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# THE EFFECT OF SOME FOLIAR FERTILIZERS ON FRUIT QUALITY OF PEACH

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***Abstract***

*The utilization of foliar fertilizers has become a fundamental management tool in intensive and super-intensive orchards. For this experiment, five peach genotypes ("DDD 67", "Maria Bianca", "Eureka", "HB 19-9" and "Tokinostate") were studied. Each genotype was treated with four different foliar fertilizers, two organic and two chemicals, during three separate growth phenophases. The genotypes were divided into five groups from which one group functioned as the experimental control and received no foliar treatment. In the case of the analyzed genotypes, the fertilizers, especially the biological ones, had significant positive influences on the internal characteristics of the fruits. Regarding the soluble solid content, in all genotypes, except "HB 19-9", better results were obtained in the case of biological fertilizers usage, especially the Cropmax fertilizer. The highest values of total polyphenol content, in all genotypes, except "Eureka", were also obtained in the case of biological fertilizers usage.*

***Key words**: foliar fertilizers; peach; total polyphenol content; soluble solid content.*

## INTRODUCTION

Fertilizer application has become an essential management tool in intensive and super-intensive orchards, being one of the essential factors for ensuring high productivity and high quality harvests (Andreev et al., 2018; Barreto et al., 2020; Farias Barreto et al., 2022; Maatallah et al., 2024). The trend toward foliar fertilizers is increasing (Das & Mandal, 2015; Fernández & Eichert, 2009). Foliar fertilization strategies can increase nutrient use efficiency, and lessen their detrimental effects on the environment (Farahy et al., 2021; Niu et al., 2021; Otálora et al., 2018).

*Persica vulgaris* L. is considered an important species, that contributes to human nutrition, being the second-largest temperate fruit crop worldwide, after apple crop (Cantin et al., 2009; Manganaris et al., 2022).

Due to their high content of phenolic compounds and carotenoids, peaches have been associated with favorable effects on human health such as effects on the heart, chemoprevention, obesity, antidiabetic activity and neurodegenerative illnesses (Bento et al., 2022; Hussain et al., 2021; Mokrani et al., 2016; Noratto et al., 2014).

In the last period peach consumption had a negative trend. Studies on consumer preferences have linked the lower rates of peach consumption to overripe, tasteless, and/or immature fruit (Clareton, 2000; Crisosto, 2001; Iglesias, 2013; Manganaris et al., 2022).

Considering that fruit quality can only be obtained in the orchard, through optimal preharvest parameters (Minas et al., 2018) we aimed to study the effect of several foliar fertilizers in order to improve fruit quality in five peach genotypes.

## MATERIALS AND METHODS

In order to carry out our research, five peach genotypes were studied: "DDD 67", "Maria Bianca", "Eureka", "HB 19-9" and "Tokinostate" (Figure 1), which were treated with four foliar fertilizers in three different growth periods. The first treatment was carried out in mid-May, the second treatment 3 weeks later, and the last treatment was carried out about 14 days before fruit ripening. Each variety was divided into four different groups, each group being treated in all phenophases with the same foliar fertilizer. Also, for each group, controls were chosen, on which no fertilizer was applied.

The foliar products used were as follows: Cropmax (1.5 L/ha), Albit (100 mL/ha), Solfert (4 kg/ha) and Foliq N Universal (5 L/ha).

The experiment was carried out during the year 2022 at Pohalma Nursery in Lugoj county (45°42'22.1"N 21°51'36.1"E).

The trees were planted in 2015 in a 4 x 4 m planting layout and are all grafted on Oradea peach rootstock and trained in a “vase-shape".

Fruit analysis involved the determination of the soluble solid content (SSC), fruit moisture and antioxidant activity (total polyphenols content).

In order to analyze the specific parameters, 15 samples of fruit picked at the optimal ripening stage were taken from each group of the 5 genotypes.

The complex chemical determinations and analyses were carried out within the Research Platform of the University of Life Sciences “King Mihai I” from Timișoara, using specific methods in accordance with those reported in the literature (Altemimi et al., 2015; Cirilli et al., 2016; Di Vaio et al., 2008; Fauriel et al., 2007; Golisz et al., 2013; Kumar et al., 2010; Mihaylova et al., 2021; Minas et al., 2018; Tan et al., 2022).

