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Hippophae: A Unique plant

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ABSTRACT:

Hippophae, also known as seabuckthorn, is a genus of plants that contains various species with significant economic and medicinal value. The plant is characterized by its bright orange berries and silvery-green leaves, and it is widely distributed across Asia and Europe. Hippophae berries are rich in bioactive compounds, including vitamins, minerals, carotenoids, flavonoids, and fatty acids, which have been shown to possess antioxidant, anti-inflammatory, immunomodulatory, and wound-healing properties. These bioactive compounds are responsible for the various health benefits attributed to Hippophae, including improved cardiovascular health, immune function, skin health, and digestive health. In addition to its medicinal uses, Hippophae is also used in the food and cosmetic industries, where its berries, leaves, and oil are utilized in the production of various products. Overall, Hippophae is a valuable plant with numerous potential applications in the health, food, and cosmetics.

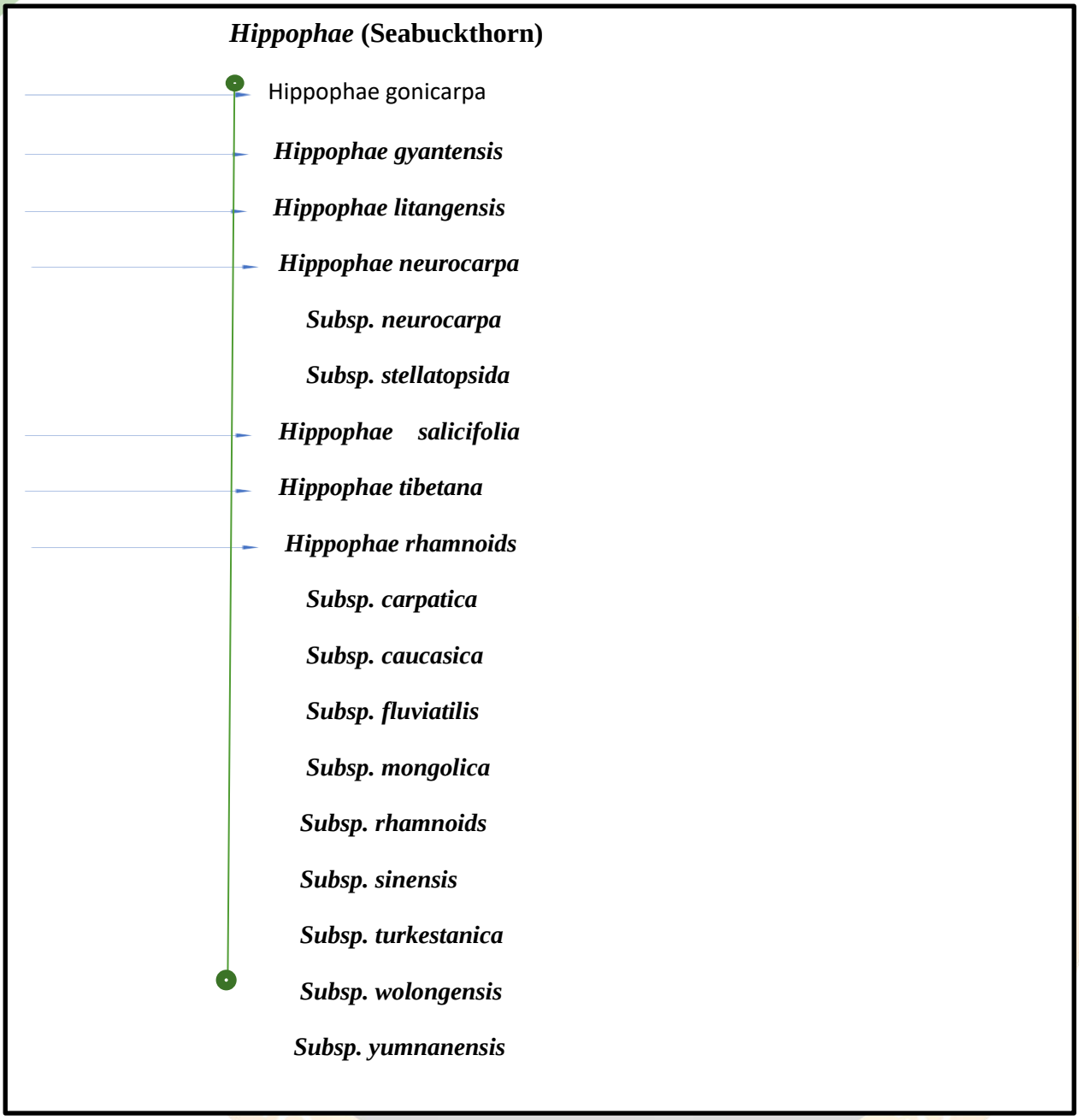
Keywords: - *Bioactive compounds, carotenoids, flavonoids, antioxidants, anti-inflammatory, immunomodulatory, cardiovascular health.*

