

Nutritional Importance and Health Benefits of Sea Buckthorn

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SUMMARY

Sea buckthorn (*Hippophae rhamnoides* L.), a fruit classified as a "medicine food homology" product for both dietary and therapeutic purposes, contains approximately 200 different nutritive and bioactive substances, including polyunsaturated fatty acids, carotenoids, sugar alcohols, superoxide dismutase, and phytosterols. The use of sea buckthorn has been emphasized due to its significant bioactivity, which includes cardiovascular benefits, anti-diabetic, and anti-obesity properties. The health benefits of sea buckthorn and its extracts were thoroughly discussed.

INTRODUCTION

The sea buckthorn (*Hippophae rhamnoides* L.) is a member of the Elaeagnaceae family (Sharma *et al.* 2019). It is a thorny nitrogen-fixing deciduous shrub native to north-western Europe, Central Asia, and the northern Himalayas. Sea buckthorn was once prized for its medicinal properties. Its medicinal significance has been known in Chinese and Indian medicine systems for thousands of years (Wen *et al.* 2020). Polyphenols, polysaccharides and sugar alcohols, superoxide dismutase (SOD) activity, organic acids, triterpenic acids (TTAs), and phytosterols are among the bioactive compounds found in all parts of the plant, especially the berries, which are the primary organ of interest. Sea buckthorn encourages the development and replication of probiotics in addition to its bioactivity for humans, making it possible to combine sea buckthorn and probiotics to create food with synergistic bioactivity (Terpou *et al.*, 2019). Various sea buckthorn products are available in many nations, including the United States, China, India, Canada, Finland, Germany, and other European countries, due to their excellent nourishing effects.

Nutritional value

Sea buckthorn's nutritional and bioactive compounds differ depending on fruit maturity, age, species, geographic area, temperature, extraction process, and even detection method (Leskinen *et al.* 2010). Table 1 lists the nutritional compounds and their contents. Sea buckthorn fruit has a moisture content of 70.6–76.9% fresh weight (FW), with solid and ash content of 18.5–33.8 percent FW and 0.40 percent –0.02 percent FW, respectively.

Table 1. Contents of nutritional compounds (%) in sea buckthorn berries/fruit of different habitats.

Compounds	Content
Moisture	70.6–76.9
Solid	18.5–33.8
Ash	0.40–22.02
Carbohydrate	0.48–2.87
Protein	0.4–2.5
Lipid	1.20–7.8
Vitamin	
VA (% oil)	0.0154
VE (% oil)	0.065–0.26
VK (mg/kg)	90–120
VC (mg/kg)	400–15,500
VB1 (mg/kg)	0.16–0.35
VB2 (mg/kg)	0.3–5.0
VB11 (mg/kg)	0–7.9

Minerals (mg/kg DW)	
Calcium (Ca)	0.27–3.12
Magnesium (Mg)	0.47–2.22
Nitrogen (N)	17.61–18.60
Phosphorus (P)	1.50–1.71
Potassium (K)	2.20–10.30
Iron (Fe)	22–282
Copper (Cu)	0.14–12.0
Manganese (Mn)	8.70–16.00
Zinc (Zn)	0.04–28.00
Boron (B)	13.61–16.30

The sea buckthorn berry and its extracts have a long list of health benefits, including cardiovascular health, blood glucose management, obesity regulation, and gut microbiota stimulation. This article studied the health benefits of sea buckthorn berries, HRe-1, RH-3, lipophilic extract, polyphenol, organic acids, proteins, and polysaccharides, as well as in vitro trials, well-designed animal and human studies.

The benefits of sea buckthorn berry

Obesity management and blood sugar control

Dried sea buckthorn berries reduced low-density lipoprotein (LDL) in overweight and obese women, with the effect being more pronounced in those with a higher CVD risk. Furthermore, human studies of sea buckthorn berry consumption revealed that direct consumption of sea buckthorn fruit increased diabetic patients' postprandial blood glucose levels. Sea buckthorn whole berry improved glycemia profile and decreased plasma insulin concentration at 30 and 45 minutes in diabetics.

Reduction in mental disorder

In animal models of depression, sea buckthorn pulps had major antidepressant-like effects, suggesting that they could be used as a natural source of antidepressant agents.

HRe-1's benefits from sea buckthorn

Hexane is used to remove HRe-1 from sea buckthorn. On nicotine-induced liver oxidative stress, HRe-1 and vitamin E had the same protective effect.

The advantages of RH-3 derived from sea buckthorn

RH-3 is a natural mixture of hundreds of compounds derived by alcohol from the sea buckthorn berry. Flavones, flavonoids, and vitamin C are secondary metabolites found in it. It can help with free radical scavenging and anti-oxidation, allowing it to perform bioactive functions. In terms of MTT reducing capacity in U 87 cells, RH-3 at concentrations of 7.5 and 10g/ml (15 min) was found to be the most effective in protecting against 2Gy-induced cytotoxicity.

