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Short communication

Variation in nutrient composition of seabuckthorn (*Hippophae rhamnoides* L.) leaves collected from different locations of Ladakh

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ABSTRACT

Seabuckthorn an important fruit crop grown under high altitude areas of cold arid in north western Himalayas. Under such conditions, plant nutrient studies are important for improvement of fruit yield and juice quality. In order to answer this question the nutrient-partitioning was studied in leaves from 9 different contrasting altitudes in the Ladakh mountains. Mineral nutrients content followed consistent altitudinal trends. The higher altitude sample always had higher N, P, K, Cu contents per unit leaf area. However, variable contents were observed for Na, Ca, Fe, Zn, Mg and Mn. The leaves sampled from Spituk, Leh (L_4) had higher N, P and K contents, *i.e.*, 3.31, 0.04 and 2.09% respectively and lower content was recorded from Suru river bank, Kargil (L_8), *i.e.*, 1.84, 0.03 and 1.51%. The growth of leaves at high altitude seems to be controlled in a way that leads to comparatively high nutrient contents, which in turn support high metabolic activities.

Key words: Seabuckthorn, leaf, nutrients, cold arid regions.

Seabuckthorn (*Hippophae rhamnoides* L.) is a temperate, thorny and bushy plant which prefers to blossom in the snow covered peaks of the dry Himalayas. It grows naturally on the high hills in Ladakh region of Jammu & Kashmir, Lahaul-Spiti, Kinnaur and Chamba districts of Himachal Pradesh, Kumaon and Garhwal hills of Uttarakhand, Sikkim and Arunachal Pradesh in the North East. The species has the ability to tolerate sub-zero temperatures and little precipitation. The bush has bright prospects for use as fuel, fodder, fence, medicine and fruit, besides being used as a potential forest species for greening degraded and undulating lands in Ladakh. Owing to its deep root system, it acts as an effective soil binder and helps to check erosion which is prone to erosion. The fruits are rich source of vitamins, minerals, organic acids, micro-elements and valuable oil (Dwivedi *et al.*, 3). With the commercialisation of value-added products from seabuckthorn, this species has attracted the attention of researchers on various aspects. Work related to nutrient/element content in pulp and seed of seabuckthorn has been reported by earlier workers (Dhyani *et al.*, 1; Indrayan *et al.*, 5; Sabir *et al.*, 7). However, information regarding nutrient composition in the leaves of seabuckthorn is lacking. Therefore, the present investigation was carried out to determine the nutrient composition in seabuckthorn leaves.

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The leave samples were collected from nine different locations (L_1-L_9), *viz.*, FRL Campus, Leh (L_1) (3500 m), Sindhu Ghat, Shey (L_2) (3,332 m), Forest Park, Chogalamsar (L_3) (3,312 m), Spituk, Leh (L_4) (3,299 m), Chuchhost, Leh (L_5) (3,317 m), Hunder, Nubra (L_6) (3,145 m), Diskit, Nubra (L_7) (3,126 m), Suru, river bank, Kargil (L_8) (2,827 m) and Shani village, Zanskar (L_9) (2,788 m) during 2008. The leaf samples were collected in ice box and brought to the laboratory for analysis. Samples were washed with distilled water, dried in shade and then grinded to fine powder. The grinded samples were digested with di-acid (HNO_3: $HClO_4$, 9:4) ratio on hot plate and the final volume was made to 100 ml with distilled water, stored in clean plastic bottles and analysed for their macro- and micro-nutrients. The nitrogen content was determined by Kjeldahl's method and phosphorus by vanadomolybdo-phosphoric yellow colour method (Jackson, 6). Potassium content was estimated by flame photometer. Other secondary and micro-nutrients were estimated by atomic absorption spectrophotometer (GBC Avanta 932 AA). The data were analysed as per method suggested by Gomez and Gomez (4).

