THE EFFECT OF CHEMICAL FERTILIZERS AND REMANING EFFECT OF ORGANIC FERTILIZERS UPON THE PRODUCTION AT WINTER WHEAT IN SUGAR BEET – WHEAT – CORN ROTATION

EFECTUL ÎNGRĂŞĂMINTELOR CHIMICE ŞI REMANENŢA CELOR ORGANICE ASUPRA PRODUCŢIEI GRÂULUI DE TOAMNĂ, ÎN ROTAŢIA SFECLĂ PENTRU ZAHĂR – GRÂU – PORUMB

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Abstract. *In bifactorial experience placed after the method of subdivided plots at Ezăreni station, Iaşi has watched the effect of nitrogen fertilizers (N_0, N_{40}, N_{80}, N_{120}, N_{160}) applied on the next agrofunds: $P_{64}K_{64}$; manure 30 t/ha applied on pre-plant (sugar beet) and chaff 5 t/ha + the rest from sugar beet applied to winter wheat. It found that the greatest production of 7940 kg/ha was obtained in chemically fertilized variant followed by organic fertilized with 7055 kg/ha. The fertilization with chemical fertilizers, on average, determined in N_0 variant a production of 6228 kg/ha and 8441 kg/ha in the variant fertilized with N_{160}, production increase being 35,53%. The interaction of factors highlighted variant fertilized with $P_{64}K_{64}$ x N_{160}, who obtained a maximum production of 8788 kg/ha, with an increase of 42,75% compared to variant control.*
Key words: wheat, fertilizer,wheat production

Rezumat. *Într-o experienţă bifactorială, organizată în parcele subdivizate la ferma Ezăreni-Iaşi, s-a urmărit efectul îngrăşămintelor cu azot (N_0, N_{40}, N_{80}, N_{120}, N_{160}) aplicate pe grofondurile $P_{64}K_{64}$, gunoi de grajd 30 t/ha aplicat la planta premergătoare (sfeclă pentru zahăr) şi paie tocate 5 t/ha + coletele de sfeclă aplicate la grâul de toamnă. S-a constatat că cea mai mare producţie, de 7940 kg/ha , s-a obţinut în varianta fertilizată chimic, urmată cu 7055 kg/ha de variantele fertilizate organic. Fertilizarea cu îngrăşăminte chimice, în medie, a determinat o producţie de 6228 kg/ha în varianta N_0 şi 8441 kg/ha în varianta fertilizată cu N_{160}, sporul de producţie fiind de 35,53%. Interacţiunea dintre factori a scos în evidenţă varianta fertilizată cu $P_{64}K_{64}$ x N_{160}, care a realizat o producţie maximă de 8788 kg/ha, cu un spor de 42,75% faţă de varianta martor.*
Cuvinte cheie: grâu, fertilizare, producţia de grâu

INTRODUCTION

From the research carried out so far both in Romania and foreign show that nitrogen has a significant influence on winter wheat yield (Hera et al., 1984, Mihăilă

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et al.,1992, 1980). It was also shown that application of nitrogen and phosphorus fertilizers increase the productivity indices (Hera et al., 1971, Toncea, 1985).

The most important factor determining the growth and of winter wheat caryopses is fertilization with nitrogen (Dorneanu, 1976, Hera, 1984).

The fertilization applied in autumn and spring in divided doses increased the coefficient of use of fertilizers with 8 – 9%. The cumulative effect of nitrogen and phosphorus has a major influence in increasing production of wheat (Burlacu Gh. et al., 2007).

In a long experience at Ezareni station, Iasi, there was realized higher productions of nitrogen fertilizers variants overlap with retition of manure applied to preceding wheat pre – plant: sugar beet (Mogârzan et al., 1998).

When applying nitrogen fertilizers may be an appropiate strategy to ensure the plants requirements for nitrogen. Generally, the nitrogen fertilizers applied to the seedbed preparation are positively affects the wheat plant development and implementation later increases the amount of protein carryopses (Fowler and Brydon, 1989).

The purpose of this paper is to quantify the effect of chemical fertilizers and remaning organic fertilizers over carryopses production for winter wheat.

MATERIAL AND METHODS

The experience was establish in autumn 2010 on Ezareni station, Iasi, by the method in three repetitions subdivided parcels.

The experimental factors were:

A factor – Organic and chemical fertilizer phosphorus and potassium with three graduations:

a_1 – manure 30 t/ha applied to pre – plant (sugar beet) + $P_{64}K_{64}$;

a_2 – chaff 5 t/ha applied to pre – palnt + the rest from sugar beet applied to wheat + $P_{64}K_{64}$;

a_3 – $P_{64}K_{64}$.

B factor – Chemical fertilizer with nitrogen, phosphorus and potassium:

b_1 – $N_0P_0K_0$; b_2 – $N_{40}P_{64}K_{64}$; b_3 – $N_{80}P_{64}K_{64}$; b_4 – $N_{120}P_{64}K_{64}$; b_5 – $N_{160}P_{64}K_{64}$

In autumn plowing were incorporated 64 kg/ha a.i. phosphorus and potassium.

