

INFLUENCE OF FERTILIZATION ON MAIZE YIELD AND QUALITY UNDER CONDITIONS OF SUSTAINABLE AGRICULTURE ON ARGIC CHERNOZEM FROM SCDA CARACAL

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Abstract

Modernization of agricultural structures is an essential factor to ensure food security worldwide, with differentiation from area to area, depending on the level achieved economic progress and the general concept of sustainable development and implementation of systems of production.

Romania has special problems in the materialization of a sustainable agriculture, whereas large areas of agricultural technology are extensive, with limited resources, relying on a low degree of mechanization on human labor, and sometimes even animal traction. In most cases, the technologies are applied on small agricultural land of 1-2 ha, and where they are used as intensively in farms with large areas, are not always harmonize with local particularities and requirements of plants grown.

INTRODUCTION

The objectives of sustainable development must be harmonized with the intensive development, but to protect the environment and achieve high quality products.

The modern concept of sustainable management of soil resources should be based on the old urge to say, it must leave to future generations of agricultural land in a better shape based on the concept "*uses, improves, restores*".

MATERIAL AND METHODS

The experiment was made at Agricultural Research and Development Station Caracal during the 2006 – 2008 years on argic chernozem soil with good natural fertility. The experience has two factors:

- different phosphorus levels of P_0 , P_{40} , P_{80} , P_{120} ;
- different nitrogen levels of N_0 , N_{60} , N_{120} , N_{180} , N_{240} .

The experimented maize hybrid was OLT, sown at a density of 50000 plants/hectare. As control we use the average/agro found variant.

RESULTS AND DISCUSSION

During the experimental period of 2006 – 2008 years the climate conditions were different as favorability for corn culture as follow: the 2006 year was very favorable, the 2007 was unfavorable year due the high temperature from the period of maize vegetation (figure 1) and the 2008 was considered as medium favorable for corn crop in the Caracal Plain.

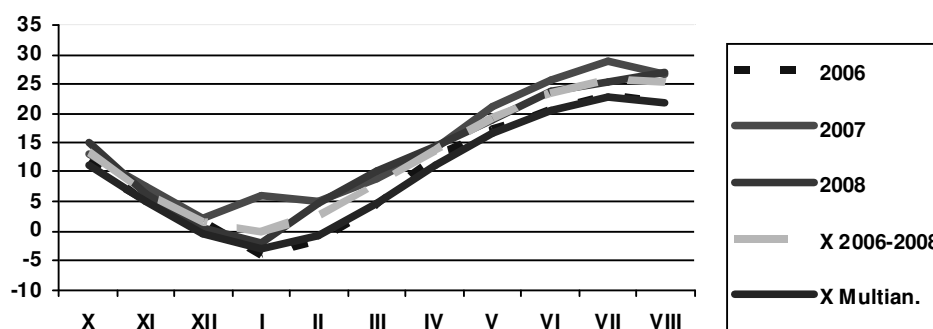


Fig. 1. Temperature during the 2006 – 2008 years

Improving the technology of maize cultivation has contributed to the optimization of growth factors, are achieving new levels of production. With this increased amount of nitrogen and exported with the harvest, this is causing the use of higher doses of nitrogen.

Related to this aspect the standard seed yields obtained at maize crop has registered great amplitude between the years with different plus productions in comparison with the witness (table 1).

In 2006 the recorded average yields varied between 82.7 q/ha on the agro found of P_0 and 91.8 q/ha on the agro found of P_{120} . The influence of the applied phosphorus is clear in the levels of yields, those increasing for every level of fertilization. The nitrogen applied conduct to very significant increases in production on every agro found with phosphorus, but the most valuable variants proved to those with high doses of N_{180} and N_{240} which realized yields over 98 q/ha and respectively 102 q/ha.

In 2007 the level of productions was smaller than the previous year and varied between 21.3 q/ha at the unfertilized variant from the level of P_0 and 30.7 q/ha at the variant with N_{240} on the last agro found of P_{120} . The yields average of every tested agro found was between 25.8 q/ha and 30.4 q/ha, well below the potential production for maize in this area.

