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**Araştırma Makalesi**

# Determination of Nutrition Status of Quince (*Cydonia oblonga* MILL.) Gardens By Leaf Analysis in Geyve District, Sakarya

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**Abstract**

This research was carried out in order to determine the nutritional status of quince gardens in villages where Eşme variety quince (*Cydonia oblonga* Mill.) Is grown in Sakarya province, Geyve district. Nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), iron in leaf samples taken from 34 quince gardens in 13 villages where Eşme variety is intensively cultivated, 8-12 weeks after the full flowering period. (Fe), Copper (Cu), zinc (Zn) and manganese (Mn) concentrations were determined. Since there are no limit values determined for evaluating the results of herbal analysis related to quince in the literature, the values determined for pear (*Pyrus communis*) and apple (*Malus domestica*), which are from the same family with the quince *(Rosaceae)*, were taken as reference. The reason for using the reference values determined for pear in the literature; It is the use of quince rootstocks for dwarfing the pear plant. N 9% deficiency, 91% sufficient in leaf samples taken from quince gardens in the research area; P 100% is sufficient; K 6% deficient, 85% sufficient, 9% high; Ca 18% sufficient, 82% high; Mg 69% sufficient, 31% high; Fe 97% sufficient, 3% high; Mn 23% deficient, 74% adequate, 3% high; Zn 50% deficient, 47% sufficient, 3% high; Plant nutrient levels were determined as 100% higher than Cu. Correlation analysis of the amount of plant nutrients determined as a result of the research was found statistically significant [(P≤0.050), (P≤ = 0.01)].

**Keywords**: Sakarya province, Geyve district, Quince (*Cydonia oblonga* Mill.), nutrient element

## INTRODUCTION

Quince (*Cydonia oblonga* Mill.) belongs to the *Maloideae* sub-family of the *Rosaceae* family, which includes commercially important fruits such as apples and pears. This sub-family includes 30 genera and about 1.000 species belonging to these breeds. A fruit with distinctive cores is characterized by the number of seeds and 17 base chromosomes (Mirabdulbaghi et al., 2014). *Cydonia sinesis* Thouin and *Cydonia japonica* Persian, which are used as ornamental plants. (Gencer, 2011). According to fruit shapes; pear-shaped quince (*Cydonia oblonga exists. Pyriformis* [Dierb.]) And there's the apple-shaped quince *Cydonia oblonga. Maliformis* [Mill.]*)* divided into two variants (Özçağıran et al., 2011).

Quince, which develops in the form of woodpeckers or shrubs, which is one of the very old types of fruits that have been cultured; It has been reported that it has a brown and red body that can grow up to 6-8 meters, has a superficial root structure, has young shoots of feathered yellowish green color, has a dark green top and has wide ellipse or egg-shaped leaves (Özçağıran et al., 2011).

Its homeland is thought to be around North Anatolia, North-West Iran, the South Caucasus and the Caspian Sea. Their ancestors date back to Turkistan in the east. It moved from Anatolia to Greece and Rome in the years before B.C. It is known that it was bred in Greece in 650 B.C. and then spread to central and eastern Europe. Although it is grown in other countries except Australia today, this type of fruit is not as popular as other cultured fruits (Özbek, 1978; Özkan, 1995; Özçağıran et al., 2005; Gökçe, 2019).

According to FAO 2018 data, 688,660 tons of quince were produced in 82.941 ha areas worldwide. According to 2019 TÜİK data in Turkey, 180.542 tons of quince were produced in the area in 71.031. Approximately 26.20% of the world's quince production is produced in Turkey. According to TÜİK 2019 data in Turkey, 59.123 tons of quince, which is approximately 32.67% of the amount of quince produced, was produced in Geyve district of Sakarya province.

Fruit trees that stay in the soil where they are planted for a long time and maintain their economic and physiological life are perennial plants and remove plant nutrients from the soil during their economic life. Taking into account environmental factors such as soil, water and factors such as yield and quality, fertilization programs based on scientific basis should be applied, and nutritional balance should be emphasized by avoiding excessive or low fertilizer use in plant feeding. When plant nutrient fertilizers are used more than necessary and for a long time, environmental problems such as heavy metal accumulation in agricultural soils, deterioration in microorganism activity, salting, nutrient imbalance, eutrophication and nitrate increase in waters, greenhouse effect caused by thinning of the ozone layer as a result of gas emissions containing sulfur and nitrogen into the air arise.

In the research carried out on the determination of the types and quantities of commercial fertilizers to be applied to apple trees in some centers where apple production is intensive in Turkey; As a result of the application of fertilizers containing N, P, K to apple orchards, it was determined that although nitrogen and phosphorus contents increased in the orchards of apple trees, potassium content was not affected (Ateşalp and Işık, 1978).

Köksal et al. (1999), in a study conducted with Williams pear, investigated the possibilities of using three different amino acid cleyti leaf fertilizers in order to find solutions to the discomforts such as yellowing, browning and shedding of the leaves in the early period and the decline in yield, fruit quality and development. As a result of the three-year study, they found that by comparing amino acid cleyti-Fe with control, total yield increased by 64%, extra fruit ratio by 75%, shoot length by 70%, iron content of leaves by 112%, zinc content by 11%, copper content by 22%. They also reported that this applied leaf manure prevents the leaves from turning yellow, browning and shedding.

Taher and Hassan (2005), who examined the effects of some chemical applications on the fruit formation and quality of the Leconte pear variety, applied boron, gibberellic acid, benzyladenine adenine and sucrose to the trees during the fruit binding phase and three weeks after this stage. They determined that these applications significantly increased yield with the formation of the first and last fruits.

