

Sea Buckthorn (*Hippophae rhamnoides* L.) Juice: Nutritional Composition, Functional Properties, and Comparative Evaluation with Selected Berry Juices

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Dr. Swapnil Singh¹, Dr. Rashmi Singh², Ritika Panday³, Avdhesh Kumar⁴

¹Teaching Associate, College of Community Science, Department of Resource Management and Consumer Science (Chandra Shekhar Azad University of Agriculture and Technology, Kanpur)

²Associate Professor, College of Community Science, Department of Food and Nutrition (Chandra Shekhar Azad University of Agriculture and Technology, Kanpur)

³Research Scholar, Department of Human Development and Family Studies (Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya)

⁴Research Scholar, Department of Fruit Science, College of Horticulture & Forestry (Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya)

Sea buckthorn (*Hippophae rhamnoides* L.), belonging to the family Elaeagnaceae, has been traditionally utilized in Asian and European medicinal systems for centuries. Its berries are recognized for their therapeutic properties and nutritional richness. Historical records indicate its use in treating digestive, respiratory, and skin-related ailments.

The plant thrives in extreme environmental conditions, including high altitudes and poor soils. In India, it is predominantly found in Himalayan regions such as Ladakh and Himachal Pradesh. Due to its high nutritional value, it has been recommended as a dietary

supplement, particularly for individuals exposed to harsh climates.

Recent scientific investigations have revealed that sea buckthorn berries contain more than 190 biologically active compounds, making them one of the most nutritionally complex plant sources available. The juice derived from these berries retains most of these compounds, making it an important functional beverage.

Nutritional Composition

The berries contain moderate levels of carbohydrates, proteins, and fats. A distinctive feature of sea buckthorn is its lipid composition, which includes all major omega fatty acids—omega-3, omega-6, omega-7, and omega-9.



Omega-7 (palmitoleic acid), rarely found in plant sources, is particularly significant due to its role in metabolic regulation and skin health. The presence of dietary fiber further enhances its nutritional profile.

Vitamin Content

Sea buckthorn juice is exceptionally rich in vitamin C, with concentrations significantly higher than most fruits. It also contains substantial amounts of vitamin E and provitamin A carotenoids. Additionally, several B-complex vitamins are present, contributing to metabolic and neurological functions.

Phytochemical Composition

Polyphenols and Flavonoids

Polyphenols represent the dominant antioxidant components present in sea buckthorn juice. Research indicates that the total polyphenol concentration ranges between 12.36 and 34.6 mg GAE/g (gallic acid equivalents), which is considerably higher than that found in commonly consumed fruits such as oranges, mandarins, blueberries, sour cherries, and strawberries.

Comprehensive studies have identified nearly 100 individual polyphenolic constituents in sea buckthorn, including approximately 17 phenolic acids. Among these, salicylic acid is the most abundant, accounting for nearly 55–74% of the total phenolic acid fraction in the fruit.

Flavonoids are present in substantial quantities in sea buckthorn juice and include important compounds such as quercetin, kaempferol, isorhamnetin, rutin, and myricetin. These bioactive molecules exhibit antioxidant, anti-inflammatory, antiviral, and anticancer effects.

Carotenoids

Sea buckthorn berries are recognized as one of the richest natural sources of carotenoids among plant-based foods. The major carotenoids present include beta-carotene, lycopene, zeaxanthin, lutein, cryptoxanthin, and canthaxanthin.

The overall carotenoid concentration in freshly extracted juice generally ranges between 30 and 60 mg per 100 mL. These compounds are responsible for the bright orange coloration characteristic of sea buckthorn berries and their juice.

Functionally, carotenoids possess strong anti-inflammatory and anticancer properties and play a protective role against certain types of skin cancers. Lutein and zeaxanthin are particularly important for eye health.

Organic Acids

Sea buckthorn juice contains a diverse range of organic acids, including quinic acid, L-malic acid, D-malic acid, succinic acid, pyruvic acid, tartaric acid, acetic acid, formic acid, and citric acid.

These acids contribute to the characteristic taste of the juice and have physiological importance, including potential roles in bone formation and improved skeletal health.

Minerals and Trace Elements

Sea buckthorn juice is a valuable source of essential minerals, containing at least 14 elements in biologically significant amounts. Potassium is the most predominant mineral. Other important minerals include phosphorus, copper, and calcium.

Selenium plays a key role in antioxidant defense and immune regulation. The high vitamin C content enhances iron absorption in the human body.

Comparative Nutritional Analysis

Nutrient Comparison (per 100 g fresh weight)

Nutrient	Sea Buckthorn	Blueberry	Raspberry	Strawberry	Cranberry	Black Currant
Calories (kcal)	82–120	57	52	33	46	63
Carbohydrates (g)	5–8	14.5	12.0	7.7	12.2	15.4
Fibre (g)	6.55	2.4	6.5	2.0	4.6	3.6
Protein (g)	3.12	0.74	1.2	0.67	0.39	1.4
Omega-7 (mg)	High*	None	Trace	Trace	None	None
Vitamin C (mg)	360–2500	9.7	26.2	58.8	13.3	181
Vitamin E (mg)	~15	0.57	1.07	0.29	1.2	1.0
Carotenoids (mg)	30–60	0.08	0.06	0.01	0.05	0.27
Polyphenols (mg GAE/g)	12–35	2.19	1.8	1.12	3.2	6.4
Potassium (mg)	~200	77	151	153	85	322
Selenium	Significant	Low	Low	Low	Low	Low

Key Differentiating Factors

The comparative evaluation clearly demonstrates the superior nutritional profile of sea buckthorn juice in relation to commonly consumed berry juices.

It has exceptionally high vitamin C content, significantly higher vitamin E levels, and dramatically greater carotenoid concentration compared to other berries. These attributes make it a highly valuable functional food.

Health Benefits of Sea Buckthorn Juice

Cardiovascular Health: Consumption of sea buckthorn juice has been associated with improved lipid profiles.

Immune System Support: High levels of vitamin C and antioxidants strengthen immune defense mechanisms.

Anti-Cancer Potential: Bioactive compounds such as flavonoids and carotenoids inhibit cancer cell growth.

Skin and Dermatological Benefits: Sea buckthorn promotes collagen synthesis, improves skin elasticity, and protects against UV damage.

Discussion

The analysis indicates that sea buckthorn juice is one of the most nutritionally superior plant-based beverages. Its unique combination of vitamins, antioxidants, and fatty acids provides multiple health benefits.

Variability in nutrient composition due to geographic and environmental factors remains a challenge, and standardization is necessary.

Safety and Consumption

Sea buckthorn juice is generally safe when consumed in moderate quantities (50–100 mL per day).

Individuals on medication should consult healthcare professionals before regular consumption.

Conclusion

Sea buckthorn juice is a highly valuable functional food with exceptional nutritional and therapeutic

properties. Its superiority in vitamin C content, antioxidant capacity, and omega fatty acid profile makes it a promising dietary component.

References

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