

RESEARCH REGARDING THE EFFECT OF NITROGEN FERTILIZERS ON CONSTANT BACKGROUND OF PHOSPHORUS ON SUNFLOWER PRODUCTION IN THE CONDITION OF SOIL DIFFERENT TILLAGE

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Abstract

This paper presents the experimental results obtained from the sunflower crops, cultivated on the chernozem from ARDS Caracal in conditions of nonirrigated regime and different soil tillage. The fertilization with different doses of nitrogen on constant background of phosphorus lead to smaller productions for the three methods of soil tillage: working with chisel at normal depth had as result productions between 793 – 3691 kg/ha, working with normal plow produced between 673 – 4091 kg/ha and the use of chisel at 8 – 10 cm depth produced 713 – 3488 kg/ha.

INTRODUCTION

Cultivated as oily plant, sunflower was introduced in Romania towards the end of XIXth century, becoming the most important plant for extracting oil. In order to obtain higher and constant productions it is necessary to organize a crop rotation in which the percent of sunflower cannot pass beyond 17% (Vranceanu A.V., 1974).

Although sunflower is considered a plant relatively resistant to drought, in droughty years sunflower production is much diminished, and even partially or totally compromised (Vannozi G. P. et al., 1988).

The research, made in Romania on sunflower cultivated on chernozem, have shown that fertilizers determined small increases of production (Hera C., 1968).

MATERIAL AND METHODS

Sunflower crop that was analyzed took part of a wheat – corn – sunflower rotation of a polifactorial experiment located on the chernozem from SCDA Caracal after the subdivided plots method.

The experimental field has comprised the following factors:

The A factor – tillage with three graduations:

- a₁ – plowing at 22-25 cm + harrowing and two disking for the seedbed preparation;

- a₂ – chisel at 22-25 cm + harrowing and two disking for the seedbed preparation;
- a₃ – chisel at 8-10 cm + harrowing as a basis tillage and chisel at 8-10 cm for the seedbed preparation.

The factor B – nitrogen fertilization on a constant background of phosphorus P₈₀ with 4 graduations:

- b₁ – N₀
- b₂ – N₄₀
- b₃ – N₈₀
- b₄ – N₁₂₀.

The phosphorus fertilizers have been applied in autumn (as simple superphosphate with 20% P₂O₅) before plowing and the nitrogen as ammonium nitrate (33.5% N) in the established quantities, after drilling.

The soil where the experiment was located is a chernozem that has in the arable layer a moderate acid reaction. This soil can be considered as average supplied with nitrogen and the available phosphorus content is higher than the total nitrogen and is reduced on the soil profile from 44.9 to 20.9 ppm.

As regards the available potassium, the SCDA Caracal chernozem is good supplied with this element, the first two horizons recording a variation between 224.5 and 252.8 ppm.

The climatic conditions differed as thermal regime and rainfall, less favorable being the first two experimental years, the following year, approximate normal and the last experimental year has recorded an usual thermal regime and higher rainfall.

The yield was calculated at the moisture of 11% on each variant with the three replication and then was made an arithmetical average on each treatment.

RESULTS AND DISCUSSION

Analyzing the effect of basic tillage in comparison with a mineral fertilizers that were applied, the differences of production obtained on sunflower crops were obvious.

The determination of average sunflower yields in the last 3 years of experimentation, function of the studied factors, indicates a different reaction of the plants and different values of the yields.

Sunflower is genetically resistant to drought.

Cultivating sunflower in the established rotation in nonirrigated regime, as it was expected, lead to obtaining the smallest production, the 3 tools used in different quantities had the same effect for every system of soil tillage.

In the case where we used plow at 22-25 cm + harrow for the seedbed preparation in the 3 years of experiments and function of the nitrogen doses, the production of seeds increased from 673 to 1087 kg/ha in the first year, from 974 to 2447 kg/ha in the second year and from 2268 to 4031 kg/ha in the last year of experiment (table 1). The growth of sunflower production obtained through mineral fertilization has pointed out that this plant uses less fertilizers than other plants, especially in conditions of drought; in this case we recommend moderate doses of nitrogen.

The replacement of usual plow with the chisel and keeping the depth has determined higher productions in 2003 corresponding to the applied nitrogen doses; in 2004 the production was even higher for N₀ and N₄₀ but in the last year of experiments the productions were smaller for all the fertilizing variants (table 1).

