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Review article

Seabuckthorn: A Comprehensive Review of its Nutritional Composition, Health Benefits, and Therapeutic Potential

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ABSTRACT:

Sea buckthorn (syn.: *Hippophae rhamnoides*) is a dioecious, deciduous spiny shrub. Sea buckthorn has become a horticultural crop grown in many countries in Asia and Europe. Its popularity has increased in recent decades, mainly due to the high nutritional and medicinal properties of its fruits. All parts of this plant such as fruit, leaves, seed or pulp oil, and wood contain many bioactive compounds. Sea buckthorn is also used in human and animal nutrition. The compounds contained in this plant are versatile in many areas of human life. Traditional and modern medical professionals have used this plant to treat a variety of ailments. The whole plant is used in many industries such as pharmaceutical industry, cosmetics industry, food industry. This report examines the nutritional, medicinal and therapeutic benefits of sea buckthorn in controlling various types of acute and chronic diseases.

Keywords: Antioxidant, dermatologically healthy, immune booster, nutraceuticals, Omega-7, super fruit

1. INTRODUCTION:

Sea buckthorn (genus Hippophae) is a member of the Elaeagnaceae family. It is a hardy, berry-bearing bush. It is distributed in Asia, Europe, North and South America, China, and Mongolia. It includes six species and 12 subspecies, of which *Hippophae rhamnoides* is known as sea buckthorn, sand thorn, or seaberry. It is a spiny deciduous shrub. The unique feature of seabuckthorn is its intense orange berries that very densely overgrow the shoot. It is also known as "Siberian pineapple" because its fragrance is similar to that of pineapple. Seabuckthorn is brought from high altitudes in the Himalayas, above 10000 feet. It is a very beautiful golden orange berry. The roots of seabuckthorn go down 200 feet into the ground to gain high nutrition in order to survive the intense climate, and that's the reason they have a high amount of nutrition. (Suryakumar et al 2011)

Sea buckthorn is known as a "nature superfruit" as it contains 190 bioactive compounds. Seabuckthorn contains vitamins A, C, E, and B12, a source of complete protein, minerals like K, Na, Mg, Ca, Fe, Zn, and Se, flavonoids, hepatoprotective carotenoids, a high antioxidant, the richest source of Omega 3, 6, and 9, and the

rarest Omega 7. Seabuckthorn is used in many health issues and industries, like cardiovascular, digestive, and dermatological problems. It is also used in the food industry, the cosmetic industry, and the pharmacy industry.

The positive effects of seabuckthorn on animal and human health were already known to the ancient Greeks. They used its fruit in helminthiasis treatment in animals. The Mongolian emperor Changez Khan regularly used to give seabuckthorn to his soldiers and horses for increasing strength and stamina. Sea buckthorn is also a staple of the diet of high-altitude military personnel. (Rafalska, A. Et al 2017)

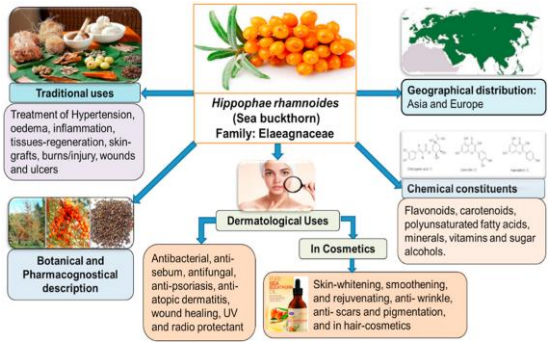


Figure 1. Reprsents various regions and uses of Seabuckthorn (Pundir, S.et al 2021)


Figure 2. Seabuckthorn in different periods. (Wang Z. Et al. 2022)

Table 1. The Distribution and the Status of Utilization of Hippophae (Rongsen L et al 2013)

