RESEARCH REGARDING THE CHEMICAL FERTILIZATION UPON THE GROWTH, FRUIT- BEARING AND PREMATURE DEATH OF THE APRICOT – TREE

CERCETĂRI PRIVIND INFLUENȚA FERTILIZĂRII CHIMICE ASUPRA CREŞTERII, RODIRII ŞI PIEIRII PREMATURE A CAISULUI

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Abstract. *In the period 1999 – 2008 in Oradea, on a brown soil silty texture with 2,11 per cent humus and 36,5 – 42,5 per cent clay, there was organized an experiment with 8 variants, with chemical fertilizers NPK, in order to observes, as well as the growth and fruitage of the trees. The results obtained show that the level of phosphorous and potassium in soil is positively and at significant rate influenced by the doses of fertilizers applied. The premature death is influenced by the doses of NPK and it is more frequent in the case of nitrogen applied in unilateral way or in double dose*.

Key words: apricot tree, chemical fertilization, fruitage, premature death

Rezumat. *În perioada 1999 – 2008 în zona Oradea, pe un sol cu textură aluvionară, cu 2,11 % humus şi 36,5 – 42,5 % argilă a fost organizată o experiență cu 8 variante, folosindu – se fertilizatori chimici cu NPK, pentru a se observa dezvoltarea şi rodirea pomilor, precum şi efectul fertilizării chimice asupra pieirii premature a caisului. Pieirea prematură este influențată de dozele de NPK şi este mai frecventă în cazul în care azotul se aplică singur sau în doză dublă.*

Cuvinte cheie: cais, fertilizare chimică, rodire, pieire prematură

INTRODUCTION

The importance of the apricot – tree in our country fruit – growing is small, mainly because as a result a higher sensitivity of the species towards the climatic conditions.

Reduction of these negative influence can be obtained by the use of proper technological measures, among them being the fertilization.

Taking into account the role of a proper fertilization in order to produce a balance apricot – tree orchard in Oradea region there were carried out researches in order to study the tree reaction when chemical fertilizers are used.

The apricot – tree plantation came into being in 1997, on brown soil with clay – texture, with an average content of clay of 40,2 % and 2,11% humus on the depth of the profile of 0 – 40 cm.

During the studied period of time, the pluviometric conditions were at 613,1 mm close to the normal, with the extremely lowest of 470,7 mm and highest of 799,7 mm.

From the point of view of the temperature, the values were lower than the normal ones, the average temperature was 10,0°C with an absolute minimum of -21,6°C.

MATERIAL AND METHOD

The plantation was made with the variety of The Best of Hungary engrafted on apricot – tree, the planting distance was 4x5 m and the top was freely flattened. Eight variants were taken into account, tables 1, 2, and 3 placed in blocks at random, with 4 repetitions and 5 trees in a repetition.

The maintenance system of the soil was cultivated field, with autumn ploughing and 3, 4 uses of the disk harrow during the vegetation period. The nitrogen, under the form of the ammonium nitrate was applied in spring, while the phosphorus and potassium were applied in autumn, by spreading it on the whole lot, except the variant no8, for which the phosphorus and potassium were applied once at every 5 years. Observations were made regarding the growing, fruit – bearing and premature death.

RESULTS AND DISCUSSIONS

The growing in thickness of the trunk is presented in table 1. The data presented point out the fact that for all the fertilized variants there are increases compared to the most fertilized trees, increase between 2 and 18%. Analyzing the contribution of each element to the increase, and having the average data for 10 years, it can be noticed that the nitrogen in a dosing of 100 kg/ha s.a. brings a fertilization increase of 14%, when phosphorus (P_2O) is added the increase is 2% and when potassium (K_2O) is added to both of them, the increase is 65. The importance of the nitrogen is pointed out when it also is applied in doses of 200 kg/ha s.a. obtaining an overfulfilment of growing between 8 and 18%.

As concerns the phosphorus and the potassium, table no.1 does not imply that these would positively influence the thickening of the trunk. It can also be underlined the diminishing of the trees grow older, and during the 8th – 10th year of planting there could be noticed a strong recovery of the trees on the lots which were not fertilized, while the trees fertilized with NPK, the increase of the trunk thickening proves reduced values, situated below the level of the witness.

