

Exploring the Pharmacognosy and Multifaceted Bioactivities of Different Parts of *Hippophae rhamnoides L.*: A Review

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ABSTRACT

Hippophae rhamnoides L., commonly known as sea buckthorn, is a deciduous shrub of the Elaeagnaceae family with a long history of use in traditional medicine across Eurasia. Recent comprehensive reviews have consolidated knowledge on its pharmacognostic characteristics, phytochemistry, and pharmacological activities, highlighting the therapeutic potential of different plant parts. Pharmacognostic studies have elucidated macro- and microscopic features (stem, leaf, seed, fruit), including anatomy (vascular tissues, trichomes, secretory structures), powder microscopy, as well as physicochemical parameters such as ash values, extractive values, moisture content, etc., which are essential for authentication of raw materials and quality control. For example, the stem & leaf of *Hippophae rhamnoides L.* have been characterized for their morphological and microscopic traits, and key quantitative parameters determined. In conclusion, It is also known for their strong potential for use in a nutrition, skincare and medicinal property due to its antioxidant, anti-stress, immunomodulatory, anti-tumour, hepato-protective, anti-atherogenic, cytoprotective, anti-bacterial and anti-imicrobial properties.

Keywords- *Hippophae rhamnoides L.*, Antioxidant, Immunomodulatory, Antimicrobial, anti-atherogenic, cytoprotective.

I. INTRODUCTION

Hippophae rhamnoides L. commonly known as sea buckthorn or Leh berry (India; as it grows in Leh region in Trans Himalayas) or Siberian pineapple (Russia; due to its taste and juiciness), is a shrub/small tree of the family Elaeagnaceae. The name is derived from its habit of growing near the sea, and from the possession of many spines or thorns that are reminiscent of some buckthorn species (of the genus *Rhamnus*)(1).

All scientists agree that *Hippophae rhamnoides L.* is a light demanding species and highly intolerant of shade. This requirement is more pronounced in *Hippophae rhamnoides L.* than in birch (*Betula sp.*), which is also known as a light demander. The light limit for *Hippophae rhamnoides L.* is in the range of 1615-1700 lx as compared to 430 lx in birch (Ranwell, 1972). Climatic studies in China indicate that natural distribution

of *Hippophae rhamnoides L.* is greatly influenced by temperature. Seeds require a temperature of 2-5°C for a period of pre-treatment, before they germinate. There is natural distribution of *Hippophae rhamnoides L.* in the regions with the temperature isolines over 25°C on an average in the summer. Therefore, optimum temperature during summer for natural distribution of *Hippophae rhamnoides L.* is between 15-25°C, as this plant occurs in the regions with low rainfall. However, availability of moisture is beneficial for its vigorous growth. *Hippophae rhamnoides L.* is predominantly a plant of well-drained soils(2).

For the farmers living in the mountains, seabuckthorn offers the opportunity to maintain a sustainable livelihood – providing healthy foods, variety of medicines and protecting their land from soil erosion (Lu, 1992; Ansari, 2003). The use of seabuckthorn illustrates how low input costs and careful planning can lead to quite substantial benefits; a good example of

mountain perspective-oriented sustainable development. It thus qualifies as a unique option for the simultaneous management of several problems emanating from the fragility, marginality, inaccessibility and diversity characterising mountain areas(3).

- Cancer therapy
- Cardiovascular therapy
- Gastrointestinal ulcers
- Liver diseases
- Skin diseases(4).

II. HABITAT

Hippophae rhamnoides L. generally grows in cold and low rainfall areas of Asia and Europe. It is reported growing in about 30 countries and introduced in North and South America. Rich resources of *Hippophae rhamnoides* L. is found in the countries like China, Russia and Indian Himalayas. With the discovery of rich nutritional and medicinal properties in the fruit and leaves of *Hippophae rhamnoides* L.

The *Hippophae rhamnoides* Linn. is widely distributed in European and Asian countries like India, China, Pakistan, Russia, Nepal, etc. (*Hippophae rhamnoides*) grows naturally in six valleys: Leh, Nubra, Changthang, Suru, Lahaul, and Spiti. And, is also found in a few pockets of Nathula in Sikkim. *Hippophae rhamnoides* L. has been mapped in Himachal Pradesh, Lahaul & Spiti and Ladakh regions in Jammu and Kashmir using remote sensing and GIS (5).

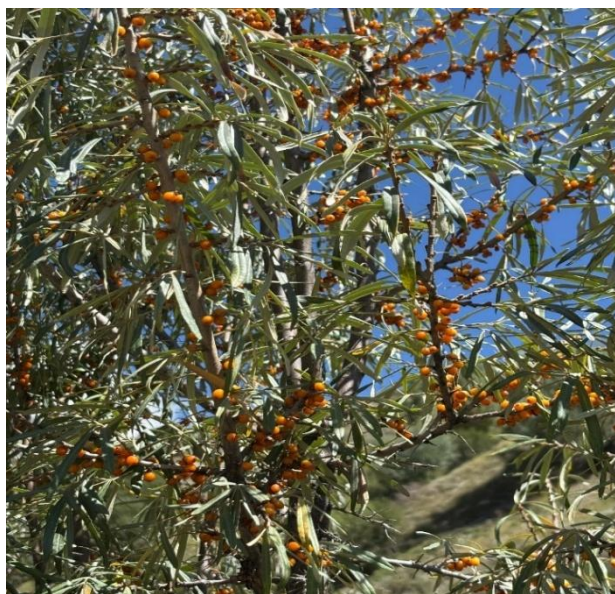


Fig.1 *Hippophae rhamnoides* L.