Introduction:

A member of the Elaeagnaceae family, *Hippophae* is often referred to as Seabuckthorn. It is ecologically, economically important commercial berry plant that attains height of 2 to 4 m. The plant is in the form of perennial herb or shrub that possess six species and twelve subspecies[1]. The word *Hippophae* means shining hairs that has been originated from the Greek word. In ancient Greece, Seabuckthorn leaves were added on the fodder of horses so that they can gain weight and have much shiny hairs. Thus, the word *Hippophae* has been originated[2].

The plant is broadly dispersed throughout the mild zone of Asia and Europe. This plant has been cultivated by antiquated plant breeders. It has been grown for millennia for its therapeutic, dietary, nutritional and ecological benefits. It is a native of the mountainous regions of Europe and Asia[3]. It is a valuable plant with a wide range of uses. The plant has been used in traditional medicine for centuries, and modern research has confirmed its potential health benefits. Seabuckthorn is widely distributed in China, Russia and in India. Due to its hardiness and versatility, Hippophae has become a popular plant for cultivation in many regions around the world. The wide range tolerant nature for soil and climate conditions, growth in areas with poor soil quality and low water availability has attracted many researchers and scientist. Now the plant has been introduced in many countries like North and South America[4]. There has been an increase in interest in recent years for the cultivation of *Hippophae* for its potential as a source of food, medicine, and economic growth. Researchers and farmers are exploring new cultivation techniques and product development opportunities, and governments are investing in *Hippophae* cultivation as a means of promoting rural development and poverty reduction[5]

There are six species and twelve subspecies of *Hippophae*[6]



Seabuckthorn is a dioecious in nature, the plant sex remains unclear till flowering. One can distinguish between floral and vegetative buds only in spring and autumn season as floral buds appears in autumns. The male flower of the Seabuckthorn is small and inconspicuous and are arranged in clusters called catkins. Each catkin is composed of numerous tiny flowers, each of which contains stamens. Tiny male flowers are apetalous. The female flower is larger than the male flower and are borne singly or in the form of cluster on the axils of the leaves. Pollination occurs with the help of wind. The time taken from flowering to fruit formation differs with species. Fruits formed are greenish hard but turns yellowish orange to red juicy fruits at maturation. The berries of Seabuckthorn remains attached to parent plant even when mature.

In winter season during extreme temperature, the berry shrinks but remains attached to mother plant without falling[7]. For this reason, the plant the Seabuckthorn plant is also called Gold mines of Himalayas because it is only the available source of food for birds and animals in extreme climatic conditions.

Seeds of Seabuckthorn are single in each fruit. Seeds are oblong, oval, greyish brown or dark brown in colour with leather and lustrous surface. The length, breadth and thickness of seeds differs with different species of Seabuckthorn. Leaves of Seabuckthorn are small, lanceolate, linear and are arranged alternatively. In *H.rhamnoides* leaves from backside are covered with silver stellate scales that helps to reduce moisture by reflecting sunshine[8]. In Leaves of *H.salicofolia* no such characters are present. The stem can be in the form of herb, shrub or in tree form. The stems are hard, erect and woody. The young stem has multicellular hairs which disappears with maturity. The number and size of thorns vary with species. The thorns of Seabuckthorn are mainly hard, cutaneious with white and brown scales. Roots are highly developed with primary, secondary and tertiary root system. The root system is so expanded that its roots branch many times in a growing season and then can form a manifold network[8].

