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THE EFFECT OF SOME FOLIAR FERTILIZERS ON THE BIOMETRIC CHARACTERISTICS OF THE FRUITS OF PEACH VARIETIES (*P. VULGARIS* L.) GROWN IN THE PEDOCLIMATIC CONDITIONS OF LUGOJ, TIMIȘ COUNTY

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Abstract

Foliar fertilizers play a very important role in obtaining quality harvests and present more and more benefits that increase the resistance of plants to diseases and pests and implicitly to reduce the number of treatments with fungicides and insecticides that have a negative impact on the environment. In order to carry out the research, two lesser-known peach varieties, 'Piros Magdalena' and 'Gold Dust' were studied. The varieties were treated with four foliar fertilizers in three different growth phenophases: the phenophase of intense shoot growth, the phenophase of fruit growth and before fruit ripening. The foliar products used were the following: Albit (organic product), Cropmax (organic product), Foliq N Universal and Solfert. Regarding the fruit mass, among the biological fertilizers, in both varieties, the best results were obtained with the Cropmax fertilizer, and among the chemical fertilizers, the best results were obtained with the Solfert fertilizer in the 'Gold Dust' variety, and with Foliq N Universal fertilizer in the 'Piros Magdalena' variety.

Key words*: fertilizer, peach, fruit mass, 'Gold Dust', 'Piros Magdalena'.*

INTRODUCTION

Fertilizer application is one of the essential cultural practices that play a very important role in obtaining quality harvests (Andreev et al., 2018; Jia et al., 1999). A combination of soil-applied and foliar applied fertilizers is more efficient and can lead to yield benefit and net income increase (Dixon, 2003; Gonzalez et al., 2008).

Moreover foliar fertilizers present more and more benefits that increase the resistance of plants to diseases and pests and implicitly to reduce the number of treatments with fungicides and insecticides that have a negative impact on the environment (Farahy et al., 2021; Iordănescu et al., 2023; Kuepper, 2003; Reuveni & Reuveni, 1998).

Persica vulgaris L. is a species that reacts well to fertilization, being a significant consumer of N and K (Damianov et al., 2022). In terms of production, the peach is the second-most significant temperate fruit crop globally after the apple and one of the most appreciated fruit (Manganaris et al., 2022; Olimpia et al., 2009).

Peach consumption has positive effects on one's health because they are rich in antioxidants, polyphenols, and carotenoids, which are all essential medicinal compounds. Peach consumption has also been linked to a number of therapeutic benefits, including impacts on the heart, chemoprevention, maintaining eye health, obesity, neurodegenerative diseases and antidiabetic activity (Bento et al., 2022; Byrne et al., 2007; Hussain et al., 2021; Noratto et al., 2014).

Considering that in a pre-purchase situation, the external appearance of the fruits has the strongest effect that determines a consumer's choice (Ali et al., 2021; Czarnocińska et al., 2003; Tarancón et al., 2021; Zhang et al., 2014), our research aims to study the effects of some foliar fertilizers on the biometric characteristics of the fruits of two peach varieties in order to enhance fruit quality.

MATERIALS AND METHODS

In order to carry out the research, two lesser-known peach varieties, 'Gold Dust' and 'Piros

Magdalena' (Figure 1 and Figure 2) were studied, which were treated with four foliar fertilizers in three different growth phenophases: the phenophase of intense shoot growth, the phenophase of fruit growth and before fruit ripening. Each variety was divided into four different groups, each group being treated in all phenophases with the same foliar fertilizer.

Figure 1. 'Gold Dust' variety

Figure 2. 'Piros Magdalena' variety

The foliar products used were the following: Albit (organic product) (100 ml/ha), Cropmax (organic product) (1.5 L/ha), Foliq N Universal (5 L/ha) and Solfert (4 kg/ha).

The experiment was conducted in the Lugoj fruit-tree nursery (45°42'22.1"N 21°51'36.1"E), during the year 2022.

The trees were planted in 2015 and are all grafted on Oradea peach rootstock and trained in a "vase-shape". The plantating distances consists in spacing of 4 m between rows and 4 m in the row.

The biometric characterization of the peach fruits involved the determination of their size (fruit height, large diameter, small diameter) and mass (with stone and without stone).