In the research carried out in Bozova district of Şanlıurfa province in a garden with the red variety pistachios of full yield age (27 years old), they found that fertilization applications made in accordance with the technique contributed greatly to growth and development in pistachio trees and therefore reduced the harmful effects of periodicity on crop yield by increasing yield, increased yield by increasing fruit size, and increased snapping rate (Bellitürk, et al., 2019).

In the research on the diagnosis and elimination of the micronutrient elements Fe, Zn, and B deficiencies seen in pear plantations in Bursa region, the lice nutrient content of leaf samples was determined. N of leaf samples taken from pear orchards is insufficient in 30% and sufficient in 70%; The amount P is sufficient at 100%; The amount K is insufficient in 45%, and sufficient in 55%; Ca amount is insufficient in 47%, sufficient in 53%; Fe amount is inadequate in 64% and sufficient in 27%; Zn amount is 85% sufficient and 15% insufficient; Amount B is inadequate in 21%, sufficient in 76%, excess 3%; Cu amount is sufficient in 80%, high in 20%; Mn amount was determined as sufficient in 33% and high in 67% (Gürel, 2013).

In the study conducted by Iranian researchers Mirabdulbaghi and Abdollahi (2014); Fruits collected from different regions of Iran (Isfahan, Horasan, Orumia, Ardebil, Astara and Tarhan) between 2006 and 2009 and 28 genotypes of quince rootstocks formed in the nurseries of the Institute of Seed and Plant Breeding within the framework of the Iran national quince collection breeding program, plant samples taken from the leaves of the same environmental conditions. As a result of nutrient analysis; stated that the nutritional responses of leaves vary within species.

In the study investigating the effects of increasing doses of vermicompost on growing vegetables such as pepper (*Capsicum annum* L.) and eggplant (*Solanum melongena* L.) on P and K contents; As a result of the analysis of peppers and eggplants, it was observed that P and K ratios were linearly increased with increasing amounts of vermicompost (Bellitürk et al., 2017).

Zn concentration was determined in the leaves of hazelnut gardens, which are located in an area of about 130 km starting from Ordu-Ünye coastal border to the end of Gülyalı district border, and 22% was found to be less than the leaf limit values. In addition to Zn, it was found to be malnourished by other elements such as N, P, K, Ca and Mg (Özkutlu et al., 2018).

## MATERIAL and METHODS

The district center image of the research area is given in Figure 1. In 2020, the research was carried out in Geyve center, Alifuatpaşa, Bağlarbaşı, Bozören, Burhaniye, Ceceler, Çengel, Doğantepe, Eşme, Hırka, Kozan and Umurbey neighborhoods (villages) of Geyve plain on the banks of the Sakarya river, where quince cultivation was carried out in Geyve district of Sakarya province.

**Figure 1.** Overview of Geyve district where research was carried out

**Table 1**. Some information about gardens where leaf samples are taken

| No | County | Neighborhood | Land(da) | Latitude | Longitude | Altitude | Age |
|---|---|---|---|---|---|---|---|
| 1 | Geyve | Alifuatpaşa | 4.7 | 40.5202 | 30.2875 | 70 | 35 |
| 2 | Geyve | Alifuatpaşa | 7.8 | 40.5184 | 30.2854 | 70 | 30 |
| 3 | Geyve | Alifuatpaşa | 2.9 | 40.5142 | 30.2871 | 70 | 35 |
| 4 | Geyve | Bağlarbaşı | 2.2 | 40.5634 | 30.3113 | 82 | 40 |
| 5 | Geyve | Bozören | 2.6 | 40.4683 | 30.1716 | 80 | 30 |
| 6 | Geyve | Bozören | 3.0 | 40.4726 | 30.1815 | 80 | 30 |
| 7 | Geyve | Bozören | 4.7 | 40.7414 | 30.1738 | 80 | 35 |
| 8 | Geyve | Burhaniye | 5.0 | 40.5002 | 30.3670 | 80 | 25 |
| 9 | Geyve | Burhaniye | 16.8 | 40.5026 | 30.3543 | 80 | 24 |
| 10 | Geyve | Ceceler | 4.8 | 40.4424 | 30.2719 | 80 | 25 |
| 11 | Geyve | Ceceler | 3.1 | 40.4434 | 30.2542 | 80 | 28 |
| 12 | Geyve | Ceceler | 3.1 | 40.4633 | 30.2508 | 80 | 25 |
| 13 | Geyve | Çengel | 7.6 | 40.4799 | 30.2164 | 90 | 30 |
| 14 | Geyve | Çengel | 2.9 | 40.4826 | 30.2189 | 90 | 30 |
| 15 | Geyve | Çengel | 2.6 | 40.4759 | 30.2104 | 90 | 25 |
| 16 | Geyve | Çengel | 6.1 | 40.4801 | 30.2157 | 90 | 20 |
| 17 | Geyve | Doğantepe | 4.5 | 40.5032 | 30.3531 | 80 | 20 |
| 18 | Geyve | Doğantepe | 5.0 | 40.5038 | 30.3516 | 80 | 30 |
| 19 | Geyve | Eşme | 8.0 | 40.5229 | 30.3101 | 80 | 25 |
| 20 | Geyve | Eşme | 3.7 | 40.5224 | 30.3093 | 80 | 25 |
| 21 | Geyve | Merkez | 7.3 | 40.5115 | 30.2834 | 80 | 45 |
| 22 | Geyve | Merkez | 5.0 | 40.5116 | 30.2786 | 80 | 45 |
| 23 | Geyve | Hırka | 6.0 | 40.4999 | 30.3109 | 80 | 18 |
| 24 | Geyve | Hırka | 10.0 | 40.4972 | 30.3009 | 80 | 20 |
| 25 | Geyve | Hırka | 4.3 | 40.4932 | 30.3009 | 80 | 25 |
| 26 | Geyve | Hırka | 7.4 | 40.4971 | 30.3112 | 80 | 18 |
| 27 | Geyve | Kozan | 3.8 | 40.4570 | 30.1841 | 80 | 30 |
| 28 | Geyve | Kozan | 3.1 | 40.4543 | 30.1364 | 80 | 35 |
| 29 | Geyve | Kozan | 3.5 | 40.4553 | 30.1264 | 80 | 35 |
| 30 | Geyve | Kozan | 7.3 | 40.4650 | 30.1519 | 80 | 30 |
| 31 | Geyve | Umurbey | 6.5 | 40.4894 | 30.2556 | 80 | 30 |
| 32 | Geyve | Umurbey | 3.4 | 40.4814 | 30.2576 | 80 | 25 |
| 33 | Geyve | Umurbey | 8.5 | 40.4952 | 30.2684 | 80 | 23 |
| 34 | Geyve | Safibey | 7.8 | 40.4933 | 30.2480 | 80 | 35 |
| Total | | | 185.0 | | | | |

