THE INFLUENCE OF FERTILIZATION UPON THE CONTENT OF NITROGEN, PHOSPHORUS AND KALIUM IN THE INTENSIVE SYSTEM APPLE TREE PLANTATION OF DIDACTIC STATION IN TIMIŞOARA

INFLUENȚA FERTILIZĂRII ASUPRA CONȚINUTULUI ÎN AZOT, FOSFOR, POTASIU DIN PLANTAȚIA DE MĂR ÎN SISTEM INTENSIV DE LA STAȚIUNEA DIDACTICĂ TIMIŞOARA

Casiana MIHUȚ, Olimpia Alina IORDĂNESCU

Agricultural and Veterinary University of the Banat, Timişoara, Romania
Corresponding author: Casiana Mihuț, e-mail:mihut.casiana@personal.ro

Abstract: *This work presents the content of the cambic chernozem in total nitrogen assimilate phosphorus and kalium in the intensive system apple tree plantation of Didactic Station Timişoara after fertilization with mineral and organic fertilizers during 2003-2005.*

Rezumat: *Lucrarea prezintă conținutul cernoziomului cambic în azot total, fosfor asimilabil şi potasiu asimilabil din plantația de măr de la Stațiunea Didactică Timişoara în sistemul de cultură intensiv ca urmare a aplicării de îngrăşăminte minerale şi organice pe perioada 2003-2005.*

Key words**:** study, intensive system, soil, nitrogen, phosphorus, kalium
Cuvinte cheie**:** *studii, sistem intensiv, sol, azot, fosfor, potasiu*

INTRODUCTION

The research was made during three years 2003, 2004, and 2005. The soil studied is a cambic batigleic, ortocalcic, clay chernozem on medium-fine loessoide storage.

The planting distance of trees on a row in intensive system is of 2 meters and between the rows is of 4 meters (2x4).

The nutritive elements absorbed by the roots are schematically transported to the top by the gross sap, the backwards movement being the one of the elaborated sap. Some of the elements are enough (phosphorus and kalium) so that in case of insufficiency the alimentation of some parts of the tree can be made by the help of other parts. In this way, the leaves can give a part of kalium to feed the fruits.

MATERIAL AND METHOD

There were applied organic and mineral fertilizers.

Out of the mineral fertilizers there were used:

- fertilizers that contain nitrogen –
- fertilizers that contain phosphorus –
- fertilizers that contain kalium –

The mineral fertilizers that contain nitrogen (%) was given in fractions according to the tree's physiological necessities throughout the vegetation:

- 50% of the doses was applied in spring at the time of bud opening and beginning of shoots' growth;
- 50% was applied in autumn when the wood and tissues are making up.

The mineral fertilizers that contain phosphorus and kalium (ppm) were applied in autumn, under the ploughland.

The organic fertilizer, which is the manure, was applied in autumn, after the start of vegetative stagnation of the apple trees, in the first year of research (2003).

Knowing the fertilizers concentration I active substance, based on the fertilization scheme, there was established the quantity of fertilizers that had to be used for each variant that is for each tree in both cultivation systems.

The experience is polyfactorial, of 2x6, having the fallowing factors:

Factor A – culture system: a_1 – intensive system (4x2);

a_2 – super intensive system (4x1).

Factor B – doses of the mineral and organic fertilizers

Factor B has 6 variants and 4 repetitions:

b_0 – not fertilized witness

b_1 – $N_{70}P_{30}K_0$

b_2 – $N_{100}P_{50}K_{20}$

b_3– $N_{150}P_{100}K_{50}$

b_4 – manure (20t/ha)

b_5 – $N_{50}P_{30}K_{10}$ + manure

The dose of the total nitrogen was established by the use of Kjeldhal method (the mineralization of soil is made by boiling with concentrated sulphuric acid in the presence of a catalyser).

The mobile phosphorus was determined by Egner-Rhiem-Domingo method on a UV-VIS spectrophotometer.

The assimilate kalium was extracted in ammonium lactate acid and it was determined by atomic absorption spectrophotometer.

