

THE INFLUENCE OF NITROGEN FERTILIZATION AND THE INTERACTION BETWEEN NITROGEN AND PHOSPHORUS UPON THE PRODUCTION OF EXOTIC AND RENAN TYPES OF WINTER WHEAT

Popovici Mariana*, Iancu Carmen Violeta**

*University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048
Oradea; Romania, e-mail: mariana_mediu@yahoo.com

**University of Oradea, Faculty of Environmental Protection, 26 Gen. Magheru St., 410048
Oradea; Romania, e-mail: ciancu2000@yahoo.com

Abstract

In order to obtain big and high quality productions of seeds and for bakery, fertilization with chemical fertilizers is a must as it is an important link in the wheat culture technology.

The study related to the influence of fertilization at the Exotic and Renan types of wheat has been performed at Les agricultural farm during the period 2011-2013, in different weather conditions, with a level of rainfall between 418,1 mm/m² in 2011, 491,7 mm/m² in 2012 and 596,7mm/m² in 2013.

The production analysis for the two types of wheat has been performed in the conditions of nitrogen fertilization, in increasing doses: N₆₀P₀, N₁₂₀P₀, N₁₅₀P₀ and the analysis of the complex fertilization with nitrogen and phosphorus in the following doses: N₆₀P₄₀, N₁₂₀P₈₀, N₁₅₀P₁₂₀.

The studies have been done on a brown luvic soil, in four variants, a non fertilized one and three fertilized ones with successively increased doses for each of the two types.

Key words: chemical fertilizers, fertilization, doses of fertilizers, average production

INTRODUCTION

The winter wheat is one of the agricultural plants that has a good reaction to the application of fertilizers in all the pedoclimatical conditions existent in our country(Bâlțeanu, et all, 1989,2003, Muntean,2001).

As an essential measure to increase the productions, fertilization can not issue prescribed results if it is not performed in a context in which the other agricultural and technological measures are performed accordingly. (Berca,1999).

The nitrogen is absorbed by the plants during the whole vegetation period, with different intensity, according to the phenophase. During the first growing period the plants use small quantities of nitrogen. During the period of maximum growing, the period of the vegetative organ formation the plants absorb the highest quantities of nitrogen. (Mocanu et all, 2007).

The nitrogen ensures the rooting and the plantship, it increases the resistance to low temperatures, it increases the number of fertile flowers and it increases the content of proteic substances in the grains. (Borcean et all, 2006).

Nitrogen fertilization brings in a production increase in the wheat culture in comparison with the non fertilized culture. In order to ensure the quality of the production as well, phosphorus is applied too.

Phosphorus is an element that increases the resistance of the plants to the unfavorable vegetation conditions (frost, falling, break, etc)(Rusu et all, 2005).

The optimization of the culture production can be realized by differentiating the fertilizer doses, the combination reports, as well as the type of fertilizer(Berca,1999, Oancea, 2005).

The association of nitrogen fertilizers with phosphorus fertilizers leads to the realization of superior levels of protein content as a consequence of the realization of superior grain productions(Ciobanu et all, 2003, Ciobanu 2007).

In what the wheat is concerned, the interaction between the nitrogen and phosphorus leads to productions of up to 6000 kg/ha(Berca, 2011).

MATERIAL AND METHOD

The study related to the influence of the fertilization level and of the types of fertilizers upon the wheat production for the Exotic and Renan types of wheat have been performed at Les agricultural farm during the period 2011-2013.

The experimental factors analysed have been the following:

- Factor A- type of wheat
 - a₁- Exotic
 - a₂- Renan
- Factor B – fertilization with nitrogen doses:
 - b₁- N₀P₀
 - b₂ – N₆₀P₀
 - b₃ – N₁₂₀P₀
 - b₄ – N₁₅₀P₀
- Factor C- fertilization with nitrogen and phosphorus:
 - c₁ – N₀P₀
 - c₂ – N₆₀P₄₀
 - c₃ – N₁₂₀P₈₀
 - c₄ – N₁₅₀P₁₂₀

The culture technology applied to the two types of wheat has entirely followed the technological requests specific to the wheat in the conditions of a brown luvic soil:

- The sowing has been done during the optimum period 10th-20th of October;
- The fertilizers with phosphorus have been applied in autumn, before the sowing and the fertilizers with nitrogen have

been applied fractionally, 1/3 of the nitrogen has been applied in autumn and 2/3 of the dose has been applied in spring.

The level of rainfall during the three years of culture was different: in 2011 have been registered 418,1 mm/m², in 2012-491,7 mm/m², and in 2013-596,7 mm/m².