In this research, leaf samples were taken from 34 gardens in 13 neighbourhoods where quince cultivation is carried out intensively. All trees sampled are of the Eşme variety. Global Position System (GPS) data of the points where the samples were taken and some information about the gardens are given in Table 1. and in Figure 2 in the gardens where leaf samples were taken. In addition, the statistical analysis of the data obtained from the results of the leaf analysis in the study was performed using the SPSS package program (SPSS, 2017). Pearson Product Moment Correlation Coefficient method was applied to determine whether the plant nutrients obtained from the analysis of leaf samples show positive or negative relationships with each other.

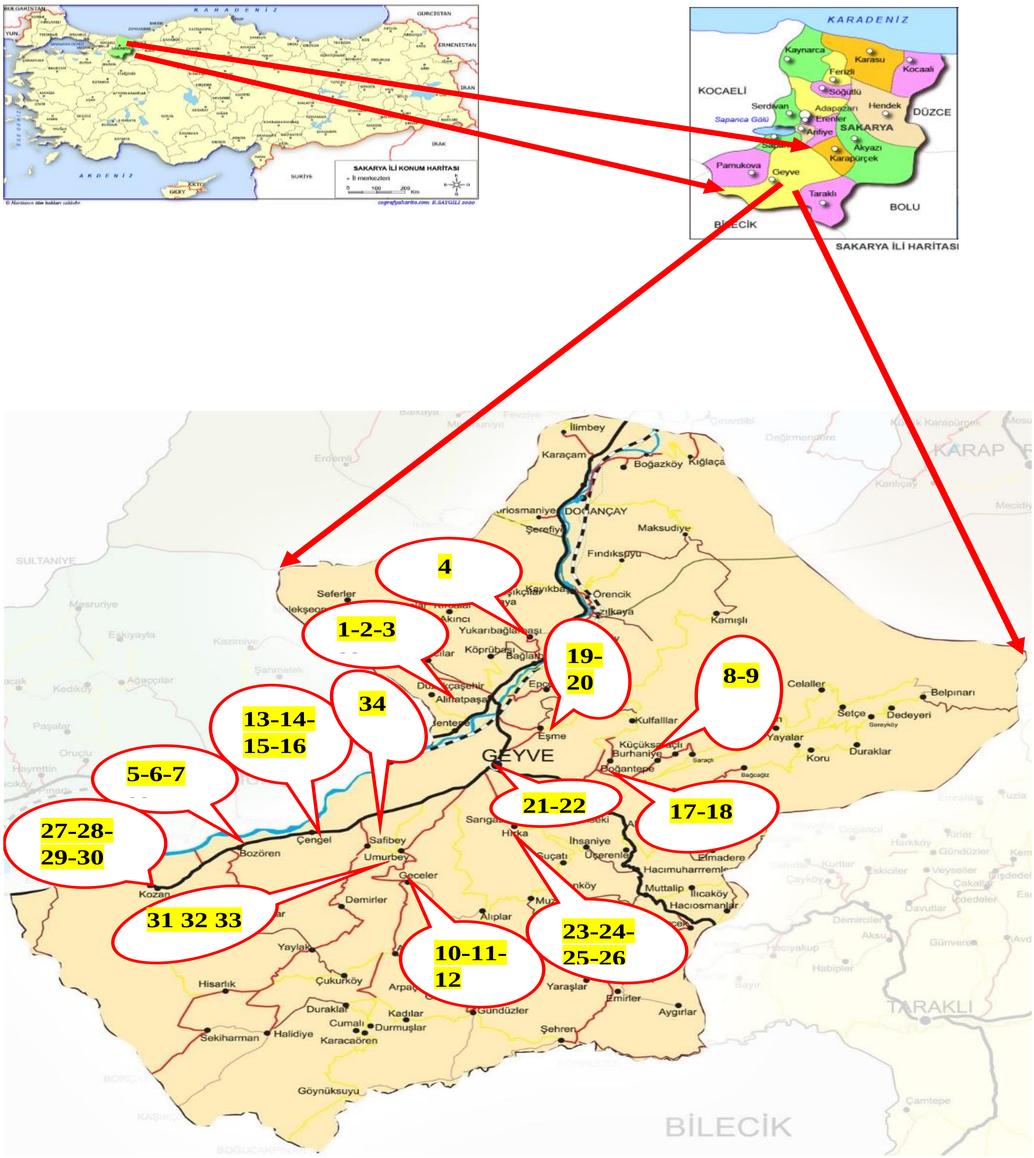


**Figure 2**. Gardens where leaf samples were taken in Geyve district

Leaf samples; in 2020, 8-12 weeks after full bloom (in July), it was taken from the leaves that had completed their development in the middle part of the shoots that continued in the same year. The leaves were removed from the shoulder-level branches from four directions of the tree and from each tree along with 4-8 leaf stalks. As a sampling, 100 leaves were collected from 25 trees by walking in a U-shaped garden and skipping a tree. After the leaf samples were taken from the quince orchards in a perforated paper bag, the information about the garden, which was sampled, was written in pencil with two labels indicating the date and place it was taken and delivered to the laboratory as soon as possible. In the laboratory, when the samples became air dry, they were left to dry for 24 hours and at 65 °C and the dried samples were ground and prepared for analysis. Total N analysis of leaf samples prepared for analysis was performed by Kjeldahl distillation method (Kacar and İnal, 2008). Phosphorus, potassium, calcium, magnesium iron, manganese, zinc and copper elements were determined by ICP-OES (Inductively Coupled Plasma) in the filter obtained by age burning method from leaf samples. The results are given as % in the exchange item for elements P, K, Ca, Mg It is given as mg in dry matter for Fe, Mn, Zn and Cu elements mg $kg^{-1}$ (Kacar and İnal, 2008).

## RESEARCH FINDINGS and DISCUSSION

Data showing the amounts of some macro and micro plant nutrients (N, P, K, Ca, Mg, Fe, Cu, Zn, Mn) obtained as a result of the analysis of leaf samples taken from quince gardens in the research area are given in Table 2 and Table 3. The data obtained were discussed by comparing the reference values given by Alpaslan et al. (1998).

