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Determination of Macronutrients of Organic Cherry Kemalpaşa İzmir Region

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Abstract

This study is about examining the macro element ingredients of soil and leaf samples in the entegrated garden where Salihli and Sapıkısa types in Kemalpaşa Region are grown. At the soil analysis of organic gardens, nitrogen (N) and magnesium (Mg) were found in medium, phosphorus (P) and potassium (K) in low, calcium (Ca) in high quantities. It has been discovered in gardens where entegrated production is made that K, Ca, and Mg had the same properties with the gardens where organic production is made but, N and P had high values. In both production methods, it has been found out that N which is a leaf food element had values much lower than the value it should have had, P and Mg had sufficient values, K and Ca had lower values. The relations between the results were examined and the total nutrition and nutrition balance data between N, P, K and K, Ca, Mg in leaf samples were evaluated.

INTRODUCTION

Pollution of the environment results from industrial and nuclear wastes, sound and air pollution, and besides this, it results from applying conventional agriculture methods and using intense and uncontrolled input in regions where there is rapid population increase and the demand for agricultural products is high and so, it threatens human health. Fertilizers containing nitrate (NO_3^-) and phosphate (PO_4^{3-}) in high amount which mix in the water as a result of excess and unconscious fertilization to get more products from unit area in traditional agriculture cause the moss population increase in these conditions and the amount of oxygen they use may threaten the life of other living things [1].

As a result of all these, environmental pollution has increased and the natural balance has been damaged. Against these mentioned problems, producers and consumers got organized in many countries and started to produce and consume clean products which do not make poison effect in human beings and other living things without disturbing the natural balance and polluting the environment. The production system developed for this purpose is called “ecological agriculture”.

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Ecological agriculture is an alternative production method; it offers organic and green fertilization, rotation, protecting the soil, increasing the resistance of the plant and getting use of natural enemies, it prohibits using synthetic chemical agriculture insecticides, plant growth regulators and mineral fertilizers, it aims not only the increase in amount but also, increase in quality by executing all these applications in a closed system [2].

Each of the macro elements has important functions in plant growth and development. If they aren't at enough quantity, the development draws back, the quality and the quantity of the product are affected negatively [3].

Kemalpaşa County of İzmir which has the most important cherry growth area of the Aegean region, has an important place in growing organic cherry. This study was done to determine the quantity of macro elements in nutrition conditions in the gardens where organic cherry growth is made in Kemalpaşa County of İzmir. As it is known that success can be achieved in cherry growing by the approach of organic agriculture, healthy fruit can be raised and our country has a big potential in this field.

MATERIAL AND METHODS

Trees which are grown organically in productivity age in 8 gardens in the fields of volunteer producers in Çambel village of Kemalpaşa County of İzmir and in Central County and trees which are grown entegrated in 5 gardens which represent Kemalpaşa make up the material of the study. Entegrated production is made appropriate for traditional methods, but it is controlled and carried out by irrigation different from gardens which make organic production. To determine the nutrition conditions and the soil properties of the plants, leaf samples were taken from random chosen trees which represent Salihli and Sapıkısa types in the period of sampling [4] for the region. The leaf samples taken were dried (60-65^{o}C), chewed and after that, burnt wet [5] and P [6] K, Ca, Mg [7] element quantities were determined in the obtained extract. Total nitrogen was determined by Kjeldahl method [8].

The soil samples were determined by opening a profile in each garden and the first four horizons were determined, they were taken from 4 different depths to represent each of them, macro element analysis were made to determine the productivity in all the samples taken. Total nitrogen was determined by Kjedahl method, the results were expressed as % [8]. After extraction with pure water, the available P value (Specord 50 analytic, Jena, Germany) was measured in the filtrate according to the Bingham method [6]. The available Ca, K (Eppendorf geratebau netheler + Hinz Gmbh Hamburg) values and the available Mg (Varian spectra AA 220 fast sequential) values were measured [7] in the filtrates obtained from soil samples shaken with 1 N NH_4OAc (pH: 7).