Taxons	The Areas of Distribution	The Status of Utilization
H. rhamnoides. subsp. rhamnoides	Scandinavian countries, Baltic Sea countries, Germany, Belgium, Netherlands, Ireland, Poland, U.K. France, Russia	Many varieties are cultivated in some European countries and Canada
H. rham. subsp. sinensis	The North, Northwest, Southwest of China	Wild resources are used for ecological restoration and berries are processed for products. Some new varieties are in tests.
H. rham. subsp. yunnanensis	Sichuan, Yunnan, Tibet of China	Wild resources are used for ecological restoration only.
H. rham. subsp. mongolica	Siberia of Russia, Mongolia, Xinjiang of China	More than 60 varieties are cultivated in Russia, Mongolia, many East European counties. Many West European counties, Canada and China introduced the varieties for test
H. rham. subsp. turkestanica	India, Pakistan, Afkhanistan,Turkmenistan, Kirghizstan, Uzbekistan, Kazakhstan, Iran, Turkey, Xinjiang , Tibet of China	Wild resources are used for ecological restoration and berries are processed for various products
H. rham. subsp. fluviatilis	Around Alps Mountains: Germany, France, Switzerland, Austria, Czech, Slovakia, Italy,	Most of wild resources are protected as forest species. Some berries are collected for processing products
H. rham. subsp. carpatica	The Capathinan Mountains, Transsylvanian Alps,the valley and the mouths of the Donube and its tributary.	Most of wild resources are protected as forest species. Some varieties are cultivated for processing products
H. rham. subsp. caucasica	The Caucasus Mountains, Georgia, Azerbaijan, Armenia, Ukraine, Romania, Turkey, Bulgaria, Iran, Russia.	Most wild resources are protected as forest species. Some selected varieties are cultivated for the test.
H. goniocarpa	Sichuan, Qinghai of China	Most wild resources are protected as forest species. Very few studies have been done on it.
H. goniocarpa subsp. litangensis	Sichuan, Qinghai of China	Most wild resources are protected as forest species. Very few studies have been done on it.
H. neurocarpa	Sichuan, Qinghai,Gansu of China	Most wild resources are protected as forest species. Very few studies have been done on it.
H. neurocarpa subsp. stellatopilosa	Sichuan, Qinghai, Tibet of China	Most wild resources are protected as forest species. Very few studies have been done on it.
H. tibetana	Sichuan, Qinghai, Gansu, Tibet of China, Nepal, India	Most wild resources are protected as grassland species. Very few studies have been done on it.
H. gyantsensis	Tibet of China	Most wild resources are protected as forest species. Some berries are collected for

		producing Tibetan medicine.
H. salicifolia	The southern slope of Himalayan Mt. Tibet of China, Bhutan, Nepal, India	Most wild resources are protected as forest species. Some berries are collected for producing products.

2. LITERATURE REVIEW :

Seabuckthorn (Hippophae rhamnoides) is a versatile shrub that has gained significant attention in recent years due to its numerous health benefits and potential applications. This literature review aims to provide an overview of the scientific research conducted on seabuckthorn, covering its botanical characteristics, traditional uses, phytochemical composition, pharmacological properties, and potential applications in various industries. The review highlights the importance of seabuckthorn as a rich source of bioactive compounds, including vitamins, minerals, flavonoids, carotenoids, and fatty acids. Additionally, it explores the antioxidant, anti-inflammatory, immunomodulatory, antimicrobial, and anticancer properties associated with seabuckthorn. Furthermore, this review presents studies that investigate the therapeutic potential of seabuckthorn in the management of various health conditions such as cardiovascular diseases, gastrointestinal disorders, skin ailments, and metabolic disorders. Finally, the review examines the potential applications of seabuckthorn in the food, nutraceutical, pharmaceutical, and cosmetic industries, emphasizing its functional and therapeutic attributes.

A recent study suggests that lactic acid bacteria found in sea buckthorn berries could potentially limit the spread of the new coronavirus. Researchers discovered the presence of lactobacillus gasseri (L. Gasseri) in fermented sea buckthorn berries, which effectively inhibits the activation of purine, the virus's energy source. The study also found ehstreptococcus thermophilus and lactobacillus rhamnosus in sea buckthorn berries, which have similar chemical binding sites as COVID-19 and affect protein activity related to AIDS. The researchers identified antioxidants, minerals, and amino acids in sea buckthorn berries as well. Another research team in China found similarities between the mutation of COVID-19, Ebola, and AIDS viruses, with COVID-19 creating spike proteins to survive and attacking purine for replication. Korea has been using AIDS drugs to treat COVID-19 patients, which inhibit proteolytic enzyme activity and have shown improvement in symptoms. Experts believe that L. Gasseri from sea buckthorn berries could be an effective supplementary treatment to limit the spread of COVID-19 by inhibiting purine activity and suggest further research in related fields.