**Table 2**. Macro plant nutrient element scopes of quince leaf samples (%)

| Sample No. | County | Neighborhood | N | P | K | Ca | Mg |
|---|---|---|---|---|---|---|---|
| 1 | Geyve | Alifuatpaşa | 1.93 | 0.15 | 1.57 | 2.63 | 0.51 |
| 2 | Geyve | Alifuatpaşa | 2.02 | 0.17 | 1.34 | 2.73 | 0.54 |
| 3 | Geyve | Alifuatpaşa | 1.77 | 0.14 | 1.61 | 2.73 | 0.49 |
| 4 | Geyve | Bağlarbaşı | 1.43 | 0.22 | 2.10 | 1.68 | 0.32 |
| 5 | Geyve | Bozören | 1.96 | 0.16 | 1.47 | 2.41 | 0.39 |
| 6 | Geyve | Bozören | 1.94 | 0.16 | 1.40 | 2.86 | 0.61 |
| 7 | Geyve | Bozören | 1.90 | 0.15 | 1.00 | 3.07 | 0.69 |
| 8 | Geyve | Burhaniye | 1.90 | 0.18 | 1.62 | 1.41 | 0.38 |
| 9 | Geyve | Burhaniye | 1.93 | 0.14 | 0.99 | 2.35 | 0.51 |
| 10 | Geyve | Ceceler | 2.04 | 0.16 | 1.59 | 2.31 | 0.51 |
| 11 | Geyve | Ceceler | 1.70 | 0.17 | 1.37 | 2.79 | 0.43 |
| 12 | Geyve | Ceceler | 2.29 | 0.21 | 1.62 | 3.18 | 0.52 |
| 13 | Geyve | Çengel | 1.68 | 0.17 | 1.72 | 1.23 | 0.33 |
| 14 | Geyve | Çengel | 1.79 | 0.14 | 1.41 | 2.54 | 0.56 |
| 15 | Geyve | Çengel | 2.45 | 0.15 | 1.03 | 3.35 | 0.67 |
| 16 | Geyve | Çengel | 1.68 | 0.24 | 1.85 | 1.45 | 0.40 |
| 17 | Geyve | Doğantepe | 1.90 | 0.17 | 1.26 | 1.73 | 0.44 |
| 18 | Geyve | Doğantepe | 1.74 | 0.21 | 1.92 | 1.70 | 0.44 |
| 19 | Geyve | Eşme | 1.90 | 0.15 | 1.41 | 1.74 | 0.39 |
| 20 | Geyve | Eşme | 1.85 | 0.14 | 0.86 | 3.36 | 0.61 |
| 21 | Geyve | Merkez | 1.71 | 0.12 | 1.46 | 1.27 | 0.41 |
| 22 | Geyve | Merkez | 1.65 | 0.13 | 1.64 | 1.14 | 0.43 |
| 23 | Geyve | Hırka | 1.54 | 0.18 | 1.63 | 1.53 | 0.42 |
| 24 | Geyve | Hırka | 2.40 | 0.18 | 1.56 | 3.05 | 0.51 |
| 25 | Geyve | Hırka | 1.99 | 0.15 | 1.37 | 2.51 | 0.52 |
| 26 | Geyve | Hırka | 1.48 | 0.15 | 1.77 | 1.77 | 0.43 |
| 27 | Geyve | Kozan | 1.46 | 0.14 | 1.71 | 1.78 | 0.41 |
| 28 | Geyve | Kozan | 1.29 | 0.24 | 2.22 | 1.75 | 0.43 |
| 29 | Geyve | Kozan | 1.43 | 0.17 | 1.89 | 1.78 | 0.42 |
| 30 | Geyve | Kozan | 1.65 | 0.14 | 1.49 | 2.52 | 0.40 |
| 31 | Geyve | Umurbey | 1.40 | 0.15 | 1.81 | 1.41 | 0.47 |
| 32 | Geyve | Umurbey | 1.99 | 0.17 | 1.41 | 2.10 | 0.50 |
| 33 | Geyve | Umurbey | 1.65 | 0.16 | 2.20 | 1.60 | 0.46 |
| 34 | Geyve | Safibey | 1.37 | 0.25 | 2.43 | 1.68 | 0.45 |
| Minimum | | | 1.29 | 0.12 | 1.00 | 1.14 | 0.32 |
| Maximum | | | 2.45 | 0.25 | 2.43 | 3.36 | 0.69 |
| Average | | | 1.78 | 0.17 | 1.58 | 2.15 | 0.47 |

