

## Leaf nutrient status of high density apple orchards in Kashmir valley

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### ABSTRACT

To study the leaf nutrient status of high density apple cultivars and its relationship with yield, healthy leaves of three cultivars such as Golden Delicious (GD), Star Crimson (SC) and Cooper - 4 (C-4) grown on M - 9 root stock were collected from ten different locations in North Kashmir. These leaf samples after processing and digestion were analyzed for the determination of N, P, Ca, Mg, S and micronutrient cations viz Zn, Cu, Mn, Fe. The study revealed that leaf N, P and K in GD, SC and C-4 ranged from 1.05 - 2.25, 1.93 - 2.41, 1.83 - 2.28, 0.19 - 0.39, 0.21 - 0.42, 0.18 - 0.33 and 1.32 - 1.90, 1.36 - 1.90, 1.39 - 1.93, respectively. Similarly Ca, Mg and S varied from 1.35 - 1.79, 1.36 - 1.82, 1.35 - 1.78, 0.29 - 0.70, 0.26 - 0.63, 0.27 - 0.65 and 0.20 - 0.58, 0.14 - 0.63, 0.12 - 0.49 % respectively. The foliar micro nutrient contents viz Zn, Cu, Mn and Fe in these three cultivar ranged from 23.8 - 43.0, 21.0 - 45.0, 21.0 - 49.0, 10.2 - 16.4, 10.0 - 15.0, 10.1 - 17.2, 60.0 - 120.5, 47.0 - 120.0, 68.0 - 117.6 and 90.0 - 146.0, 70.0 - 140.0, 92.0 - 142.0 ppm respectively. The leaf analysis indicated that apple orchards were medium to high in all the nutrients and significant differences were revealed by these three cultivars for N, Ca, Mn, Zn and Fe contents. Correlation studies revealed that the leaf N and Ca exhibited significantly positive relationship with yield in all the three cultivars, while as S showed a significantly positive relationship with yield only in case of Cooper-4 cultivar.

**Key words :** Apple, Leaf nutrient, High density, Orchard.

An apple a day keeps the doctor away – this old age proverb focuses man's attention on the importance of apple in daily diet. It is a typical temperate fruit produced in all the continents of the world. However, 80 % of the world production is in Europe. In Europe the major apple producing countries are Italy, France and Germany. Numerous uniform clonal rootstocks were developed which facilitated high density orcharding. The exotic introduction were used as scion on such rootstocks and performed well with respect to yield and quality of fruit. Chemical analysis of plant tissues provides the assessment of the ability of soil to supply nutrient to crop plants. Leaf analysis is an essential tool to diagnose both apparent and hidden nutritional disorders, if any, in plants. It reveals some of the complicated soil - plant mechanism, which govern nutrient uptake from soil.

### MATERIALS AND METHODS

For the study of leaf nutrient status of high density apple orchards. Disease and pest free trees of uniform age and vigour are being maintained under almost uniform management practices. Three cultivars viz., Golden Delicious, Star Crimson and Cooper-4 grown on M-9 root stock were selected for the study.

Leaves of these three cultivars were collected from ten representative orchards for analysis (Kenworthy,

1950). For Nitrogen the leaf samples were digested in concentrated  $H_2SO_4$  in presence of digestion mixture comprising of  $K_2SO_4$ ,  $CuSO_4$ ,  $FeSO_4$  and selenium powder in the ratio of 10:0.5:1.0:0.1 and nitrogen in leaf was estimated by micro Kjaldhal's distillation method as described by Jackson (1973).

For the determination of P, K, Ca, Mg, S, Fe, Mn, Cu, and Zn leaf samples were digested in a di-acid mixture in the ratio of ( $HNO_3$  :  $HClO_4$  = 9:4). Phosphorus was determined by Vendate Molybdate method (Jackson 1973), Potassium flame photometrically, calcium and magnesium by Versenate method (Jackson 1973) Sulphur by Chesnin and Yien method (1951), Zn, Cu, Mn and Fe were determined with the help of Atomic absorption spectro photometer.

### RESULTS AND DISCUSSION

#### Leaf nutrient status

The nitrogen content in the leaves of Golden delicious, Starcrimson and Cooper-4 cultivars was adequate, which can be attributed to the annual application of this nutrient, decomposition of plant biomass besides the biological fixation of nitrogen by the legumes present in the vegetation of orchards. These results are in line with the findings of Gosh and Malakouti (1992). The leaf phosphorus status of all the three cultivars was optimum but a significant difference was observed in leaf phosphorus content among these, which can be attributed