Researchers from the Indian Institute of Technology, Mandi, and CSK Himachal Pradesh Agriculture University Palampur, along with other institutes, have proposed a research project to develop an immune-boosting drug derived from seabuckthorn. The project, worth Rs 7.5 crore, has been submitted to the Ministry of AYUSH in India. Seabuckthorn is a plant found in cold desert and dry temperate regions of India and is known for its high content of vitamins, carotenoids, polyphenols, and sterols. Previous studies have shown its effectiveness in treating various health issues. Seabuckthorn has also been found to possess strong antiviral properties, and research conducted in different countries has demonstrated its ability to enhance immunity and combat viruses. South Korea has reported a breakthrough in using seabuckthorn against COVID-19, and over 55 countries are involved in scientific research and commercial use of seabuckthorn.

Seabuckthorn is a plant that is gaining recognition worldwide, not just in India. It has great potential and it is important to invest in research and development to fully utilize its natural growth. The establishment of

modern orchards with specific cultivars is necessary and already in the planning stage. The Indian Government has approved the creation of a center of excellence for Seabuckthorn in Leh, and both national and state-level science and environment departments are actively involved in its plantation.

Researchers are expected to focus on various aspects of seabuckthorn, including genomics, proteomics, metabolomics, as well as micropropagation, genetic resources documentation, conservation, DNA technology applications, and nanomaterial development. Successful regeneration of plants has been achieved using different tissues and organs in various growth media. Clonal propagation in greenhouses and open fields using both hard wood and soft wood cuttings is currently being practiced, but further improvements and recommendations are needed. There is also potential for mass-scale multiplication of seabuckthorn tissues in bio-reactors to produce its products on a larger scale. The primary focus is on utilizing seabuckthorn oil for health and skincare purposes.

3. BIOACTIVE NUTRIENTS:

Sea buckthorn berries are the most nutritious and vitamin-rich fruit in the plant kingdom. They are high in protein, carbohydrates, antioxidants, essential fatty acids, phytosterols, and flavonoids.

- **Vitamins**:

Sea buckthorn has the highest concentration of vitamin C in the plant kingdom. It has 12 times more vitamin C than oranges. The amount of vitamin C in sea buckthorn in European subspecies is 360 mg per 100 g; in India, the concentration of vitamin C is 223.2 mg per 100 g. The variation in vitamin C concentrations is due to the specific geographic nature of an area where short reproductive seasons prevail.

Vitamin E boosts the immune system and maintains skin and eye health. It has more vitamin E than all other fruits. The amount of vitamin E present in berries is 160 mg per 100 g. Sea buckthorn is a rich source of vitamin A in carotene form. Carotenoid concentration is the primary criterion used to trade sea buckthorn oil economically. Basically, the vitamin B complex is divided into eight B vitamins that depend on each other. Vitamin B helps to convert food into glucose in the body and keeps the nervous and immune systems healthy. Vitamin B12 is the most important vitamin in the vitamin B complex, which is present in sea buckthorn fruit. (Jaśniewska, A.et al 2021)

- **Protein:**

Protein is important for the human body. In sea buckthorn fruit, 18 out of 22 amino acids have been found, which play an essential role in different processes such as energy production, building cells and muscles, and brain function. (Jaśniewska, A.et al 2021)

- **Minerals**:

Minerals are important for physical growth, the strengthening of bones, and the immune system. There are many mineral elements present in the berries, juice, and seed of sea buckthorn, and 24 chemical elements present in sea buckthorn juice, like Na, K, Mg, Cu, and Fe. (Wang, Z. Et al. 2022)

- **Phytosterols** :

A plant-based compound that has a structure similar to cholesterol. Phytosterols help manage blood cholesterol levels, reducing cardiovascular diseases, heart attacks, and strokes. The major phytosterol found in sea buckthorn oil is beta-sitosterol, with 5-avenasterol second in quantitative importance.