**Table 3**. Covers the micro-plant nutrient element of quince leaf samples (mg $kg^{-1}$)

| Sample No. | County | Neighborhood | Fe | Cu | Zn | Mn |
|---|---|---|---|---|---|---|
| 1 | Geyve | Alifuatpaşa | 279.20 | 363.70 | 26.36 | 88.78 |
| 2 | Geyve | Alifuatpaşa | 180.20 | 400.30 | 33.86 | 87.68 |
| 3 | Geyve | Alifuatpaşa | 179.90 | 339.20 | 28.05 | 84.15 |
| 4 | Geyve | Bağlarbaşı | 95.00 | 47.00 | 26.00 | 11.00 |
| 5 | Geyve | Bozören | 202.40 | 79.38 | 26.20 | 74.84 |
| 6 | Geyve | Bozören | 156.10 | 606.70 | 27.34 | 82.89 |
| 7 | Geyve | Bozören | 143.40 | 567.00 | 30.00 | 79.57 |
| 8 | Geyve | Burhaniye | 99.00 | 304.00 | 7.80 | 22.00 |
| 9 | Geyve | Burhaniye | 89.00 | 260.00 | 15.00 | 38.00 |
| 10 | Geyve | Ceceler | 217.00 | 214.00 | 27.03 | 76.90 |
| 11 | Geyve | Ceceler | 196.30 | 72.90 | 31.18 | 76.80 |
| 12 | Geyve | Ceceler | 211.00 | 221.60 | 30.73 | 70.07 |
| 13 | Geyve | Çengel | 71.00 | 581.00 | 20.00 | 13.00 |
| 14 | Geyve | Çengel | 147.30 | 517.10 | 24.84 | 72.21 |
| 15 | Geyve | Çengel | 144.60 | -- | 18.76 | 94.68 |
| 16 | Geyve | Çengel | 101.00 | 311.00 | 59.00 | 40.00 |
| 17 | Geyve | Doğantepe | 75.00 | 510.00 | 12.00 | 31.00 |
| 18 | Geyve | Doğantepe | 71.00 | 526.00 | 12.69 | 30.00 |
| 19 | Geyve | Eşme | 68.00 | 168.00 | 13.00 | 45.00 |
| 20 | Geyve | Eşme | 155.00 | -- | 19.64 | 106.30 |
| 21 | Geyve | Merkez | 71.00 | 75.00 | 13.00 | 14.60 |
| 22 | Geyve | Merkez | 83.00 | 265.00 | 17.00 | 23.00 |
| 23 | Geyve | Hırka | 71.00 | 57.00 | 17.00 | 34.00 |
| 24 | Geyve | Hırka | 189.40 | 222.40 | 26.87 | 67.32 |
| 25 | Geyve | Hırka | 136.00 | 380.20 | 24.56 | 88.34 |
| 26 | Geyve | Hırka | 69.00 | 46.00 | 19.00 | 51.00 |
| 27 | Geyve | Kozan | 125.00 | 900.00 | 21.60 | 42.30 |
| 28 | Geyve | Kozan | 84.00 | 113.00 | 26.00 | 32.00 |
| 29 | Geyve | Kozan | 139.00 | 881.00 | 19.60 | 15.00 |
| 30 | Geyve | Kozan | 188.70 | 71.87 | 29.02 | 74.64 |
| 31 | Geyve | Umurbey | 66.00 | 32.00 | 106.00 | 29.00 |
| 32 | Geyve | Umurbey | 222.20 | 243.10 | 24.65 | 72.94 |
| 33 | Geyve | Umurbey | 86.00 | 1286.00 | 33.00 | 18.60 |
| 34 | Geyve | Safibey | 96.00 | 53.00 | 36.00 | 121.00 |
| Minimum | | | 66.00 | 32.00 | 7.80 | 11.00 |
| Maximum | | | 279.20 | 1286.00 | 106.00 | 121.00 |
| Average | | | 132.57 | 334.82 | 26.55 | 56.135 |

The general distribution amounts of some macro and micro plant nutrients obtained from the research area are given in Figure 3. According to the data obtained, the N amount of 34 leaf samples is deficient in 31 and sufficient in 3; The amount P is sufficient on the 34th; The amount of K is deficient in 2, sufficient on the 29th, high in 3; Ca amount is sufficient on 6, high on 28; The amount of mg is sufficient in 22, high in 12; Fe amount is sufficient on 33, high on 1; The amount of Mn is sufficient on the 8th, the 25th is sufficient, the 1st is high; Zn amount was found to be deficient on 17, sufficient on 16 and high in 1.