In C agrofound, the nitrogen fertilizers were applied to split, the first half (40 kg n/ha) in the second and third variants and 80 kg N/ha in fourth and fifth variants, the second half of 40 kg N/ha was applied in late spring in third, fourth and fifth variants and the third half was apllied in heading stage in fifth variant.

The experience was mounted on a cambic chernozem soil with medium fertility – good, the content in phosphorus and poatssium is moderate – normal with pH values mild acid to neutral reaction and with clayey-sandy texture.

We used the Glosa variety created by ICCPT Fundulea.

RESULTS AND DISCUSSIONS

In this experience we have analyzed the influence of both chemical and organic fertilizers remaning on caryopses production in crop year 2010 - 2011.

We have studied the inffluence of A factor on winter wheat production (tab. 1) and we have observed that the chemical fertilizers with phosphorus and potassium have made the biggest production of 7940 kg/ha, significantly, with 12,53% higer than version control which has obtained a production of 7055 kg/ha.

Winter wheat productivity was positively influenced by nitrogen doses (tab. 2) the differences of production being very significant . The most carryopses production of 8441 kg/ha was performed on variant fertilized with 160 kg N/ha followed by N_{120}, N_{80} and N_{40} variants with the production of 8039 kg/ha, 7787 kg/ha, respectively 6836 kg/ha.

The productions increased with enlarge doses of nitrogen, the percentage of growth was 9,76% in the N_{40} version, 25,03% in the N_{80} version, 29,07% in N_{120} version and 35,53% in the N_{160} version.

Table 1

The remanent effect of organic fertilizers on wheat production in crop year 2010 – 2011

A factor The remanent organic fertilizers + chemical fertilizers	Average Kg/ha	%	Differences Kg/ha	Significance
a_1 Manure 30 t/ha + $P_{64}K_{64}$	7055	100,00	Mt.	
a_2 Chaff 5 t/ha + $P_{64}K_{64}$	7404	104,94	349,3	
a_3 Chemical fertilizer $P_{64}K_{64l}$	7940	112,54	884,4	*
DI 5%	588,1 kg/ha			
DI 1%	975,2 kg/ha			
DI 0,1%	1821,4 kg/ha			

The figure 1 shows the correlation between the nitrogen doses applied and the obtained production and it's observed that between these two components is a significant correlation ($R^2 = 0,9833$*).

Analyzing the effect of chemical fertilizers interation and retition of organic fertilizers on production (tab. 3) we observed that the agrofound manure 30 t/ha + $P_{64}K_{64}$ variant fertilized with 160 kg N/ha realized a production of 8124 kg/ha, very significant with 31,96% higher than the control variant which has obtained a yield of 6156 kg/ha. Compared with the control variant, N_{120} realized a growth rate of 18,98% being significant. N_{80} and N_{40} variants have obtained higher productions than the control variant, with 14,89% and respectively 7,17%, but statistically uninsured.

On the chaff 5 t/ha + $P_{64}K_{64}$ agrofound, productions was realized with significant differences in interaction with N_{80} (7930 kg/ha), N_{120} (9113 kg/ha) and N_{160} (8412 kg/ha). In variant fertilized with 40 kg N/ha was obtained a yield of 6622 kg/ha, with 7,56% more than version control, but not statistically assured and the unfertilized variant acheved a small production with 211 kg/ha compared to control variant.

Table 2

The effect of nitrogen fertilizer on wheat production in crop year 2010–2011

B factor Nitrogen doses	Average Kg/ha	%	Differences Kg/ha	Significance
N_0	6228	100,00	Mt.	-
N_{40}	6836	109,76	607,4	*
N_{80}	7787	125,03	1559,4	***
N_{120}	8039	129,07	1811,4	***
N_{160}	8441	135,53	2212,9	***
DI 5%	554,0 kg/ha			
DI 1%	753,0 kg/ha			
DI 0,1%	1008,4 kg/ha			

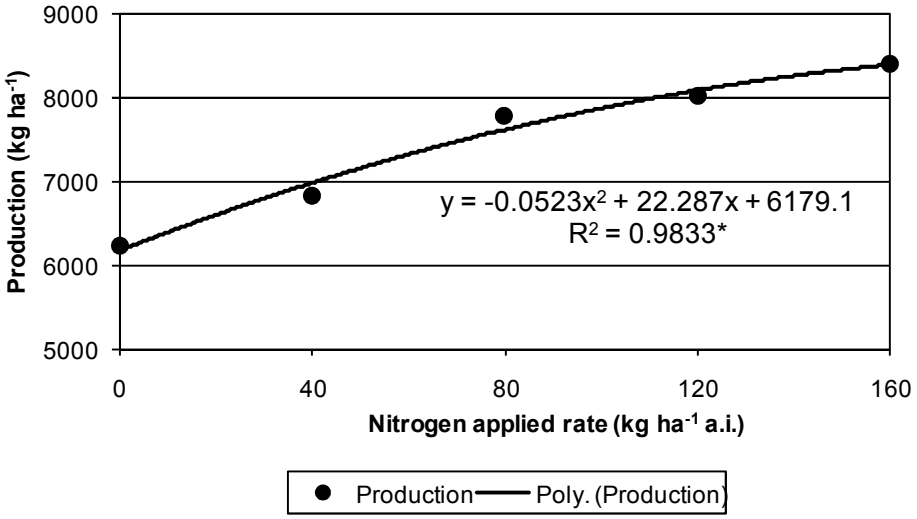

Fig. 1 - The correlation between the nitrogen doses applied and obtained production