- **Antioxidant** :

Antioxidants are very essential to reducing free radicals in our body. Free radicals damage cells. Also, it is increased by smoking, pollution, UV rays, an unbalanced diet, and stress. According to research, sea buckthorn berry, also known as Himalayan superfruit, has the highest ORAC (oxygen radical absorbance capacity). The ORAC value is 895,281 mol TE/100 g. (Puredia et al 2021)

- **Flavonoids**:

Flavonoids are mostly found in seabuckthorn. Isorhamnetin, quercitin, myricetin, and kaempferol are the four major flavonoids found in it. Each of these flavonoids has significant health benefits. Flavonoids have been extensively researched and discovered to have powerful anti-viral and antioxidant properties, allowing them to attack free radicals and protect cells from their damaging effects, boost the immune system to protect the body from infection, and aid in the process of cell regeneration, leaving the body stronger and healthier than ever before. Current study suggests that flavonoids may potentially prevent or significantly lower the risk of heart disease, cancer, and degenerative disorders, all of which become more common as we age.

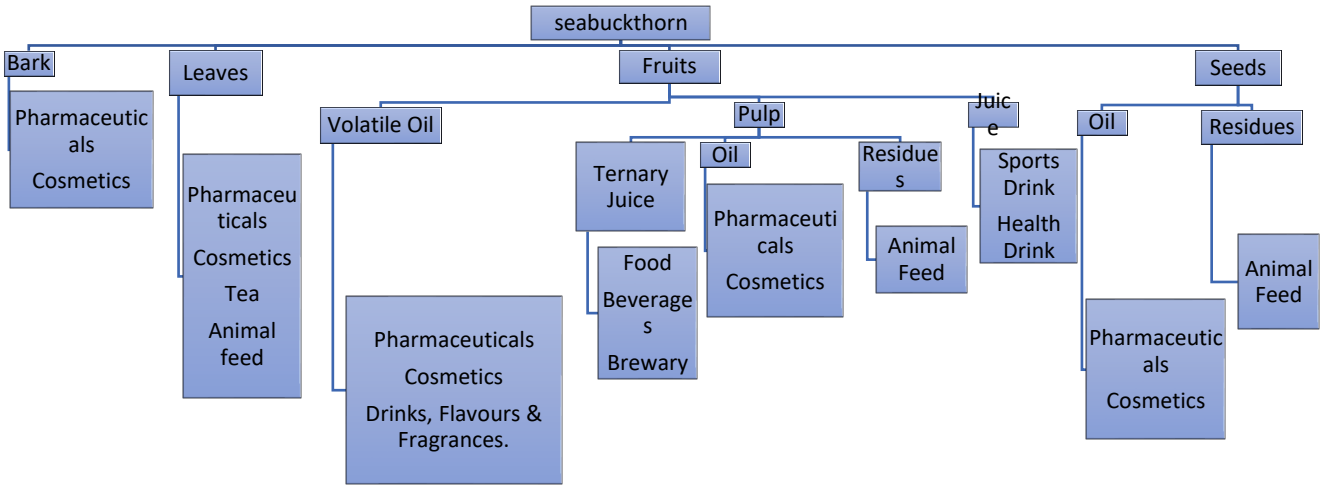
- **Essential Fatty Acids:**

Sea buckthorn has essential fatty acids like Omega 3, 6, 9, and the rarest, Omega 7. Sea buckthorn oil is high in fatty acids and may be beneficial in a variety of human health activities. Palmitoleic acid has a clear therapeutic use in the treatment of skin and mucosal problems such as vaginal inflammatory atrophy, hyperpigmentation of the skin or wounds, and infections. Other beneficial benefits in hypercholesterolemia, diabetes, and liver dysfunction have also been documented. Oleic acid has a well-established role in preventing cardiovascular disease. Although ALA (Alpha linolenic acid) is well known for its ability to lower cardiovascular risk, it is also beneficial for dry eyes and bone health. The omega-6 fatty acids (Gamma-linolenic acid and linolenic acid) may be useful in treating skin diseases. Linolenic acid is effective in the treatment of psoriasis, while GLA (Gamma-linolenic acid) is beneficial in the treatment of acne, atopic dermatitis, and dry eyes. Furthermore, LA (Linolenic acid) appears to benefit atherosclerosis. There is a large number of experimental evidence indicating that those fatty acids might impact a wide variety of human health activities, making them a potential contender for numerous therapeutic applications. Because of the diversity of fatty acids and the particular composition of omega-7 fatty acids, it is feasible to infer that sea buckthorn oil is a promising product, and these fatty acids have a significant relationship with human health. (Solà Marsiñach, M. Et al 2019)