Recently people have better understanding on Seabuckthorn. Research and scientific studies on seabuckthorn revealed its importance not only to human beings but also to environment. Now scientist and engineer worldwide are concentrating on its ecological and socio-economic benefits. Present studies describe the use of Seabuckthorn berries as it contains Vitamin A, Vitamin B2 and Vitamin C in higher concentration rather than other vegetables. Seabuckthorn fruit also contain high level of Vitamin B1, P and K. Potassium is the major element present in the berries of Seabuckthorn[9,10]. Of the total sugar content Fructose and sucrose are around 90%[11]. Among the organic acid malic acid and quinic acid are in large amount present in the fruit juice of Seabuckthorn. Vitamin E and Carotenoid in large amount. Vitamin variation content in Seabuckthorn oil depends on derived part whether it's from seed oil, juice oil or the pulp oil. Normally pulp oil and seed oil contains more Vitamin E[12]. Alpha tocopherol is the most active form of Vitamin E in humans and is more powerful biological antioxidant[13]. The pharmacological functions of Seabuckthorn juice are best for stomach and for lungs, spleen, blood stasis removal and for blood circulation. Seabuckthorn leaves contains nutrients and bioactive components substance. Flavonoid content in leaves also enriched with carotenoids, free and esterified sterol, triter phenol and isoprenol[14]. The extensive system of seabuckthorn reclaims the land, conserve the soil especially the fragile slopes. Seabuckthorn, also known as the "wonder plant," is a versatile and hardy shrub that is widely cultivated for its numerous

health benefits and its ability to thrive in harsh environmental conditions. However, the rapid expansion of Seabuckthorn cultivation has also led to concerns about its impact on the natural landscape. To address these concerns, landscape management tools have been developed to help farmers and land managers effectively manage Seabuckthorn cultivation and maintain the ecological balance of the surrounding environment. One of the most effective landscape management tools for Seabuckthorn cultivation is the use of agroforestry systems[15]. Agroforestry systems involve the cultivation of trees or shrubs alongside crops or livestock, creating a more diverse and sustainable landscape. Seabuckthorn is particularly well-suited to agroforestry systems due to its ability to fix nitrogen in the soil, improve soil fertility, and provide food and habitat for a variety of wildlife species. Seabuckthorn is a nitrogen-fixing plant, meaning it has the ability to convert atmospheric nitrogen into a form that can be used by other plants. This process not only improves the soil fertility, but also reduces the need for synthetic fertilizers that can have negative impacts on the environment. Seabuckthorn can be used as a green manure, which helps to replenish nitrogen in the soil and improves soil structure. Seabuckthorn has a deep and extensive root system that helps to prevent soil erosion. The plant can be used as hedges or windbreaks, to protect crops from wind and soil erosion[16]. Additionally, Seabuckthorn leaves and branches can be used as a natural mulch, which helps to retain moisture in the soil, reduce evaporation, and suppress weed growth. Seabuckthorn provides important food and habitat for a variety of wildlife species. The plant produces small, nutrient-rich berries that are high in vitamins and antioxidants, which are important for birds, mammals, and insects. Seabuckthorn hedges and windbreaks provide shelter for wildlife and create microclimates that support a diverse range of species. Seabuckthorn is a fast-growing plant that can sequester large amounts of carbon from the atmosphere. The plant has the ability to store carbon in its woody biomass and in the soil, which helps to mitigate climate change. Seabuckthorn has a low water requirement and can be grown in arid and semi-arid regions. The plant has deep roots that can access water from deeper soil layers and reduce water stress. Seabuckthorn can be used in dryland agriculture, where it helps to conserve water resources and maintain soil moisture. Seabuckthorn berries are a great source of vitamins, minerals, antioxidants, and other bioactive substances. The berries can be consumed fresh, frozen, or processed into various food products, such as jams, jellies, juices, sauces, and desserts. Seabuckthorn juice is particularly popular in Asia and Europe, where it is used as a health drink and a traditional medicine. Seabuckthorn has a long history of use in traditional medicine for various health conditions, including digestive disorders, skin disorders, and respiratory illnesses. The plant has been shown to have anti-inflammatory, antimicrobial, antioxidant, and

