Examining Leaf and Soil Micro Element Contents of Organic Cherry Orchards around Kemalpaşa (İzmir)

Kemalpaşa (İzmir) Yöresi Organik Kiraz Bahçelerinde Yaprak ve Toprak Mikro Element İçeriğinin İncelenmesi

Research Article

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ABSTRACT

In this study, the micro element content of leaf and soil samples of organic and integrated gardens where Salihli and Sapıkısa types of Kemalpaşa region were investigated. Soil analysis of organic gardens, iron (Fe) content is determined medium and sufficient in most part the gardens and generally sufficient in integrated gardens; zinc (Zn) element is low in organic gardens, high in integrated gardens. Copper (Cu) and manganese (Mn) is found in high amounts in all gardens. In both production methods, it has been found that Zn which is a leaf food element is found much lower than the value it should have, Cu sufficient, Fe and Mn in lower amount. Relations between the findings have been examined, the data of them have been evaluated.

Key Words
Organic agriculture, cherry, plant nutrition, micro element

ÖZET

Bu çalışmada Kemalpaşa Yöresi Salihli ve Sapıkısa çeşitlerinin yetiştirildiği organik ve entegre bahçenin yaprak ve toprak örneklerinde mikro element içerikleri incelenmiştir. Organik bahçelerin toprak analizinde demir (Fe) içeriklerinin bahçelerin büyük bölümünde orta ve yeterli, entegre bahçelerde ise genelinde yeterli durumda olduğu, çinko (Zn) elementinin ise organik bahçelerde düşük, entegre bahçelerde yüksek miktarlarda olduğu saptanmıştır. Bakır (Cu) ve manganın (Mn) tüm bahçelerde yüksek oranlarda bulunduğu belirlenmiştir. Her iki üretim yönteminde de yaprak besin elementlerinden Zn'nun olması gereken değerlerin çok altında, Cu'ın yeterli, Fe ve Mn'ın ise daha düşük miktarlarda olduğu saptanmıştır. Bulgular arasındaki ilişkiler incelenmiş olup, verileri değerlendirilmiştir.

Anahtar Sözcükler
Organik tarım, kiraz, bitki besin elementleri, micro element

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INTRODUCTION

Uses of uncontrolled and intensive inputs, beside reasons environmental pollution, industrial and nuclear waste, noise and air pollution especially in areas experiencing rapid population growth and demand for agricultural products is increasing highly threatens human health.

As a result of all these, environmental pollution has increased the natural balance has been damaged. Facing these problems, producers and consumers in many countries have got organized and have begun to produce and consume clean products without causing poisonous effect in human beings and other living things without polluting the environment and disturbing the natural balance. The production system developed for this purpose is called "ecological agriculture". Ecological agriculture is an alternative production method aiming increase in amount of production with quality at the same time by prohibiting using synthetic chemical agriculture pesticides, plant growth regulators and mineral fertilizer; suggesting organic and green fertilization, rotation, protecting the land, increasing the resistance of the plant and getting use of natural enemies, executing all these applications in a closed system [1].

If micro elements are not in sufficient amount in spite of being in low amount in plant structure; development drops down, the quality and amount of the product is affected negatively [2].

The Kemalpaşa Country of İzmir which has the most important cherry production area of the Aegean Region has an important place in raising cherry. This study was made to discover the micro element amount of the gardens at nutrition situation where organic cherry is produced in Kemalpaşa region of İzmir which has the most important cherry production area of the Aegean Region, because it is known that success is reached and healthy fruit is produced by organic agriculture approach in cherry production, and our country has a high potential at this subject.