4. SEABUCKTHORN IN DIFFERENT INDUSTRIES OR APPLICATIONS:

Sea buckthorn is widely used in human life because it has an abundant amount of biologically active compounds. These compounds include carotenoids, flavonoids, tannins, vitamins, and macro- and microelements. This unique chemical composition, health benefits, color, and flavor of fruit are important for the pharmaceutical, cosmetic, and food industries.

Following chart shows potential uses of components from different parts of seabuckthorn (Rafalska, A. Et al 2017) :



4.1 PHARMACEUTICAL INDUSTRY:

• Cardiovascular System:

Hippophae rhamnoides is a rich source of flavonoids, which are good for heart health. The research suggests that the cardioprotective effect of sea buckthorn intake is connected with the flavonoids and beta-sitosterol contained in that plant. Diseases like flu, cardiovascular problems, and skin problems can be treated by this plant. TFH improves mechanocardiography and ischemic electrocardiography. Omega 7 in sea buckthorn has been shown to induce broad improvements in overall lipid levels, including a reduction in LDL and an increase in HDL. (Krejcarová et al 2015, Zakynthinos et al 2015)

• Alternative For Antibiotic Drug :

Researchers are looking for antimicrobial properties in a new substance called sea buckthorn, which has shown antimicrobial efficacy in gram-positive and gram-negative bacteria and fungal cultures. Sea buckthorn extracts showed significant or intermediate antimicrobial activity against positive gram-positive bacteria (B. subtilis and B. thuringiendis) and negative gram-negative microorganisms (Pseudomonas fluorescens, E. coli, Agrobacterium tumefaciens, and Acinetobacter junii). One of the sea buckthorn species showed the highest antimicrobial and antifungal activity in crude seed extract, suggesting it may be used as a natural medicine and food preservative. (Krejcarová et al 2015)

• **Hepatoprotective**:

It is medically claimed that sea buckthorn has phytoantioxidant, anti-inflammatory, and anti-cancer properties. Sea buckthorn could reduce serum levels of laminin, hyaluronic acid, total bile acid, and collagen type ll in patients with liver cirrhosis. Sea buckthorn extract has considerable anti-fat effects. Malic acid and oxalic acid in sea buckthorn protect the liver from all types of inflammation and infection.

• **Anti-inflammatory Activity:**

Hippophae rhamnoides has been used since ancient times for the treatment of gastric ulcers by controlling pro-inflammatory mediators. The oils and leaves of this plant are very beneficial for supporting the healing of skin injuries and skin disorders. Omega 7 in sea buckthorn is considered an essential topical agent to support cell tissue and wound healing.

• **Diabetes Treatment:**

According to some research on diabetes patients, it is indicated that the activity of alpha glucosidase is decreasing. This enzyme has the ability to cleave glucosidase bonds in oligosaccharides. Sea buckthorn includes lots of different properties, like flavonoids in seeds and fruits that cause hypoglycemia and hypolipidemia. According to the 2015 result of research, which aimed to find out the effect of sea buckthorn extracts on diabetes treatment, the results show that sea buckthorn leaves have alpha glucosidase inhibition activity. (Krejcarová et al 2015)

- **Cancer therapy :**

The majority of this research has been conducted on laboratory animals. A group led by HC Goel (at the Department of Radiation Biology, Institute of Nuclear Medicine and Allied Sciences in Delhi) published several reports on the potential of a hippophae extract (an alcohol extract containing mostly flavonoids) to protect bone marrow from radiation damage; his group also demonstrated that the extract may aid in the faster recovery of bone marrow cells. A research in China found that mice fed sea buckthorn oil recovered quicker from high-dose chemotherapy. In preliminary laboratory experiments, the seed oil was found to boost nonspecific immunity and produce anti-tumor properties. (Krejcarová et al 2015)

