genus *Hippophae* with names of their respective taxonomists[6,7] as shown in Table 1.

*Hippophae* is a spinscent, dioecious, nitrogen fixing, wind pollinated plant deciduous, thorny willow-like pioneering, shrubby or with luxuriant foliage and strong root system; which can retain the soil from erosion.[5,8] The genus has been reported to grow in low humid (15%), alluvial gravel, wet landslips, various soil conditions, hills, gully tops, and riverside with brown rusty-scaly shoots.[6,9,10] *Hippophae* species are fast growing, hard woody plant, which is able to grow and survive well with low precipitations (300 mm), in soils with pH of 9.5 and 1.1% salts.[6,11,12] Hence, it can be planted even in marginal soils.[6] The whole plant (fruits, roots, leaves, and stem) is economically important.[6]

In general, the global distribution pattern of Sea buckthorn shows that the plant is concentrated mostly in the cold

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Different research works carried out on pharmaceutical, nutraceutical and cosmeceutical applications of selected species of Hippophae is available in literature. The plant has also been explored for its ecological benefits. The detail of reported taxons, distribution area, growing altitude, plant height, flowering time, fruit ripening, and utilization of various species of Hippophae is summarized in Table 2.

In the past, various authors have reviewed the pharmacognosy, phytochemistry, pharmacology and clinical applications of Hippophae genus generally and Hippophae rhamnoides specifically. The present review is an updated account of the botany, phytochemistry, ethnopharmacology, pharmacology and uses of different species of Hippophae genus, viz: H. rhamnoides, Hippophae salicifolia, and Hippophae tibetana. Figure 1a-c shows the picture of trees of H. salicifolia and shrubs of H. rhamnoides and H. tibetana, respectively. Figure 2a-c shows the pictures of fruits of three species of Hippophae reproduce with the permission of Professor Virendra Singh.

**H. RHAMNOIDES**

Common name with their region: English: Swallowthorn, sea buckthorn, seaberry; German: Sanddorn; Dutch: Duindorn; Finnish: Tyrni; French: Argousier; Italian: Olivella spinosa and ventrie marina; Romanian: Catina, catinaalba, catinacensusie and catina de riu; Russian: Oblepicha; Spanish: Espino Amarillo; Sewdish: Havtorn.

**ETHNOPHARMACOLOGY**

Bioactive oil has been obtained from young branches and leaves used for treating a wide variety of skin damage including burns, bedsores, eczema, and radiation injury. The leaves and fruits have been used as antiseptic and wound healing agent as well as in the treatment of ulcers in folk medicines in Turkey. Literature reported that H. rhamnoides has valuable medicinal importance.
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Table 2: Geographical distribution and utilization of some species of Hippophae

<table>
<thead>
<tr>
<th>Taxons</th>
<th>Distribution area</th>
<th>Growing altitude (m)</th>
<th>Plant height (m)</th>
<th>Flowering time</th>
<th>Fruit ripening time</th>
<th>Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>H. rhamnoides Subsp.</td>
<td>Scandinavian countries, Baltic sea countries, Germany, Belgium, Netherlands, Ireland, Poland, U.K., France, Russia</td>
<td>600-4,200</td>
<td>5-6</td>
<td>May</td>
<td>September-October</td>
<td>Used in ancient traditional medicine</td>
</tr>
<tr>
<td>H. rhamnoides</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H. salicifolia</td>
<td>The southern slope of Himalayan Mt. Tibet of China, Bhutan, Nepal, India</td>
<td>2,700-5,200</td>
<td>3-10</td>
<td>June</td>
<td>October</td>
<td>Whole plant is used as fences around houses and cultivated-fields for protection against wild animals</td>
</tr>
<tr>
<td>H. tibetana</td>
<td>Sichuan, Qinghai, Gansu, Tibet of China, Nepal, India</td>
<td>3,000-5,200</td>
<td>0.8-1.2</td>
<td>May</td>
<td>August-September</td>
<td>The wood is used for fuel. A red cosmetic is obtained from the ripe fruit</td>
</tr>
<tr>
<td>H. goniocarpa</td>
<td>Sichuan, Qinghai of China</td>
<td>2650-3700</td>
<td>5-8</td>
<td>April</td>
<td>September-October</td>
<td>Most of wild resources are protected as forest species</td>
</tr>
<tr>
<td>H. neurocarpa</td>
<td>Sichuan, Qinghai, Gansu of China</td>
<td>2,800-4,300</td>
<td>1-3.5</td>
<td>April</td>
<td>September-October</td>
<td>Treating burns, eczema and radiation injury</td>
</tr>
<tr>
<td>H. gyantsensis</td>
<td>Tibet of China</td>
<td>3,200-3,800</td>
<td>5-8</td>
<td>April</td>
<td>September-October</td>
<td>Some berries are collected for producing Tibetan medicine</td>
</tr>
</tbody>
</table>