Table 1

The influence of the interaction of nitrogen and phosphorus to the maize yield

Factors		Yield (q/ha)			Yield 2006-2008 (q/ha)	Differences		Signif.
		2006	2007	2008		q/ha	%	
P 0	N 0	68.3	21.3	34.8	41.4	-12.7	76.5	ooo
	N 60	75.7	26.3	49.3	50.4	-3.7	93.1	-
	N 120	84.2	29.2	53.4	55.6	+1.5	102.7	-
	N 180	90.0	26.4	62.9	59.8	+5.7	110.5	**
	N 240	95.3	26.0	68.8	63.3	+9.2	117.0	***
Average/agro found		82.7	25.8	53.8	54.1	St	100	St
P 40	N 0	72.7	24.3	40.2	45.7	-12.7	72.2	ooo
	N 60	81.7	29.0	52.1	54.2	-4.2	92.8	o
	N 120	91.7	31.2	60.9	61.2	+2.8	104.7	-
	N 180	96.4	29.7	64.8	63.6	+5.2	108.9	**
	N 240	102.5	29.2	71.2	67.6	+9.2	115.7	***
Average/agro found		89.0	28.6	57.8	58.4	St	100	St
P 80	N 0	75.0	26.1	41.4	47.5	-12.1	79.6	ooo
	N 60	83.5	30.3	53.3	55.7	-3.9	93.4	-
	N 120	93.0	32.2	61.9	62.3	-2.7	104.5	-
	N 180	98.1	30.4	65.7	64.7	+5.1	108.5	*
	N 240	102.6	30.2	71.5	68.1	+8.5	114,2	***
Average/agro found		90.4	29.8	58.7	59.6	St	100	St
P 120	N 0	77.1	26.5	42.0	48.5	-11.9	80.2	ooo
	N 60	84.9	31.0	53.6	56.5	-3.9	93.5	-
	N 120	94.3	32.8	62.0	63.0	+2.6	104.3	-
	N 180	98.7	31.3	65.9	65.3	+4.9	108.1	*
	N 240	104.4	30.7	72.0	69.0	+8.6	114.2	***
Average/agro found		91.8	30.4	59.1	60.4	St	100	St
DL 5%		4.3	2.9	4.7	4.0			
DL 1%		5.8	3.8	6.1	5.2			
DL 0.1%		7.5	5.1	8.6	7.1			

In 2008 the contribution of phosphorus fertilization is highlighted by increases in production to yields obtained. As in previous years are recorded significant production increases at all variants which was given to nitrogen, differences are

very significant in the face of the unfertilized variants per each agro found. The values of the recorded yields varied between 53.8 q/ha on P₀ agro found and 59.1 q/ha on high level of phosphorus of P₁₂₀.

In average 2006 – 2008 the production of grain maize grown in the conditions of SCDA Caracal varied as follows:

- *On the P₀ agro found* – we recorded values of 41.4 q/ha at unfertilized variant to 63.3 q/ha at the N₂₄₀ variant. Unilateral application of nitrogen increases the production to ensure only the N₁₈₀ and N₂₄₀ variants in comparison with the average/agro found of 54.1 q/ha;
- *On the P₄₀ agro found* – application of a moderate dose of phosphorus increased yields which were between 45.7 q/ha in N₀ variant and 67.6 q/ha in variant N₂₄₀. Related to the witness – the average/agro found – with distinct significant increase in production at the N₁₈₀ variant which registered a plus production of 8.9%.
- *On the P₈₀ agro found* – increasing the dose of phosphorus at 80 kg/ha active substances does not conduct to considerable increases, the difference compared to previously level being only 1.2 q/ha. It can be observed nearly identical increases in doses of nitrogen applied to the N₀ variant.
- *On the P₁₂₀ agro found* – we observe almost the same situation than the previous one, with small increase of 2.6 q/ha at the N₁₂₀ variant and 8.6 q/ha at the N₂₄₀ variant.

The agro found with high level of phosphorus of P₁₂₀ ensure increases that are not economic for those applied doses.

From the quality point of view we made analysis to maize seed to determinate the content of nitrogen, phosphorus and potassium.

On a constant phosphorus level (figure 2), applying a dose of nitrogen increased the nitrogen content in maize seed. The higher nitrogen content (1.87%) is found in variant P₄₀N₂₄₀.