- **Eyes protection :**

The berries of sea buckthorn are high in chemicals that are helpful to human health. Because of their antioxidant, anti-mutagenic, and anticancer capabilities, carotenoids are extremely important chemicals in the category of biologically active compounds. There are several carotenoids in the plant, including zeaxanthin, b-cryptoxanthin, and b-carotene. Zeaxantin is a yellow pigment that may be found in the retina and lens of the eye. As a result, it is widely assumed that this molecule, together with lutein, may protect the eyes against age-related degeneration and cataracts. These chemicals have protective roles in the macula lutea of the eye, preventing photo-oxidative damage to the yellow spot.

Because of their anti-oxidant properties, these chemicals provide this function. Blue light with a high energy level may be filtered by zeaxantin and lutein. Reduced exposure to blue light, which can reach the macula lutea, may lower oxidative stress in the retina. The findings of a study that sought to investigate the carotenoid content

of sea buckthorn berries and leaves (free carotenoids, carotenoid esters, and chlorophyll) were published in 2014. (Krejcarová et al 2015)

4.2 COSMETIC INDUSTRY:

• Protect Against Uv Rays:

Carotenoids are present in sea buckthorn, which are highly valued compounds for the cosmetic industry. They show the capability of absorbing UV radiation and turning it into retinol (vitamin A). Sea buckthorn oil, which strongly absorbs UV-B radiation and causes both tanning and sunburn, can be used as a natural sunblock lotion. (Rafalska, A. Et al 2017)

• Skin-related Problems:

The potential health-related substance contained in sea buckthorn may prevent dermatology illnesses such as atopic eczema, chlamydia, and xeroderma. Omega 7 is ideal for skin dryness. It nourishes and moisturizes cracked skin and helps retain humidity. Macadamia nuts are the only other significant plant source of palmitoleic acid; the oil is used to moisturize the skin. Sea buckthorn oil is already commonly used topically for burns, scalds, ulcerations, and infections, either alone or in combination with other ingredients. It is used in sunscreen because it contains UV-blocking and emollient characteristics, and it aids in tissue regeneration. The fruit can also be used to help with hair care: the term hippophae means “shiny horse,” and relates to the healthy coats acquired by horses that eat the plant. (Krejcarová et al 2015, Zakynthinos et al 2015)

• Wrinkles And Skin Dryness:

Pollution, an unbalanced diet, stress, and a poor lifestyle induced problem today adversely impact beauty and affect the proper functioning of the body, which immediately reflects on the face and skin in the form of dark patches on the skin, blemishes, pigmentation, and wrinkles, as well as leading to damaged hair and brittle nails. The health benefits of sea buckthorn are widely documented. The most common characteristics of this wild organic berry include their regenerative, emollient, and anti-aging actions. Omega 3 and Omega 7 in sea buckthorn are vital for skin and immunity and are known to help in the prevention of dry skin, the reduction of wrinkles, and the creation of glowing skin. (Krejcarová et al 2015)

3.3 FOOD INDUSTRY:

• Juices And Beverages:

Juices and drinks are the most common and oldest produced goods created from sea buckthorn. Sea buckthorn juice and beverages are popular in China, Germany, Scandinavia, and other Nordic countries. At the 1992 Olympic Games, they were the official drinks of Chinese athletes. This plant’s beverages were also included in the diet of Indian troops. The oil component of the sea buckthorn fruit pulp is frequently centrifuged to get juice. Piat and Zadenowski (2014) developed recipes for four drinks that contain fruit nectars with carotenoids ranging from 1.01 to 3.75 mg per 100 ml. The pumpkin sea buckthorn nectar was the most desirable because it contained the most vitamin C and fats.