All variants on agrofound that have received only chemical fertilizers have achieved higher production version control. Therefore, the variant fertilized with nitrogen had a production increase 6,93%, but wasn't statistically assured while the variant fertilized with 40 kg N/ha achieved a production of 7288 kg/ha, the differences being significant. The variants wich were applied 80, 120 and 160 kg N/ha obtained production of 8630 kg/ha, 8681 kg/ha and 8788 kg/ha, compared to the control variant differences are very significant.

Based on the analyzes performed it's obeserved that one kilogram a.i. of fertilizer to caryopses increased the production of 2,626 kg to 10,591 kg.

The figure 2 shows the correlation between the nitrogen doses applied on the three agrofonduri and obtained productions, in this case all three

nitrogen dose applied on agrofounds is correlated with obtained production, the standard deviation is statistically assured (significant).

Table 3

The effect of interaction of chemical fertilizers and retention of organic fertilizers on wheat production in crop year 2010 – 2011

A factor Organic fertilizers+ PK	B factor Nitrogen doses	Average Kg/ha	%	Differences Kg/ha	Significances	caryopses kg to 1 kg fertilizer a.i.
Manure 30 t/ha + $P_{64}K_{64}$	N_0	6156	100,0	Mt.	-	-
	N_{40}	6598	107,17	441,3		2,626
	N_{80}	7073	114,89	916,6		4,403
	N_{120}	7325	118,98	1168,3	*	4,710
	N_{160}	8124	131,96	1967,6	***	6,831
Chaff 5 t/ha + $P_{64}K_{64}$	N_0	5945	96,57	-211,0		-
	N_{40}	6622	107,56	465,3		2,769
	N_{80}	7930	128,81	1774,0	***	8,528
	N_{120}	8113	131,79	1957,0	***	7,891
	N_{160}	8412	136,64	2255,3	***	7,830
Chemical fertilizers $P_{64}K_{64}$	N_0	6583	106,93	426,3		-
	N_{40}	7288	118,38	1131,0	*	6,732
	N_{80}	8360	135,80	2203,0	***	10,591
	N_{120}	8681	141,01	2524,3	***	10,178
	N_{160}	8788	142,75	2631,3	***	9,136
DI 5%		959,5 kg/ha				
DI 1%		1304,2 kg/ha				
DI 0,1%		1746,7 kg/ha				

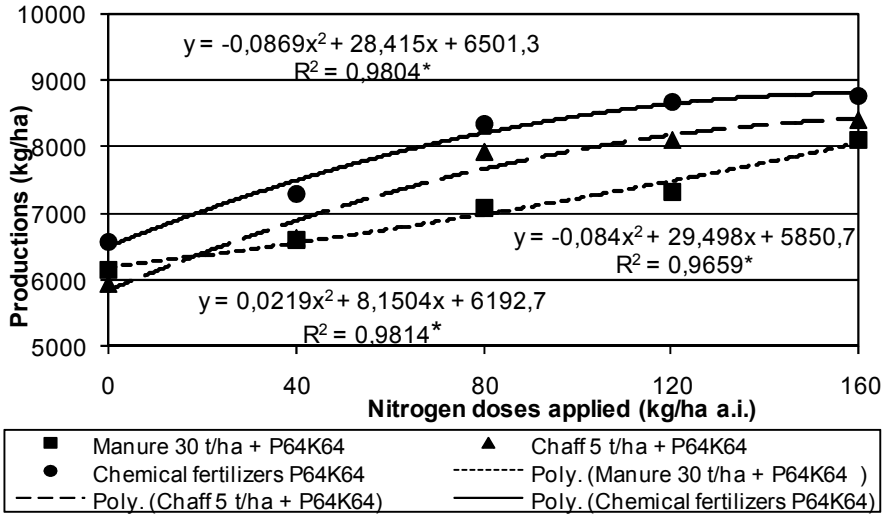

Fig. 2 - The correlation between nitrogen doses applied and obtained productions to the three adrofounds

CONCLUSIONS

1. Analyzing the remaining effect of organic and chemical fertilizers it is observed that the application of chemical fertilizers has obtained the highest yield of 7940 kg/ha wheat.

2. In variants that remaining manure was followed three years and chaff after two years, yieds were reduced by 7055 kg/ha and 7040 kg/ha.

3. The productions of carryops increased with enlarge nitrogen doses applied, the highest of 8441 kg/ha being at N_{160}.

4. The interaction of factors highlighted version $P_{64}K_{64}$ x N_{160} with a production of 8788 kg/ha, the differences from the control variant being very significant.

5. The correlations between nitrogen doses applied and the productions obtained are significant, the standard deviation being statistically assured.

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