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A Review :

Diagnosis and recommendation integrated system for detection of nutritional deficiencies and excesses in fruit production

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Nutrition and fertilization are important factors in determining fruit yield and fruit quality. One of the main plant mineral nutrition objective is increasing net income through efficient fertilization management. To attain this goal, it is necessary to correctly determine the yield-limiting impact of a given nutrient. The search for an effective method to determine plant nutritional status has been the target of many researches in plant nutrition. Current methods include both soil and tissues analysis. The soil analysis method is based on the assumption that the chemical extractants simulate the root system acquisition of soil nutrients in a comparable manner. However, it does not take into account factors such as soil temperature and aeration, and even the higher or lower absorption due to the own plant nutritional needs. Another soil analysis limitation is soil sampling, which is supposed to actually represent the soil portion explored by the roots (Reuther and Smith, 1954).

Tissue analysis is considered a more direct method of plant nutritional status evaluation than soil analysis, but this method must necessarily involve a well-defined plant part analysis (Hallmark and Beverly, 1991). Leaf analysis can be a very useful tool for plant nutritional diagnosis, since adequate procedures are available for data analysis. Because of the dynamic nature of the leaf tissue composition, strongly influenced by leaf age, maturation stage, and the interactions involving nutrient absorption and translocation, the tissue diagnosis may be a practice of difficult understanding and utilization (Walworth and Sumner, 1987). Several methods for nutritional diagnosis using leaf tissue analysis have been proposed and used, including the critical value (CV), the sufficiency range approach (SRA), and the diagnosis and recommendation integrated system (DRIS). Considering that DRIS uses the nutritional balancing concept (relationship among nutrients), it is postulated that this method might be more precise than the others in the detection of nutritional deficiencies and excesses.

The DRIS method :

This method intends to evaluate isolated deficiency or excess values, without measuring the overall nutritional balance. A new interpretation for leaf analysis was firstly developed and proposed by Beaufils (1957; 1973) for rubber trees (*Hevea brasiliensis*), named as Diagnosis and Recommendation Integrated System (DRIS). It is based on the principle that absorption of any nutrient depends on the other nutrients in the system and to quantify this relationship, nutrient ratios are used instead of individual concentration. In countries such as United States, Canada, and China, DRIS is being adopted as part of a representative diagnosis (Lopes, 1998; Hallmark and Beverly, 1991; Walworth and Sumner, 1987). The DRIS method expresses results of plant nutritional diagnosis through indices, which represent, in a continuous numeric scale, the effect of each nutrient in the nutritional balance of the plant. These indices are expressed by positive or negative values, which indicate that the referred nutrient is in excess or deficiency, respectively. The closer to zero are the indices for all the nutrients, the closer will be the plant to the