Wastes from sea buckthorn berry processing are unavoidable, and incorrect disposal of these wastes will pollute the ecosystem. Fermentation and reuse of these wastes can raise the use rate of sea buckthorn while also increasing its economic worth. Waste from the processing of sea buckthorn can be utilized as a suitable substrate for fermentation. Under ideal fermentation conditions, a 3% ethanolic sea buckthorn beverage was produced. Sea buckthorn contains a high concentration of minerals and beneficial substances. Sea buckthorn has a lot of potential as a botanical component for new functional food applications. It appears promising to fully use sea buckthorn fruits, peels, and seeds, as well as to investigate novel methods of processing sea buckthorn. (Wang, Z. Et al. 2022, Krejcarová et al 2015)

• Jams And Jellies:

Sea buckthorn berries can be used to make jams and jellies, but their strong flavor can be toned down by combining them with other fruits. Sea buckthorn berries were mixed with other fruits to create a variety of flavors. Sensory analysis revealed that sea buckthorn jams with gooseberries and raspberries had the highest content of vitamin C and phenols. The highest amount of carotenoids was found in sea buckthorn and raspberry jam. (Krejcarová et al 2015

• Nutritional Supplements And Food Additive Products:

On the food market, products made of sea buckthorn with the addition of its oil play an essential role. Sea buckthorn oil is an important ingredient, as it has unique nutritional properties and can be used to improve mucous membranes.

They are also a natural source of carotenoids, EFA, and phytosterols, making them attractive to consumers. Unfortunately, sunflower oil is used to falsify sea buckthorn oil, adding beta-carotene to give it a similar orange color. Sea buckthorn is used as a nutritional ingredient in baby food because of its ability to inhibit fatty acid decomposition and enrich meat with plant-derived polyphenols that are beneficial to human health. According to studies, a 2% addition of powdered berries has no effect on the organoleptic properties of MDM products.

• Animal Nutrition:

Sea buckthorn, particularly its leaves, pomace, and press cake, can be used as an animal feed ingredient, stimulating the growth and productivity of livestock and poultry. Dorhoi et al. (2006) discovered that sea buckthorn improves cellular immunity in chickens. (Krejcarová et al 2015)

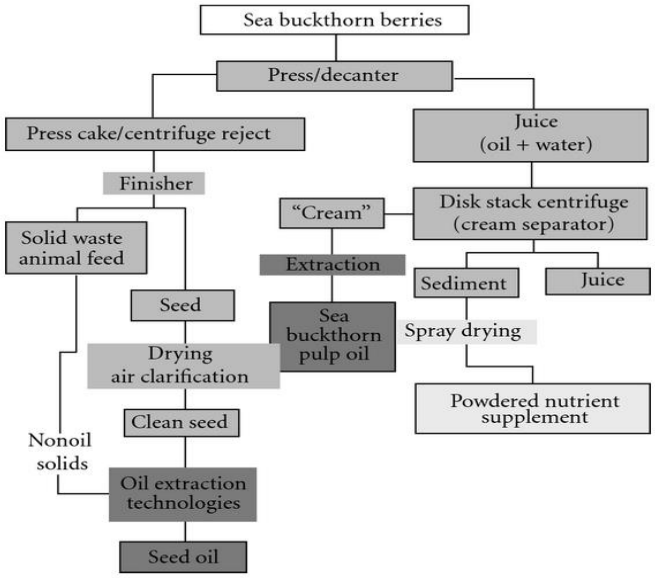


Figure 4. Flow diagram of manufacturing of product from sea buckthorn (Patel, C. A. et al 2012)

Table 2. A list of accessible sea buckthorn market goods. (Patel, C. A. Et al 2012)

Product name	Manufacturer name
Sea buckthorn oil softgel	Fraken biochem co., ltd. [Shandong, China]
Fructus hippophae extract	Rui heng industry co., ltd. [China]
Sea buckthorn pulp oil	Inner mongolia yuhangren hi-tech industrial co., ltd. [province: Inner Mongolia, China]
Sea buckthorn seed oil	Hebei shenxing sea buckthorn health products co., ltd. [China]
Immune-enhancing ingredients	Shanghai brightol international co., ltd. [province:shanghai, China]
Fish oil softgel capsule & lecithin softgel capsule	Qingdao dacon trading co., ltd. [province:Shandong, China]
Sea buckthorn berry oil sea buckthorn seeds	Beijing powdery food co., ltd. [province:Beijing, China]
Oil capsule (y-o-04)	Youchain group co., ltd. [province:Hebei, China]
Shenxing sea buckthorn xinzhian oral liquid	Hebei shenxing sea buckthorn health products co., ltd. [province:Hebei, China]
Organic sea buckthorn fruit oil soft capsule	Hebei shenxing sea buckthorn health products co., ltd. [province:Hebei, China]
Organic sea buckthorn berry/fruit powder	Hebei shenxing sea buckthorn pharmaceutical co., ltd. [province:Hebei, China]
Sea buckthorn fruit oil capsules-1	Jinan sea buckthorn trade co., ltd. [province:Shandong, China]
Jinan sea buckthorn trade co., ltd. [province: Shandong, China]	Jinan sea buckthorn trade co., ltd. [province:Shandong, China]
Seabuckthorm seed oil capsule	Wutai mountain sea buckthorn co., ltd. [province:Shanxi, China]

