

# INFLUENCE OF ECOLOGIC FACTORS AND ENTERING MANNER OF NITROGEN FERTILIZER ON YIELD, SEED, OIL CONTENT AND SUNFLOWER OIL YIELD

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## INTRODUCTION

According to Popovic, (1971) volume of plant production nowadays is such that it is not any more question of its increment, but its economy which depends more and more on utilization of mineral fertilizers.

Thus when defining quantity, manner and time of application of fertilizers one should have in mind what effect a shall be on yield with the objective to realize the most economical production.

Results of many experiments show that is quite correct to bring nitrogen in spring at once since there is no fear of rinsing, and its reaching in zone of root system is provided by water falling flows. In such way plant cure will be more simple and at the same time would be provided good feeding in first stages of growing which are very important to form organs significant for yield.

In this study we are going to give our results received in Kosovo region, on soil typ Vertisol, so we are joining to the other investigators that were delt in their studies with the question of time when to bring nitrogen fertilizers under sunflower in order to contribute to get higher and more economical yields of this crop.

## INVESTIGATING METHODS

We have organized field experiments with urea 46,3% N. and KAN 25% N. in 1968, 1969, 1970 and 1971.

The objective of our testing was to define possibilities of putting the whole dosage of urea and KAN in pressowing soil preparation for

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sunflower sowing and to define whether we may avoid feeding. In addition to that we intended to define influence of manner of bringing urea and KAN on yield and sunflower oil content.

The experiment was organized according to RANDOM distribution in five repeating. Parcel size was 42 m<sup>2</sup>. Each parcel had seven rows. For calculation were used 5 rows while 2 rows were protective belt between parcel. Sowing was made on the distance (70 x 35) or 40.816 crops per 1 ha.

Peredovik type was used through four years of experiments. In each year of testing pre-crop was winter wheat. Soil cultivation was made in optimum terms as for normal production. Distribution of mineral fertilizers, sowing, care and picking were manual. Sowing was made on April the 10th, 1968, May the 2th, 1969, April the 28th 1970 and April the 25th, 1971 and harvest was made on September the 10th, 1968, September the 7th 1969, September the 10th 1970 and September the 10th, 1971.

The first feeding was in the stage of 2-4 permanent leaf, the second feeding 9-11 permanent leaf.

Fertilizer level expressed in active material was as follows:

N = 150 kg/ha, P<sub>2</sub>O<sub>5</sub> = 112 kg/ha and K<sub>2</sub>O = 120 kilos/hectar

N is given as Urea 46,3% and KAN 25%

P<sub>2</sub>O<sub>5</sub> as superphosphate 16%

K<sub>2</sub>O as 40% potassium salts.

Potassium and phosphoric fertilizers: one half is ploughed at basic cultivation and the second half in pre-sowing soil preparation.

Urea and KAN in the experiment were applied according to the following scheme:

TABLE 1

*The experiment Experiment Scheme*

Alternative No.	Fertilizer	Urea and KAN Applying Time
1	2	3
I. Urea 46,3% N.		
1	Urea	100% in pre-sowing soil preparation
2	Urea	1/2 in pre-sowing preparation, 1/2 in first feeding
3	Urea	1/3 in pre-sowing soil preparation, 2/3 in first and second feeding
II. KAN-25% N.		
4	KAN	100% in pre-sowing soil preparation
5	KAN	1/2 in pre-sowing preparation, 1/2 in the first feeding
6	KAN	1/3 in pre-sowing soil preparation, 1/2 in the first feeding

We have defined seed yield by measuring, bringing it on humidity of 13%. We have defined humidity (moisture) on seed samples according to the standard methods. Corrections on empty places was made according to Henrich method-formula.

Oil content we have defined in the laboratory of oil factory in Urosevac, according to the standard methods.

Results calculation was made by statistical-mathematical methods and by the method of variance analyses.