Figure 1: (a) Hippophae salicifolia trees, (b) Hippophae rhamnoides shrub, (c) Hippophae tibetana shrub

in the treatment of skin disorder resulting from bed incarceration, peptic ulcers (both stomach and duodenal ulcers) and cardiovascular disorders, inflammation and burns in Chinese folk medicines.\[^{25,26}\] H. rhamnoides oil has been used in nutraceuticals, natural medicines and cosmetics as raw materials in Russia for some decades.\[^{27}\] H. rhamnoides has been used in various part of the world as traditional medicine for the treatment of indigestion, cough and blood sepsis, psoriasis, lupus erythematosus, and dermatosis.\[^{28,29}\]
PHYTOCHEMISTRY

*H. rhamnoides* has four flavonoids, viz., isorhamnetin (1), quercetin (2), kaempferol (3), rhamnetin (4), and flavonol glycoside rutin (Quercetin-3-O-rutinoside) (Figures 3 and 4) reported from the fruits, seeds, and leaves by various authors. Further, quercetin-3-O-galactoside flavonoid glycoside was reported from fruits, seeds, and leaves. Other chemical constituents reported from the fruits are fatty acids such as 2-hydroxydecanoic acid, nona-7-enoic acid, undec-9-en-7-ynoic acid, 13-phenyl tridecanoic acid, 5,9,21-nonacosatrienoic acid, and 1,3-dicapryloyl-2-linoleoylglycerol. Supercritical CO$_2$ extracted seed oil contained fatty acids, viz., myristic, palmitic, palmitoleic, stearic, oleic, linoleic, and linolenic acids. In addition, both fruits and seed oil yielded carotenoids (β-carotene), tocopherols (α-, β-, and γ-T), tocotrienol (α-T3, δ-T3, γ-T3+δ-T), and sterols (β-sitosterol, campesterol, and stigmasterol). Palmitoleic acid is used to treat wounds.

The total phenolic content was reported to be 363 mg/g (w/w) in aqueous leaves extract. The phenolic contents identified from seeds, leaves, and fruits were gallic acid, protocatechuic acid, p-hydroxybenzoic acid, vanillic acid, salicylic acid, p-coumaric acid, cinnamic acid, caffeic acid, ferulic acid, and myricetin. Gallic acid was found as the predominant phenolic acid in free and bound forms with diode array detection method. *H. rhamnoides* juice include K, Cu, Cd, Fe, Zn, and Mg. The juice is an important source of some valuable chemicals such as Vitamin C, tocopherol micronutrients, organic acids, and polyunsaturated fatty acids. Table 3 gives the details of the different phytochemical constituents that have been reported from different parts of *H. rhamnoides*.

PHARMACOLOGICAL USES

The most important pharmacological functions attributed to sea buckthorn oil are its antimicrobial, pain relieving, and tissue regeneration prospective. Seed oil contains Vitamin K (1.1–2.3 mg/g) which promotes blood coagulation because of its catalytic role in forming prothrombin. Hiporamin purified fraction of polyphenol from sea buckthorn leaves possess very strong action against HIV infection and indicates its potential use in the treatment of AIDS.

Table 4 shows different pharmacological investigation carried out using *H. rhamnoides* for different activities reported in literature.

In addition to above pharmacological activities, there are several diseases were the sea buckthorn seed oil is used for the treatment of gastrointestinal ulcers and reducing inflammation. Sea buckthorn extract helped for normalizing liver enzymes, serum bile acids, and immune system markers involved in liver inflammation and degeneration. Sea buckthorn seed oil containing many fatty acids including alpha-linolenic acid, linoleic acid and palmitoleic acid that are responsible for the treatment of burns and heal in wounds. In one of the reported studies of skin plasma phospholipids and neutral lipids, sea buckthorn seed oil increases the level of omega-3 and omega-6 by decreasing the level of palmitic acid and when pulp oil is applied that increases the level of omega-7 in the skin and lowering down the amount of pentadecanoic acid in skin glycerospholipids. The lyophilized alcohol aqueous extract of the fresh berries of sea buckthorn has shown radioprotective activity in a single i.p. dose of 10-50 mg/kg in mice. Radiation-induced gastrointestinal toxicity also gets prevented by restricting the decrease in the number of cells per crypt and per villus of jejunum tissue of irradiated animals along with decreasing the apoptosis and caspase-3 activity. Sea buckthorn berries extract showed apoptosis in...
Seed oil and fruit juice have been reported to show antihyperlipidaemic activity by reducing the diet-induced increase in blood total cholesterol, triglycerides, LDL-cholesterol, LDL/HDL ratio, and atherogenic index along with increasing the blood HDL cholesterol and HDL cholesterol/total cholesterol ratio.