The equipment used for analyses are: ATAGO PAL 3870 digital refractometer (soluble solid content); Binder FD 115 oven (water content); UV-VIS Analytic Jena Specord 205 spectrophotometer (total polyphenols content (TPC)).

Statistical calculations were performed using Microsoft Excel and SAS Studio SAS® Studio 3.8 software, with application of the One Way Anova test.


Figure 1. The studied varieties and genotypes of peaches

## RESULTS AND DISCUSSIONS

The results determined for the examined parameters (soluble solid content, fruit moisture and total polyphenols content) are presented in Figures 2-4.

### *Soluble solid content*

The fruits of the "DDD 67" genotype recorded values of the SSC between 9.4 °Brix (Foliq N) and 22.1 °Brix (Albit), with an experimental average of 15.51°Brix, with no significant differences recorded. The highest values (18.03 °Brix on average) were obtained with Cropmax fertilizer, and the lowest were obtained in the control (13.57 °Brix on average).

For the "Maria Bianca" variety the recorded values range between 14.4 °Brix (Solfert) and 18.9 °Brix (Cropmax fertilizer), with an experimental average of 17.03 °Brix, with no significant differences. The highest values (18.17 °Brix on average) were obtained with Cropmax fertilizer, and the lowest with Solfert fertilizer (15.63 °Brix on average).

In the "Eureka" variety, the SSC values were between 10.6 °Brix (Solfert fertilizer) and 17.2 °Brix (Foliq N fertilizer), with an experimental average of 13.73 °Brix, with significant positive differences for Cropmax fertilizer compared to Solfert fertilizer. The highest values (16.03 °Brix on average) were obtained with Cropmax fertilizer, and the lowest with Solfert fertilizer (11.04 °Brix on average).

The "HB 19-9" genotype recorded values between 18.4 °Brix (Foliq N) and 23.4 °Brix (Solfert fertilizer), with an experimental average of 21.02 °Brix, with no significant differences recorded. The highest values (22.37 °Brix on average) were obtained in the case of the control, being the only variety in which the control recorded better results compared to all the fertilizers used. The lowest values were obtained with Cropmax fertilizer (19.63 °Brix on average).

The fruits of the "Tokinostate" variety recorded values of the SSC between 12.4 °Brix (the control) and 18.8 °Brix (Cropmax fertilizer), with an experimental average of 15.73 °Brix, with significant positive differences for Albit fertilizer compared to the experience control ($p>0.0169$). The highest values (17.6 °Brix on average) were obtained with the Albit fertilizer, and the lowest were obtained with the control (13.6 °Brix on average).