In order to analyze the specific parameters, were taken 15 fruit samples from each group of the two varieties. The fruits had been harvested at their optimal ripening stage.

Fruit height, large diameter and small diameter were determined with the digital caliper (Insize-1108, Loganville, GA, USA) and the mass of the fruits was measured using the analytical balance (Kern PES620-3M, Balingen, Germany).

Statistical calculations were performed using SAS Studio software SAS® Studio 3.8, applying One Way Anova and nonparametric Kruskal-Wallis test at a significance level of 0.05.

RESULTS AND DISCUSSIONS

The results determined for the examined parameters (fruit height, large diameter, small diameter, fruit mass and stone mass) are presented in Table 1, Table 2 and Figures 3-7.

Table 1. The influence of the fertilisers on the characteristics in the 'Gold Dust' variety

Fertiliser	Variable	Mean	Standard Deviation	Minimum	Maximum	Median
Albit	Fruit height (mm)	50.78	2.93	48.41	54.05	49.87
	Large diameter (mm)	55.20	2.56	53.44	58.13	54.02
	Small diameter (mm)	53.86	3.00	51.22	57.12	53.23
	Fruit mass (g)	92.09	18.10	77.91	112.48	85.89
	Stone mass (g)	12.51	1.57	10.87	13.99	12.68
Cropmax	Fruit height (mm)	52.22	2.12	50.21	54.44	52.02
	Large diameter (mm)	57.35	2.40	55.08	59.86	57.11
	Small diameter (mm)	55.55	2.10	54.13	57.97	54.56
	Fruit mass (g)	100.08	10.43	91.81	111.80	96.62
	Stone mass (g)	12.86	1.44	11.26	14.05	13.27
Foliq N	Fruit height (mm)	52.25	1.56	50.96	53.98	51.80
	Large diameter (mm)	58.05	3.16	54.68	60.95	58.52
	Small diameter (mm)	56.76	2.81	54.27	59.81	56.20
	Fruit mass (g)	101.84	10.22	90.86	111.09	103.56
	Stone mass (g)	12.86	0.54	12.25	13.26	13.08
Solfert	Fruit height (mm)	52.52	3.79	49.39	56.73	51.43
	Large diameter (mm)	58.45	7.40	52.78	66.82	55.75
	Small diameter (mm)	56.73	4.88	52.77	62.18	55.25
	Fruit mass (g)	104.57	32.02	81.80	141.18	90.72
	Stone mass (g)	11.81	1.93	9.93	13.78	11.73

Table 2. The influence of the fertilisers on the characteristics in the 'Piros Magdalena' variety

Fertiliser	Variable	Mean	Standard Deviation	Minimum	Maximum	Median
Albit	Fruit height (mm)	51.82	1.97	50.12	53.98	51.35
	Large diameter (mm)	57.39	3.01	55.41	60.85	55.90
	Small diameter (mm)	56.55	4.18	51.79	59.62	58.23
	Fruit mass (g)	96.34	19.36	80.52	117.93	90.57
	Stone mass (g)	12.08	0.22	11.94	12.33	11.96
Cropmax	Fruit height (mm)	55.20	3.15	51.67	57.73	56.20
	Large diameter (mm)	58.46	2.05	56.10	59.81	59.48
	Small diameter (mm)	56.40	2.97	53.14	58.95	57.12
	Fruit mass (g)	101.02	9.53	90.58	109.26	103.22
	Stone mass (g)	10.20	1.22	8.89	11.30	10.42
Foliq N	Fruit height (mm)	53.36	1.83	52.05	55.45	52.59
	Large diameter (mm)	57.36	3.19	53.69	59.42	58.98
	Small diameter (mm)	56.33	3.55	52.38	59.23	57.39
	Fruit mass (g)	100.43	15.26	83.20	112.22	105.88
	Stone mass (g)	9.97	1.19	9.01	11.30	9.61
Solfert	Fruit height (mm)	51.35	2.65	49.80	54.41	49.84
	Large diameter (mm)	55.66	4.09	51.10	58.99	56.89
	Small diameter (mm)	55.64	2.51	52.77	57.42	56.72
	Fruit mass (g)	93.69	17.23	75.34	109.53	96.19
	Stone mass (g)	9.85	1.13	8.65	10.89	10.01

Fruit height values (Figure 3)

'Gold Dust' variety had values of the fruit height between 48.41 mm (Albit fertiliser) and 56.73 mm (Solfert fertiliser), with an experiment average of 51.94 mm, with no significant differences recorded. The best results (52.52 mm mean) were obtained with the Solfert fertiliser. Between the organic fertilisers the best result were obtained with the Cropmax fertiliser (52.22 mm mean).