The advantages of sea buckthorn lipophilic extract

Sea buckthorn berry oil (SBBO), sea buckthorn pulp oil (SBPO), and sea buckthorn seed oil are the three types of sea buckthorn oil extracts (SBSO). Maintaining cardiovascular health, blood glucose control, and obesity regulation, improvement of gastric ulcer and hepatic damage, and relief of psoriasis and dry eye syndrome are only a few of the health benefits they provide (DES). CVD refers to ischemic or hemorrhagic disorder that is triggered by hyperlipidemia, blood viscosity, atherosclerosis, and elevated blood pressure in the heart, brain, and systemic tissue. Histopathological and ultrastructural examinations indicated that sea buckthorn oil would avoid isoproterenol (ISO)-induced cardiotoxicity. SBBO's free radical scavenging and antioxidant activities reduce myocardial damage in ISO-induced cardiac injury in rats.

Improvement of gastric ulcers

In ligation-induced gastric ulcer rats, oral administration of SBSO and SBPO (7.0 mL/kg/day) significantly decreased the index of pylorus from 5.5 to 3.36 and 3.72, respectively, by decreasing gastric acid and pepsin secretion and increasing gastric wall mucus secretion.

Reduction in hepatic damage

SBSO's hepatoprotective effect was found to be equivalent to that of silymarin (200 mg/kg) at all doses measured, as evidenced by liver histopathology in mice.

Relief from psoriasis

Sea buckthorn oil's unsaturated fatty acids and vitamins helped to maintain the health of skin tissue. SBPO has the potential to be an anti-inflammatory and anti-psoriatic nutraceutical. DES (dry eye syndrome relief) is becoming more common, particularly in developed countries. During the cold season, SBSO reduced the rise in tear film osmolarity and improved dry eye symptoms.

The benefits of sea buckthorn polyphenol**Preserving cardiovascular health**

Sea buckthorn polyphenols are diverse in content and have a wide range of bioactive roles, attracting a lot of interest. In male ICR mice with femoral artery thrombosis, total flavones from sea buckthorn at a concentration of 3.0g/mL significantly prevented in vitro platelet aggregation induced by collagen (2.0g/mL) in a concentration-dependent manner.

Weight management and blood glucose control

Polyphenols found in sea buckthorn may help humans and animals lose weight.

Cancer cell proliferation inhibition

Cancer cells such as human hepatocellular carcinoma cells and breast cancer cells can be inhibited by sea buckthorn polyphenols.

Improved gut microbiota

Obesity, diabetes, carcinoma, and autism are all linked to the microbiota in the gut. In terms of the proliferation of beneficial gut microbiota, sea buckthorn was a strong source of prebiotic substrate.

Safety of the skin

When compared to a placebo, sea buckthorn extracts containing polyphenols were found to be selective on melasma.

Promotion of Retinal Health

Total flavones from sea buckthorn significantly reduced the number of TUNEL-positive cells in the inner nuclear layer and ganglion cell layer in rabbits with visible light-induced retinal damage, maintained outer nuclear layer thickness, and decreased the number of TUNEL-positive cells in the inner nuclear layer and ganglion cell layer, by increasing antioxidant Défense and suppressing pro-inflammatory and angiogenic cytokines.

Free radical damage scavenging.**The benefits of organic acids, proteins and polysaccharides from sea buckthorn**

In the extraction of sea buckthorn, polyphenols are water soluble and simple to acquire. Sea buckthorn, on the other hand, contains organic acids, proteins, and polysaccharides that need a more complex solvent to remove, and their bioactive benefits should not be overlooked.

Cancer cells inhibition of organic acids

Heptane was used to extract organic acids from sea buckthorn, followed by ethyl acetate, ethanol, and water. Ursolic acid levels in the ethyl acetate fraction were found to be exclusively high, and their effects on cell proliferation were studied in Caco-2 and Hep G2 cells.

Gut microbiota diversity and T2DM improvement of proteins

The effects of the sea buckthorn protein on the regulation of gut microbiota were studied in a study of Type 2 diabetic mice's intestinal microbial population distribution.

Liver injury recover and inhibitory activity to glucosidase of polysaccharides

Sea buckthorn polysaccharides have glucosidase inhibitory activity, and the higher the concentration, the more noticeable the inhibition effect.

CONCLUSION

Sea buckthorn is a wonderful fruit that has been farmed and used for its nutritional and therapeutic properties for thousands of years. This article created a database of sea buckthorn phytochemical components and emphasized the most recent findings on sea buckthorn's health benefits. The foregoing findings demonstrated that sea buckthorn, as a safe food and food ingredient, can help to regulate human metabolism and promote overall health.

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