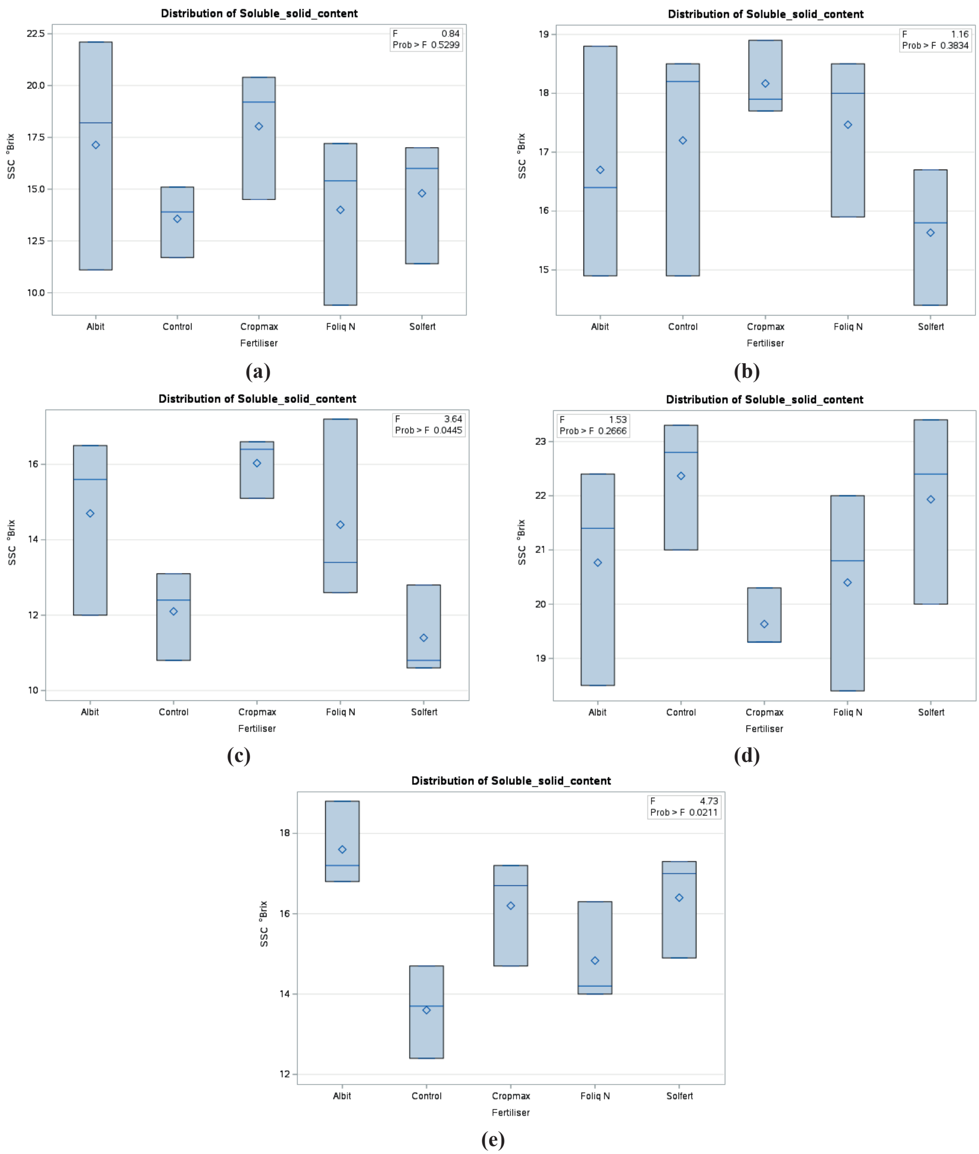



Figure 2. The influence of the fertilisers on the SSC: **(a)** "DDD 67" genotype; **(b)** "Maria Bianca" variety; **(c)** "Eureka" variety; **(d)** "HB 19-9" genotype; **(e)** "Tokinostate" variety

***Fruit moisture content***

The optimum moisture content for peaches varies between 80% and 90% (Bauman et al., 2005; Kumar et al., 2010; Lufu et al., 2020). Moisture content is a crucial factor in food quality, preservation and also in increasing resistance to deterioration (Nielsen, 2010).

As can be observed in Figure 3, the moisture content of the fruits varied depending on the genotype, but also on the fertilizer used, with significant differences being recorded in each group. The lowest moisture content values were recorded for the "HB 19-9" genotype (76.57-82.37%), and the highest values for the "Eureka" variety (85.21-90.27%).

On average, the highest humidity was recorded in the case of the controls (in two of the genotypes: "DDD 67", "Tokinostate") and in the case of the use of Solfert fertilizer, and the lowest values were recorded in the case of the use of Albit and Cropmax fertilizers.