*H. rhamnoides* seed oil showed increase the vasorelaxant activity of acetylcholine on phenylephrine-contracted aortic segments. The aqueous leaf extract, alcoholic fruit and seed extract, and seed oil obtained by supercritical CO$_2$ extraction showed *in-vitro* antiplatelet activity by inhibiting the ADP (0.2 mM) stimulated aggregation of human platelets having IC$_{50}$ values of 55.0, 48.0, 304.0 and 0.58 μg/ml, respectively.

The ethanolic extract of sea buckthorn leaves reduces the increased level of serum glutamic oxaloacetic transaminase, serum glutamic pyruvic transaminase, and serum creatine phosphokinase activities to show hepatoprotective activity. The cerebroprotective effect was already reported with the pretreatment of seed oil that restrict the hypoxia-induced rise in catecholamines, viz., norepinephrine and epinephrine.
<table>
<thead>
<tr>
<th>Pharmacological properties</th>
<th>Parts used</th>
<th>Model</th>
<th>Activity remarks</th>
<th>Results</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antioxidant and antibacterial activity</td>
<td>Seed extract</td>
<td>In-vitro model</td>
<td>DPPH and liposome model system showed the highest antioxidant and antibacterial activity for MeOH extract</td>
<td>1 g/ml methanolic extract at the concentration of 50 show 93.5% scavenging activity</td>
<td>[26,48]</td>
</tr>
<tr>
<td>Antioxidant activity</td>
<td>Seed oil</td>
<td>In-vitro model</td>
<td>Increase in concentration of seed oil showed that DPPH radical scavenging activity, ferrous ion chelating activity, reducing power and inhibition of lipid peroxidation activity</td>
<td>EC$_{50}$ value of sea buckthorn seed oil that is effective is 7.37 mg/ml. At the dose of 0.92-18.3 mg/ml show ferrous chelating activity 7.74-38.5%. At concentration of 8.32 mg/ml, the reducing power of sea buckthorn seed oil was 0.37% sea buckthorn seed oil at doses of 3.00 mg/ml inhibited lipid peroxidation in the linoleic acid system by 65.8%, respectively</td>
<td>[49,50]</td>
</tr>
<tr>
<td>Acute and sub-acute toxicity studies</td>
<td>Leaf extract</td>
<td>In-vivo model</td>
<td>Ethanolic extract of sea buckthorn leaves showed practically no toxicity</td>
<td>The acute toxicity study at LD$_{50}$ of the extract to be higher than 5 g/kg body weight via oral route. And Subacute toxicity study at 1.25 g/kg body weight per day did not show a significant change in any of the hematological and biochemical parameters</td>
<td>[51,52]</td>
</tr>
<tr>
<td>SBSO fat emulsions for intravenous injection.</td>
<td>Seed oil</td>
<td>In-vitro model</td>
<td>SBFE for injection was developed in this study, which consisted of refined SBSO 10% (w/v), soya lecithin 1.2%(w/v), F68 0.2% (w/v), Tween 80 0.2% (w/v), glycerin 2.5% (w/v) , EDTA 0.005% (w/v) and Na2SO3 0.025% (w/v)</td>
<td>Sea buckthorn fat emulsion is suitable for industrial scale production and clinical application</td>
<td>[53]</td>
</tr>
<tr>
<td>Healing efficacy on burn wounds</td>
<td>Seed oil</td>
<td>In-vivo model</td>
<td>SBT seed oil was co-administered by two routes at a dose of 2.5 ml/kg body weight (p.o.) and 200 microl (topical) for 7 days on experimental burn wounds in rats</td>
<td>Sea buckthorn seed oil augmented the wound healing process due to increase in wound contraction, hydroxyproline, hexosamine, DNA and total protein contents</td>
<td>[54]</td>
</tr>
<tr>
<td>Antimutagenic activity</td>
<td>Berries</td>
<td>Ames Salmonella histidine reversion assay</td>
<td>Berries showed inhibition of mutagenicity caused by various strains</td>
<td>20 µg/0.1 ml/plate</td>
<td>[55]</td>
</tr>
<tr>
<td>Hypoxia protection activity</td>
<td>Seed oil</td>
<td>In-vivo study</td>
<td>Curtailed hypoxia induced enhanced vascular leakage in the brain</td>
<td>SBT seed oil at a dose of 2.5 ml/kg body weight significantly restricted hypobaric hypoxia induced increased fluid leakage and water content</td>
<td>[56]</td>
</tr>
</tbody>
</table>