## SOIL AND ECOLOGIC FACTORS

Soil: Field experiment in Pristina was organized on the soil type Vertisol. Chemical composition of that soil is of neutral reaction (pH u n KCl 6,60), about 3% is humus, about 0,15% of nitrogen, P<sub>2</sub>O<sub>5</sub> about 1 mg/100 grams of soil and K<sub>2</sub>O 28 mg/100 grams of soil.

The soil is poor with nitrogen, poor with phosphorous and enough supplied with calium.

It has high capacity for water and very bad air features. According to mechanical composition is heavy soil, content of clay amounts from 58,04 up to 84,36%.

## ECOLOGIC FACTORS

Meteorological conditions: as ecologic factors are very important for seed yields and oil yields we shall give only basic data: temperature and precipitation in vegetation period for four years of investigations.

In the Table 2 are shown ecological factors during sunflower vegetation for the period of experiment.

Having in mind that Kosovo belong to a semi-arid region with the annual precipitation from 530 up to 680 mm, on the basis of these data one may conclude that in vegetation period fall only 1/3 of the annual quantity.

Variation and rainfall distribution in vegetation period of sunflower and other crops are considerable. The lowest rainfall were in the year 1969 (230 mm) while other years were more or less the same.

If one analyses rainfall in May, June and July by decades that distribution would be even worst. Namely, third decade of May, the first and the second decade of June are followed by low rainfall and high temperatures. Since prefeeding of sunflower in Kosovo region is

TABLE 2

*Long-range monthly air temperature and precipitation in vegetation period of sunflower by years of investigating*

Month	Temperature in C°				Precipitation in mm.			
	1968	1969	1970	1971	1968	1969	1970	1971
I	2	3	4	5	6	7	8	9
III	5.0	4.0	16.0	55.0	27.0	50.0		
IV	13.0	9.0	10.0	9.0	16.0	35.0	47.0	15.0
V	14.0	17.0	12.0	13.0	54.5	7.0	144.0	110.0
VI	15.0	17.0	17.0	18.0	65.0	22.0	17.0	68.0
VII	19.0	18.0	20.0	18.0	7.0	56.0	69.0	34.0
VIII	18.0	20.0	19.0	21.0	139.0	55.0	28.0	12.0
Total:	—	—	—	—	297.0	230.0	328.0	289.0

usually applied in the second half of May and in the first half of June one may expect that Urea and KAN give better results when in pre-sowing soil cultivation in April all quantities of mineral fertilizers are put.

In the Table 2 we have put average monthly temperatures for each year of investigation. One may notice here in each year and in months of investigation, with low rainfall in vegetation period in particular in May, June, July and August temperatures are increasing. According to our opinion high temperatures in period of feeding crops with Urea and KAN are supporting in losing nitrogen, by evaporation, what was noticed on the sunflower yield in that alternatives in relation to the alternative where Urea and KAN were put in pre-sowing soil preparation for sunflower sowing, putted on certain depth.

## RESULTS AND DISCUSSION

During the experiment we have tested if it is possible to avoid faeding of sunflower in conditions of the Kosovo climate and on soil typ Vertisol applying Urea and KAN in pre-sowing soil preparation for sunflower sowing.

In addition to that we were interested how shall applied alternatives influence on the following: seed yield, oil content, absolute and hectolitar weight and whether would be higher effect if Urea is applied or KAN in each alternative.

Results of four year investigation we shall give in the following tables.

Seed Yield: in the table 3 are shown four year results of the experiments; time testing and manner of Urea and KAN entering and their influence on seed yield.

According to the results that are given in the table 3 one may see that we received statistically positive significant differences with alternative where we put all Urea and KAN in pre-sowing soil preparation. Expressed in percentages seed yield in four year period is implemented in this alternative for 7% higher in relation to the average of the experiment as control. In alternative where Urea was applied 1/2 in the first feeding and 1/2 in pre-sowing soil preparation —we did not receive statistically positive significant differences. Yields are in relation to the control lower for 9%.

