Investigation of Nutritional Balance in the Olive Gardens

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ABSTRACT

In order to investigate and understand the nutritional disorders and to determine optimal level the concentration of nutrients in the olive gardens, method the deviation of optimal levels (DOP) was carried out in Qazvin. First, 20 yellow cultivar olive gardens were selected of Tarom that they differ in terms of soil properties and crop yield but in terms gardening have desirable management, especially in irrigation and pruning. A composite soil sample was selected order to measure elements and determinate chemical properties of the gardens. A composite sample was prepared for each 5 ha from depth soil of 0-30 cm and 30-60 cm. A tree was selected for sampling for every 5 to 10 trees. Leaf samples were prepared in July from the current season shoots and finally yield fruits were determined. The calculations were carried out by formula deviation of optimal level (DOP). Standard concentration of nutrient elements were obtained for N=1/38, P=0/069, K=1/695 (%) and for Iron=499/5, Zn=21, Mn=52/5 and B=24/4 (mg/kg Soil), respectively. The average nutritional needs of nutrient elements in olive gardens were identified as follows: *N>Fe>Mn>Zn>K>P>B>Cu.*

Keywords: Olive of yellow cultivar, Analysis of leaf and fruit, Deviation of optimum percentage, Qazvin province

INTRODUCTION

Olive is plant from Oleaceae family and from *Olea* genus, scattered mostly at tropical areas and they are decorative and industrial trees. Olive is one of the most important and strategic products in Iran, but there are many problems about rate of performance, quality and consistency of their regular fruiting. One reason for this is nutritional disorders. unfortunately in our country, especially in the area of olive gardens, nutritional balance has not been met due to lack of real understanding of the deficiencies, the calcareous soils, irrigation water of bi-carbonation, sensitivity of trees to the nutrient elements and knowing exclusive use of chemical fertilizers. Nitrogen and phosphorus at gardens and their result is emergence of a series of problems caused by nutritional disorders, decline in yield and decrease in fruit quality. Therefore with regard to the above items, plant nutrition is as an effective factor that is a function of interaction of nutrient elements and environmental conditions. Therefore, exact determination of nutrient elements required by plants, in order to determine the amount of nutrient elements deficiency requires scientific methods [1]. For this purpose, soil test method, plant analysis, visual symptoms or a combination of them are used and each has advantages and disadvantages [2]. Appropriate nutrition of plant and nutrient availability plays an important role in the growth of optimal olive and to provide the necessary elements should evaluate. Availability elements as correct and accurate. Because leaf is the most important place of

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plant metabolism, therefore nutrient concentrations in the leaves of certain stages from plant growth and development can affect its performance [3]. If the analysis and interpretation of results be right, can give good information on the nutritional status of the plant and then perform the appropriate fertilizer recommendations. On the other hand balance between the nutrient elements in the fruit gardens is an important factor in increase yield and improve quality of fruit produced. Sumner [4] argues that an imbalance nutrient element in fruit tree affect the performance and quality of their fruit.

Investigations [5] about the relationship between nutrient elements in the leaf and qualitative and quantitative yield of fruit gardens have shown that balanced nutrition is an important factor at performance and quality of fruit. One of the main reasons for the low yield at the fruit garden in Iran is unbalanced using from fertilizer and on the other hand undesirable nutrition of fruit trees [6,7]. Deviation of optimum percentage (DOP) method is newest method used in interpretation of leaf analysis [6]. In this method for each nutrient element, an index is calculated using the formula.

DOP method is used as an indicator to detect the nutritional status of the trees and determine the lack of excess of nutrient elements [8]. When the elements are prioritized based on DOP values, nutrient element with small DOP Index shows a greater need than other nutrient elements. Nutritional balance index (ΣDOP) is obtained from sum of absolute values of Indicators of deviations from optimum percentage. High values of ΣDOP show more nutritional imbalance in the plant. Deviation of optimum percentage (DOP) index use from the relationships between nutrient elements concentrations instead the absolute concentration of nutrient elements. Studies have shown that comparison of any relationship with average relationship the society of reference plant is effective in the interpretation of leaf analysis [9].

The results of studies using DOP on two cultivars of cherries grafted on seven basic cherry showed that concentrations of Zn, Fe, N and P had the relative deviation with optimal concentrations [10]. In Iran, these methods have been used to determine the optimal level (norm) nutrient elements products such as corn, potato, berry, pistachio and sugar beet [11], wheat [12], Apple gardens and vineyards of Kohkeluyeh and Boyer Ahmad [13]. Goodarzi and Hosseini Farahi [13] by the deviation of optimum percentage (DOP) method about apple in Kakan area showed that except in a few cases, the elements or in a state of deficiency or at case over. Calculations show that Zn deficiency at 6/82%, Fe 82/6%, Cu 78%, Mn 95/6%, B in 52%, K 82/6%, P 52%, N 56/5%, Mg 43/4% and Ca 60/8% is at gardens with low performance. Considerable point is that the sum of the absolute value of DOP indicators for the various gardens are all greater than zero, and in some cases much larger. This shows that there is a nutritional imbalance at the apple gardens. According to the amount and type of fertilizer used, climate and weather conditions, soil physical and chemical characteristics and different varieties of olives, enough information are not to determine optimal level of nutrients (norm) and use them to assess the nutritional status the olive (yellow cultivars) in the province. Therefore it is necessary that the optimal level nutrient elements at the olive determine using the DOP.

