Annals of the University of Oradea, Fascicle: Environmental Protection, doi.org/10.5281/zenodo.4362307, **Vol. XXXV, 2020**
Analele Universităţii din Oradea, Fascicula: Protecţia Mediului, doi.org/10.5281/zenodo.4362307, **Vol. XXXV, 2020**

THE INFLUENCE OF FERTILIZATION WITH CHEMICAL FERTILIZERS ON PHOSPHORUS AND POTASSIUM PRESENT IN THE APPLE TREE LEAVES DURING 2017-2019 PERIOD

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Abstract

Fertilization represents an important technological link, which is meant to provide on a permanent basis an optimum level of nutritive elements for the soils filled with roots. These have to be accessible for the roots and in adequate relations for the carying out of the physiological balance, in order to encourage a good growth of the trees and an abundant fruit bearing, year after year

Adding fertilizers on the plantations has many possitive effects, such as: the increase of the fruit production, the quickening of the ripening, the increase of the assimilation of the leafage, the prolongation of the trees' lifetime, the growth in resistance of the trees against the frost, against the attacks of the cryptogenic diseases.

Key words: chemical fertilizer, the phosphorus and the potassium present in the leaves, type Golden delicious, type Starkrimson

INTRODUCTION

The effect of the chemical fertilizers on the growth and apple fruit-bearing have raised interest in many researchers. According to the age of the trees, to the depth of the trophic layer, the content of humus and clay in the soil, they proposed fertility systems of the orchards as near as possiblle to the needs of the trees (Amzăr, Branişte, 2000).

Sean from the efficiency angle and from the enorgetic productivity, the proddem of the establisment of an adequated efficient fertility system has a big importance that materializeas in the fruit obtained.

Considered to be the king of the fruits, the apple tree has in its composition considerable quantities of vital elements for the human body such as: carbon hydrate, lignin, cellulose, free acids, pectin, phosphorus, magnesium, A, B, C vitamins (Drăgănescu,2002).

Starkrimson is the most well spread species from the delicious red group because of its weakness and great capacity of fructification. It has big fruits in the shape of a truncated cone, colored in dark red, of a very good quality production needs an adequate division into the zones confronted with the vegetation factors (Cimpoieş et al., 2001).

Golden delicious is the most cultivated species of apple, has middle vigour, forms thick crowns, and has the tendency of overloading with fruits.

It is productive, but for a good quality of the fruit it has to be planted in regions with small atmospheric humidity, otherwise it rusts and it is very sensitive to the scurf and it dehydrates slowly over the period of preserving in normal conditions. The fruit has an average size, spherical, green-yellowish at harvesting, reaching a golden yellow at the consumption maturity, sweet taste and specific flavor (Cimpoieş et al., 2001).

MATERIAL AND METHODS

The research took place in an apple tree orchard at Cheresig country over 2 apple ranges: Golden delicious and Starkrimson grafted on the middle vigor port grafted M_4.

The trees are planted in an intensive system, the distance between the rows being of 4 m and the distance in the row is 5.5-6.0 mg P_2O_5, 6,0-6,5mg K_2O poorly supplied with humus. The yearly rainfalls amount to 625 mm and the yearly average temperature 10,1- 10,5 degrees C. The experiment includes a number of 6 variants, 5 fertilized variants and a witness variant.

The doses of chemical fertilizers for the fertility of the variants from the experiment have been the following: V_1 $N_{40}P_{20}K_0$; V_2 $N_{70}P_{35}$ K_0; V_3 $N_{140}P_{70}K_0$; V_4 $N_{200}P_{100}K_{50}$; V_5 $N_{270}P_{135}K_{70}$ applied in two stagies in spring and autumn.

The total nitrogen was determined through the Kjeldahl method procedure, the nitric nitrogen through the calorimetric method; the phosphorus and the potassium through the gravimetric method.

RESULTS AND DISCUSSION

The supply of the soil with phosphorus in soluble forms was less pointed out in the composition of the leaves, the differences being most of the time insignificant.

The phosphorus didn’t show big variations of the values from one season to another or between the fertile variants and the witness. The growths in phosphorus existed, but they didn’t follow any certain rule, in some cases these have diminishing values unjustified for a Golden delicious (table 1).

