

Results of *BIO-GEL* organic fertilizer field tests on sunflower

Experimental site – Kherson Region, Skadovsk district, Institute of Rice, NAAS, Ukraine, field No 3 of crop rotation under irrigation.

1. Soil-climatic zone – southern steppe of Ukraine
2. Soil: dark chestnut alkaline combined with saline (30-50%), pH (water) of soil solution in a layer of 0-40 cm – 7.25; total salt content – 0.179 %; humus content (according to Tyurin) – 1.93 %; mobile phosphorous forms (according to Machigin) – 4.09 mg/100 g soil; potassium exchange forms (according to Machigin) – 26.6 mg/100 g soil; easily hydrolyzed nitrogen (according to Tyurin-Kononova) – 3.97 mg/100 g soil.
3. Crop: *Yason F1* sunflower hybrid bred by the Yuriev Institute of Plant Growing.
4. Precursor: winter wheat + buckwheat after harvest.
5. Seeding rate: 65000 pc/ha, date of sowing – 25.04.2017. Sowing was performed by the CПЧ-8 wide-row seeder, space between rows being 70 cm.
6. Agrotechnology used: common for sunflower cultivation in the southern steppe of Ukraine under irrigation (the main cultivation is plowing to the depth of 20-22 cm). Fertilizers – $N_{75}P_{50}K_{15}$ – 300 kg/ha ammonium sulfate and 200 kg/ha superphosphate during presowing cultivation and 94 kg/ha compound NPK fertilizer during sowing. Chemical protection against weeds – *Gezagard 500* soil herbicide, the rate being 2.0 l/ha, + *Propanid 720*, the rate being 2.0 l/ha, during presowing cultivation and spraying crops with the mixture of *Borey Neo*, 0.15 l/ha (insecticide) + *Impact K*, 1.0 l/ha and 1.5 l/ha (fungicide) at the star stage. 2 vegetation waterings were carried out, the total irrigation rate being 700 m³/ha.
7. Test schedule and terms of preparations use:
 - control (integrated plant protection IPP);
 - IPP + presowing seed treatment with *BIO-GEL*, 1.5 l/t (15% concentration) – 23.04.2017.
 - IPP + spraying plants with *BIO-GEL* at the stage of 2-3 true leaves, the rate being 1.5 l/ha (0,75 % concentration) – 31.05.2017.
 - IPP + presowing seed treatment with *BIO-GEL*, 1.5 l/t (15% concentration) – 23.04.2017 + spraying plants at the stage of 2-3 leaves with *BIO-GEL*, the rate being 1,5 l/ha (0,75% concentration) – 31.05.2017. + spraying plants with *BIO-GEL* at the beginning of the budding stage, the rate being 1.5 l/ha (0,75 % concentration) – 19.06.2017.
8. Test type: the size of sown area – 5.6×10 m², discount area – 1.4×10 m². Three times repeated tests. Systematic disposition.
9. Equipment used – manual knapsack sprayer. Working liquid consumption according to the specified concentration in the test scheme
10. Method of registration: Yield registration according to test variants was made on September, 14, 2017 by harvesting sunflower heads from the discount area and their threshing manually. Crop data are given according to standard indicators (100% purity, 10% humidity).

11. Test results and analysis: as a result of field tests (within the range of cultivation variants used in the experiment) there has been confirmed the positive effect of *BIO-GEL* on plants productivity and sunflower yield. A significant yield increase was obtained after a single vegetation spraying with *BIO-GEL*, the rate being 1.5 l/ha (0.75% concentration) at the stage of 2-3 true leaves. Yield increase after additional plants spraying and presowing treatment (variant 4) was insignificant, within error (+1.7 c/ha) compared to the variant in which crops were sprayed once during the vegetation period.

Table 5.1 Sunflower yield depending on *BIO-GEL* use at different vegetation stages, c/ha

№	Experiment variant	Repeatability			On average	Increase compared to control	%
		I	II	III			
1	Control	46.4	39.3	42.0	42.6	-	-
2	<i>BIO-GEL</i> , 1.5 l/t (seeds)	46.4	46.4	44.6	45.8	+ 3.2	
3	<i>BIO-GEL</i> , 1.5 l/ha (2-3 pairs of leaves)	45.7	52.9	55.0	51.2	+ 8.6	20.1
4	<i>BIO-GEL</i> , 1.5 l/t 2 (seeds) + <i>BIO-GEL</i> , 1.5 l/ha (2-3 pairs of leaves) + <i>BIO-GEL</i> , 1.5 l/ha (beginning of tillering)	56.4	51.9	50.3	52.9	+ 10.3	24.1

HIP₀₅ 7.3 c/ha

12. Conclusions and recommendations: in order to increase sunflower productivity in the southern steppe of Ukraine under irrigation it is advisable to spray sunflower with *BIO-GEL*, the rate being 1.5 l/ha (15% concentration) at the 2-3 pairs of leaves stage.