For the production analysis for the two types of wheat(factor A) the production level has been studied only in the case of nitrogen fertilization (factor B) and the production level in case of nitrogen and phosphorus fertilization (factor C), and as a witness we have chosen the a₁b₁ variant for the Exotic type N₀P₀ and a₂c₁ – variant for the Renan type N₀P₀.

RESULTS AND DISCUSSIONS

The analysis of the wheat production according to the level of nitrogen fertilization at the Exotic and Renan types of wheat, over the period of the three years of study 2011-2013 is presented in table 1.

Table 1

The influence of the nitrogen fertilization level upon production for the Exotic and Renan types of winter wheat, in the conditions of Leş-Bihor (2011-2013)

Type of wheat	Fertilization variants	Annual production 2011		Annual production 2012		Annual production 2013		Average production 2011-2013	
		Kg/ha	%	Kg/ha	%	Kg/ha	%	Kg/ha	%
Exotic	N ₀ P ₀	2740	100	2910	100	3020	100	2890	100
	N ₆₀ P ₀	3060	111.67	3120	107.21	3240	107.28	3140	108.65
	N ₁₂₀ P ₀	3220	117.51	3280	112.71	3450	114.23	3316	114.74
	N ₁₅₀ P ₀	3350	122.26	3390	116.49	3580	118.54	3440	119.03
Renan	N ₀ P ₀	2910	100	3020	100	3100	100	3010	100
	N ₆₀ P ₀	3130	107.56	3250	107.61	3380	109.03	3253	108.07
	N ₁₂₀ P ₀	3360	115.46	3430	113.57	3590	115.80	3460	114.95
	N ₁₅₀ P ₀	3420	117.52	3650	120.86	3730	120.32	3600	119.60

The wheat production obtained at the Exotic type in those three years of study(2011-2013) at the cultures fertilized with increasing doses of nitrogen, in comparison with the non fertilized witness variant presents positive differences. The highest production of 3580 kg/ha was obtained in N₁₅₀P₀.

At the Renan type during the same analyzed period, the highest production was also obtained in 2013 and it was of 3730 kg/ha at a fertilization dose of N₁₅₀P₀, 2013 at the fertilization with.

Analyzing the three years of study it comes out that the highest production was obtained in 2013 for the three levels of fertilization, this high production being due to the average quantity of rainfall, meaning 596,7mm/m², in comparison with 2011 when there was the lowest level of

rainfall, of only 418,1, fact that had as a consequence a lower level of the obtained productions.

Analyzing the average productions over the three years of study one can notice that the production increase grows proportionally with the increase of nitrogen fertilizer doses, reaching to 19% in comparison with the non fertilized witness. Comparing the two types of wheat analyzed, it can be noticed that the average productions are higher than in what the Renan type of wheat is concerned, both in the non fertilized variant: 3010kg/ha, in comparison with 2890kg/ha in the case of the Exotic type of wheat and of 3600 kg/ha in the case of fertilization with $N_{150}P_0$, in comparison with 3440 kg/ha in the case of the Exotic type of wheat.

The production obtained in the Exotic and Renan types of wheat for the period 2011-2013 through fertilization with different doses of nitrogen and phosphorus are registered in table 2.

Table 2
The influence of nitrogen and phosphorus fertilization upon the Exotic and Renan types of winter wheat in the conditions from Leş-Bihor (2011-2013)

Type of wheat	Variants	Production. 2011		Production. 2012		Production. 2013		Average production 2011-2013	
		Kg/ha	%	Kg/ha	%	Kg/ha	%	Kg/ha	%
Exotic	N_0P_0	2740	100	2910	100	3020	100	2890	100
	$N_{60}P_{40}$	3560	129.92	3650	125.42	3770	124.83	3660	126.64
	$N_{120}P_{80}$	4150	151.45	4320	148.45	4580	151.65	4350	150.51
	$N_{150}P_{120}$	4570	166.78	4880	167.69	5350	177.15	4933	170.69
Renan	N_0P_0	2910	100	3020	100	3100	100	3010	100
	$N_{60}P_{40}$	3850	132.30	3930	130.13	3970	128.06	3916	130.09
	$N_{120}P_{80}$	4260	146.39	4540	150.33	4750	153.22	4516	150.03
	$N_{150}P_{120}$	4870	167.35	5360	177.48	5640	181.93	5290	175.74

Application of complex fertilizers based on nitrogen and phosphorus lead to high productions which exceed 5000 kg/ha, in the case of the two types of wheat taken into consideration in this study (table 3).