TABLE 3

*Influence and Manner of putting Urea and KAN on Sunflower Seed Yield in metric cent/Ha by years of investigation with 13% of moisture*

Alternative	YEAR				Average 1968- 1971	Relative average in %
	1968	1969	1970	1971		
1	2	3	4	5	6	7
I. Urea 46,3% N						
1. 100% in presowing soil preparati.	28,8x	39,60x	28,8x	28,8x	30,2	107
2. 1/2 in presowing soil prepara. 1/2 in first feeding	25,2	30,0	21,6	25,2	25,2	91
3. 1/3 in presowing soil preparat. 2/3 in I and II feeding	26,4	40,8x	21,6	28,8x	29,4	103
II. KAN 25% N						
4. 100% in presowing soil preparati.	27,6	37,2	25,2	33,6	29,6	105
5. 1/2 in presowing soil preparat. 1/2 in I feeding.	24,0	31,2	24,0	24,2	26,0	92
6. 1/3 in presowing soil preparat. 2/3 in I and II feeding	25,2	39,6x	22,8	28,8x	29,0	102
Average of the Experiment	26,2	34,0	24,0	28,4	28,3	100
LSD = P = 5%	0,69	3,05	0,56	0,36		
P = 1%	1,16	5,10	1,15	1,14		

In alternative where Urea was used with 1/2 in pre-sowing soil preparation and in the second feeding we also received statistically positive significant differences. Expressed in percentages yield in this alternative is higher than in control only for 3%. Thus, having in mind four year investigation results with Urea on Kosovo Vertisol would be possible to get good yields with Urea application only in pre-sowing soil preparation. Our opinion is that this region has such climate and soil factors which are supporting this hypothesis. This because water sediments are low at the end of May and beginning of June when usually are made first and second feeding, that is one of the reasons for alternatives where we made one or two feeding did not give better results.

Two feedings in relation to control with Urea gave almost the same results but they are not justified economically and organizationally. If one analyses this table and watch KAN will see all alternative gave similar yields as with UREA but considerably lower comparing it with Urea. With alternative KAN in presowing soil preparation we received statistically positive significant differences in relation to the control (see table 3).

On the basis of these data one may say the nitrogen in the shape of KAN is possible to be applied successfully in total quantities during sowing and with that alternative are better results in region similar to the Kosvo.

The alternative 1/2 with sowing and 1/2 in the first feeding with Urea and KAN did not give statistically positive significant differences. The similar results received the other authors as for example: Lozanic, (1960), Kostic and Babovic (1971), Milojic, Milic and Bozic (1971). They made experiments with the other crops, other fertilizers.

Sunflower oil content and yield: In addition of defining influence of manner of applying Urea and KAN on seed yield we have investigated influence of time and manner of Urea and KAN using on sunflower oil content and yield that could be received per 1 hectare.

In the table 4 the same thing appeared as well as in the seed yield. Namely, we have received the highest content of oil in alternative where all quantities of Urea and KAN were applied in pre-sowing soil preparation. So the highest oil yield per 1 ha both by years and average for four years (see table No. 4).

In the table 5 we have put separate influence of Urea and KAN in the same alternatives in the experiment. One may notice here that Urea in relation to KAN in the same alternative in the experiment gave higher seed yields, oil content in average for four years.

TABLE 4

*Influence of time and manner of Urea and KAN entering on content and quantity of oil per 1 ha by testing years on soil typ Kosovo Vertisol*