RESULTS AND COMMENTS

The nitrogen is the essential element for plants' growth and developing. The quantity of total nitrogen was determined in spring and autumn as it can be seen in table and figure 1.

Table 1

The content of soil in total nitrogen (%)

Year	Month	Factor B						Mean	Difference %
		$N_0P_0K_0$	$N_{70}P_{30}K_0$	$N_{100}P_{50}K_{20}$	$N_{150}P_{100}K_{50}$	**g.g.**	g.g. + $N_{50}P_{30}K_{10}$		
2003	April	0.327	0.340	0.370	0.436	0.414	0.442	0.400	0.073
	September	0.305	0.325	0.361	0.432	0.410	0.439	0.393	0.088
2004	April	0.325	0.358	0.382	0.452	0.402	0.430	0.405	0.080
	September	0.303	0.350	0.374	0.448	0.397	0.425	0.399	0.096
2005	April	0.314	0.352	0.390	0.464	0.398	0.428	0.406	0.092
	September	0.300	0.348	0.368	0.452	0.391	0.421	0.396	0.096

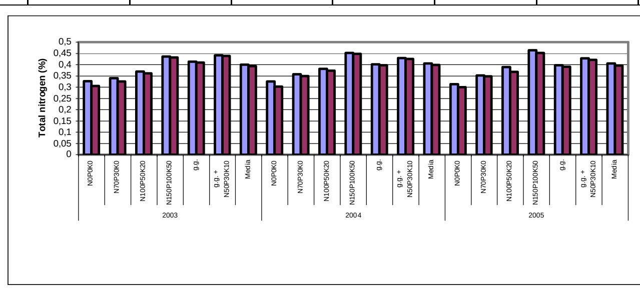

Fig. 1. Dynamic of total nitrogen in the soil, in the intensive system (%)

In 2003, the total nitrogen content varies between 0.340% in b_1 and 0.442% in b_5, which is more than the witness 0.327% at the end of April and between 0.325% and 0.439% at the beginning of September, in the same variants.

In 2004, the total nitrogen content varies between 0.352% in b_1 and 0.452% in b_3, which is more than the witness 0.325% at the end of April and between 0.350% and 0.448% at the beginning of September, in the same variants.

In 2005, the total nitrogen content varies between 0.352% in b_1 and 0.464% in b_3, which is more than the witness 0.314% at the end of April and between 0.348% and 0.452% at the beginning of September, in the same variants having an average of 0.406% in April and 0.396% in September.

The assimilate phosphorus content is presented in table and figure 2.

Table 2

The content of soil in mobile phosphorus (ppm)

Year	Month	Factor B						Mean ppm	Difference ppm
		$N_0P_0K_0$	$N_{70}P_{30}K_0$	$N_{100}P_{50}K_{20}$	$N_{150}P_{100}K_{50}$	g.g.	g.g. + $N_{50}P_{30}K_{10}$		
2003	April	21.69	21.86	22.58	26.85	25.43	27.12	24.76	3.08
	September	21.03	21.26	22.32	26.71	25.32	27.02	24.53	3.50
2004	April	21.43	21.75	22.47	26.80	25.20	27.08	24.66	3.23
	September	21.00	21.23	22.30	26.64	25.19	26.94	24.46	3.46
2005	April	21.38	21.67	22.38	26.75	25.16	26.90	24.57	3.19
	September	19.92	21.19	22.26	26.60	25.09	26.84	24.40	4.48

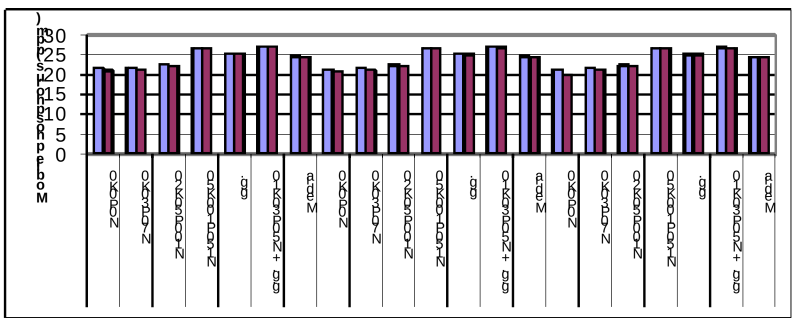

Fig. 2. Dynamic of assimilate phosphorus in the soil, in the intensive system (ppm)

In 2003, the soil content of mobile phosphorus varies between 21.86 ppm in b_1 and 27.12 ppm in b_5, than 21.69 ppm in the witness variant at the end of April and between 21.26 ppm and 27.02 ppm at the beginning of September, in the same variants.