Table 1

The phosphorus present in the leaves for the Golden delicious type

Variant	Applied chemical fertilizer (kg/ ha)	Type Golden delicious					
		2017		2018		2019	
		23.04	28. 08	25.04	30.08	24.04	24.08
V_0	-	0.13	0.16	0.15	0.17	0.16	0.17
V_1	$N_{40}P_{20}K_0$	0.19	0.16	0.18	0.19	0.19	0.19
V_2	$N_{70}P_{35}K_0$	0.17	0.17	0.18	0.22	0.17	0.16
V_3	$N_{140}P_{70}K_0$	0.16	0.16	0.20	0.20	0.19	0.19
V_4	$N_{200}P_{100}K_{50}$	0.16	0.17	0.19	0.18	0.18	0.20
V_5	$N_{270}P_{135}K_{70}$	0.19	0.20	0.21	0.24	0.20	0.21

For the Starkrimson type, the condition is quite similar to the Golden delicious. (table 2).

Table 2

The phosphorus in leaves for the Starkrimson apple

Variant	Applied chemical fertilizer (kg/ha)	Type Starkrimson					
		2017		2018		2019	
		23.04	28.08	25.04	30.08	26.04	24.08
V_0	-	0.14	0.15	0.16	0.17	0.17	0.17
V_1	$N_{40}P_{20}K_0$	0.23	0.21	0.27	0.25	0.29	0.28
V_2	$N_{70}P_{35}K_0$	0.23	0.10	0.29	0.26	0.26	0.25
V_3	$N_{140}P_{70}K_0$	0.23	0.24	0.28	0.21	0.30	0.31
V_4	$N_{200}P_{100}K_{50}$	0.25	0.20	0.29	0.23	0.32	0.33
V_5	$N_{270}P_{135}K_{70}$	0.26	0.24	0.28	0.25	0.32	0.35

The potassium

For the Golden delicious type the values of the content in potassium have been registered a regression from spring to autumn, but comparing the fertilized variants and the unfertilized ones the differences were insignificant. High values have been registered for the fertilized variants with potassium (Table 3).

Table 3

Potassium in the leaves for the Golden delicious apple

Variant	Applied chemical fertilizer (kg/ ha)	Type Golden delicious					
		2017		2018		2019	
		23.04	28.08	25.04	30.08	26.04	24.08
V_0	-	1.20	0.78	1.22	0.81	1.23	1.01
V_1	$N_{40}P_{20}K_0$	1.26	0.77	1.25	0.83	1.28	1.05
V_2	$N_{70}P_{35}K_0$	1.24	0.75	1.24	0.75	1.22	0.78
V_3	$N_{140}P_{70}K_0$	1.22	0.78	1.26	0.78	1.28	0.76
V_4	$N_{200}P_{100}K_{50}$	1.43	1.18	1.60	1.11	1.59	1.12
V_5	$N_{270}P_{135}K_{70}$	0.53	1.25	1.68	1.31	1.70	1.19

The values of the potassium content of the leaves grew from one year to another for all variants, except in the third year of experience. During this third year, the process has been used mostly for the fructification process, reaching low values for the V_1, V_2, V_3 variants in comparison with the V_4, V_5 variants. In the case of the last variants, the dosage of the used chemical fertilizer has been much more in comparison with V_1, V_2, and V_3.

Drawing the analysis of V_4, V_5 in comparison with V_1, V_2, V_3, variants, it results that the values of the potassium content of the leaves are higher than in the case of the fertilized variants with larger doses of potassium.

Table 4.

The potassium in the leaves of Starkrimson apple

Variant	Applied chemical fertilized (kg/ha)	Type Starkrimson					
		2017		2018		2019	
		23.04	28.08	25.04	30.08	26.04	24.08
V_0	-	1.46	0.79	1.11	0.82	1.25	1.01
V_1	$N_{40}P_{20}K_0$	1.57	0.77	1.15	0.79	1.37	1.10
V_2	$N_{70}P_{35}K_0$	1.55	0.81	0.95	0.71	1.15	0.91
V_3	$N_{140}P_{70}K_0$	1.65	0.75	0.81	0.69	1.41	0.95
V_4	$N_{200}P_{100}K_{50}$	1.85	1.15	1.51	0.98	1.48	1.11
V_5	$N_{270}P_{135}K_{70}$	1.89	1.21	1.81	1.15	1.65	1.17

CONCLUSIONS

Based on the results obtained after the fertilization with diferent doses of chemical fertilizers, we can draw the following conclusions: the phosphorus was present in relatively close quantities to the fertilized variants. In all the situations, the concentrations have been higher in the fertilized variants in comparison with the witness variant.

The potassium was found in high quantities in the leaves of the trees from the variants fertilized with this element for both ranges.

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