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Short communication

Foliar nutritional estimation of apple cultivar Starkrimson under high density planting system at different locations

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ABSTRACT

The present investigation was carried-out to estimate the foliar nutritional status of apple cultivar Starkrimson under high and low density planting systems at different locations. Highest leaf nitrogen content of 3.04 and 2.92% was observed in plants under low density plantation in Pulwama and Baramulla districts. Whereas, leaf content of phosphorous (0.25 and 0.25%), potassium (1.20 and 1.18%) and calcium (1.21 and 114%) were high under high density plantation at both districts. Non-significant differences were noted when the high density orchards of districts Pulwama and Baramulla were compared.

Key words: Apple, Starkrimson, HDP, LDP, foliar nutrients.

In Kashmir valley, several exotic spur type apple cultivars were introduced under Indo-Bulgarian project for high-density plantation. Amongst these cultivars Vista Bella, Mollie's Delicious, Starkrimson, Cooper-IV, Granny Smith and Golden Spur have gained popularity (HDP) especially in Baramulla, Pulwama, Anantnag and Srinagar districts. Introduction and adoption of superior cultivars and production technologies have boosted production of apple manifold over the years with a significant area expansion as well. Though the productivity in India has increased from 4.12 to 10.34 MT/ha over the last 25 years (Anon, 1), yet it does not meet the international standards for quality. In the light of this scenario, high density planting system has been found to be a promising endeavour, which is based on concept planting higher number of plants of superior cultivars per unit area, using size controlling clonal rootstocks and specialized training and pruning systems. Above all these factors, nutrients are also essential for higher productivity and quality of different fruits. Hence, determination of nutritional status for efficient production of high quality fruit is an important aspect in apple production. Leaf is the principle site of metabolism and its analysis has proved to be the best for formation of proper nutritional and fertilization scheduling (Bhargava and Chadha, 2). Leaf analysis is not only a tool in determining the total quantity of nutrient removed from the soil but also as a biological method for assessing soil fertility. As the nutrient status of leaves varies due to seasonal factors like leaf age, its position, growth and location (Robinson, 8), it is essential to work out the effect of location on the nutritional status of tree. The present investigation was carried-out with objectives to study the foliar nutritional estimation of apple cv. Starkrimson under high density planting system.

The present investigation was carried out on apple cultivar Starkrimson at Baramulla and Pulwama districts of Kashmir valley. The cv. Starkrimson grafted on semi-vigorous rootstock MM106 at both the locations (Pulwama and Baramulla) having spacing of 2 m × 3 m, *i.e.* High Density Plantation (HDP) and were trained on central leader system. Tree were 9 year-old and there were 1,666 trees/ha, whereas in case of Low Density Orchards (LDP) which was treated as control had 500 trees/ha. There were five HDP and one LDP orchards per location. From each orchard trees of uniform size, vigour and health were selected randomly. All standard cultural practices were adopted during the course of study to ensure uniform growth of the experimental plants. Thirty leaves from middle portion of current season growth were collected per experimental plant from four different directions. For estimating nitrogen the leaf samples were digested in a triple acid mixture of potassium sulphate, ferrous sulphate and copper sulphate in a 10 : 1 : 0.5 ratio and expressed as N%. For estimating phosphorous, leaf samples of each experiment plant were digested in a di-acid mixture of nitric acid and perchloric acid in ratio of 9: 4 and was determined by using ammonium molybdate and ammonium melovenedate. The leaf potassium and calcium were estimated using flame photometer (Jackson, 5). The data was statically analysed under Complete Randomized Block design and was

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interpreted as per method described by Gomez and Gomez (4).

Significant differences were observed in the foliar nitrogen content of the high density and low density orchards (Table 1). Foliar nitrogen content of high density orchards ranged between 2.46 to 2.85 per cent, while as the foliar nitrogen concentration of low density orchard of Tenghar was 3.04 per cent, which was significantly higher over high density orchards. Significant differences in case of phosphorous content were observed in high density to low density orchards. Higher leaf phosphorous content were observed in high density orchards, which ranged from 0.24 to 0.26 per cent. The low density orchard of Tenghar recorded foliar phosphorous content of 0.22 per cent. Maximum foliar potassium content was noted in Lajoora orchard (1.44%) followed by Malikpora (1.37%) and Safnagri (1.34%). Among the high density orchards minimum foliar potassium content was recorded in orchard of Noru (0.92%). However, 0.84% potassium content was noted from Tenghar orchard, which was a low density orchard. Significant differences were exhibited between high and low density orchards with respect to leaf calcium content. In high density orchards foliar calcium content varied from 1.33 per cent in Safnagri to 1.22 per cent in Peerpora. However, only 0.93 per cent foliar calcium content was noted in low density orchard.