This observation can be also made in the case of the fruit production which is positively related to the trunk thickening.

Table 2 shows that the trees started to bear fruit beginning with the third year from planting and, even if the level of the crop is low, the differences between the fertilized variant and the witness are obvious, with values statistically assured for the experiment.

Table 1

The diameter growth of the trunk at the apricot – tree (mm) under the influence of certain doses of NPK

Variant	Years										Average	
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	mm	%
V_1- witness	10,4	9,9	7,7	5,1	6,0	5,8	1,8	7,5	7,1	5,1	6,64	100
V_2 - N_{100}	12,0	12,6	10,8	9,2	5,3	7,3	1,4	8,7	3,6	5,1	7,60	114
V_3 - $N_{100}P_{80}$	10,8	13,3	8,3	6,2	4,9	6,1	1,1	6,5	5,6	5,3	6,81	102
V_4 - $N_{100}P_{80}K_{100}$	11,2	11,8	11,0	9,0	5,5	6,1	1,7	6,3	3,6	4,1	7,03	106
V_5 - $N_{200}P_{80}K_{100}$	14,7	15,4	10,2	8,8	7,9	8,3	1,3	5,2	3,9	3,0	7,07	118
V_6 –$N_{200}P_{100}K_{100}$	12,5	12,9	8,3	9,1	7,7	6,1	2,3	5,8	5,5	4,0	7,42	112
V_7 –$N_{200}P_{160}K_{200}$	12,1	13,5	9,8	7,6	6,6	5,9	1,1	4,7	6,7	3,8	7,19	108
V_8 –$N_{200}P_{400}K_{500}$ once every 5 years	19,5	8,8	9,3	8,4	5,7	7,9	1,8	8,8	3,7	8,3	7,42	112
Average for years:	12,9	12,3	9,4	7,9	6,2	6,7	1,6	6,7	4,9	4,8	7,24	-

Table 2

The influence of certain doses of NPK upon the fruit production (Oradea 1999 – 2008)

Variant	Years																Average (1999 - 2008)	
	I999		2000		2002		2004		2005		2006		2007		2008			
V_1- witness	1,2	100	0,8	100	2,5	100	0,3	100	0,4	100	1,7	100	4,6	100	6,7	100	2,3	100
V_2 - N_{100}	1,3	113	1,3	173	2,7	108	2,1	700	9,0	203	5,8	341	11,0	239	4,9	73	4,1	178
V_3 - $N_{100}P_{80}$	1,6	135	1,8	233	3,0	120	2,4	800	11,3	256	5,0	294	11,7	125	7,9	118	4,9	213
V_4 - $N_{100}P_{80}K_{100}$	1,5	130	2,6	346	3,3	132	2,4	800	10,2	231	6,6	388	14,4	313	5,5	82	5,1	221
V_5 - $N_{200}P_{80}K_{100}$	1,9	165	1,5	200	3,8	152	2,5	833	10,4	239	3,8	223	8,8	191	3,1	47	4,0	174
V_6– $N_{200}P_{100}K_{100}$	1,8	156	1,3	173	3,4	136	3,1	1033	8,5	193	8,4	494	7,6	165	3,9	100	4,2	182
V_7– $N_{200}P_{160}K_{200}$	1,4	117	2,5	326	2,5	100	1,7	566	8,5	193	5,5	323	11,9	258	5,2	58	4,8	208
V_8– $N_{200}P_{400}K_{500}$ every 5 years	1,9	161	2,0	266	3,3	132	2,6	866	10,9	245	2,8	164	13,7	298	6,7	100	4,9	213
Average for years:	1,5	-	1,7	-	3,0	-	2,1	-	9,2	-	5,0	-	10,5	-	5,5	-78	4,2	-
DL 5%	-		3,3		-		1,77		6,3		2,4		8,7		-		-	

Analyzing the production data on an average of 8 years, it can be noticed that the best results are obtained using the $N_{100}P_{80}K_{100}$ dosage of fertilizer, when the crop was 5,1 t/ha close results were obtained at the trees with a yearly application of the fertilization formula $N_{100}P_{80}$ or N200 yearly $P_{400}K_{500}$, applied every 5 years, which gave an average crop of 4,6 t/ha apricots per year.