Fruit height values in the 'Piros Magdalena' variety were between 49.80 mm (Solfert fertiliser) and 57.73 mm (Cropmax fertiliser), with an experiment average of 52.93 mm, with no significant differences recorded. As can be seen in Figure 3 **(b)** the best results regarding the fruit height were obtained with the Cropmax fertiliser (55.20 mm mean).

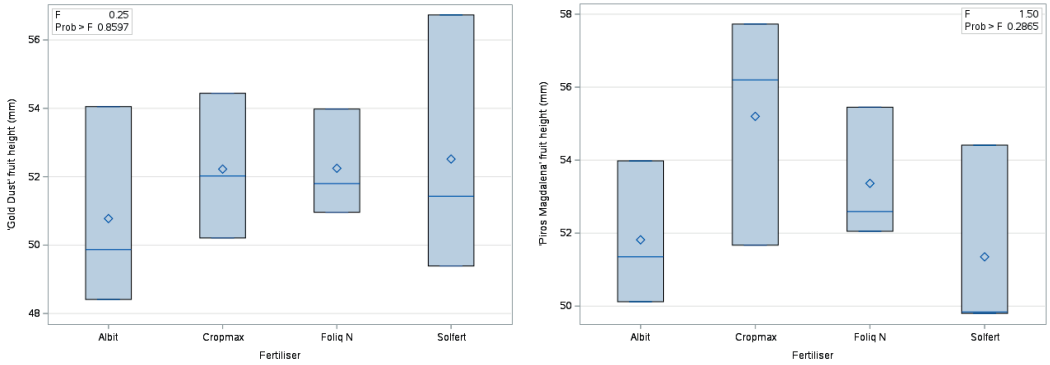

Figure 3. The influence of the fertilisers on the fruit height: **(a)** 'Gold Dust' variety; **(b)** 'Piros Magdalena' variety

Fruit large diameter values (Figure 4)

'Gold Dust' variety fruits had values of the large diameter between 52.78 mm (Solfert fertiliser) and 66.82 mm (Solfert fertiliser), with an experiment average of 57.26 mm, with no significant differences recorded. The best results (58.45 mm mean) were obtained with the Solfert fertiliser. Between the organic fertilisers, the best results were obtained with the Cropmax fertiliser (57.35 mm mean).

Values of the large diameter of the fruits in the 'Piros Magadalena' variety ranged between 51.10 mm (Solfert fertiliser) and 60.85 mm (Albit fertiliser) with an experiment average of 57.21 mm, the differences not being statistically significant.

The best results for this variety were obtained with the Albit fertiliser (57.39 mm mean).

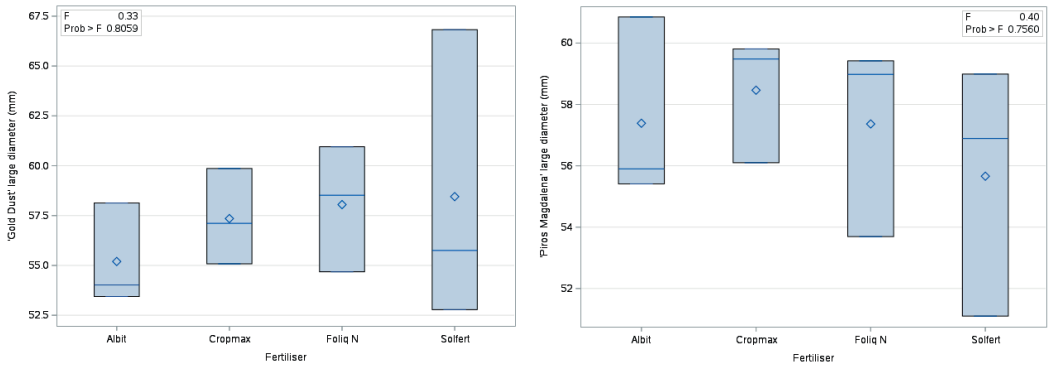

Figure 4. The influence of the fertilisers on the large diameter: **(a)** 'Gold Dust' variety; **(b)** 'Piros Magdalena' variety

