Variation of Leaf Nutrition Status in Relation to Fruit Growth in Mango

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ABSTRACT

During each of the months of October, November and December 1996 and January 1997, leaves on fruit bearing terminal shoots on trees of the mango cultivars Zill, Tommy Atkins, Sensation, Heidi, and Kent were taken for analysis. N, P, K, Ca, Mg, Cu, Fe, Mn, and Zn leaf concentrations were determined. Leaf N, K, Ca, Mn, Fe, Cu and Zn concentrations generally increased during the rapid phase of fruit growth, and generally decreased during the later stages of fruit development. The variation in Ca, K, N and Mn was most marked. Mg and P varied very little. The results indicate that leaf nutrient concentrations are generally undergoing flux during the month of November, when the fruits are expanding rapidly. The month of November might thus not be ideal for taking leaf samples for analysis.

INTRODUCTION

In South Africa, leaves are sampled from mango trees in November to assess tree nutrient status. This is done despite there being little knowledge of the variation in the concentration of leaf nutrients during the events of flowering, fruiting, postharvest flushing and bud quiescence. During the month of November, mango fruits are generally enlarging rapidly.

In the present study, the variation in nutrient status of leaves on fruit bearing terminal shoots during the period of fruit growth was investigated in a number of mango cultivars.

MATERIALS AND METHODS

In August 1996, eighteen adjacent mango trees were selected in each of five cultivar blocks at Mariepskop Estate and at Bavaria Fruit Estate (10 tree groups in total). Each cultivar block comprised a different cultivar at each estate. The cultivars Zill, Tommy Atkins, Sensation, Heidi, and Kent were included. The estates in question fall in the same region, and are in the vicinity of Hoedspruit.

During each of the months of October, November, and December 1996 and January 1997, a leaf sample was taken from each tree for nutrient analysis (180 leaf sample analyses per month). Four fruit bearing terminal shoots were selected per tree, one within each tree quadrant, and four leaves taken from each of them (one-year-old leaves taken). The leaves were analyzed for N, P, K, Ca, Mg, Cu, Fe, Mn, and Zn by Outspan or Central Agricultural Laboratories. The nutrient concentration averages were determined and plotted for each sampling date and group of trees.

Prior to sampling, on randomly selected fruit on each tree was tagged. On each sampling date, these fruits were measured. Fruit size was expressed as the average of two circumference measurements, one taken longitudinally, from and back to the point of pedicel attachment, and the other equitorially.

RESULTS

The variation in leaf N, P, K, Ca, and Mg concentrations in relation to fruit growth is shown in Fig. 1. Ca, N and K generally increased during the rapid growth phase. Ca and K increased by approximately 0.5%, and N by approximately 0.2%. P and Mg varied very little (average increase of approximately 0.01%).

N, K and Ca generally decreased during the later stages of fruit development. The reduction in N was least pronounced (approximately 0.3%), whereas that of Ca was most pronounced (approximately 0.8%). In certain instances, Ca decreased by more than 1%. K decreased by approximately 0.35% during this period. P and Mg varied very little (average reduction of approximately 0.03%).

The variation in leaf Cu, Fe, Mn and Zn concentrations in relation to fruit growth is shown in Fig. 2. Mn showed the greatest variation. Mn generally increased during the rapid phase of fruit growth (maximum increase = 619 ppm), and decreased during the later stages of fruit development (min. reduction = 93 ppm; max. reduction = 342 ppm).

Leaf Cu, Fe and Zn also showed general increases during the rapid phase of fruit growth and general decreases during the later stages of fruit development. The average deviations were 20, 71 and 34 ppm for each nutrient respectively during the initial phase, and -150, -103 and -64 ppm for each nutrient respectively during the later stages.

CONCLUSIONS

Studies specifically showing the variations of nutrients in mango leaves traditionally taken for leaf analysis in relation to flowering, fruiting, postharvest flushing and bud quiescence are lacking. Leaf variations of the nature reported in the present study have not been made previously to the knowledge of the author.

The leaf nutrient increases observed during the rapid phase of fruit growth are difficult to explain. Reductions might be seen to suggest depletion by the fruit.