(Contd...)
hypoxic gasping time and survival time.\[66\] The alcoholic extract of the leaves, inhibited the lipopolysaccharide-induced anti-inflammatory response in murine macrophage cell line RAW 264.7.\[70\] It also show cognitive activity on its oral administration of the aqueous as well as ethanolic extract of the leaves at 100-500 mg/kg p.o. doses for 5 days that did not enhance cognitive functions with reference to avoidance learning during exposure to stressful conditions of multiple stressors.\[71\]

**H. SALICIFOLIA**


**BOTANY**

*H. salicifolia* is a species of *Hippophae* found in moist gravel or stony areas, often beside rivers or streams at 2800-3500 m altitude in Bhutan, Nepal and Northern India.\[72\] Shrubs or trees are 2-3 (−10) m tall, and the trunk is more than 30 cm in diameter. Petiole is 2-3 mm; leaf blade abaxially whitish with usually reddish brown midrib, adaxially ± green, linear-oblong, abaxially tomentose, adaxially stellate-hairy, and margin usually revolute. Male flowers are 2.5-3(-4) mm; anthers 2-2.5 mm. Female calyx 2 mm. Peduncle 1-4 mm. Fruit orange-yellow to greenish brown or yellow to deep red, globose, terete, 5-7 × 5-7 mm. Endocarp easy to separate from seed. Seed broadly ellipsoid to ovoid, ± flattened, 2.8-5.2 mm.\[29\]

**ETHNOPHARMACOLOGY**

The leaves of *H. salicifolia* are used to make tea; its fruit is used for polishing gold and silver. It has been widely used in traditional system of medicine for treatment of asthma, skin diseases, gastric ulcers, lung disorders, cough, diarrhea, and menstrual disorders.\[73,74\] *H. salicifolia* plant has various applications as an efficient source of timber, fuel, and fodder. The whole plant is used as fences around houses and crops for protection against wild animals. The seed cake of *H. salicifolia* is used as animal feed which contains rich proteins and mineral content.\[75,76\] It is also used in stomach ache, cough, cold and sore throat, pulmonary complaints and cutaneous troubles while its juice is used to destroy fish poison.\[77-79\]

**PHYTOCHEMISTRY**

In a preliminary study, the fruits, leaves and twigs revealed the presence of alkaloids and absence of saponins and flavonoids whereas the stem bark showed the presence of flavonoids and was devoid of saponins and alkaloids.\[80\] The bark has been reported to contain β-sitosterol, saturated aliphatic long-chained hydrocarbon, and a sterol glycoside. The presence of two alkaloids harmol and harman were also detected in the bark.\[81,82\] It was reported that the crude protein content in the leaves of *H. salicifolia* (21.6%) was significantly higher than those of the *H. rhamnoides* biotypes as fodder values of the plants of sea buckthorn and fat content varies from 3.5% to 4.8% in *H. rhamnoides* to 4.6% in *H. salicifolia*. Natural detergent fiber value in the leaves of *H. salicifolia* (32.7%) was higher than the biotypes of *H. rhamnoides*.\[20\]
Different plant parts and their respective phytoconstituents of *H. salicifolia* are listed in Table 5 and their structures are Figures 3 and 5.

**PHARMACOLOGICAL INVESTIGATION OF H. SALICIFOLIA**

Various pharmacological activities have been carried out on different plant parts of *H. salicifolia*. This species of *Hippophae* has been reported to have antioxidant, antibacterial, antifungal, anticancer, anti-inflammatory, immunomodulatory, radioprotective, adaptogenic, antiatherosclerosis, and anti-sterility properties due to the presence of multivitamin content, flavonoids, and fatty acids. Some of these important activities are listed in Table 6.