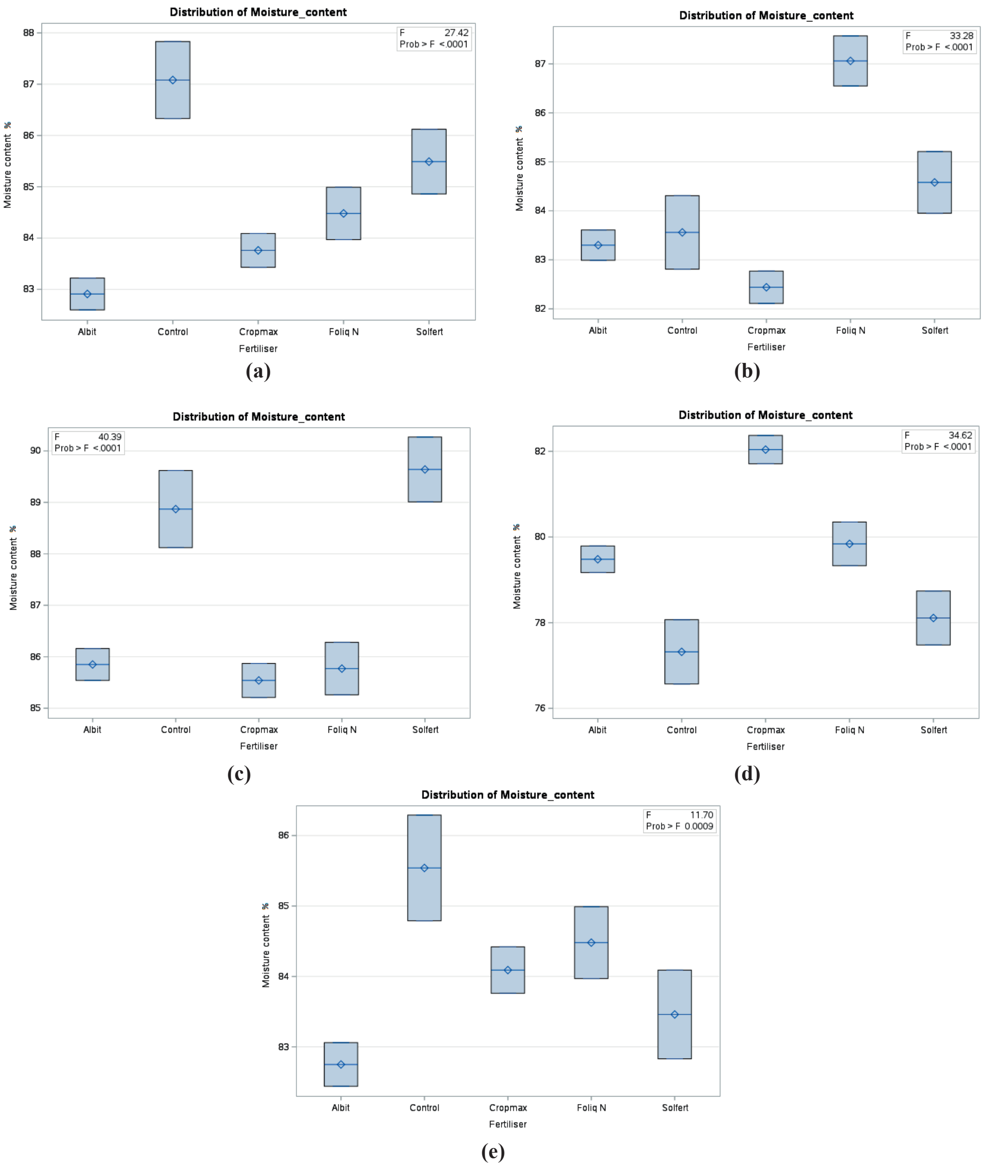


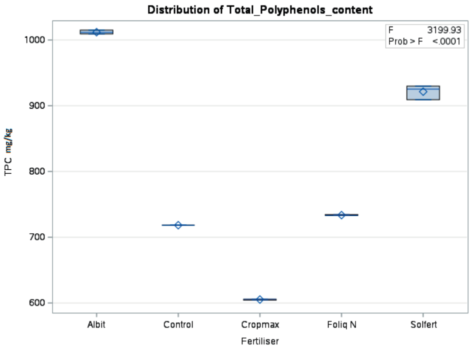

Figure 3. The influence of the fertilisers on the fruit moisture content: **(a)** "DDD 67" genotype; **(b)** "Maria Bianca" variety; **(c)** "Eureka" variety; **(d)** "HB 19-9" genotype; **(e)** "Tokinostate" variety