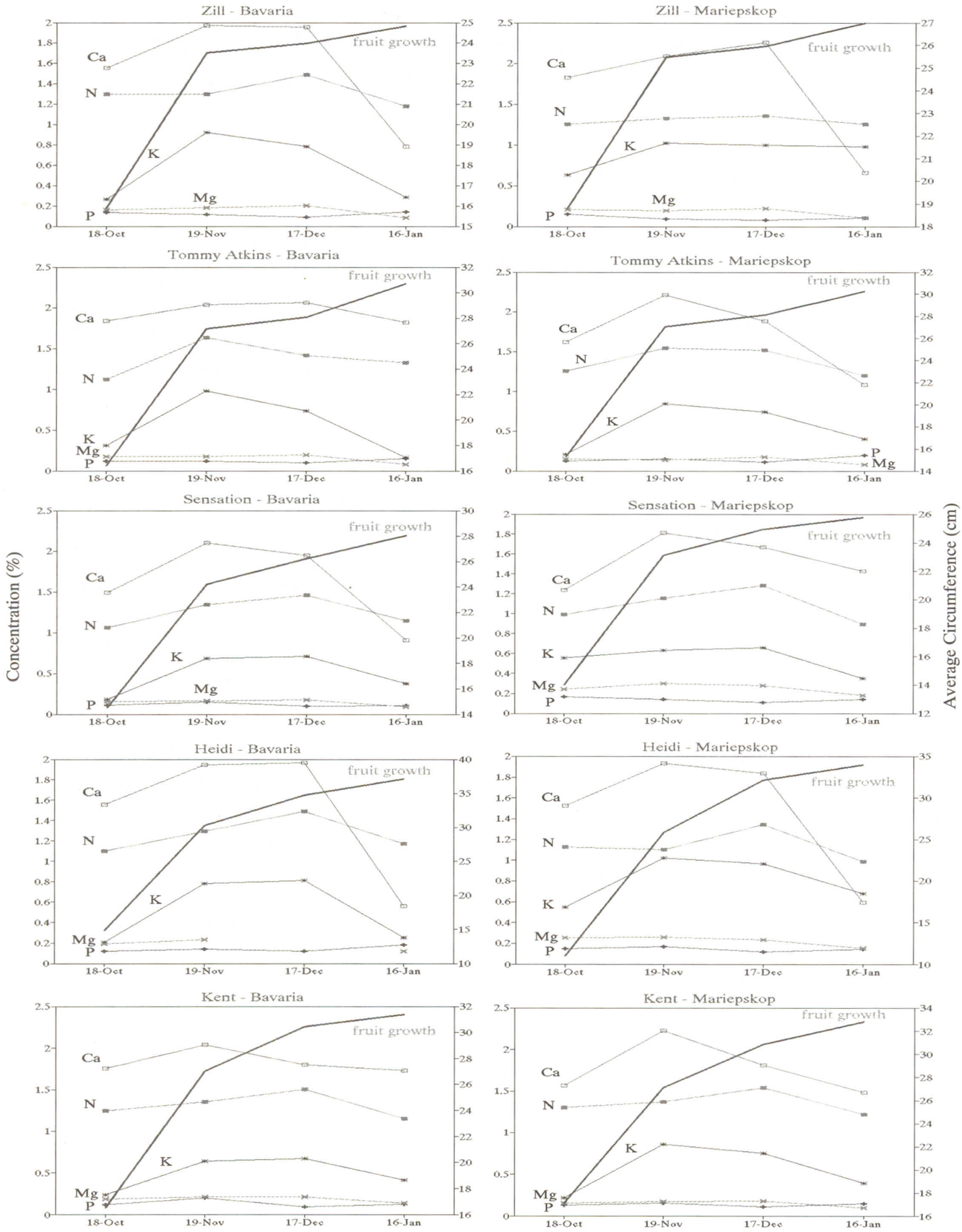

Fig. 1 *Variation in N, P, K, Ca and Mg leaf concentrations of fruit bearing terminal shoots in relation to fruit growth.*