RESULTS AND DISCUSSION

Macro Element Results of Garden Soils

The macro element results of soil samples taken from the gardens are shown in Table 1. According to this, the nitrogen content of organic and entegrated soil samples changes between 0.03-0.11% and 0.05-0.23% consecutively and a decrease towards lower layers is seen in all gardens. This change can be explained by the collection of organic material in higher values which contains this food element in its structure in high amount as the result of intense biological activities in upper layers.

The available P amount of the organic and

entegrated gardens are between 0.40-7.33 mg/kg and 0.46-14.48 mg/kg values consecutively, and a striking difference was observed in between them by finding the phosphorus amount in the gardens in which traditional agriculture is made higher than the gardens in which organic agriculture is made. This difference can be explained by intense fertilization in entegrated gardens.

The changeable potassium amount of organic and entegrated gardens were between 34.34-421.83 mg/kg and 29.43-461.07 mg/kg consecutively, the change of the element mentioned in both production methods was seen as decrease along the profile.

It was found out that the available calcium content of organic gardens was 1334 mg/kg minimum, 7700 mg/kg maximum, the dispersion in entegrated gardens was between 1530-4936 mg/kg values. In all gardens, calcium amount increased as the depth increased and this situation was explained by the expressed element going down to lower layers by being washed. Also, it shouldn't be ignored that this situation can result from the properties of the main material.

When the organic gardens are taken into consideration, the lowest available magnesium content was determined as 36 mg/kg, the highest was 416 mg/kg, the dispersion in entegrated gardens was between 16-212 mg/kg values.

Results of Leaf Macro Elements

The macro element results of leaf samples taken in the study are shown in Table 2. Leaf N results for Salihli and Sapıkısa types in organic gardens were found as 1.76-2.26 % and 1.79-2.38%, they were found as 2.35- 2.49 % and 2.52% in entegrated gardens, it was thought that both types had considerable low nitrogen content under organic growing conditions.

The phosphorus content of Salihli type in organic gardens was between 0.14-0.21%, in Sapıkısa type it was between 0.16-0.24% values. In entegrated gardens same results were achieved, the values 0.17-0.20% and 0.18% were found consecutively, it was observed that the phosphorus content in the leaves in both production types were at sufficient value.

The potassium content of Salihli type in organic gardens was between 0.91-2.28%, in Sapıkısa type it was between 0.82%-1.55% values. When entegrated gardens were considered, the values 1.00-1.37% and 1.27% were found.

Leaf calcium results for Salihli and Sapıkısa types in organic gardens were between 0.71-1.22% and 1.02-1.61% values. In entegrated gardens in Salihli type, it was found as 1.10-1.85%, in Sapıkısa type it was 1.38%.

Table 1. Macro element analysis results of soil.

Elements	Organic		Integrated		Reference Values
	Min.	Max.	Min.	Max.	
N (%)	0.03	0.11	0.05	0.23	0.10 - 0.15***
P (mg/kg)	0.40	7.33	0.46	14.48	3.13 - 4.00**
K (mg/kg)	34.34	421.83	29.43	461.07	200 - 300*
Ca (mg/kg)	1334.00	7700.00	1530.00	4936.00	2143 - 2857*
Mg (mg/kg)	36.00	416.00	16.00	212.00	80 - 160*

***:[8], **:[6], *:[5]

Table 2. Macro element analysis results of leaves.

Elements	Organic				Integrated			Reference Values*
	Salihli		Sapikisa		Salihli		Sapikisa	
	Min.	Max.	Min.	Max.	Min.	Max.		
N (%)	1.76	2.26	1.79	2.38	2.35	2.49	2.52	2.2 - 2.6
P (%)	0.14	0.21	0.16	0.24	0.17	0.20	0.18	0.14-0.25
K (%)	0.91	2.28	0.82	1.55	1.00	1.37	1.27	1.6-3.0
Ca (%)	0.71	1.22	1.02	1.61	1.10	1.85	1.38	1.4-2.4
Mg (%)	0.27	0.58	0.31	0.75	0.36	0.58	0.51	0.30-0.80

*: [9]

The magnesium content in leaf samples in organic gardens was between 0.27-0.58% in Salihli type, it was between 0.31-0.75% in Sapıkısa type. When the entegrated gardens were examined, similar values to gardens making organic production were observed, in Salihli type it was 0.36-0.58%, in Sapıkısa type it was 0.51%.

