J. Hortl. Sci.
Vol. 7(1):98-100, 2012

Short communication

Standardization of leaf sampling technique for macronutrients in apricot under temperate conditions

H.U. Rehman, M.K. Sharma and F.A. Banday
Division of Fruit Science
Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir
Shalimar-191 121, India
E-mail : drsharma_mk@rediffmail.com

ABSTRACT

Macro- and micro-nutrient content influenced by position of leaf on the shoot and time of sampling was studied to determine leaf-sampling time for apricot grown in temperate region of the country. Results revealed that middle order leaves were the most suitable for determining nutrient needs in apricot trees. Leaf samples should be collected during June - July for determining N, K and Ca; first fortnight of July for P; and, from mid-June to mid-July for Mg.

Key words: Leaf sampling, apricot, nutritional diagnosis, suitable sampling date

Apricot (*Prunus armeniaca* L.) occupies an important position in terms of area and production among stone fruits. It is grown commercially in Kashmir valley and 'New Castle' is a popular variety. Foliar analysis is an accepted tool to ascertain adequacy or otherwise of mineral nutrient status in fruit plants. However, this needs to be standardized for selection of index leaf for a given nutrient element. The most suitable leaf position and sampling time are those that show least variation in mineral concentration (Mason, 1958). Nutrient standards developed for recommendation of fertilizers are specified to a cultivar, and under particular climatic conditions (Westwood, 1993). As no such information is available on apricot grown in Kashmir valley, the present study intended to bridge this gap.

The study was conducted on 'Newcastle' apricot in our Experimental Orchard during 2009-10. Four healthy trees of uniform age, size and vigour were chosen. Three leaf sampling positions were selected, i.e., top, middle and basal. Leaf samples with petioles were collected at 15 day intervals, viz., 1st and 15th of each month, starting from May to September. Leaf samples were thoroughly washed first with tap water, then with 0.1NHCl and, distilled and double distilled water. Washed samples were then dried in shade and, subsequently, in an oven at 68°C, ground and, finally stored for chemical analysis. Nitrogen content was determined by Micro-Kjeldhals distillation method (A.O.A.C., 1980), phosphorus by ammonium molybdate:ammonium meta vanadate method, potassium and calcium by flame photometer, U.K. (Jackson, 1967) and magnesium by Atomic Absorption Spectrophotometer. Results were expressed as percentage on dry matter basis. Data was analyzed by the method of Gomez and Gomez (1983).

Variation in leaf N content in apricot followed a definite trend during the sampling season (Fig. 1). N content of basal and top leaves increased significantly from first sampling date, i.e., May 1 and upto June 15. Thereafter, it decreased significantly to the lowest value on September 1. However, no period of stability in N content was recorded

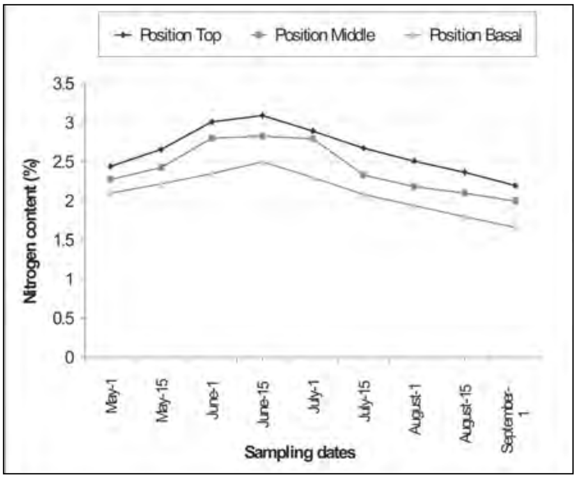

Fig 1. Nitrogen content in apricot leaf influenced by position of leaf on the shoot and time of sampling (% dry weight)

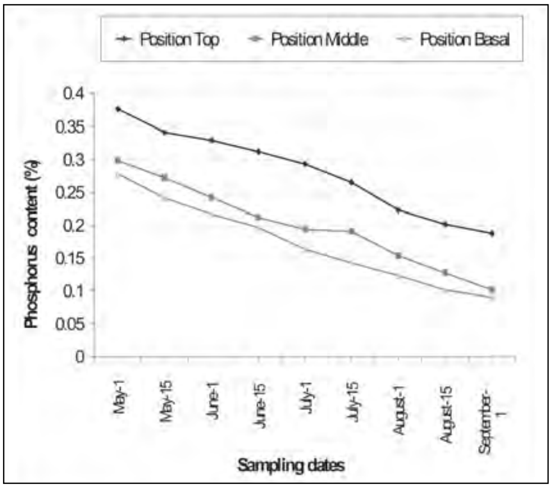

Fig 2. Phosphorus content in apricot leaf influenced by position of leaf on the shoot and time of sampling (% dry weight)