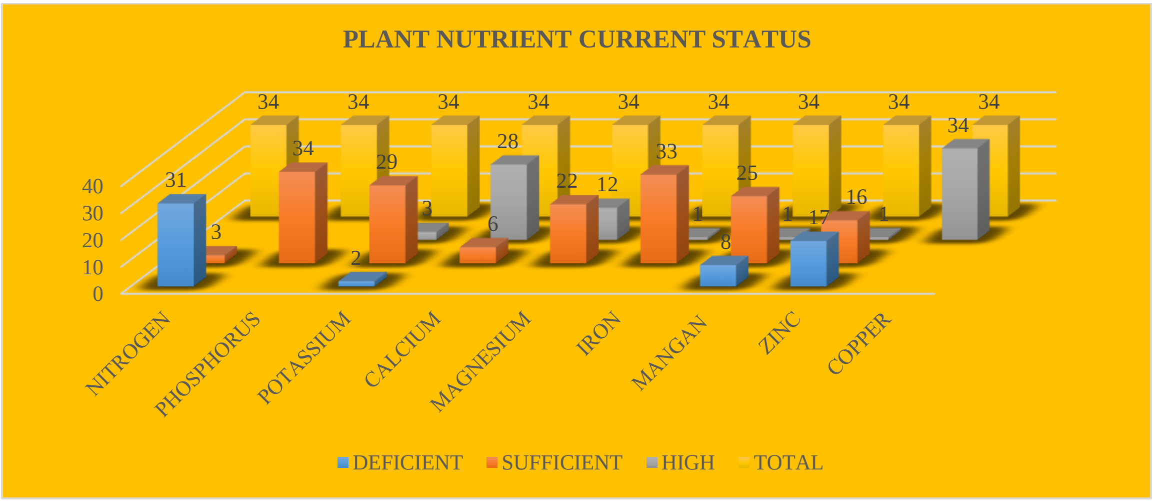


**Figure 3**. General status of the amount of plant nutrients in the research area

Some macro plant nutrient content of leaf samples taken from the research area in Geyve district of Sakarya province is given in the following Figure 4., Figure 5., Figure 6., Figure 7. and Figure 8. The total nitrogen coverage of leaf samples taken from some quince gardens in Geyve district of Sakarya province varies between 1.29-2.45% in dry matter. Alpaslan et al. (1998) reported that 2.20-2.80% was sufficient in 91% of quince gardens (31 examples) and 9% (3 samples) were found to be sufficient. High levels of N were not found in any of the samples taken from the gardens in the research area. The current situation is clearly visible in Figure 4. The total phosphorus scope of leaf samples taken from some quince gardens in Geyve district of Sakarya province varies between 0.12-0.25% Compared to the 0.11-0.25% limit values reported by Alpaslan et al. (1998), the P rate was sufficient in 100% of quince gardens (34 samples). No deficiency or high amount was found in any of the samples from the research gardens. The current situation is shown in Figure 5. Total potassium content of leaf samples taken from some quince orchards in the research area of Geyve district of Sakarya province varies between 1.00-2.43%. Compared with the limit values of 1.00-2.00% reported by Alpaslan et al. (1998), 6% (2 samples) of the quince orchards are deficient, 85% (29 samples) are sufficient and 9% (3 samples) high amount of K has been detected. The current situation of the samples taken from the gardens in the research area is clearly seen in Figure 6. The total calcium scope of leaf samples taken from some quince gardens in Geyve district of Sakarya province varies between 1.14-3.46%, Compared to the 1.00-1.50% limit values reported by Alpaslan et al. (1998), 18% (6 samples) of quince gardens and 82% (28 samples) were found to be high. Ca deficiencies were not found in any of the quince gardens in the research area. The current situation is clearly visible in Figure 7. The total magnesium coverage of leaf samples taken from some quince gardens in Geyve district of Sakarya province varies between 0.32-0.69% Compared to the 0.25-0.50% limit values reported by Alpaslan et al. (1998), a sufficient amount of Mg was detected in 65% (22 samples) and high amounts of Mg in 35% (12 samples). Mg deficiencies were not found in any of the quince gardens in the research area. The current situation is clearly visible in Figure 8.