MATERIAL AND METHOD

The material of the study covers trees which are raised integrated in 5 gardens that represent Kemalpaşa and trees raised organic in 8 gardens in total in productive age in lands of volunteer producers form Central county and Çambel village of Kemalpaşa County of İzmir Province. The integrated production was executed appropriate for traditional methods, but controlled and under wet conditions, different from gardens in which organic production is made. To determine the nutrition conditions and soil properties of the plants; leaf samples were taken in sampling period [3] for the region from random chosen trees which represent Salihli and Sapıkısa types. After drying (60-65°C) and chewing the taken leaf samples, they were burnt wet [4] and Fe Cu, Zn, Mn [5] element amount were determined in the obtained extract. For soil samples, first four horizons were determined by opening profile in each garden, samples were taken from 4 different depths to represent each of them, micro element analysis of all samples were made. The available Fe, Cu, Zn, Mn amount [6] has been determined in Varian Spectra AA 220 Atomic Absorption Spectrophotometer, after taking 20 g of air dry soil sample, shaking and filtering it with 40 ml DTPA (diethylenetriaminepentaacetic acid) + $CaCl_2.2H_2O$ + TEA (triethanolamine).

RESULT AND DISCUSSION

Micro Element Results of Garden Soil

The micro element results of soil samples taken in the study were shown in Table 1. The available iron content were found between 1.32-6.58 $mgkg^{-1}$, higher values were taken in integrated gardens between 2.95-20.26 mg kg^{-1} regular decrease was observed in organic gardens toward lower layers, decrease was observed in the last layer in integrated gardens.

The available zinc content of organic and integrated gardens show a distribution between 0.20-0.81 mg kg^{-1} and 0.14-3.51 mg kg^{-1} consecutively, when the taken element is examined according to depths, decrease is seen toward lower layers in all gardens.

When copper and manganese content of organic gardens are examined, it is seen that they are between 0.60 mg kg^{-1}- 12.46 mg kg^{-1}; 1.84-17.50 mg kg^{-1} values consecutively, in integrated gardens copper is between 0.67-36.50 mg kg^{-1} values, manganese is between 2.92-24.88mgkg^{-1} values. Both elements were found in sufficient class when all depths in the gardens are taken into consideration.

Table 1. Micro element analysis results of soil.

Elements (mg kg^{-1})	Organic		Entegre		Referance Values**
	Min.	Max.	Min.	Max.	
Fe	1.32	6.58	2.95	20.26	> 4.5
Zn	0.20	0.81	0.14	3.51	> 1.0
Cu	0.60	12.46	0.67	36.50	> 0.2
Mn	1.84	17.50	2.92	24.88	> 1.2

**:[6]

Leaf micro element results

The micro element results of leaf samples taken in the study are shown in Table 2.

The iron contents of leaves of organic gardens are between 57.2-95.3 mg kg^{-1} values in Salihli type, between 85.3-157.8 mg kg^{-1} values in Sapıkısa type. Iron content of the types in integrated gardens were determined as 79.0-160.6 mg kg^{-1} and 99.9 mg kg^{-1} consecutively. It was discovered that Fe contents of integrated gardens were better than organic gardens.

Leaf Zn results in organic gardens of Salihli and Sapıkısa types were found between 7.75-12.1 mg kg^{-1}, 5.56-10.9 mg kg^{-1} values consecutively, in integrated gardens they were between 6.83-10.7 9.39 mg kg^{-1} values.

It was found out that all the samples in all gardens were in deficient class for Zn.

Leaf manganese content in organic gardens in Salihli type were found between 4.40-17.9 mg kg^{-1} values, between 8.70-52.6 mg kg^{-1} values in Sapıkısa type, in integrated gardens they were between 4.30-43.6 mg kg^{-1}, 21.9 mg kg^{-1} values.

Leaf copper content in organic gardens were found between 6.70-13.3 mg kg^{-1} values in Salihli type, between 7.90-18.6 mg kg^{-1} values in Sapıkısa type, in integrated gardens they were between 7.90-51.2 values in Salihli type, 10.1 mg kg^{-1} in Sapıkısa type.

Relations among analysis results

Among leaf food element contents, relations were determined in Salihli type generally in positive way, relations were seen partially in Sapıkısa type, in both of them one linear relation was obtained commonly.