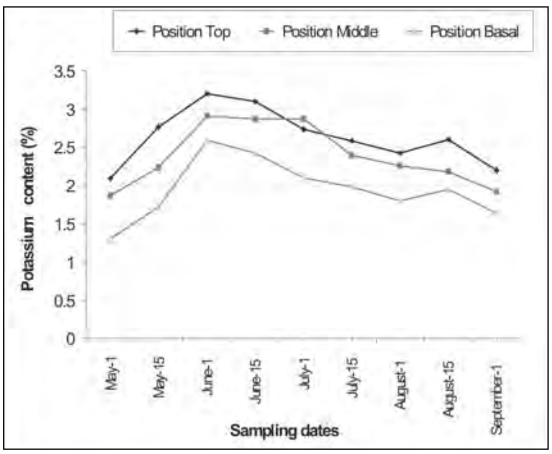

Fig 3. Potassium content in apricot leaf influenced by position of leaf on shoot the and time of sampling (% dry weight)

in basal and top leaves. Although N content of middle leaves exhibited a similar trend as in basal and top leaves, during June 1 to July 1, it remained statistically at par. Mean N content of apricot leaves increased, irrespective of position of the leaf on the shoot from May 1 to June 15 as a result of both current absorption and remobilization of N accumulated in the previous season. Mean N content was recorded highest in 'top' positioned leaves, followed by middle and basal leaves. Nitrogen, being a mobile element, tends to accumulate in top leaves (Singh and Rajput, 1978). Similar results were recorded by Verma and Bhandari (1990) and Malik and Ahmad (2008).

Phosphorus content of top and basal leaves showed a decreasing trend from first sampling date to the last sampling date (Fig. 2). No period of 'least variation' was observed in top and basal leaves. Similarly, P content in middle leaves decreased significantly from May 1 to July 1, followed by a nutrient stability period of July 1 to July 15.Subsequently, P content of the middle leaves again declined significantly upto the last sampling date, i.e. September 1. The decline in P content could be due to dilution effects of growth, and it being a mobile element, significant remobilization of this element may have occurred to various sinks, prior to leaf-fall (Clark and Smith, 1990). Mean P content showed significant difference among leaf positions and was recorded highest in the top leaves, followed by middle leaves, and was lowest in the basal leaves. The present results agree with earlier reports of Batjer and Westwood (1958).

Potassium content, irrespective of position of the leaf on the shoot, followed a similar trend from May 1 to June 1, and thereafter, K content of top and basal leaves decreased significantly upto the last sampling date. However, K content of middle leaves showed least variation i.e., highest stability from June 1 to July 1. Thereafter, it showed a trend similar to that in top and basal leaves (Fig. 3). Highest level of K was noticed in top leaves, followed by middle leaves and was lowest in the basal leaves. These results are in conformity with findings of Lekhova (1974) and Verma and Bhandari (1990).

Calcium content, irrespective of leaf-position on the shoot, showed an increasing trend from May 1 (the first sampling date) to September 1 (the last sampling date). Increase in Ca content was significant in top and basal leaves, and no period of stability was observed in any pair of sampling dates (Fig. 4). There was, however, gradual but non-significant increase in Ca content between June 1 - July 1. The ever-increasing concentration of Ca may be attributed to limited mobility of calcium in the phloem and, also, low demand in the fruit (Smith; 1962 and Shear and Faust, 1980). Ca content of leaf samples increased with leaf position on shoot basipetally, since, deposition of Ca as calcium pectate in the middle lamella increases with age of the leaf. The present findings are in agreement with observations of Verma and Bhandari (1990) and Malik and Ahmad (2008) wherein authors reported higher Ca content with advancing age of the leaf.

Magnesium content of top leaves increased significantly between May 1 - June 15. Between June 15 - July 1, significant decrease in Mg content was observed (Fig. 5). From July 1 to August 1, an increasing trend in Mg content was noticed. Thereafter, Mg content showed significant decline with advancement of sampling season.