On a constant nitrogen agro found the content of phosphorus in maize seed increase on unfertilized variant as increasing quantities of phosphorus administration, reaching maximum level at N₀P₁₂₀ (0.285%). In variants fertilized with N₁₂₀ and N₂₄₀ is increased up to P₈₀, after which it is observed a decrease in content of phosphorus application dose P₁₂₀ (figure 3).

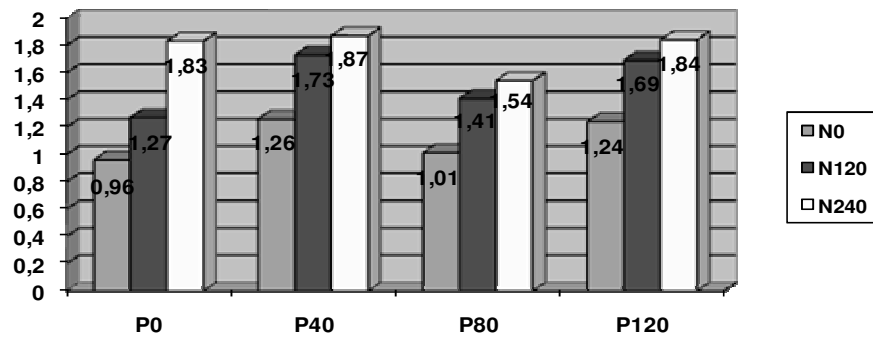


Fig. 2. Nitrogen content (%) of maize seed depending of fertilization with phosphorus and nitrogen

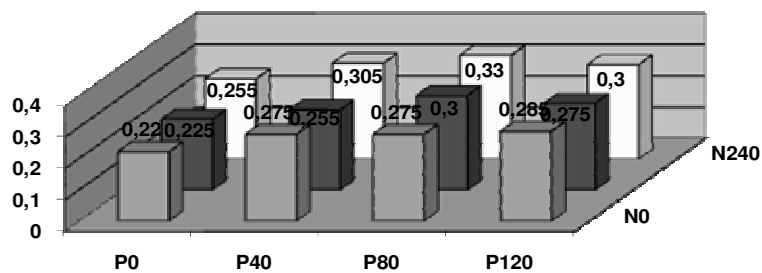


Fig. 3. Phosphorus content (%) of maize seed depending of fertilization with phosphorus and nitrogen

On a constant nitrogen agro found (figure 4), the highest potassium content was observed in a N₂₄₀P₁₂₀ variant of 0.410%.

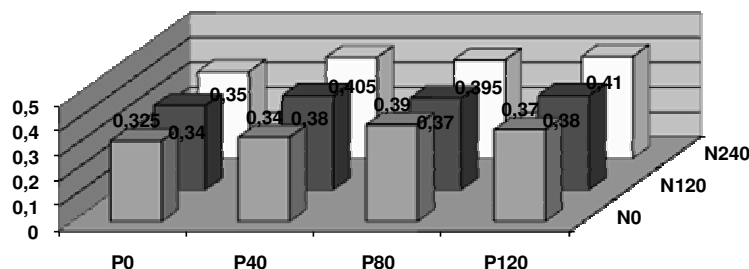


Fig. 4. Potassium content (%) of maize seed depending of fertilization with phosphorus and nitrogen

CONCLUSIONS

Regarding the influence of fertilization on the quantity and quality of the maize yield may hold some important issues, as follows:

1. The maize cropped in the climatic conditions of Agricultural Research and Development Station Caracal has proven to be a culture able to capitalize on good conditions of climate and soil of this area and to generate large grain yield which varied between 41.4 q/ha at P₀N₀ variant to over 69 q/ha at P₁₂₀N₂₄₀ in average on the three experimented years.
2. The most valuable yields, economical point of view, were obtained on the variants with nitrogen of N₁₂₀, N₁₈₀ and N₂₄₀ on the P₄₀ level of phosphorus.
3. The combination of nitrogen fertilization with phosphorus has allowed more efficient recovery of nitrogen from the soil by increasing the nitrogen content of corn beans. The highest levels were determined in samples from plants fertilized with N₁₂₀P₄₀ and N₂₄₀P₄₀.
4. Doses supplementation of phosphorus leads to an increased content of phosphorus in maize grains. From this standpoint, maize has proved to be able to respond to the intake of phosphorus in the growing medium.

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