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INFLUENCE OF MINERAL FERTILIZERS ON SUNFLOWER YIELD AND SEED OIL CONTENT UNDER IRRIGATION

There are numerous data in literature concerning sunflower fertilization under non-irrigated cropping system. Mineral fertilization of sunflower under irrigation, however, is not thoroughly studied. In our country the following authors studied this problem: T. Vrebalov (1962), M. Milic (1963), P. Drezgic (1963); among foreign authors we may cite N. Gruyev (1974), V. Pavlenko (1963), Y. Kruzhilin (1962), L. Shapiro (1974), N. Ivanov (1962). No studies were made of the dosages and ratios of nutritive elements of sunflower fertilization under irrigation on meadow-marshy soils in Yugoslavia. That is why in 1972-1973 we carried out experiments with Soviet varieties Peredovik and VNIIMK 8931 at the regional experimental station of the Biotechnical Institute (city of Prishtina). We found reactiveness of sunflower to certain types of mineral fertilizers and to their combinations.

The soil of the experimental plot contained much clay (58-80%), with the maximum field water capacity in the 0-60 cm layer ranging from 41 to 45% and with the total porosity of 44-50%. Humus content in the soil profile was ranging from 4.1 to 1.5%, nitrogen content from 0.2 to 0.7%, and the soil showed slight acidity. Mobile phosphorus and exchange potassium in the upper soil horizon were respectively, 3.6 and 26.8 mg per 100 g of soil.

Experiments were carried in 5 replications, the plot size being 40 sq m. Plant density was 47,600 plants per hectare. Irrigation was carried out by sprinklers. Soil humidity was maintained at least at 70% of maximum field water capacity. Plants were harvested by hand.

Results of two years of studies have shown that varieties are different in reaction to fertilization under irrigation (see Table). Peredovik fertilized with one nutritive element gave the highest yield gain (11.1 c/ha), when fertilized by nitrogen. Separate applications of phosphorus and potassium were less effective. VNIIMK 8931 showed a clearly positive reaction to separate application of phosphoric fertilizer (yield gain 15.1 c/ha). The least gain was obtained from potassium fertilizer (6.0 c/ha).

Peredovik clearly reacted to the application of double fertilizers (NP), the yield gain after the N100P136 application being 15.8 c/ha and the total yield 48.5 c/ha. VNIIMK 8931 more strongly reacted to the PK-fertilizer; at the rate of P-136, K200 the gain was 12.5 c/ha. It should be noted however that this gain was slightly less than in the case of single phosphoric fertilizer at the rate of P-100. Different triple combinations of nutritive elements were effective with the Peredovik variety, but the gains obtained from them were not over and above those obtained from double combinations. Thus, the highest gain (14.4 c/ha) of the triple combination was obtained at the dosage of N150P136K200, but it was less than that obtained at the dose of N100P136. Application of N150P170K200 for VNIIMK 8931 allowed to obtain the highest seed yield, 48.9 c/ha, the gain being 16.5 c/ha. But the most effective rate of fertilization for this variety should be P100.

Fertilizers considerably influenced the oil content of the seeds. The range of oil content in all varieties and for all combinations of fertilizers was 39.3-48.8%. Application of one element fertilizers to the Peredovik variety was most effective in the case of phosphorus (+4.5%); potassium increased oil percentage by 4, and nitrogen only by 2%. In the VNIIMK 8931 the highest effect on oil content was produced by potassium (+4.0), while phosphorus increased oil content by 1%, and nitrogen by 0.5%. Among

Table

Sunflower Yields in Relation to Dosages and Combinations of Mineral Fertilizers under Irrigation

Variants	Peredovik		VNIIMK 8931	
	Yield	Gain	Yield	Gain
		c/ha		
1. Check	32.75	-	32.37	-
2. N_{100}	43.87	11.12	41.87	9.50
3. P_{100}	42.62	10.87	47.50	15.13
4. K_{100}	42.00	9.35	38.37	6.00
5. N_{100} P_{136}	48.50	15.75	43.00	10.13
6. $N_{100}K_{200}$	43.21	10.40	42.75	10.38
7. $P_{136}K_{200}$	44.00	11.35	44.87	12.50
8. $N_{100}P_{100}K_{100}$	45.00	12.35	45.64	12.27
9. $N_{100}P_{200}K_{100}$	40.87	8.12	43.75	11.38

Table (cont.)

Variants	Peredovik		VNIIMK 8931	
	Yield	Gain	Yield	Gain
	c/ha			
10. $N_{200}P_{100}K_{100}$	43.12	10.37	45.14	12.77
11. $N_{100}P_{100}K_{160}$	43.00	10.35	46.50	14.13
12. $N_{100}P_{136}K_{200}$	43.50	10.75	42.25	9.88
13. $N_{150}P_{136}K_{200}$	47.00	14.35	43.12	10.75
14. $N_{100}P_{170}K_{200}$	44.62	11.87	45.00	12.73
15. $N_{100}P_{150}K_{200}$	44.25	11.50	45.12	12.75
16. $N_{150}P_{170}K_{200}$	45.50	12.75	48.87	16.50
	43.37	10.62	43.78	11.41
	Varieties	Fertilizers	Varieties	Fertilizers
P = 0.05%	1.73	4.92	6.92 c/ha	
for P = 0.01%	2.28	6.51	9.21 c/ha	
Variation coefficient				11.36

double combinations P136K200 was most effective for oil percentage in both varieties. Among triple combinations the most effective for oil percentage in both varieties was the combination N100P170K200.

Oil yields calculated for all variants of the experiment have shown that they are the highest for Peredovik fertilized at the rate of N100P136 and N100P170K200, and for VNIIMK 8931 at the rate of P100 and N150P170K200.

Conclusions

1. Mineral fertilizers are effective means to increase sunflower seed yields under irrigation on the meadow-marshy soils.

2. Requirements and reactions to fertilizers are different depending on variety. The highest seed yields of the Peredovik variety (48.5 c/ha) were obtained when N_{100} P_{136} was applied and those of the VNIIMK 8931 were obtained with the fertilizer rate of $N_{150}P_{170}K_{200}$, the latter variety being most reactive to P100. The gain in seed yield following fertilization was 15.8-16.5 c/ha.

3. Fertilizing elements in different combinations considerably influenced the oil content of seeds, ranging from 39.3 to 48.8%. The bulk of variants increased oil content. Utilization of optimal rates of mineral fertilizers under irrigation may allow oil yield up to 20.5 c/ha.