In addition to these uses, its fruits have been shown to improve appetite, used in lung complaints, aphonia, paralysis of tongue and throat muscles; as an antidote for food poisoning; in catarrh and influenza. It is also used for the treatment of rectal and vaginal mucositis. The fruit juice is also used in dandruff. Its stem bark has been used in ulcer treatment. Powder obtained from the plant bark has shown its wounds healing activity and also as an anticancer agent. Plant roots have been reported to check nausea and bad breath.

**HIPPOPHAE TIBETANA**


**BOTANY**

Shrubs are small and sometimes rhizomatous, (5-)10-60(-80) cm tall. Older stems are dark gray, thick, with regularly spaced scars of deciduous leafy branches; leafy stems slender, unbranched, spine-tipped. Leaves are mostly in whorls of 3; petiole ca 1 mm; leaf blade abaxially whitish, adaxially grayish, linear-oblong, 1.2-2 × 0.25-0.4 cm, densely scaly, abaxially with scattered sub entire, reddish brown scales and reddish brown midrib, margin flat. Male flowers are ca 2 mm; anthers ca 1.5 mm. Peduncle 1-2 mm. Fruit grow in yellowish green color, globose to elliptic, terete, 8-11 × 6-9 mm. Endocarp is difficult to separate from seed. Seed are somewhat flattened. The flowers are dioeciously and are pollinated by wind.

**PHYTOCHEMISTRY**

The fruit is a very rich source of Vitamins A, C and E, flavonoids and other bio-active compounds. It is being
investigated as food, which is capable of reducing the incidence of cancer.\textsuperscript{[101]} The wood is used for fuel.\textsuperscript{[102,103]} A red cosmetic is obtained from the ripe fruit.\textsuperscript{[103]}

**ETHNOPHARMACOLOGY AND PHARMACOLOGICAL USES**

The tender branches, leaves, and fruits contain bio-active substances which are used to produce oil, which is used as an ointment for treating burns.\textsuperscript{[101]} The fruit has high-quality medicinal uses in the treatment of cardiac disorders, radiation injury, intestinal diseases.\textsuperscript{[101]} It is used in the treatment of disorders of the lungs, inflammation of the pulmonary tract and difficulty in expelling phlegm. It is used as an antitussive agent, blood purifier, and expectorant.\textsuperscript{[104]} Table 7 shows the comparison of phytochemicals constituents present in *H. rhamnoides*, *H. salcifolia*, and *H. tibetana*.

**SEA BUCKTHORN MARKETED PRODUCTS**

At present, different company manufactured sea buckthorn products such as juice, beer, wine, jam, preserve, compote and tea for its pharmaceutical, nutraceuticals and cosmeceutical applications. Some of available marketed products are given in Table 8.

**CONCLUSIONS**

*Hippophae* is a genus known by its other name sea buckthorn which is a unique and valuable plant of temperate region. The natural habitat of sea buckthorn extends widely in China, Mongolia, Russia and most parts of Northern Europe. Genus *Hippophae* exists in different species and sub-species. The importance of the plant is emphasized by its usefulness as...
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Radioprotective, immunomodulatory, antiplatelet and wound healing agent, anti-inflammatory, antitumor, antioxidant, antibacterial activities. The available information for species Hippophae goniocarpa, Hippophae litangensis, and H. neurocarpa are very limited, and there is much scope for research on these species to isolate and characterize bioactive

Table 7: Comparison of phytochemical constituent present in different species of Hippophae genus

<table>
<thead>
<tr>
<th>Chemical constituents</th>
<th>H. rhamnoides</th>
<th>H. salcifolia</th>
<th>H. tibetana</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berries Vitamin C (mg/kg)</td>
<td>1.444-4.877</td>
<td>22.979-29.840</td>
<td>8.789-9.279</td>
<td>[105]</td>
</tr>
<tr>
<td>Berry pulp phenolic content (mg/kg)</td>
<td>3956-5728</td>
<td>5913-6719</td>
<td>5719-5893</td>
<td>[25]</td>
</tr>
<tr>
<td>Berries flavonols (mg/kg)</td>
<td>308</td>
<td>428</td>
<td>401</td>
<td>[106]</td>
</tr>
<tr>
<td>Berry pulp flavonoids (mg/kg)</td>
<td>122-308</td>
<td>353-428</td>
<td>342-401</td>
<td>[106]</td>
</tr>
<tr>
<td>Pulp oil fatty acids</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Palmitoleic acid (omega-7)</td>
<td>48.2</td>
<td>36.5</td>
<td>34.0</td>
<td>[107]</td>
</tr>
<tr>
<td>Oleic acid (omega-9)</td>
<td>10-17</td>
<td>13-18</td>
<td>22-26</td>
<td></td>
</tr>
<tr>
<td>Pulp oil carotenoids (mg/kg)</td>
<td>2350-3420</td>
<td>692-840</td>
<td>2693-3166</td>
<td>[108]</td>
</tr>
<tr>
<td>Pulp oil tocopherols (mg/kg)</td>
<td>1301-1788</td>
<td>666-902</td>
<td>1368-1546</td>
<td>[109,110]</td>
</tr>
<tr>
<td>Seed oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linoleic acid (omega-6)</td>
<td>33-40</td>
<td>Both present</td>
<td>Both present</td>
<td></td>
</tr>
<tr>
<td>α-Linolenic acid (omega-3)</td>
<td>30-36</td>
<td>about 63%</td>
<td>about 64.9%</td>
<td></td>
</tr>
</tbody>
</table>

