

RESEARCH REGARDING THE PHOSPHORUS EXPORT FROM SOIL BY THE WHEAT YIELD IN LONG TERM FIELD EXPERIMENTS FROM AGRICULTURAL RESEARCH AND DEVELOPMENT STATION ORADEA

Albu Ramona*, Ciobanu Gheorghe**, Cosma Corina*

* Agricultural Research and Development Station Oradea, Romania e-mail: scdaoradea@yahoo.com

** University of Oradea, Faculty of Environmental Protection, Oradea, Romania

Abstract

At Agricultural Research and Development Station Oradea have been set up beginning with 1974 long term field experiments regarding the influence of manure, chemical fertilizers and limes on chemical properties of soil, yield levels and it's quality.

The experiments were set up using a unitary design in all the network of research station belonging of INCDA Fundulea. In this experiments were followed aspects regarding the agrochemical indexes soils evolution, the yield answer at fertilizers application, chemical composition of yield and the nutrients uptake by the main and secondary yield.

In this paper is presented the results obtained in experiments with nitrogen and phosphorus regarding the influence of NP fertilizers applied in period 1977 – 2012, on wheat yield and phosphorus uptake by yield. The paper makes comparative analyses between the phosphorus quality applied and the phosphorus quantity uptake from soil by the main yield.

Key words: phosphorus, fertilizers, wheat, yield, rate, preluvosoil.

INTRODUCTION

The preluvosoil from North-West of Romania is a medium soil, provide with the main nutritive elements, with a weak acid reaction in the plough horizon.

Long term fertilization with nitrogen determined the increase of the soil acidity and decrease of the mobile phosphorus.

The application of the fertilizer with phosphorus determined in time important modifications regarding phosphate potential with influence of the yield levels.

The application of phosphorus big rates lead in time to an increasing of phosphorus potential, but a part of phosphorus applied became unavailable.

MATERIAL AND METHOD

The researches in this paper was obtained at Agricultural Research and Development Station Oradea and presents the results of a long term experiments since 1974, after an integrated design established by INCDA Fundulea in all the networks researches.

The factors researched were the nitrogen and phosphorus fertilizers application:

- a. phosphorus rates: P_0 , P_{40} , P_{80} , P_{120} , P_{160} like superphosphate, applied in autumn
- b. nitrogen rates: N_0 , N_{40} , N_{80} , N_{120} , N_{160} , applied like nitrates (1/2 rate in autumn and 1/2 in spring)

The rotation plants used was sunflower – pea – winter wheat – maize.

The results present the effect of nitrogen and phosphorus fertilizers application on the wheat yield content and phosphorus export comparative with phosphorus rates applied.

RESULTS AND DISCUSSION

The influence of nitrogen and phosphorus fertilizers on wheat yield (average 1977 – 2012) is presented in figure 1.

Phosphorus applied unilateral, determined an increasing of yield from 1640 kg/ha to 1990 kg/ha.

The highest yield level was obtained in variants fertilized with 120 kg P_2O_5 /ha. The rate of 160 kg P_2O_5 /ha determined decreasing of yield.

The highest level of wheat yield on this period (4513 kg/ha) was obtained in variants fertilized with $P_{120}N_{120}$.

In average the yield spores obtained because of nitrogen application are taken values between 1244 and 2327 kg/ha, and because of phosphorus application between 222 and 630 kg/ha.

The influence of nitrogen and phosphorus application on phosphorus kernel content (%) of winter wheat is presented in table 1.

The phosphorus content of wheat kernels is weak influenced by the nitrogen and phosphorus fertilizers. The bigger influence on this chemical indexes has nitrogen and phosphorus applied in rates of 80 kg/ha.

Increasing of rates up to these values the phosphorus content of wheat kernels are decreasing. Those mean the best fertilizers rates for the phosphorus content in kernels is $N_{80}P_{80}$.

The influence of phosphorus export through yield is presented in table 2.

The phosphorus uptake by the wheat kernels yield is depending, by the level of yield and by the phosphorus yield content and takes values between 162.69 kg/ha (unfertilized plots) and 524.95 kg/ha (plots fertilized with $N_{120}P_{80}$).

In period 1977 – 2012 the total rate of phosphorus applied has values between 1240 and 4960 kg/ha. It can be observed that exist big differences between the quantity of phosphorus applied and the phosphorus uptake through wheat yield.