Although they are in the same gardens and similar conditions, the significant difference between the contents in the plant in types which make up the test subject and interactions among them can be explained as follows:

The physiological effectiveness of the types on root and over root parts vary some kind because of morphological differences.

Different development phases cause development period of one type and the other occur in different times, each happen under changing environmental factors.

		Salihli	Sapıkısa
Leaf Fe – Leaf Mn	→	0.944**	0.746*

The linear interaction in both types between iron and Mn can be explained according to the qu-

Table 2. Micro elements analysis results of leaves

Elements (mg kg^{-1})	Organik				Entegre			Referans Values*
	Salihli		Sapıkısa		Salihli		Sapıkısa	
	Min.	Max.	Min.	Max.	Min.	Max.		
Fe	57.20	95.30	85.30	157.80	79.00	160.60	99.90	100-250
Zn	7.75	12.10	5.56	10.90	6.83	10.70	9.39	20-50
Cu	6.70	13.30	7.90	18.60	7.90	51.20	10.10	5-16
Mn	4.40	17.90	8.70	52.60	4.30	43.60	21.90	40-160

*: [5]

antities of the mentioned elements in the plant. As seen in Table 2, Salihli type is found in insufficient and deficient amount from Fe values, Sapıkısa type is found partially at sufficient class, but near to the lower border of the sufficient class. The distribution of manganese is similar to iron. Observing linear interaction between the two elements mentioned can be explained by their insufficient content to result in opposite interaction between them.

Leaf Fe – Leaf Cu → 0.905**
Leaf Cu – Leaf Mn → 0.946**

As shown in the above relation, because Fe shows semi-mobile, Cu and Mn show immobile property, it may be considered that they are carried parallel and together, as a result of this, linear relations happen between them. The mentioned relations are seen in Salihli type, all three elements show lower values to Sapıkısa type, and this can be explained as they did not reach the level high enough to disturb the parallel interaction among them.

The relations determined in Sapıkısa type were evaluated by taking the results in Salihli type into account:

Leaf Mg – Leaf Zn → 0.849**

The linear and important relation of Magnesium with Zn can be explained by morphological, physiological and development period differences between the types.

Analysis made is important for developing correct fertilization methods. Taking into account the usable amount of micro food elements and the need to increase their contents in the plant in soil in the fields where organic agriculture is made, if the deficiency of micro food elements is found in leaf and soil analysis made, because "organic agriculture regulations" permit using micro elements, fertilization can be made according to the analysis result.

Also, green fertilization should be permitted in both production methods for soil productivity. Besides, some side products having organic origin can be given with supervision by control and certification associations.

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REFERENCES

1. Aksoy ve Altındişli, Dünyada ve Türkiye'de Ekolojik Tarım Üretimi, İhracatı ve Geliştirme Olanakları (2001) 13.
2. B. Kacar, V. Katkat, Gübreler ve Gübreleme Tekniği, Uludağ Üniversitesi Güçlendirme Vakfı Yayını (1999) 2, Bursa.
3. L. Tuna, Kemalpaşa Bölgesi Kiraz Plantasyonlarının P–K–Ca– Fe–Zn yönünden Beslenme Durumlarının Değerlendirilmesi ve Bu Elementlerin Mevsimsel Değişimleri Üzerine Araştırmalar, E.Ü.Z.F. Yüksek Lisans Tezi, Bornova–İzmir (1991)
4. B. Kacar, 1962, Plant and Soil Analysis. Univ.of Nebraska , College og Agriculture, Dept. Of Argon. Nebraska, USA (1962).
5. D.J. Reuter, J.B. Robinson, Plant Analysis An Interpretation Manual (1986) 127.
6. W.L. Lindsay and W.A. Norwel, Development of a DTPA Soil Test for Zinc, Iron, Manganase and Copper, Soil Science of America 42 (1978) 421.