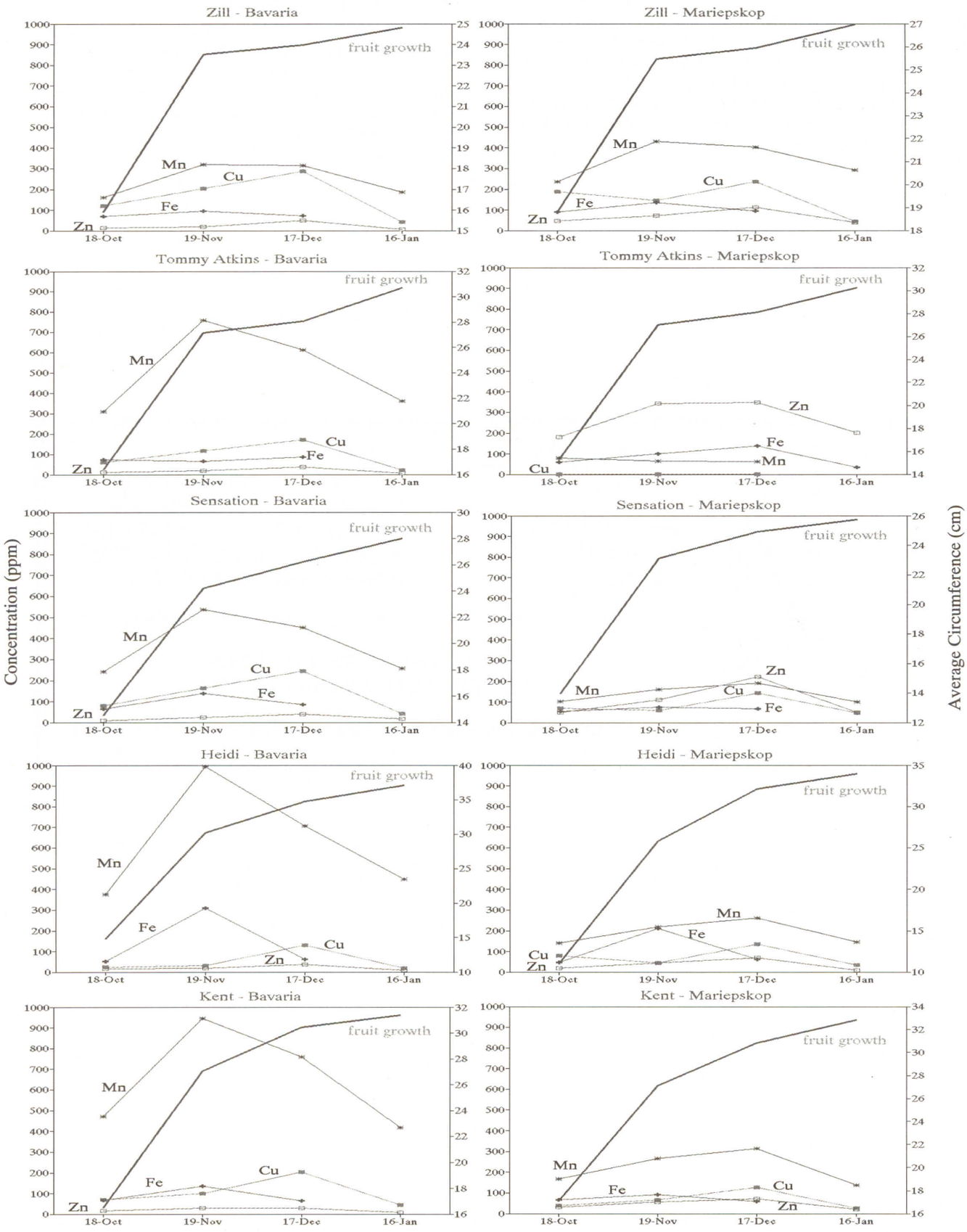

Fig. 2 *Variation in Cu, Fe, Mn, and Zn leaf concentrations of fruit bearing terminal shoots in relation to fruit growth.*

The results indicate that leaf nutrient concentrations are undergoing flux during the month of November. Relative stability in this regard is usually cited as a reason for the month advocated for the taking of leaf samples for analysis. The month of November might thus not be ideal for leaf sampling. Further research is required to determine leaf nutrient variations in relation to all of the growth events occurring during phenological cycle of mango trees.

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