In 2004, the soil content of mobile phosphorus varies between 21.75 ppm in b_1 and 27.08 ppm in b_5, than 21.43 ppm in the witness variant at the end of April and between 21.23 ppm and 26.94 ppm at the beginning of September, in the same variants.

In 2005, the soil content of mobile phosphorus varies between 21.67 ppm in b_1 and 26.90 ppm in b_5, than 21.38 ppm in the witness variant at the end of April and between 21.19 ppm and 26.84 ppm at the beginning of September, in the same variants.

Analyzing the results, we can se that this element does not present high fluctuations during the year. This can be explained by the phosphorus feature that it can be better retained into the soil than the nitrogen that looses throughout levigation. From a year to another, we can remark a decrease of phosphorus quantities because it is used by the trees in the processes of growth and development.

The soil content of assimilate kalium was high, which is normal because the soils in our country have in general a higher content of kalium than the others as we can notice in table 3.

In 2003, the soil content of assimilate kalium varies between 121.5 ppm in b_1 and 252.0 ppm in b_5, at the end of April and between 136.5 ppm and 278.3 ppm at the beginning of September, the average being of 147.2 ppm in April and 190.2 ppm in September.

Table 3

The soil content in assimilate kalium (ppm)

Yean	Month	Factor B						Mean ppm	Difference ppm
		$N_0P_0K_0$	**$N_{70}P_{30}K_0$**	**$N_{100}P_{50}K_{20}$**	**$N_{150}P_{100}K_{50}$**	**g.g.**	**g.g. + $N_{50}P_{30}K_{10}$**		
2003	April	121.5	121.5	143.0	202.6	170.1	252.0	147.2	25.7
	September	136.5	136.5	152.0	209.3	188.0	278.3	190.2	66.7
2004	April	140.1	140.1	132.8	208.0	165.6	245.1	174.7	52.6
	September	144.8	144.8	140.5	215.6	185.8	281.6	189.7	64.9
2005	April	123.3	123.3	136.2	187.3	160.7	214.7	164.4	41.1
	September	124.0	124.0	142.6	194.4	175.3	232.5	173.8	49.8

In 2004, the soil content of assimilate kalium varies between 140.1 ppm in b_1 and 245.1 ppm in b_5, than 140.1 ppm in the witness variant at the end of April and between 144.8 ppm and 281.6 ppm at the beginning of September, in the same variants, the average being of 174.7 ppm in April and 189.7 ppm in September.

In 2005, the soil content of assimilate kalium varies between 123.3 ppm in b_1 and 214.7 ppm in b_5, at the end of April and between 124.0 ppm and 232.5 ppm at the beginning of September, the average being of 164.4 ppm in April and 173.8 ppm in September.

CONCLUSIONS

Analyzing the results obtained during the research made upon the cambic, batigleic, ortocalcic chernozem in the apple tree plantation of Didactic Station in Timişoara between 2003-2005 we can discuss the fallowing conclusions:

1. The total nitrogen content varies between 0.300% in September 2005 in b_0 variant and 0.442% in April 2003 in b_5 variant. The total nitrogen content is between medium to high limits.

2. The assimilate phosphorus content varies between 19.92 ppm in September 2003 and 27.12 ppm in April 2003. We can say that this soil has a medium quantity of phosphorus.

3. The assimilate kalium content varies between 121.5 ppm, variant b_0 in April 2003 and 288.0 ppm, variant b_4 in September 2003. the soil has a low or medium quantity of kalium, as an exception being variant b_5, which has a good content of this element.

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