The nitrogen, phosphorus and potassium content of seabuckthorn leaves at different locations varied between 1.84 to 3.31, 0.03 to 0.04 and 1.51 to 2.09%, respectively (Fig. 1). Nitrogen, phosphorus and potassium (3.31, 0.04 and 2.09%) was recorded higher in the leaves sampled from L_4, while lower values of N, P and K, *i.e.*, 1.84, 0.03 and 1.51% were recorded in location L_8. The nitrogen content in leaves collected from L_2, L_4 and L_6 did not show any significant

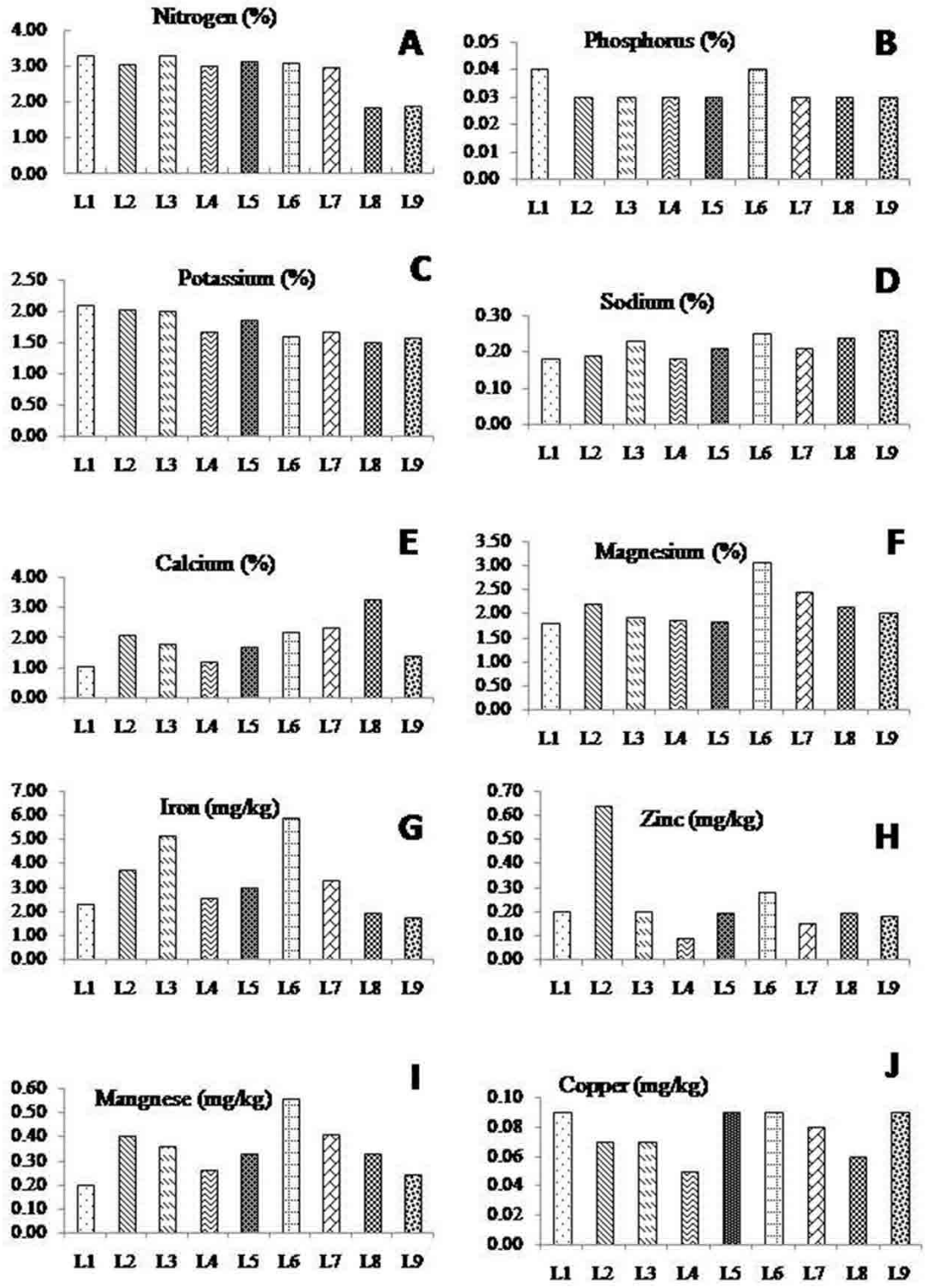

Fig. 1. Nutrient concentration in seabuckthorn leaves collected from different locations of Ladakh, J&K.