immunomodulatory properties, which make it a promising candidate for modern medicine. Seabuckthorn extracts and oils are used in various pharmaceutical and nutraceutical products, such as capsules, tablets, creams, and ointments. Seabuckthorn oil is a popular ingredient in cosmetics and personal care products, such as creams, lotions, shampoos, and soaps. The oil is rich in fatty acids, vitamins, and antioxidants, which help to nourish and protect the skin and hair. Seabuckthorn oil is particularly beneficial for dry, sensitive, and aging skin, as it helps to hydrate, regenerate, and firm the skin[17]. The plant can be used in windbreaks, or alley crops, to protect crops from wind and soil erosion and to improve soil fertility. Seabuckthorn leaves and branches can also be used as a natural fertilizer, mulch, or livestock feed. Seabuckthorn cultivation and processing can provide income and employment opportunities for rural communities, particularly in arid and semi-arid regions where other crops may not be viable. Seabuckthorn harvesting and processing require a significant amount of labour, which can create jobs and support local economic[18,19]. Additionally, the plant can be used for reforestation and land restoration, which can provide long-term benefits for the environment and the community.

Natural propagation of Seabuckthorn is through seeds. Consequently, plants propagated through seeds are not identical, one at young stage cannot distinguish seed propagated plants whether they are male or female. Moreover, propagation through seeds is quite a long process. One has to wait for years to see the results. Other method of propagation is through stem cuttings. Stem cuttings are possible in hardwood and softwood. Stem cutting is quite a simple and inexpensive process. Treating cutting with hormones can yield fast and better results. Other method of propagation is through suckers, which totally depends upon the root mass formed. It is also simple and inexpensive process rather plant may be affected by transplant shock[20]

The plant is over exploited and listed in Red list category as threatened category in 2012. The species is in danger of losing sustainable habitat. It has been impacted by hydropower development, excessive deforestation for fire wood and cultivation of land for another agricultural/horticultural practise. Preventive measures for the conservation of this important plant are to be initiated on time[21].

Deforestation, construction of buildings, dams, resorts, landslides, uneven use have ruined the true natural habitat of this plant. Moreover, the importance of Sea buckthorn increases, as it is only food source available during winter. It is vital and urgent need to save the plant, using tissue culture techniques. Other researchers and scientist had put their level best and provide

information regarding molecular and biochemical aspect of this plant. A lot of work has been carried out onto Biochemical aspects of this important plant.

In India, research and development of Sea buckthorn has gained momentum by department of biotechnology. They identified *H.rhamnoides* as a promising bio- resources. Most of the scientists have their focus on surveys, morphological, ecological and genetic characterization, establishment of germplasm resources centre, the use of marker for molecular basis study are in progress

Conclusion

Seabuckthorn plant has been the subject of extensive research and study, leading to a growing body of literature on its various uses and benefits. The plant's unique properties and diverse applications, including its potential for antioxidants, antimicrobial agents, and essential fatty acids, have attracted researchers in fields ranging from medicine to agriculture. Furthermore, the plant's adaptability to different environmental conditions and its ability to promote soil conservation and biodiversity make it an excellent plant for sustainable agriculture and reforestation efforts. This paper has highlighted some of the most important findings and developments in seabuckthorn research, underscoring the plant's potential to contribute to human health and ecological sustainability. As such, further research is needed to fully understand the plant's properties and potential, as well as to identify new avenues for its commercial and environmental applications.

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