Fruit small diameter values (Figure 5)

'Gold Dust' variety fruits had values of the small diameter between 51.22 mm (Albit fertiliser) and 62.18 mm (Solfert fertiliser), with an experiment average of 55.72 mm, with no significant differences recorded. The best results (56.7 mm mean) were obtained with the Foliq N fertiliser. Between the organic fertilisers, the best results were obtained with the Cropmax fertiliser (55.55 mm mean).

Values of the small diameter of the fruits in the 'Piros Magadalena' variety ranged between 51.79 mm and 59.62 mm (Albit fertiliser), with an experiment average of 56.23 mm, the differences not being statistically significant. The best results for this variety were obtained with the Albit fertiliser (57.39 mm mean).

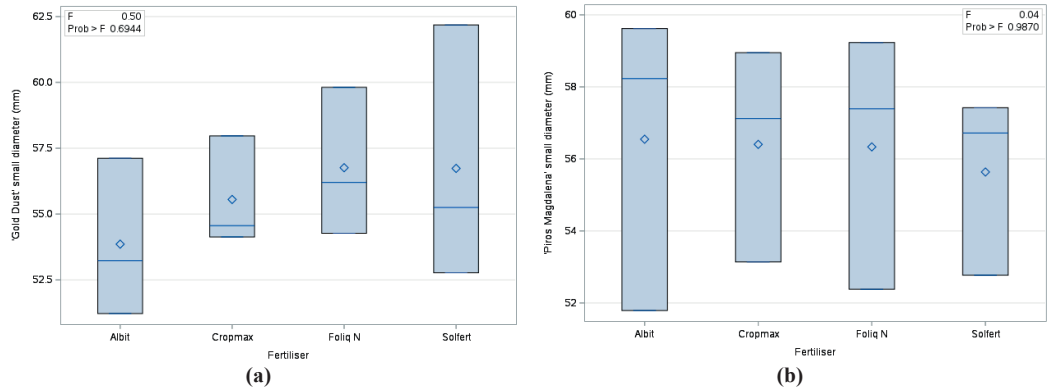

Figure 5. The influence of the fertilisers on the small diameter: **(a)** 'Gold Dust' variety; **(b)** 'Piros Magdalena' variety

Fruit mass values (Figure 6)

'Gold Dust' variety had values of the fruit mass from 77.91 g (Albit fertiliser) to 141.18 g (Solfert fertiliser), with an experiment average of 99.64 g, with no significant differences. The best results (104.57 g mean) were achieved with the Solfert fertiliser. Among the organic fertilisers the best result were obtained with the Cropmax fertiliser (100.08 g mean).

Fruit mass values in the 'Piros Magadalena' were between 75.34 g (Solfert fertiliser) and 117.93 g (Albit fertiliser), with an experiment average of 97.87 g, with no significant differences recorded. The best results regardind the fruit mass were registered with the Cropmax fertiliser (101.02 g mean).

