



# Depth Wise Assessment of Soil Fertility in Seabuckthorn in Comparison to Willow and Poplar in Cold Arid Himalayas

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**Abstract:** *Hippophae* L. is a multipurpose plant in the cold deserts of Himachal Pradesh. The aim of the study was to understand the effect of seabuckthorn plantation on soil fertility and to compare it with willow and poplar at Khangsar village, soil samples were collected from three depths, i.e., 0-15 cm, 15-30 cm and 30-45 cm and analysed for pH, organic carbon, available N, P, K, S, exchangeable Ca, Mg and micronutrient cations following standard procedures. All the available nutrients, pH and organic carbon were higher in seabuckthorn plantation except available K, which was higher in wasteland. With the increase in depth, the decrease in content of available nutrient was observed in all three plantations. Soil pH was negatively correlated with available N, P, K, S, exchangeable Ca, and Mg, whereas soil organic carbon was positively correlated with available N, P, K, S, exchangeable Ca, and Mg. Comparatively the soils under seabuckthorn are more fertile and it can be recommended for the sustainability of cold arid Himalayas.

**Keywords:** Seabuckthorn, Macronutrients, Micronutrients, Himalayas, Soil fertility, Exchangeable Ca and Mg

The cold desert area represents the harsh climatic conditions, high wind velocity, scanty rainfall, great variation in temperature, massive snowfall and extremely xeric conditions. In India trans-Himalayan zone covers the cold deserts, lying in the rain shadow of the main Himalayan range and are usually described as high altitude Himalayas. Himachal Pradesh's two districts Lahaul-Spiti and Kinnaur represents approximately 13.45 per cent of the total area of cold desert in India (Sharma et al 2006). The various environmental challenges prevailing in the region includes the poor water management, soil erosion and degradation of soil fertility. Eco sensitive zones are in threat due to climate change which causes extreme events such as storms, landslides, avalanches and rock falls in these mountain areas (Kohler et al 2010). The growth of human as well as livestock population, the widespread incidence of poverty and the current phase of economic and trade liberalization, is exerting heavy pressures on India's limited land resources for competing uses in forestry, agriculture, pastures, human settlements and industries. This has led to significant land degradation. Therefore, management and maintenance of soil fertility is essential for sustainability. The major reason of land degradation and loss in soil fertility in cold deserts are deforestation, indiscriminate and unscientific management practices. Due to steep slopes cultivation is confined only to the flatter portions of the valley land and with possibilities of irrigation. Very little is known about the indigenous land-use techniques and fertility status of these soils. So, to study the

nutrient status of these soils is highly important and useful. Due to land degradation and increase in desertification there is a great need to have some technology or practice which can minimize the problem. Seabuckthorn can be used a solution to this problem.

Seabuckthorn is a general term given to the shrub-tree *Hippophae* L. Seabuckthorn (*Hippophae* L.) a member of the family Elaeagnaceae, is a thorny deciduous bush. Most importantly seabuckthorn is nitrogen fixing shrub/small tree of 2-6 m height, growing widely on river sides indicating that it is a water loving plant and growing at altitudes up to 5200 m. It rapidly develops an extensive root system and is therefore, an ideal plant for preventing soil erosion (Natasha 2011). The well-developed root system of this plant not only improves the soil fertility through its root nodular nitrogen fixation with the help of Frankia symbiotic association, but also adds to soil organic matter through root and litter decomposition. It has also been used in land reclamation for its ability to fix atmospheric nitrogen and conserve other essential nutrients (Akkermans et al 1983). Many investigations found seabuckthorn as a most suitable species to rehabilitate the wasteland of mining areas. Planting of seabuckthorn increases soil fertility and favours a policy of increase of vegetation and sustainable land use in the hilly and mining areas, which conserves slope farmlands into more sustainable land uses. Hence, seabuckthorn shrub and grassland is a cost efficient way to achieve soil conservation and increase in soil fertility.