Table 8: List of marketed products for sea buckthorn

<table>
<thead>
<tr>
<th>Product name</th>
<th>Manufactures</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sea buckthorn cream</td>
<td>Summerbee products</td>
<td>As moisturizing cream to promote the regeneration of the skin and mucous membranes</td>
</tr>
<tr>
<td>Sea buckthorn skin oil</td>
<td>Summerbee products</td>
<td>This oil contains a 7.5% solution of sea buckthorn oil in pure sweet almond oil use for their rejuvenating, restorative and anti-ageing action</td>
</tr>
<tr>
<td>Sea buckthorn pure fruit oil</td>
<td>Summerbee products</td>
<td>Pure sea buckthorn fruit oil may be applied directly to the lips or internal mouth ulcers</td>
</tr>
<tr>
<td>Exfoliating face and body scrub</td>
<td>SIBU®</td>
<td>Use to deep clean pores and remove dead, dull surface cells and scrub removes excessive oil from clogged pores</td>
</tr>
<tr>
<td>Age Defying Eye Cream</td>
<td>SIBU®</td>
<td>It is designed to gently support the delicate eye area which soft, smooth, bright and youthful</td>
</tr>
<tr>
<td>Omega-7 Support soft gels</td>
<td>SIBU®</td>
<td>Source of Omegas 3, 6, 9 and Omega-7 fatty acid</td>
</tr>
<tr>
<td>SBT Wellness Matcha</td>
<td>Sea buckthorn International Inc.</td>
<td>It is a powerful anti-inflammatory and rich in antioxidants, vitamins, and minerals that support heart, brain, bone, skin, digestive, and overall health. Its antioxidant properties also aid in preventing oxidative cell damage</td>
</tr>
<tr>
<td>Sea buckthorn berry oil</td>
<td>Seabuck Wonders</td>
<td>Rich supply of Omega-7 (30-35%) as well as Vitamin E, making sea buckthorn berry oil invaluable for health benefits which replenish, moisten mucus membranes that line the digestive urogenital tracts and for topical skin treatments</td>
</tr>
<tr>
<td>Sea buckthorn body lotion</td>
<td>Seabuck Wonders</td>
<td>Nourishment with age-defying properties for soft, healthy skin</td>
</tr>
<tr>
<td>ArboAmrit Plus</td>
<td>Himalaya Naturals</td>
<td>As nutraceuticals rich in Omega 6-7-9 fatty acids</td>
</tr>
<tr>
<td>SeAmrit 7</td>
<td>Himalaya Naturals</td>
<td>A multi-nutrient rich super food rich in Omega 6-7-9 fatty acids which is useful in treating high blood lipid symptoms, eye diseases, gingivitis and cardiovascular diseases</td>
</tr>
<tr>
<td>Sea Buckthorn Force™</td>
<td>Newchapter</td>
<td>Source of omega-7 fatty acid</td>
</tr>
<tr>
<td>Sea buckthorn seed oil 1000 mg</td>
<td>Ko and Humble beautifying oils</td>
<td>Promotes skin health, moisturizing, restorative, calming effects on damaged skin</td>
</tr>
<tr>
<td>Sea buckthorn berry oil 1000 mg</td>
<td>Lamberts®</td>
<td>As food supplement</td>
</tr>
</tbody>
</table>
constituent(s) and in vivo studies, to explore the potential uses of *Hippophae* that may contribute in drug development.

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1966;5:3649-57.


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