variation. Non significant variation was recorded in the leaf Phosphorus content at different locations. The potassium values at locations L_8 (1.51%), L_9 (1.57%) and L_6 (1.59%) were at par. The variation in leaf nitrogen content at different locations might be due to variation in soil texture, fertility status of the soil and different climatic conditions prevailing at high altitude, such as cold and dry conditions. This could also be due to differential response in nutrient absorption by the species. The reason for lower macro-nutrient status in the leaves of seabuckthorn sampled from the Suru river bank and Zanskar areas may be attributed to the fact that the soil in these area are deficient in available macronutrients. The study confirm the findings of Dwivedi *et al.* (2) and Sharma *et al.* (8) who reported that the soils of Suru river bank and Zanskar areas of Kargil district are deficient in available macro- and micro-nutrients. Moreover, mineralization rate of nutrients in these areas is also slow due to sub-zero temperature for longer period.

Significant differences in sodium contents were observed in leaf samples collected from the locations L_9, L_8, L_6 and L_3 which varied between 0.18 to 0.26%. The calcium content in seabuckthorn leaves at different location exhibited wider variation between 1.05 to 3.24%. It was recorded maximum in the leaves sampled from location L_8 (3.24%), while it was minimum at location L_1 (1.05%). The calcium content was at *par* in the samples from locations L_2 and L_6. Magnesium content was recorded maximum at location L_6 (3.06%) followed by L_7 (2.46%), L_2 (2.20%), L_8 (2.13%), L_9 (2.01%), L_3 (1.92%), L_4 (1.85%), L_5 (1.83%) and L_1 (1.79%), respectively. Dhyani *et al.* (1) also reported high contents of potassium, sodium, calcium, magnesium and phosphorus in seabuckthorn berries grown in northern areas of Pakistan.

Iron content in the leaves varied between 1.75 to 5.87 mg kg^{-1}. Significant differences were observed between the locations L_1, L_2, L_3, L_5, L_7 and L_9 and it was recorded maximum at location L_6 (5.87 mg kg^{-1}) and minimum at location L_9 (1.75 mg kg^{-1}). Zinc content in the leaves varied between 0.09 to 0.64 mg kg^{-1} and maximum value (0.64 mg kg^{-1}) was observed in the leaves sampled from location L_2, while it was minimum in the leaves sampled from location L_4 (0.09 mg kg^{-1}). However, the value of zinc content in leaves sampled from location L_1 and L_4 was statistically at par with location L_5 (0.19 mg kg^{-1}). Significant differences were observed in the manganese content at different locations with a variation between 0.20 to 0.56 mg kg^{-1}. Leaves samples at location L_6 showed the maximum value (0.56 mg kg^{-1}) of manganese, while it was minimum at location L_1 (0.20 mg kg^{-1}). Copper content ranged from 0.05 to 0.09 mg kg^{-1} and the maximum value, *i.e.* 0.09 was recorded in the leaves sampled from locations L_1, L_5, L_6 and L_9, while it was minimum at L_4 (0.05 mg kg^{-1}). Similar findings have also reported by Dhyani *et al.* (1). The present investigation reveal that seabuckthorn leaves is a good source of mineral nutrients. However, its level varies with the locations. Therefore, the future line of work in this important species should focus on standardization of leaf sampling technique which may be used as a guide in formulating fertilizer experiments.

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