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The influence of fertilization on dry matter and sugar accumulation in the Delta nectarine cultivars

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Abstract

The values of dry matter and sugars in the nectarine cultivars tend to decrease to the minimum or increase to the maximum, depending on the particular cultivar, on the environmental factors, or on the use of fertilizers and the applied agro-technical methods. The values of the chemical properties reach the maximum value during a year characterized by abundant rainfall (800 mm distributed evenly), optimal duration of sunshine and high temperatures (proper to the cultivation of nectarines). The present paper demonstrates that if fertilizers are applied in optimal doses, at the proper time, these values increase. The chemical properties give taste and flavor to nectarines, also increasing their nutritional value. The research was carried out at the tree-vineyard plantation of the University of Agricultural Science and Veterinary Medicine of the Banat Timişoara.

Keywords: characteristics, cultivar, experiment, organic

1. Introduction

The research was conducted to study the importance of using various types of both organic and mineral fertilizers, as well as the direct influence of these fertilizers applied in different doses on the chemical properties of fruit (dry matter and sugars). The research was structured in two phases. Phase 1, in which the fertilizers were applied and then samples were collected and Phase 2, in which analysis and calculations were performed. The testing was carried out on the Delta nectarine cultivars, the experiment was monofactorial and it was organized after the pattern of randomized storey blocks, using the 5 experimental variants / in four repetitions. The peach trees were grafted onto Mirabelle plum trees and rootstocks, and these proved to be quite suitable for the peach tree, if taking into consideration the clay loam soil texture which has not influenced the experiment in any way [1,2].

2. Materials and Method

The fertilizers that have been used had the following graduations: v1- unfertilized (witness variant), v2 – manure 40 t/ha (organic fertilizer), v3- $N_{30}P_{30}K_{30,}$, v4 - $N_{45}P_{45}K_{45}$, v5 – $N_{90}P_{45}K_{45}$.

The Delta nectarine cultivar is an American variety of nectarines obtained by embryoculture at the Rutgers, The State University of New Jersey. It was studied in the seedling stage, and then selected and approved by the S.C.P.P. Trajan's Wave in 1991. The tree is of an average vigor and it has a globulous crown with mixed fruit branches. The flowering buds are located in the middle of the branch and their shape is campanulated. The fruit is rather small in size (75-95 g), it is of a spherical shape, slightly elongated, with a relatively thick skin which is also glossy, the flesh is of a yellowish green color, but 60-70% of its covering is bright red. It contains about 7-11% dry matter. The flesh is semi adherent and each kernel is about 10-16% of

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the fruit's weight. It has an early maturation. The agrobiological characteristics of the Delta nectarine cultivars are the following: faster fruit bearing, greater production, and a better resistance when confronted with diseases, especially when it develops blisters (Taphrina deformans), and moreover it is an early ripening nectarine with high quality fruits [3,4].

The chemical composition of the fruits affected by the fertilization variants was determined as it follows: content of soluble dry matter and content of carbohydrates (sugars). The soluble dry matter has been determined by using the Zeiss hand refractometer as it follows: from 25 fruits in each variant the fruit pressing method was used to extract the juice, and then it was put with a rod on an ebonite plate of the refractometer and the reading process began. That means that there have been performed 25 readings for a variant and the average number of the readings was also taken into consideration.

Regarding the sugar content, this process has been determined by reading the soluble substance on the refractometer using the formula:

Sugars % = [(read dry matter × 4.25) /4] – 2.5

3. Results and Discussion

Analyzing the Table 1, one can see the influence of fertilizers on the soluble dry matter. The best results are obtained from the variants where mineral fertilizers have been applied V_4 ($N_{45}P_{45}K_{45}$) and V_5 ($N_{90}P_{45}K_{45}$).

Regarding the sugar accumulation in the Delta nectarine cultivars one can observe significant differences in the chemical fertilized variants (V3, V4, and V5). The highest value of sugar was obtained in the fruits of the fifth variant ($N_{90}P_{45}K_{45}$), the total percentage obtained was of 7.88 sugars (Table 2 and Figure 2).

Table 1. Effective dry matter of the Delta nectarine cultivar on the period 2009-2011

The variant	The carbohydrates (sugars) (%)	The relative value (%)	The difference compared to the witness (%)	The signification
V_1 - mt. unfertilized	8.30	100.00	0.00	wt.
V_2(manure 40t/ha)	8.60	103.47	0.30	-
V_3($N_{30}P_{30}K_{30}$)	9.00	107.89	0.70	x
V_4($N_{45}P_{45}K_{45}$)	9.30	111.01	1.00	x
V_5($N_{90}P_{45}K_{45}$)	9.80	117.08	1.50	xx

DL5% = 0.33; DL1% = 1.43; DL0.1% = 2.58

Table 2. Glucides (sugars) of the Delta nectarine cultivar on the period 2009-2011

The variant	The carbohydrates (sugars) (%)	The relative value (%)	The difference compared to the witness (%)	The signification
V_1 - mt. unfertilized	6.35	100.00	0.00	wt.
V_2(manure 40t/ha)	6.67	104.81	0.32	-
V_3($N_{30}P_{30}K_{30}$)	7.06	111.02	0.71	x
V_4($N_{45}P_{45}K_{45}$)	7.35	115.35	1.00	x
V_5($N_{90}P_{45}K_{45}$)	7.88	123.91	1.53	x

DL5% = 0.40; DL1% = 1.55; DL0.1% = 2.70

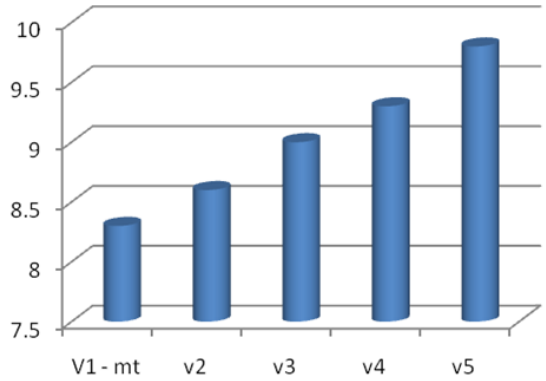

Figure 1. Effective dry matter (%) of the Delta nectarine cultivar on the period 2009-2011

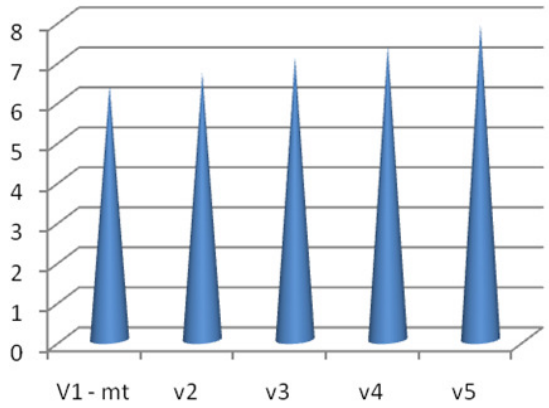

Figure 2. Glucides (sugars, %) of the Delta nectarine cultivar on the period 2009-2011

4. Conclusion

Fertilization, both organic (manure) and mineral has had a great effect on the dry matter and sugar accumulation in the Delta nectarine cultivars. 2010 was a weak year, for the results were not up to our expectations, but the average accumulation in the three years of research on the use of fertilizers has proven to be successful.

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