The execution of the seedbed preparation with chisel, but at a smaller depth (8-10 cm) lead to obtaining smaller productions, intermediate ones as level between those realized in the case of using the plow and the chisel at the same depth, from 713 kg/ha in nonfertilized variant in the first year to 3488 kg/ha in 2005 when there were applied 120 kg/ha nitrogen (table 1).

The insufficient water in the 3 years of experiments, different in what concerns the rainfalls, had manifested differently on the sunflower productions for all the nitrogen doses (N₈₀ and N₁₂₀ doses had a small effect because they were not properly used by the plants).

CONCLUSIONS

The research carried out during three years at ARDS Caracal, regarding the importance of tillage systems in different conditions of fertilization, in nonirrigating regime, on the results of sunflower production lead to the following conclusions:

1. The cultivation in nonirrigate regime of sunflower has determined small productions for the three methods of soil tillage: the chisel at normal depth has produced 793 - 3691 kg/ha, the usual plough, 673 - 4091 kg/ha and the chisel at 8 - 10 cm between 713 - 3488 kg/ha.
2. The effect of mineral fertilization was more reduced in sunflower crops that in other crops for the doses of 80 and 120 kg N/ha, especially in conditions of low water supply. In this situation we recommend moderate quantities which plants use properly.
3. The results obtained, present sunflower as a culture with high capacity of using properly the depth of tillage of the seedbed preparation without turning up the furrow, of the bigger possibilities to retain water and to maintain it in the soil for a longer period of time and also to increase the effect of the fertilization with progressive doses of nitrogen.

4. We have to notice the efficiency of moderate doses of fertilizers (the roots of the plant has the capacity to extract the nourishing elements), in this way we reduce the costs and also other possibilities of pollution with nitrates by leaching them on the soil profile.

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Table 1

Influence of soil tillages and nitrogen fertilization on constant background of P₈₀ in conditions on the sunflower yield (2003-2005)

Tillage system	N fertilization	2003				2004				2005			
		(kg/ha)	Rel. val. (%)	Abs. dif. (kg/ha)	Sem.	(kg/ha)	Rel. val. (%)	Abs.dif. (kg/ha)	Sem.	(kg/ha)	Rel.val. (%)	Abs. dif. (kg/ha)	Sem.
Plow at 22-25 cm + harrowing	N ₀	673	100	0 (mt)		974	100	0 (mt)		2268	100	0 (mt)	
	N ₄₀	853	127	+ 180	xxx	1756	180	+ 782	xxx	3174	140	+ 906	xxx
	N ₈₀	983	146	+ 310	xxx	2234	229	+1260	xxx	3258	144	+ 990	xxx
	N ₁₂₀	1087	161	+ 414	xxx	2447	251	+1473	xxx	4031	178	+1763	xxx
Chisel at 22-25 cm + harrowing	N ₀	793	100	0 (mt)		1315	100	0 (mt)		2195	100	0 (mt)	
	N ₄₀	883	111	+ 90	xxx	1859	141	+ 544	xxx	3002	137	+ 807	xxx
	N ₈₀	1080	136	+ 287	xxx	1996	152	+ 681	xxx	3374	154	+1179	xxx
	N ₁₂₀	1150	145	+ 357	xxx	2224	169	+ 909	xxx	3691	168	+1496	Xxx
Chisel at 8 -10 cm + harrowing	N ₀	713	100	0 (mt)		810	100	0 (mt)		2707	100	0 (mt)	
	N ₄₀	800	112	+ 87	xxx	1572	194	+762	xxx	3020	112	+ 313	xxx
	N ₈₀	973	136	+ 260	xxx	2124	262	+1314	xxx	3402	126	+ 695	xxx
	N ₁₂₀	1080	151	+ 367	xxx	2324	287	+1514	xxx	3488	129	+ 781	xxx

DL 5% = 35 Kg/ha
DL 1% = 48 Kg/ha
DL 0.1% = 65 Kg/ha

DL 5% = 61 Kg/ha
DL 1% = 84 Kg/ha
DL 0.1% = 114 Kg/ha

DL 5% = 58 Kg/ha
DL 1% = 80 Kg/ha
DL 0.1% = 113 Kg/ha