Analyzing the average production for the three years of study it can be noticed that, through the application of complex fertilizers, the production increase is significant. At the Exotic type the production increase is of 26.64% when $N_{60}P_{40}$, was applied in comparison with 8.65% when N_{60} , was applied and of 70.69% when applying $N_{150}P_{120}$, in comparison with 19.03% when applying N_{150} . In the case of the Renan type, the production increase is of 8.07% at the fertilization with N_{60} and of 30.09% at the fertilization with $N_{60}P_{40}$, and of 19.60% at the dose of N_{150} , in comparison with 75.74% at the application of $N_{150}P_{120}$.

Table 3

The average production(2011-2013) for the Exotic and Renan types
of winter wheat in the conditions of Leş-Bihor

Type of wheat	Dose of nitrogen N	Average production on nitrogen fertilization		Dose of nitrogen/phosphorus NP	Average production on nitrogen/phosphorus fertilization		Difference	Significance
		kg	%		kg	%		
Exotic	N ₀ P ₀	2890	100	N ₀ P ₀	2890	100	-	-
	N ₆₀ P ₀	3140	108.65	N ₆₀ P ₄₀	3660	126.64	+520	xx
	N ₁₂₀ P ₀	3316	114.74	N ₁₂₀ P ₈₀	4350	150.51	+1034	xxx
	N ₁₅₀ P ₀	3440	119.03	N ₁₅₀ P ₁₂₀	4933	170.69	+1493	xxx
Renan	N ₀ P ₀	3010	100	N ₀ P ₀	3010	100	-	-
	N ₆₀ P ₀	3253	108.07	N ₆₀ P ₄₀	3916	130.09	+663	xx
	N ₁₂₀ P ₀	3460	114.95	N ₁₂₀ P ₈₀	4516	150.03	+1056	xxx
	N ₁₅₀ P ₀	3600	119.60	N ₁₅₀ P ₁₂₀	5290	175.74	+1690	xxx

DL 5%=346, DL1%=578, DL0,1%=751

DL5%=486, DL1%=783, DL0,1=1023

In what the quantity is concerned, the production difference for the Exotic type, in case it was fertilized with complex fertilizers, reaches +520 kg/ha, at a fertilization with N₆₀P₄₀ and +1034 kg/ha, at a fertilization with N₁₅₀P₁₂₀. At the Renan type the difference of production reaches +663 kg/ha, at the fertilization with N₆₀P₄₀ and +1690 kg/ha at the fertilization with N₁₅₀P₁₂₀.

From the analysis of the above presented data it can be noticed that there is a close correlation between the doses of nitrogen and phosphorus applied and the productions obtained.

CONCLUSIONS

The study performed over a period of three years at Leş-Bihor agricultural farm emphasizes the advantages of fertilization with chemical fertilizers, outlined through the obtained wheat productions which depended on the weather conditions existent in those three years of study taken into consideration.

In order to emphasize these we have performed nitrogen fertilizations with doses between N₆₀ și N₁₅₀, as well as fertilizations with nitrogen and phosphorus with doses between N₆₀P₄₀ and N₁₅₀P₁₂₀, for two types of wheat: Exotic and Renan.

In the case of the Exotic type of wheat when the fertilization with nitrogen has been performed the highest production has been of 3580 kg/ha and it was obtained in 2013 when the soil has been fertilized with N₁₅₀P₀, in comparison with the non fertilized variant of only 3020 kg/ha. In the case of Renan type of wheat, during the same analyzed period the highest

production was obtained in 2013, it was of 3730 kg/ha at a fertilization with $N_{150}P_0$, in comparison with the non fertilized variant that had 3100 kg/ha.

At the fertilization with complex fertilizers based on nitrogen and phosphorus, the production increases obtained have been significant, the productions exceeding 5000 kg/ha.

In this way, the production obtained for the Exotic type of wheat in 2011 was of 4570 kg/ha when it was fertilized with $N_{150}P_{120}$ and of 5350 kg/ha in 2013. For the Renan type of wheat, the autumn production obtained in 2011 was of 4870kg/ha when it was fertilized with $N_{150}P_0$, and of 5640 kg/ha in 2013.

The production increase for the three years of study, at the application of complex fertilizers is significant. At the Exotic type, the production increase is of 26,64% in case $N_{60}P_{40}$ was applied in comparison with 8.65% in case N_{60} was applied and of 70.69% if $N_{150}P_{120}$ was applied in comparison with 19.03% in case of applying N_{150} . In the case of the Renan type of wheat, the production increase is of 8.07% at the fertilization with N_{60} and of 30.09% at the fertilization with $N_{60}P_{40}$, and of 19.60% at the dose of N_{150} , in comparison with 75.74% at the application of $N_{150}P_{120}$.

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