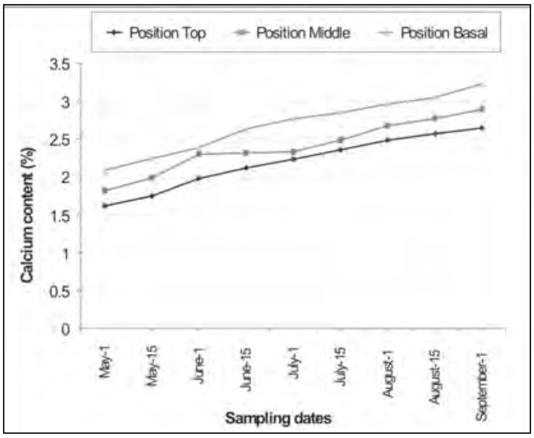

Fig 4. Calcium content in apricot leaf influenced by position of leaf on the shoot and time of sampling (% dry weight)

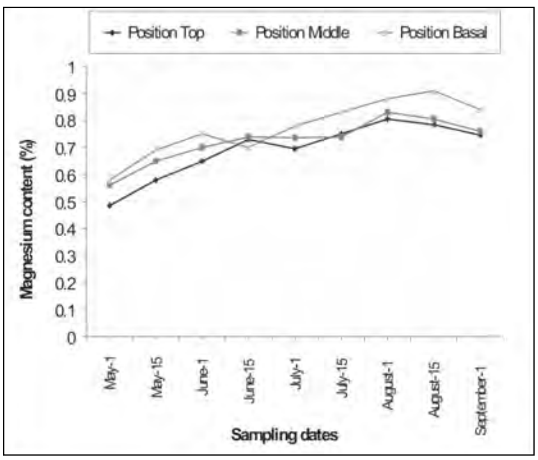

Fig 5. Magnesium content in apricot leaf influenced by position of leaf on the shoot and time of sampling (% dry weight)

Although Mg content of middle leaves followed an exactly similar trend as that in top leaves, change in Mg content between June 15 - July 15 was non-significant in the case of middle leaves. Change in Mg content of basal leaves on all dates of sampling was statistically significant, and no period of stability in Mg content of basal leaves was observed. These findings may be attributed to the relatively limited mobility of Mg in phloem, as also low demand in the fruit (Smith, 1962; Shear and Faust, 1980). Decrease in magnesium content during September may have been due to lower soil temperature, which alters root activity and, in turn, affects cation absorption (Melich and Reed, 1948). Highest mean value of Mg content was recorded in the basal leaves, followed by middle and top leaves.

Thus, it can be concluded that middle leaves of current season's growth are the most suitable for determining nutrient needs in the apricot tree. Leaf samples should be collected starting from early June to early July for determining N, K and Ca; during the first fortnight of July for determining P, and from mid-June to mid-July for determining Mg.

REFERENCES

A.O.A.C. 1980. Official methods of analysis of the Association of Official Analytical Chemists, 13th ed. (ed. W. Horowitz.). Benjamin Franklin Station. Washington, D.C. p1018

Batjer, I.P. and Westwood, M.N. 1958. Seasonal trend of several mineral elements in leaves and fruits of Elberta peach. *Proc. Amer. Soc. Hortl. Sci.*, **71**:116-126

Clark, C.J. and Smith, G.S. 1990. Seasonal changes in nutrient content of persimmon leaves. *Sci. Hort.*, **42**:85-97

Gomez, K.A. and Gomez, A.A. 1983. Statistical procedures for agricultural research. 2nd Ed., John Wiley and Sons, New York

Jackson, M.L. 1967. *Soil Chemical Analysis*. Asia Publishing House, Bombay

Lekhova, E. 1974. Changes in the nutrient content of apple leaves during the growing period. *Grad.-I-Loz. Nauka*, **11**:35-48

Malik, A.R. and Ahmad, M.F. 2008. Standardization of leaf sampling dates for early and late cultivars of apple. 3rd Ind. Hort. Cong., 194p

Mason, A.C. 1958. The concentration of certain nutrient elements in apple leaves taken from different positions on shoot and at different dates through the growing seasons. *J. Hortl. Sci.*, **33**:128-138

Melich, A. and Reed, J.F. 1948. Characterization of the plant factor in the cation requirement and contents in plants. *Proc. Soil Sci. Soc. Amer.*, **13**:399-401

Shear, C.B. and Faust, M. 1980. Nutritional ranges in deciduous tree fruits and nuts. *Hort. Rev.*, **2**:142-163

Singh, N.P. and Rajput, C.B.S. 1978. Effect of leaf age and position on fruiting status of guava leaf mineral composition. *J. Hortl. Sci.*, **53**:73-74

Smith, P.F. 1962. Mineral analysis of plant tissues. *Ann. Rev.Pl. Physiol.*, **13**:81-108

Verma, K.S. and Bhandari, A.R. 1990. Standardization of leaf sampling techniques for macro-nutrient elements in temperate peaches. *Ind. J. Hort.*, **47**:140-153

Westwood, M.N. 1978. Temperate Zone Pomology, W.U. Freeman and Company. San Francisco, USA. p. 427

(MS Received 16 May 2011, Revised 19 May 2012)