Alternative of Fertilizing	Year						Oil relative to average <sup>9,10</sup>						
	1968		1969		1970			Average 1968/71 %					
	%	kg/ha	%	kg/ha	%	kg/ha							
<b>I. Urea 46% N</b>													
1. 100% in presow. preparat.	x	1.371	x	1.797	x	1.385	x	46.6	1.342	47.5	1.435	128	190
2. 1/2 in presow. pre. 1/2 in feeding	x	1.172	43.8	1.314	44.3	957	41.6	1.048	44.5	1.136	171	87	
3. 1/2 in presow. prep. 2/3 in I II feeding	43.5	1.148	46.2	1.884	47.2	1.119	x	46.1	1.327	45.7	1.343	36	102
<b>I. KAN 25%N</b>													
4. 100% in presow. preparation	x	1.319	x	1.793	46.9	1.181	44.9	1.508	46.9	1.388	81	104	
5. 1/2 in presow. prep. 1/2 in I feeding	x	1.051	46.5	1.450	47.2	1.132	x	41.5	1.045	44.6	1.159	148	89
6. 1/3 in presow. prep. 2/3 in I and II feeding	46.6	1.174	43.7	1.730	45.9	1.046	48.3	1.381	45.6	1.262	45	96	
Average	45.8	1.199	47.7	1.836	46.6	1.118	44.8	1.272	46.2	1.307			
LSD P 5%	0.55		0.19		0.60		0.46						
P 1%	0.24		0.27										
0.38													

x Positive significant for P 5%

Positive significant for P 1%

TABLE 5

*Comparative Survey of Urea and KAN Influence on seed Yield, Oil Percentage and Oil Yield Depending on Fertilizing Alternative (Four Year Average (1968-71))*

Alternative of Fertilizing	Urea			KAN 25% N		
	seed yield mc/ha	oil percentage	oil yield kg/ha	seed yield mc/ha	oil percentage	oil yield kg/ha
1. 100% in presowing preparation	30,2	47,5	1.435	29,6	46,9	1.388
2. 1/2 in presowing preparation						
1/2 in I feeding	25,8	44,5	1.136	26,0	44,6	1.159
3. 1/3 in presowing preparation						
2/3 in I and II feeding	29,4	45,7	1.343	29,0	45,6	1.262
Average	28,3	45,3	1.304	28,2	45,7	1.269

This could be explained as follows: that fertilizer is disassembling slowly during vegetation it means nitrification process is more slow and as sunflower needs nitrogen during whole vegetation it is normal to expect that Urea will give better results than KAN which is disassembled quickly and nitrification process is more rapid.

Thus, when nitrogen fertilizers are concern for sunflower, Urea should have first place.

Finally we may say the alternatives of Urea and KAN which we investigated through four years time had influence on yield and oil content for results are statistical positive significant.

## CONCLUSIONS

On the basis of four year results investigation we may conclude the following:

1. Through four years of investigation we have received statistically positive significant differences with alternative where all quantities of Urea and KAN were used in pre-sowing soil preparation.

2. At the alternative where Urea and KAN entered as 1/2 in pre-sowing soil preparation and 1/2 in the first feeding we did not get



statistically positive significant differences, yield in this alternative in relation to the control (four year average) are lower for 9%.

3. At the alternative where Urea and KAN entered with 1/3 in pre-sowing soil preparation, 2/3 in the first and second feeding also gave statistically positive significant differences in relation to control, but much lower in relation to the alternative of all Urea and KAN in pre-seeding soil preparation.

4. According to this feeding of sunflower is considered justified only in extremely rainy (humid) regions and years.

5. Using all quantities of Urea and KAN in pre-sowing soil preparation showed positive features in relation to the other alternatives as well as in seed yield, oil content and oil yield per 1 hectare.

6. In each alternative Urea gave better results than KAN, higher seed yield, oil content, higher yield per 1 ha that is why it should be always used for sunflower fertilizing.

7. Under the climate conditions as it is in Kosovo and soil type Vertisol as well as in regions similar to it there is no fear of nitrogen rinsing off which is applied in pre-sowing soil preparation thus there is no reason to feed sunflower. All foreseen quantities of Urea and KAN may be applied in pre-sow soil preparation. Four years experiment on field in Kosovo region type soil Vertisol direct us on such conclusion.

8. Urea and KAN entering in pre-sow soil preparation is the best to do before soil leveling for fertilizer shall reach in right depth in other words shall reach zone of the root system and after that should make harrowing and sowing with weeds protection.

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