Significant differences in the leaf nitrogen content existed between the high and low density orchard (Table 2). Leaf nitrogen content from high density orchards were 2.42, 2.54,2.57, 2.35 and 2.44 per cent in the orchards of Delena, Ladoora, Chakula, Mirangund and Kunan, respectively. While as higher leaf nitrogen content was recorded at low density orchard at Chakula (2.92%). Significant differences in leaf phosphorous content was observed and high leaf phosphorous content was recorded in high density orchards at Delena (0.27%), Ladoora (0.25%), Chakula (0.27%), Mirangund (0.23%) and Kunan (0.26%) and were significantly at par with low density orchard of Chakula (0.20%). Maximum foliar potassium (1.43%) content was estimated in Ladoora orchard and minimum (0.94%) was recorded in Kunan orchard. The content of potassium in leaves was lowest in orchard of Chakula (0.87%), which was significantly lower than high density orchards. In high density orchards, calcium content ranged between 0.98 per cent in Delena to 1.18 per cent in Ladoora. In low density orchard at Chakula only 0.87 per cent calcium content was estimated.

Spacing had a significant effect on leaf mineral composition (Raghupathi and Bhargava, 6) of the plant and same was reflected in low density orchards where plant were placed at wide distance which results in higher concentration of nitrogen (Chandel and Rana, 3) but had low phosphorous, potassium and calcium content in them. The present findings are in close conformity with Sharma and Rehalia (9) who reported that leaf content of apple varied with the leaf size, location and type of soil.

Inter district comparison (Fig. 1) of foliar leaf nitrogen, phosphorous, potassium and calcium of high density orchards reveals that non-significant differences were existed between orchards in two districts. However, the leaf nitrogen content was higher (2.68%) in Pulwama than Baramulla (2.46%). Leaf phosphorous content was similar (0.25%) in both the districts. Leaf potassium and calcium were higher in Pulwama (1.20 and 1.21%) than in Baramulla (1.18 and 1.14%). Similar findings were also reported by Rana *et al.* (7) while working on nutritional status of apple orchards in Himachal Pardesh. In both the districts highest leaf nitrogen content of 3.04 and 2.92% was observed in low density orchards while the least values (2.68 and 2.46%) were observed

Table 1. Effect of locations on leaf nutrient status characters in apple cv. Starkrimson in district Pulwama.

Location	N Nitrogen (%)	P Phosphorus (%)	P Potassium (%)	Ca Calcium (%)
Lajoora	2.62	0.24	1.44	1.27
Malikpora	2.85	0.25	1.37	1.32
Noru	2.76	0.26	0.92	0.97
Safnagri	2.72	0.26	1.34	1.31
Peerpora	2.46	0.25	0.95	1.22
[c] Tenghar	3.04	0.22	0.84	0.93
$LSD_{(0.05)}$	0.16	0.03	0. 35	0.27

[c] : Check (low density)

Table 2. Effect of locations on leaf nutrient status characters in apple cv. Starkrimson in district Baramulla.

Location	N (%)	P (%)	K (%)	Ca (%)
Delena	2.42	0.27	1.12	0.98
Ladoora	2.54	0.25	1.43	1.18
Chakula	2.57	0.27	1.32	1.14
Mirangund	2.35	0.23	1.10	1.23
Kunan	2.44	0.26	0.94	1.17
[c] Chakula	2.92	0.20	0.87	0.87
$LSD_{(0.05)}$	0.13	0.06	0.41	0. 21

[c] : Check (low density)

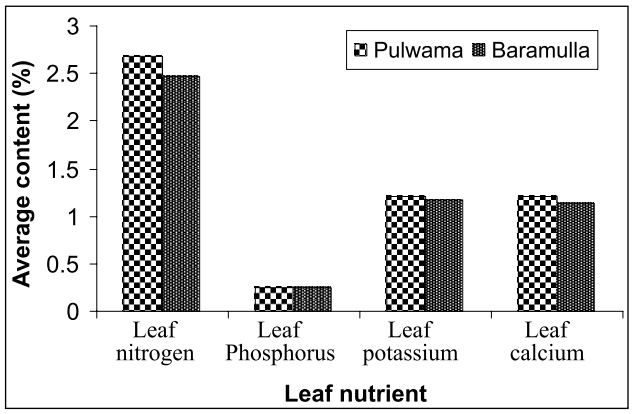

Fig. 1. Comparison of foliar status in apple cv. Starkrimson under HDP.

in plants under high density plantation. In case of phosphorous, potassium and calcium maximum concentrations were observed in high density orchards while least values were observed under low density orchards. This reveals that the location had no effect on leaf mineral composition and such variation in leaf nutrient contents has been reported by Sharma and Bandhari (9) in apple.

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