Sea buckthorn berry powder	Shijiazhuang yiling pharmaceutical co., ltd. [province:Beijing, China]	
Sea buckthorn powder	Beijing powdery food co., ltd. [province:Beijing, China]	
Spirulina	Dechen nutrachem co., ltd. [province:Shandong, China]	
Sea buckthorn seed oil (flu-s003)	Inner mongolia prosperous earth trade co., ltd. [province:Inner Mongolia, China]	
Sea buckthorn seed oil (flu-s004)	Inner mongolia prosperous earth trade co., ltd. [province:Inner Mongolia, China]	
Sea buckthorn oil	Guangzhou honsea sunshine bio science & technology co., ltd. [province:Guangdong, China]	
Sea buckthorn seed oil capsule (hy-08003)	Beijing huiyuan group youyu co., ltd. [province:Shanxi, China]	
Sea buckthorn galic softgel (psg)	Perfect (China) co., ltd. [province:Guangdong, China]	
Sea buckthorn fruit oil	Wutai mountain sea buckthorn co., ltd. [province:Shanxi, China]	
Fruit juice concentrate	Heilongjiang provincial hongri trading co., ltd. [province:Heilongjiang, China]	
Sea buckthorn effervescent tablets	Nanjing union biotech co., ltd. [province:Jiangsu, China]	
Frozen sea buckthorn berry	Conseco sea buckthorn co., ltd. [province:Beijing, China]	
Digestive support herbal candy	Candy manufacturer inc. [province:Guangdong, China]	
Capsules of nutrient products	Shanghai honghao chemicals co. Ltd. [province:Shanghai, China]	
Menova heyeqianzi slimming herbs capsule	panda international trade co., limited [province:Hong Kong, China]	
Softgel capsule [2010-08-17]	Sunrise nutrachem group [province:Shandong, China]	
Skin whitening product	Chifeng wedge pharmaceutical co., ltd. [province:Inner Mongolia, China]	

5. CONCLUSION:

Because of the important bioactives it contains, Hippophae rhamnoides is now considered one of the world's most promising functional foods. Because of its high antioxidant content, SBT has excellent nutritional and therapeutic benefits. The amount of experimental evidence demonstrating key characteristics and bioactive compounds derived from SBT is large and growing quickly. Sea buckthorn has found widespread use in a variety of fields, including medicine, dermocosmetics manufacturing, the food sector, and animal nutrition. People are becoming increasingly interested in sea buckthorn products as a result of the current healthy living trend. Furthermore, those who want to avoid chronic illnesses choose nutraceuticals and natural biocompounds over pharmacological therapeutic agents.

Sea buckthorn berries are highly nutritious fruits, known for their rich phytochemical profile and abundance of bioactive compounds. They are considered "Superfoods" due to their exceptional biological and functional properties. Consumers seeking natural products with functional benefits, whether for skincare or health supplements, are particularly interested in sea buckthorn as an outstanding source. While it holds great potential for various industries, there are significant challenges to overcome in its widespread use. One of the main barriers is the lack of exploration and innovation in leveraging its modern applications, despite the profitability of research in this area.

Moreover, sea buckthorn is not widely cultivated, presenting an opportunity for boosting the local economy and promoting sustainability. However, its overexploitation could lead to a loss of biodiversity and even extinction. Therefore, it is crucial to conserve wild genotypes of sea buckthorn to ensure their availability for future breeding and the development of new plant varieties. By managing and utilizing wild species judiciously, we can achieve greater profitability while also preserving this valuable resource.

6. **Acknowledgement :**

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