Total Nutrition and Nutrition Balance

The limits of total nutrition and nutrition balance in the leaves were examined and the results were shown in Table 3. The sum of the highest and the lowest values of N, P, K and K, Ca and Mg leaf contents of organic gardens were between 2.813-4.741%, 1.357-3.161% in Salihli type; between 2.772-4.165%, 1.386-2.695% in Sapıkısa type.

When the percentage share of each elements in the mentioned sums are examined, it was seen that with respect to lowest values the share of nitrogen and phosphorus decreased in highest values in both types in N, P, K sums.

When the distribution of each element in highest values with respect to lowest values in K, Ca, Mg total data was examined, it was determined that potassium increased in Salihli type, calcium and magnesium decreased, the share of K and Ca decreased, Mg increased.

Relations Among Analysis Results

The bilateral relations among analysis results applied to all leaf and soil samples making up the research material were examined and interpreted as follows.

K_1 x Leaf P → -0.861* (1: first depth)

K_2 x Leaf P → -0.872* (2: second depth)

It was observed that the potassium values belonging to the first two depths and the leaf phosphorus of Salihli type were in counter interaction.

Ca_1 x Leaf P → -0.863*

The negative interaction between soil first depth calcium and the leaf phosphorus of Salihli type can be explained by the increase at the fixating tendency of Ca the soil P by precipitating.

	Salihli	Sapıkısa
Leaf P – Leaf Ca →	0.763*	0.880**

In both types, it was observed that calcium was low, phosphorus was sufficient, in other words because they don't exist in high amount in plant leaves, the expected negative interaction between them didn't happen, in present conditions they had a parallel interaction.

Leaf N x Leaf K → -0.713*

Although nitrogen and K have a counter interaction

Table 3. Total nutrition and nutritional balance limits in the leaves.

	Total amounts of Leaves (%)				Share % in Total Amount			
	Lowest Amount		Highest Amount		Lowest Amount in Total		Highest Amount in Total	
	Salihli	Sapıkısa	Salihli	Sapıkısa	Salihli	Sapıkısa	Salihli	Sapıkısa
N	1.76	1.79	2.26	2.38	62.65	64.57	47.65	57.14
P	0.143	0.163	0.206	0.238	5.0	5.88	4.35	5.71
K	0.910	0.819	2.275	1.547	32.35	29.54	48.0	37.14
Total	2.813	2.772	4.741	4.165	100.0	100.0	100.0	100.0
K	0.910	0.819	2.275	1.547	67.05	59.09	71.97	57.4
Ca	0.177	0.256	0.305	0.403	13.04	18.47	9.64	14.95
Mg	0.270	0.311	0.581	0.745	19.89	22.43	18.38	27.64
Total	1.357	1.386	3.161	2.695	100.0	100.0	100.0	100.0

in Sapıkısa type and N show near values in both types, it can be explained by K showing considerably low values in Sapıkısa type.

The analysis made is significant for correct fertilization methods to be developed. Appropriate land cultivating and cultural precautions should be determined for the protection of the soil and the trees use rain water in optimum level in inclined areas. Considering the usable amount of food elements in the soil and the need to increase their content in the plant, if the soil reaction should be decreased, it may be suggested that this matter could be solved by sulfur applications.

In both examined production methods, finding leaf potassium content usually insufficient may result from the insufficient amount of the mentioned element in the soil. In integrated production, they can be given by traditional methods and with control; in organic production minerals like silvinit, kainit and potassium pheldspate, some side products of organic origin or fertilizer of potassium sulphate may be given by control and certification institutions under supervision.

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