MATERIALS AND METHODS

In order to identify nutritional abnormalities of olive groves and determine the deviation from optimal level (DOP), recognize the problems and existing anomalies in soil and water. This project was carried out for 3 years in Qazvin. For this study, the olive gardens were identified in the province and then 20 yellow cultivar from the olive gardens were selected of Tarom that they differ in terms of soil properties and crop yield but in terms gardening have desirable management, especially in irrigation and pruning. A tree was selected for sampling for every 5 to 10 trees. Leaf samples were prepared in July from the current season shoots. Selected samples were free from pest and disease. Leaf samples were sent immediately to the laboratory and were washed with distilled

water and then were dried for 48 hours at 65°C and were powdered by electric mills. In these samples, the concentration of N total by kjeldahl method, P by colorimetric method, K by flame photometer, Mn, Fe, Zn and Mn by atomic absorption and B by Korkamin method [14].

For more information, from each unit sampling from depths of 0-30 cm and 30-60 cm were prepared composite soil sample and soil texture by the hydrometer method, available phosphorus by Olsen method, available potassium by the flame photometer, pH with a pH meter, Ece by Ec meter, calcium carbonate by titration with acid and organic carbon by Valkoli black method were measured [15]. At the time harvesting was visited of the entire gardens scheme in September (at harvest canned) and was carried out to determine their performance.

$$DOP = \left[\frac{(C \times 100)}{C_{ref}} \right] - 100$$

In this formula: C - nutrient concentration at plant sample with low performance and is considered that evaluate its nutritional status; Cref - concentration the nutrient element at plants that have high performance and quality and in this regard it has desirable conditions, but in terms of other conditions is similar to the terms of plants with low performance. At interpreting the results of this method, there are two simple rules: (a) The absolute value of DOP index shows the importance or the intensity out of equilibrium because zero shows balance and high values absolute value of indicator DOP shows the high deviation from balance limit (similar to the Deris method); (b) For each element, negative value of DOP index indicates Shortage situation and positive value indicates Lot of that element (similar to the Deris method).

In this way similar Deris, is ranked as the imbalance of plant and shows an imbalance of the different elements which can be very important in terms of feed management. This method does not need to data extensive Unlike Deris, and no need to determine norm and can be used easily in all plants. Now using from index calculated deficiency and extremely of elements and sequence of feed need the gardens to different elements specified by Deviation for optimum level. So that the average concentration of nutrient elements in the leaf (separately) were calculated gardens with high yield and good fruit and was used as the optimal numbers. Using these optimum values for gardens with low performance, deviation from optimum percentage (DOP), calculated using the relevant formula for nutrient elements and using calculated indexes, Deficiency and over the elements and sequence food needs of gardens to different elements specified. Finally, rate of exiting from gardens nutritional balance with low performance specified.

RESULTS AND DISCUSSION

Deviation of optimum percentage index is one of interpretation techniques for plant analysis results that used to evaluate optimal mineral nutrition of agricultural and horticultural products [10,16]. This index provides information similar to the diagnosis and recommendation integrated system (DRIS) [17,18]. To calculate the norms DOP, the average elements concentration at plant community with high performance calculated and obtained numbers were used as a norm and compare basic. Calculated indexes were determined at gardens using reference numbers, order of nutritional need and indicators of nutritional balance (ΣDOP). Element nutrient balances DOP (ΣDOP) that are calculated from total the absolute value indicators of DOP and is used as a criterion to evaluate nutritional status of the plant without reference to its causes. In this nutritional balance index, whatever total the absolute value indicators of DOP is greater; imbalance of nutritional will be more. Order average nutritional requirements of olive gardens to nutrient elements were

determined as follows: *N>Fe>Mn>Zn>K>P>B>Cu*. Standard concentrations of nutrient elements at olive obtained as described in Table 2.

Table 1. Order average nutritional requirements of olive gardens to nutrient elements.

Nutrient element	N (%)	Fe $mgkg^{-1}$	Mn $mgkg^{-1}$	Zn $mgkg^{-1}$	K (%)	P (%)	B $mgkg^{-1}$	Cu $mgkg^{-1}$
DOP Index	-1/76	9/4	9/77	12/26	22/13	24/8	28/56	42/61

Table 2. Standard concentrations of nutrient elements.

Nutrient elements	N %	P %	K %	Fe $mgkg^{-1}$	Zn $mgkg^{-1}$	Cu $mgkg^{-1}$	Mn $mgkg^{-1}$	B $mgkg^{-1}$
Standard concentration	1/38	0/069	1/695	499/5	21	5	52/5	24/5

At Olive gardens in terms of macro elements such as nitrogen, 56/5% gardens have positive DOP and 43/5% of gardens have negative DOP. In terms of element phosphorus, 74% gardens have negative DOP and 26% gardens have positive DOP. In terms of K, 95/65% gardens have positive DOP and 4/35% garden have negative DOP. In terms of micronutrients such as iron, 73/9% gardens have positive DOP and 26/1% gardens have negative DOP. In terms of Zn, 59/1% gardens have positive DOP and 40/9% gardens have negative DOP. In terms of Cu, 95/65% gardens have positive DOP and 4/34% gardens have negative DOP. In terms of Mn, 68/2% gardens have positive DOP and 31/8% gardens have negative DOP. In terms of B, 91/3% gardens have positive DOP and 8/7% gardens have negative DOP.

CONCLUSION

Based on the results calculated indexes, among the macro elements, N has the most negative Index DOP and therefore this element is first priority of consumption in olive gardens. Microelements Iron and Mn are first and second priority, respectively. Thus, by knowing distribution and status of elements in soil and plant, we can act in the management, usage patterns, and fertilizer distribution and can produce complete fertilizers tailored to the needs of gardens. As part of suggestions from the above work, just doing a simple statistical analysis is not enough to take final decisions and large. In fertilizer recommendations, in addition according to the soil properties should be noted specifically to element concentrations in plant.

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