It should also be mentioned that the nitrogen is a dosing of 100 kg increased the crop with 78 %, applied together with the phosphorus increased the growth to 113 % and all the three elements together ($N_{100}P_{80}K_{100}$) had an effect of production increase with 121 %.

In cases of using the phosphorus and potassium in larger doses and at larger periods of time (V_8) it should be noticed that this method proved to be better, raising the production with almost a ton of fruit per hectare compared to the V_5 variant which used the same dose of NPK but every year. The superiority of this variant is more obvious, if we take into account the easiness in fertilizing, work and fuel saving.

The premature death, a complex phenomenon which has partly been placed under control up to now, was present at all the variants of the experiment. Table no.3 shows that this phenomenon appears at the majority of them even during the first tree years from the planting, whereas after 12 years being registered dried trees from 16,6% to 50%.

Even the trees which were not fertilized present 20,8% dried trees this percentage appearing on the fifth year from the planting. Out of the three elements that were tried, the one which proves a favourable action is the phosphorus; for the combination $N_{100}P_{80}$ there are 16,6 % dead trees, while for the combination $N200P_{160}K_{100}$ there are up to 20,8% death trees, the same percentage as the trees without fertilizers. The nitrogen doses (100 and 200 kg/ha) can encourage the drying of the apricot – tree with a higher percentage depending on the age, and it can be noticed that, during the first 6 years, the trees die at a yearly rate of 2,95%, while during the 6th and 12th year the rate drops to 1,56%.

Table 3

Premature death of the apricot – tree related to the chemical fertilization Oradea (1999 – 2008)

Variant	Years of experimenting									
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
V_1- witness	4,16	12,5	16,66	20,8	20,8	20,8	20,8	20,8	20,8	20,8
V_2 - N_{100}	8,33	8,33	8,33	16,66	20,8	20,8	20,8	25,0	25,0	25,0
V_3 - $N_{100}P_{80}$	4,16	8,33	8,33	8,33	12,5	12,5	12,5	12,5	16,66	16,6
V_4 $N_{100}P_{80}K_{100}$	4,16	4,16	4,16	12,5	16,66	16,66	20,8	20,8	20,8	20,8
V_5 - $N_{200}P_{80}K_{100}$	-	-	4,16	8,3	16,66	16,66	16,66	20,8	20,8	29,2
V_6- $N_{200}P_{100}K_{100}$	4,16	8,33	12,50	12,5	16,66	16,66	20,8	20,8	20,8	20,8
V_7- $N_{200}P_{160}K_{200}$	4,16	8,33	8,33	8,33	8,3	8,33	16,66	16,66	16,66	20,8
V_8-	-	12,50	20,8	25,00	29,16	29,16	33,33	37,5	37,5	37,5

$N_{200}P_{400}K_{500}$ once every 5 years										
Average V x A cumulated	3,64	7,81	10,4	14,1	17,7	17,7	20,3	21,8	22,2	23,9
Average yearly rate	3,6	4,2	2,6	3,7	3,6	0,00	2,6	1,5	0,4	1,5
Age average rate					2,95	1,56				

CONCLUSIONS

Thickening of the trunk was influenced by the doses of NPK with increases between 2 and 18%, the highest values being registered for the variants which were given bigger doses of nitrogen. The fruit production was better at all the fertilized variants compared to the witness, increases being registered between 78 and 121%. It should be noticed that for the application of 100 kg of nitrogen, the production increased with 78%, when using $N_{100}P_{80}$ the production overfulflled the witness by 113% whereas the application of potassium $N_{100}P_{80}K_{100}$ the increase was of 121%.The best crops were obtained at the variants with the fertilizing levels of $N_{100}P_{80}K_{100}$ and $P_{400}K_{500}$ applied every 5 years.

The premature death is influenced by the doses of NPK, being increased at the doses of nitrogen applied individually or in double dose. In order to diminish the effects of premature death and to spread the apricot – tree growing it is necessary that during the first 10 years the gaps should be completed at a percentage of 3%.

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