***Total polyphenols content***

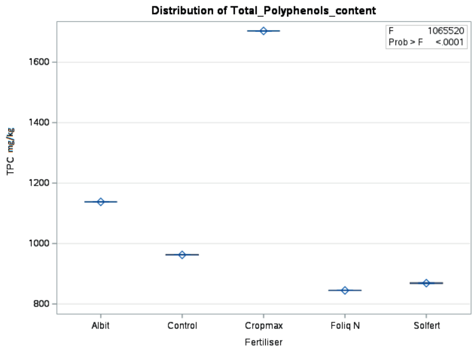
Phenolic compounds are secondary metabolites widely found in fruits, mainly represented by flavonoids and phenolic acids. The increase in interest in these substances is largely due to their antioxidant potential and the relationship between their consumption and the prevention of certain diseases. The health benefits of these phytochemicals are closely related to regular consumption and their bioavailability. Studies have shown the importance of regular fruit consumption, especially for the prevention of diseases associated with oxidative stress (Andreotti et al., 2008; Di Lorenzo et al., 2021; Fraga et al., 2019; Haminiuk et al., 2012; Lima et al., 2014; Mushtaq & Wani, 2013; Vauzour et al., 2010).

Regarding the total polyphenol content of the analyzed genotypes (Figure 4), it varied depending on the genotype, but also on the

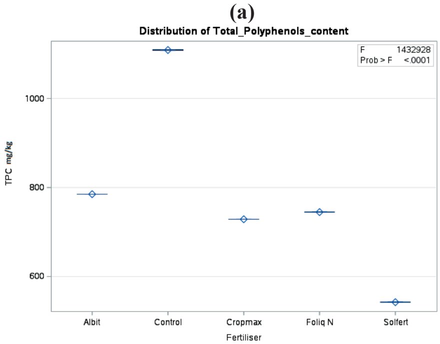
fertilizer used, with significant differences being recorded in each group.
The lowest content in polyphenols (on average) was recorded in the "HB 19-9" genotype (429.14 mg/kg), and the highest in the "Maria Bianca" variety (1103.52 mg/kg).
The highest values (on average) were obtained with the following fertilizers:
- Albit: 1011.86 mg/kg for the "DDD 67" genotype and 1036.39 mg/kg for the "Tokinostate" variety;
- Cropmax: 1703.57 mg/kg for the "Maria Bianca" variety and 564.26 mg/kg for the "HB 19-9" genotype.



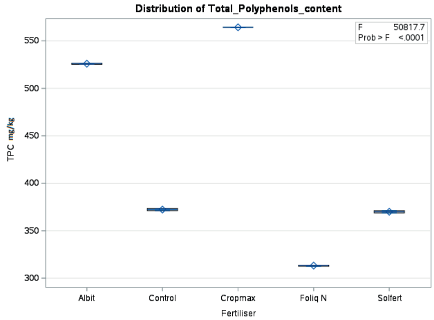
**(a)**



**(b)**



**(c)**



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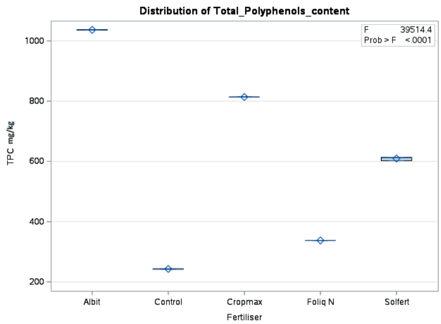

**(e)**

Figure 4. The influence of the fertilisers on the Total polyphenols content: **(a)** "DDD 67" genotype; **(b)** "Maria Bianca" variety; **(c)** "Eureka" variety; **(d)** "HB 19-9" genotype; **(e)** "Tokinostate" variety

## CONCLUSIONS

The selection of the optimal fertiliser is influenced especially by the variety.

Regarding the soluble solid content, in four out of the five genotypes, better results were obtained in the case of the use of biological fertilizers (especially Cropmax fertilizer), only in the case of the "HB 19-9" genotype were obtained better results in the case of the control, being the only variety in which the control recorded better results compared to all the fertilizers used.

Regarding the fruit moisture, on average, the highest values were recorded in the case of the controls (in two of the genotypes: "DDD 67", "Tokinostate") and in the case of the use of Solfert fertilizer.

Regarding the total polyphenols content, the highest content in polyphenols (on average) was recorded when using fertilizers Albit and Cropmax.

In conclusion, in the case of the analyzed genotypes, the fertilizers, especially the biological ones, had significant positive influences on the internal characteristics of the fruits.

Further research is necessary, especially regarding the influence of the biological fertilisers.

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