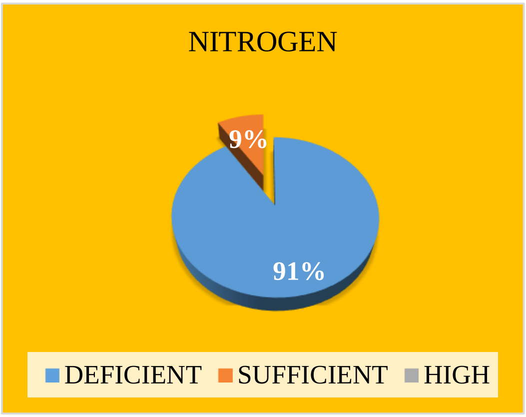


**Figure 4.** Amount of N in the research area

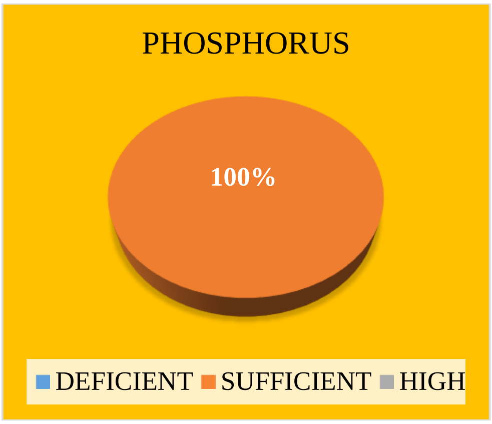


**Figure 5.** Amount of P in the research area

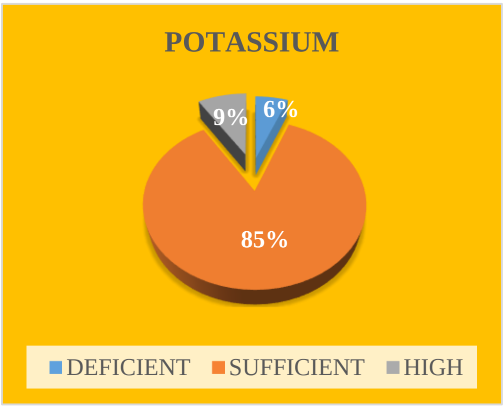


**Figure 6**. Amount of K in the research area research area

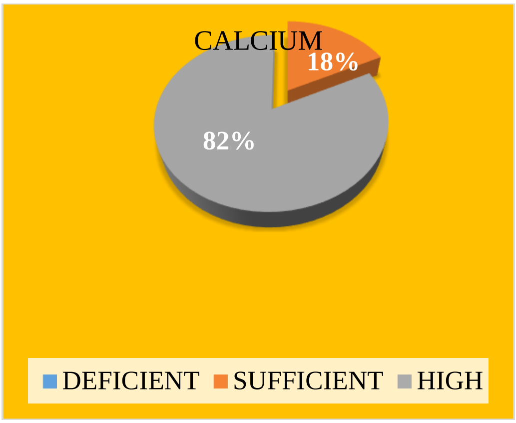


**Figure 7.** Amount of Ca in the

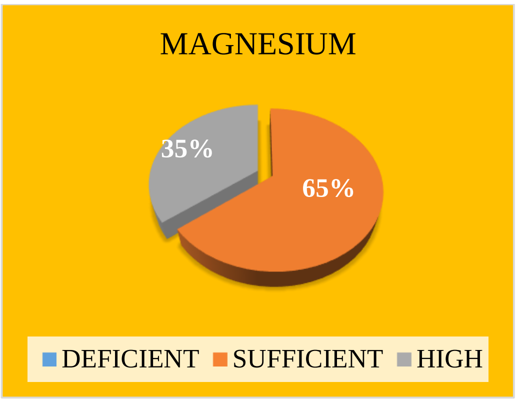


**Figure 8.** Amount of Mg in the research area

The amounts of micro-plant nutrients of leaf samples taken from some quince gardens taken from Geyve district research area of Sakarya province are as follows Figure 9., Figure 10., Figure 11. And it's given in Figure 12. The total iron scope of leaf samples taken from some quince gardens in Geyve district of Sakarya province varies between 66.0-279.20 mg $kg^{-1}$ Compared to the sufficient limit values of 60.0-250.0 mg $kg^{-1}$ reported by Alpaslan et al. (1998), 97% (33 samples) of quince gardens are sufficient and 3% (1 sample) had high iron levels. Fe deficiencies were not found in any of the quince gardens in the research area. The current situation is clearly visible in Figure 9. The total copper coverage of leaf samples taken from some quince gardens in Geyve district of Sakarya province varies between 32.0-1286.0 mg $kg^{-1}$ Alpaslan et al. (1998) reported 5.0-20.0 mg $kg^{-1}$ in 100% of quince gardens (34 examples) compared to adequate limit values. High levels of copper were found. Copper deficiencies were not found in any of the quince gardens in the research area. Current situation is also clearly visible in Figure 10. The total zinc coverage of leaf samples taken from some quince gardens in Geyve district of Sakarya province ranges from 7.80-106.20 mg $kg^{-1}$. Alpaslan et al. (1998) reported that 25.0-200.0 mg $kg^{-1}$ was found to be deficient in 50% of quince gardens (17 samples) and 47% (16 samples) with a high amount of zinc in 3% (1 sample). The current situation of quince gardens in the research area is clearly visible in Figure 11. The total manganese contents of leaf samples taken from some quince orchards in Sakarya province Geyve district research area vary between 11,0-121,0 mg $kg^{-1}$ 30.0-100.0 mg $kg^{-1}$ reported by Alpaslan et al. (1998). When compared with the sufficient limit values, 23% (8 sample) of the quince orchards were found to be deficient, 74% (25 sample) sufficient and 3% (1 sample) high manganese content. The current situation of the quince gardens in the research area is clearly seen in Figure 12.