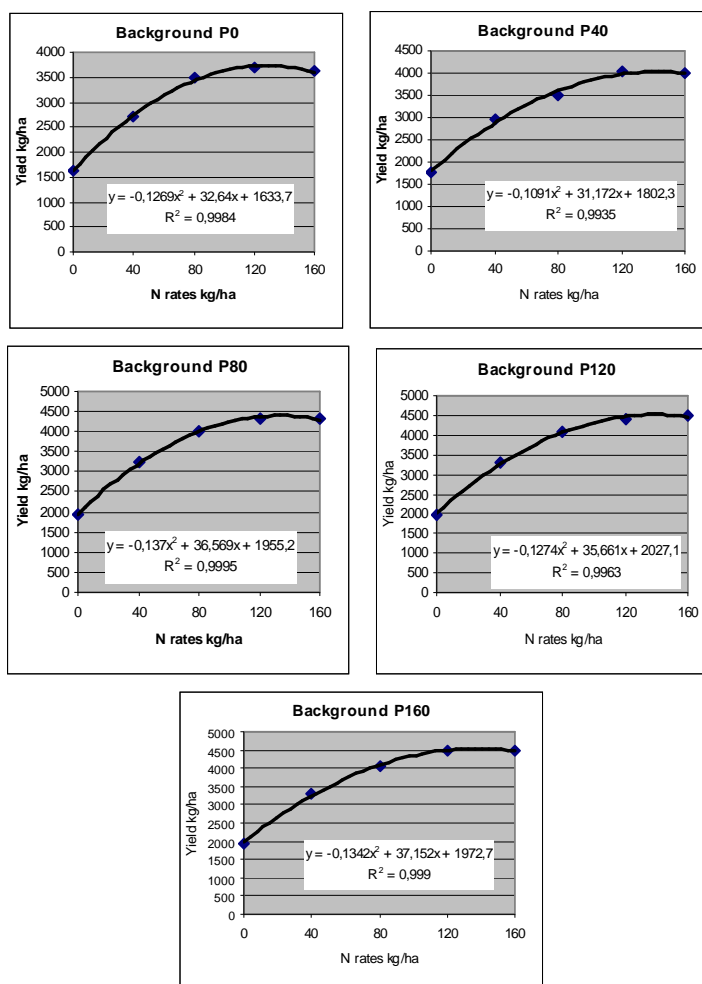
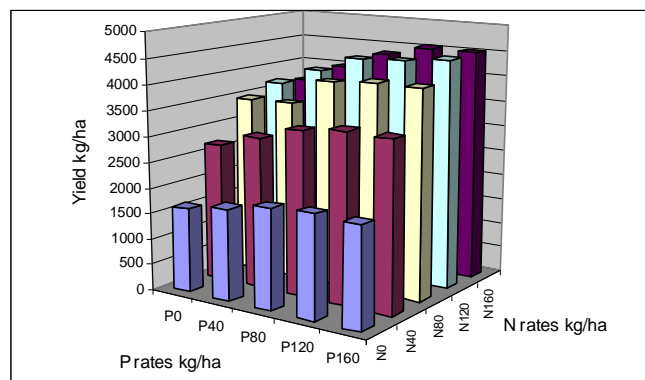


Fig. 1. The influence of nitrogen and phosphorus fertilizers on wheat yield in preluvosoil conditions from Oradea

Table 1

The influence of fertilizers on P total content of wheat kernels

Fertilizer levels		P total (%)					Average		Differences	
		P ₀	P ₄₀	P ₈₀	P ₁₂₀	P ₁₆₀	P(%)	%	P(%)	%
N ₀		0.32	0.34	0.34	0.35	0.35	0.34	100	-	-
N ₄₀		0.33	0.37	0.38	0.37	0.34	0.36	106	0,02	6
N ₈₀		0.35	0.36	0.41	0.41	0.36	0.38	112	0.04	12
N ₁₂₀		0.37	0.38	0.39	0.38	0.34	0.37	109	0.03	9
N ₁₆₀		0.35	0.35	0.37	0.34	0.32	0.35	103	0.01	3
Average	P(%)	0.34	0.36	0.38	0.37	0.34				
	%	100	106	112	109	100				
Differences	P(%)	-	0.02	0.04	0.03	0				
	%	-	6	12	9	0				

Table 2

The phosphorus uptake by the kernels wheat yield in period 1977-2012

Fertilizer levels	The phosphorus uptake by the kernels kg/ha					The N total applied (kg/ha) in period 1977-2012
	P ₀	P ₄₀	P ₈₀	P ₁₂₀	P ₁₆₀	
N ₀	162.69	186.98	204.58	215.92	211.58	-
N ₄₀	276.93	340.20	318.14	380.69	347.29	1240
N ₈₀	377.80	389.82	508.91	518.44	454.14	2480
N ₁₂₀	422.78	473.56	524.95	516.32	471.14	3720
N ₁₆₀	392.44	432.92	494.70	475.41	446.40	4960
The P total applied (kg/ha) in period 1977-2012	-	1240	2480	3720	4960	

CONCLUSIONS

- In the preluvosoil conditions from North-West of Romania, nitrogen and phosphorus rates application strong influence the yield level and it's chemical composition
- The phosphorus uptake in 1977 – 2012 period by the wheat kernels yield is depending by the yield level and by the phosphorus yield content and take values between 162 kg P/ha and 524 kg P/ha
- A part of the phosphorus remaining in soil increase phosphatic potential, but a very important part became unavailable for plants because of it's fixation like immobile nutrient as aluminium and iron phosphates
- The research data obtain show that the best fertilization formula for winter wheat in preluvosoil conditions is $N_{120}P_{80}$ when is realized the best economic results, a good quality of yield and maintaining of phosphorus potential.

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