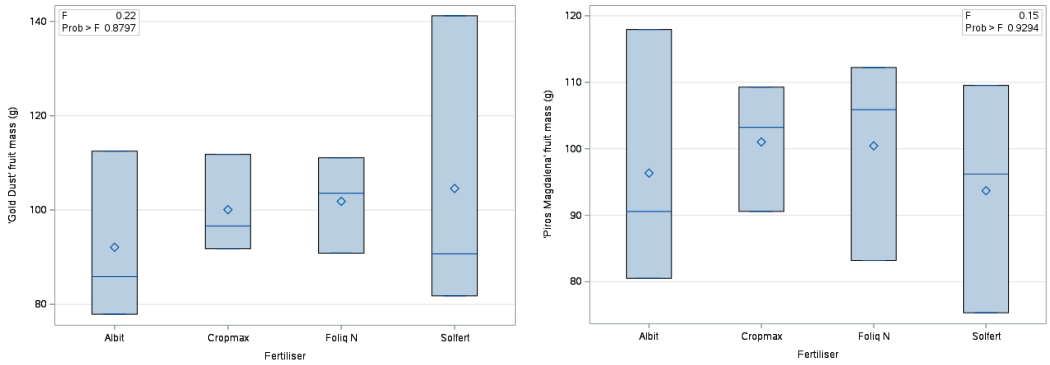

Figure 6. The influence of the fertilisers on the fruit mass: **(a)** 'Gold Dust' variety; **(b)** 'Piros Magdalena' variety

Stone mass values (Figure 7)

The lowest values of the stone mass were recorded in both varieties with the Solfert fertiliser.

'Gold Dust' variety had values of the stone mass from 9.93 g (Solfert fertiliser) to 14.05 g (Cropmax fertiliser), with an experiment average of 12.51 g, with no significant differences. Among the organic fertilisers the lowest values of the stone mass were obtained with the Albit fertiliser (12.51 g mean).

The values of the stone mass in the 'Piros Magadalena' variety were the closest ($p>0.0891$) to a p-value that can indicate a statistical difference between the foliar fertilisers. In this case, the studied parameter values were between 8.65 g (Solfert fertiliser) and 12.33 g (Albit fertiliser), with an experiment average of 10.52 g. As shown in Figure 7 **(b)**, the highest values of the stone mass were registered with the Albit fertiliser (12.08 g mean), with a very small standard deviation (± 0.22 g) and the lowest values with Solfert fertiliser (9.85 g mean).

Furthermore, to confirm the results obtained after applying the One Way Anova test, the non-parametric Kruskal-Wallis test was also applied for all the examined parameters. In all performed determinations, the p-value was higher than 0.05, which also indicates that the differences between the effect of foliar fertilisers are small in value and do not have statistical significance.

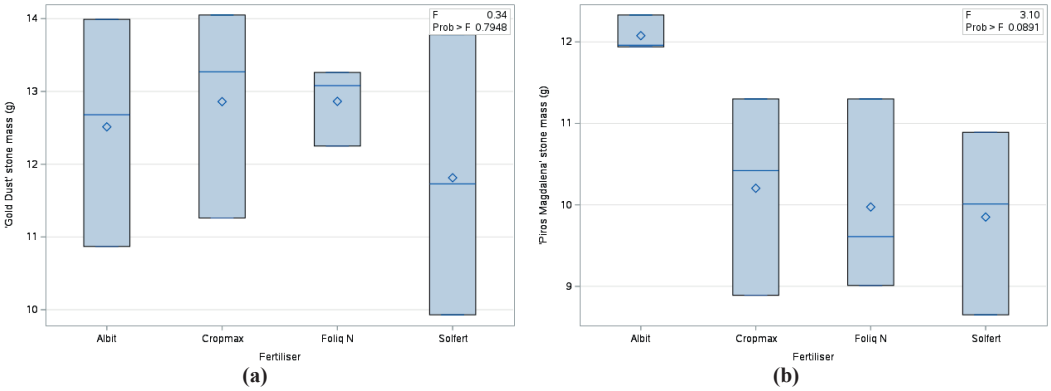

Figure 7. The influence of the fertilisers on the stone mass: **(a)** 'Gold Dust' variety; **(b)** 'Piros Magdalena' variety

CONCLUSIONS

The effect of foliar fertilizers on biometric characteristics is different depending on the variety, however, in this case without statistical significance.

Regarding the fruit mass, the best results were obtained with the Solfert fertiliser in the 'Gold Dust' variety and with the Cropmax fertiliser in the 'Piros Magdalena' variety. Among the biological fertilizers, in both varieties, the best results were obtained with the Cropmax fertilizer, and among the chemical fertilisers, the best results were obtained with the Solfert fertilizer in the 'Gold Dust' variety, and with Foliq N Universal fertiliser in the 'Piros Magdalena' variety.

Future research is necessary, especially regarding the influence of the fertilisers on the internal characteristics of the fruits.

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