Traditional uses

- Anti stress(6).
- Immunomodulatory (7).
- Hepatoprotective (8).
- Anti atherogenic (9).
- Anti-tumor (10).

- Anti-oxidant (11).
- Anti-bacterial (11).
- Cytoprotective (11).
- Anti-microbial (12)

III. BOTANICAL OVERVIEW

Scientific name: *Hippophae rhamnoides*

Family: Elaeagnaceae

Morphology:

1. Plant height: The plant height were measured from the base of the plant to the tip of the tallest shoot of each plant in cm, with the help of a metre rod.
2. Number of branches on the main stem: The number of branches on the main stem of each plant were counted.
3. Number of sub-branches on the main branch: The number of sub-branches on the main branch of each plant were counted.
4. Number of thorns on the main branches: The number of thorns on the main branches of each plant were counted.
5. Stem girth: The stem girth of each plant was measured from the base to the start of the branches on the main stem in cm.
6. Plant canopy: The canopy of the plant is the space occupied by the plant. Canopies of the plants were measured with the help of a metre rod from the two outermost branches in cm.
7. Weight of 100 berries: The weight of 100 berries was measured on a digital balance in grams(13) .

IV. VARIOUS PARTS OF HIPPOPHAE RHAMNOIDES L. AND THEIR ACTIVITIES

1. Seed and pulp oil:

Soxhlet apparatus has been used for extraction of seeds by using solvent petroleum-ether.

Various parts and their properties

Anti-oxidant, antibacterial activities, anti-platelets

- Gastric ulceration protection by sea buckthorn seed oil
- Efficacy of sea buckthorn seed oil on mucosal injuries
- Effect of sea buckthorn seed oil on atopic dermatitis
- Adverse effects and reactions (allergies and toxicity)
- Healing efficacy of sea buckthorn seed oil on burns (14).

2. Leaf

Extraction of leaf was done by using soxhlet apparatus by using solvent ethanol, alcohol (70%) (15).

Various parts and their properties

anti-oxidant, anti-diabetic, anti-inflammatory, anti-obesity (15) (16) (17) (18).

3. Fruit and fruit juice:

Hippophae rhamnoides L. berries were washed thoroughly and crushed in a mixer grinder, squeezed in muslin cloth and sieved through strainer of 30 meshes to get fine juice. The *Hippophae rhamnoides* L. juice was pasteurized at 75 °C for 30 min in water bath. In order to prevent the formation of lumps during slurry preparation (19).

Berries are rich in many essential nutrients such as polyunsaturated fatty acids, provitamins A, C, E, and a wide variety of bioactive compounds. The mesocarp of the fruit contains high levels of carotenoids, phenolic compounds, free and esterified sterols, triterpenols and isoprenols (20).

4. Roots, Branches and bark:

Saponification with ethanolic KOH and 50 mL solvent mixture in a soxlet apparatus.

They are an excellent source of phenolic compounds with a total content of 52 to 95 mg GAE/g of dry extract, For root extracts this content ranges from 36 to 139 mg GAE/g of dry extract.

Sea buckthorn branches are also a source of phenolic compounds, because in alcohol extracts from the branches it was possible to extract and to identify (+)-catechine, (+)-gallo catechin, and (ñ)-epigallocatechin.

Moreover, ursolic acid, representing triterpenoids, were separated from ethanol extract, but for none of the mentioned chemical compounds, the exact content in the extracts obtained has been determined.

Tannins were also found in the stem, and root extracts, over a range of 14 to 34 mg CE/g dry extract for stems, and 16 to 42 mg CE/g dry extract for roots. It was found that the stems and roots are also a source of amino acids and sugars (21).

V. VARIOUS CHEMICAL COMPONENTS INCLUDES IN VARIOUS PARTS OF *HIPPOPHAE RHAMNOIDES* L.

1. Seeds:

- **Carotenoids & Vitamins:** b-Carotene, Vitamin C
- **Fatty Acids & Sterols:** Palmitic acid, Palmitoleic acid, Stearic acid, Oleic/vaccenic acids, Linoleic acid, Linolenic acids, Phytosterols
- **Phenolic Acids (seed kernel):** p-Hydroxybenzoic acid, Vanillic acid 368, Cinnamic acid, p-Coumaric acid, Caffeic acid, Ferulic acid, Gallic acid (22) .
- 2. Lipids and Fatty Acids, Carbohydrates and Fibers, Proteins and Amino Acids, Mineral Elements, Lipophilic Components, Hydrophilic Components, Phenolic Compounds, Aroma Compounds (17).
- 3. **Bark, stem and leaves**
- **Fatty acids:** Palmitic acid, Palmitoleic acid, Stearic acid, Oleic acid, Vaccenic acid, Linoleic acid, a-Linolenic acids

- **Tocopherols and tocotrienols:** a-Tocopherol, b-Tocopherol, g-Tocopherol, d-Tocopherol, b-Tocotrienol, a-Tocotrienol, g-Tocotrienol
- **Phytosterols:** Campesterol, b-Sitosterol, D5-Avenasterol, Cycloartenol, Gramisterol
- **Carotenoids:** carotenoids, Xanthophylls, Carotenes, Esteri carotenoids (23-25)

VI. CONCLUSION

Hippophae rhamnoides L commonly known as seabuckthorn is a hardly Shrub, adapted to light demanding and specific climate conditions It grows in temperature between 15-25°C mainly in cold desert and this plant is rich in vitamins and bioactive compounds. It is also known for their strong potential for use in a nutrition, skincare and medicinal property due to its antioxidant, anti-stress, immunomodulatory, anti-tumour, hepato-protective, anti-atherogenic, cytoprotective, anti-bacterial and ant-imicrobial properties.

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