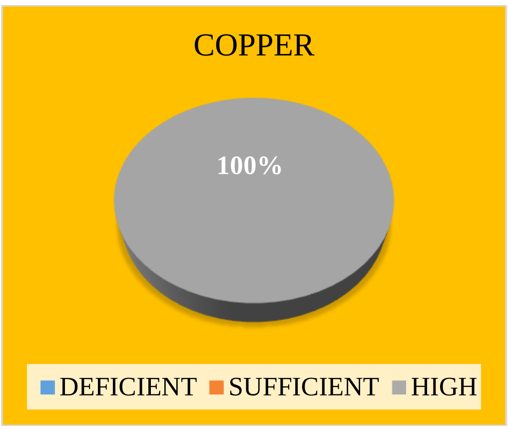


**Figure 9.** Amount of Fe in the research area

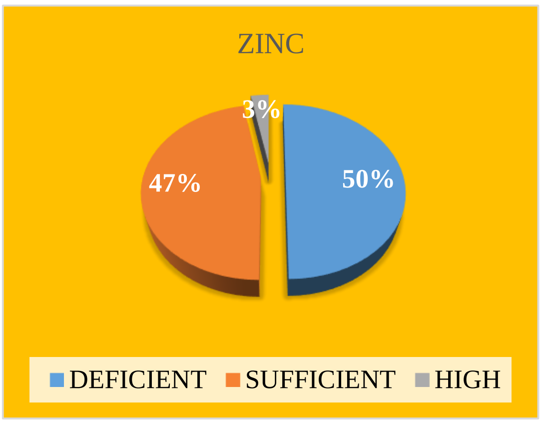


**Figure 10.** Amount of Cu in the research

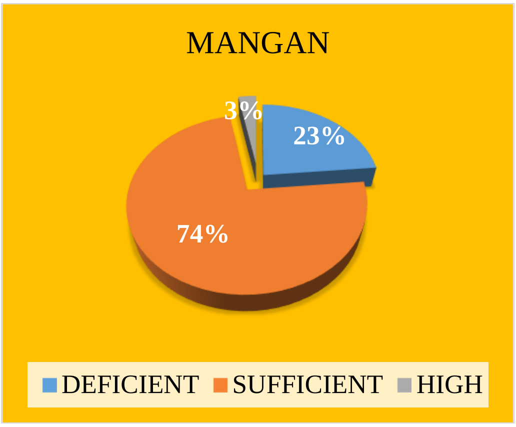


**Figure 11.** Amount of Zn in the research area

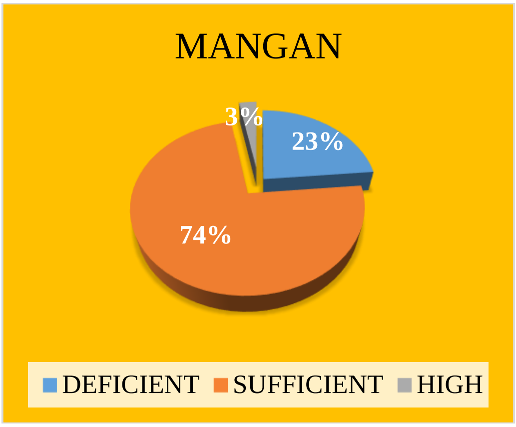


**Figure 12.** Amount of Mn in the research area

Correlation analysis results showing the interaction of some macro and micro plant nutrient content of quince leaf samples from the research area are given in Table 4 below.

**Table 4.** Correlation coefficients of elements detected in samples

| | N | P | K | Ca | Mg | Fe | Mn |
|---|---|---|---|---|---|---|---|
| **N** | | | -.632** | .679** | .558** | .524** | .434** |
| **P** | | | .630** | | | | |
| **K** | -.632** | .630** | | -.587** | -.589** | | -.364* |
| **Ca** | .679** | | -.587** | | .760** | .740** | .772** |
| **Mg** | .558** | | -.589** | .760** | | .390* | .647** |
| **Fe** | .524** | | | .740** | .390* | | .651** |
| **Mn** | .434* | | -.364* | .772** | .647** | .651** | |

Not: (**=P≤0,01, *=P≤0,05)

| | | | | | |
|---|---|---|---|---|---|
| (red) | Negative directional | (green) | Positive directional | (white) | Insignificant |

The correlation coefficients given in Table 4 are related to each other. Nitrogen-Potassium (-0.632**); Nitrogen-Calcium (0.679**); Nitrogen-Magnesium (0.558**); Nitrogen-Iron (0.524**); Nitrogen-Manganese (0.434**); Potassium-Phosphorus (0.630**); Potassium-Calcium (-0.587**); Potassium-Magnesium (0.589**); Calcium-Magnesium (0.769**); Calcium-Iron (0.740**); Calcium-Manganese (0.772**); Magnesium-Manganese (0.647**); 1% significance between plant nutrient pairs as iron-manganese (0.651**) can discover significant statistical relationships. Also, Potassium-Manganese (-0.364*); Magnesium-Iron (0.390 *); 5% significance between plant nutrient pairs is among the important activities. According to the correlation analysis results K-Mn (-0.364*) with 5% useful information; negative way; There is a positive relationship between the Mg-Fe (0.390*) pair. Likewise, N-K (-0.632**) with 1% significance and significant statistical relationships; Negative N-Ca (0.679**) between the pairs K-Ca (-0.587**) and K-Mg (-0.589**); N-Mg (0.558**); N-Fe (0.524**); N-Mn (0.434**); K-P (0.630**); Ca-Mg (0.760**); Ca-Fe

(0.740**); Ca-Mn (0.772**); Positive relationship between Mg-Mn (0.647**) and Fe-Mn (0.651**) plant nutrient pairs. According to the correlation analysis results K-Mn (-0.364*) with 5% useful information; negative way; There is a positive relationship between the Mg-Fe (0.390*) pair. Likewise, N-K (-0.632**) with 1% significance and significant statistical relationships; Negative N-Ca (0.679**) between the pairs K-Ca (-0.587**) and K-Mg (-0.589**); N-Mg (0.558**); N-Fe (0.524**); N-Mn (0.434**); K-P (0.630**); Ca-Mg (0.760**); Ca-Fe (0.740**); Ca-Mn (0.772**); Positive relationship between Mg-Mn (0.647**) and Fe-Mn (0.651**) plant nutrient pairs.

## CONCLUSIONS

In our country, the majority of quince production is carried out in quince gardens located in Geyve district of Sakarya province. This research was carried out in line with the analysis of leaf samples taken from 34 different gardens in 13 neighbourhoods (villages) and face-to-face interviews with garden owners. The results detected are described below.

8 producers with 23.53% of the 34 producers who own quince gardens do not fertilize in their garden, and 26 producers with 76.47% fertilize in their garden;

All producers are sprayed with 2% burgundy slurry (copper [II] sulfate and lime mixture) for fever blight (*Ervinia amylovora*) and powdery mildew disease (*Podosphaeraleu cotricha*);

Not all producers have had soil and leaf analysis for the last ten years;

In line with the traditional knowledge of fertilization in gardens and the information provided by fertilizer sales dealers;

At the same time, they said that they made the type and amount of fertilizer used in line with the information provided by fertilizer dealers.

As a result of the analysis of leaf samples taken from quince gardens, nitrogen contents were determined as minimum 1.29% to maximum 2.45%, and compared to the referenced value, nitrogen deficiency was found in 91% of quince gardens and sufficient in 9%. As a result of comparing the percentage of plant nutrient nitrogen levels detected in leaf samples with the percentage of producers fertilizing; 76.47% of the producer gardens that fertilized were found to be as high as 91% compared to the expectation of proficiency at this rate or near nitrogen level. This situation suggests antagonistic interaction as a result of excessive irrigation, washing, incorrect fertilizer type and quantity application.

As a result, only the results of plant sample analyses were evaluated in this research. In order to make a more detailed assessment of the nutritional status of the quince gardens in Geyve district, the agricultural activities of agricultural product producers; in line with fertilization and spraying programs prepared in line with scientific realities; they should be provided with education and legal obligation to do so in a way that prevents financial losses and environmental pollution that will occur as a result of sustainable waste.

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