

## Results of BIO-GEL organic fertilizer field tests on winter wheat

1. Experimental site – Kherson Region, Skadovsk district, the Institute of Rice, NAAS, Ukraine, field No 4 of rice crop rotation.
2. Soil-climatic zone: southern steppe.
3. Soil: meadow-steppe saline, deep, pH (water) of soil solution in a layer of 0-40 cm – 7.28; total salt content – 0.143 %; humus content (according to Tyurin) – 1.79 %; phosphorous movable forms (according to Machigin) – 2.15 mg/100 g soil; potassium exchange forms (according to Machigin) – 23.4 mg/100 g soil; easily hydrolyzed nitrogen (according to Tyurin-Kononova) – 3.96 mg/100 g soil.
4. Crop: winter wheat, *Kiriya* variety.
5. Precursor: oil flax.
6. Seeding rate: 220 kg/ha, date of sowing – 16.10.2016. Sowing was carried out with Amazone AD-P Super trailed precision seeder, 18 cm space between rows.
7. Agrotechnology used: common for winter wheat cultivation on rice irrigated fields (basic soil cultivation – disking, 2 tracks to a depth of 12-14 cm). Fertilizers: N<sub>60+51</sub> – 300 kg/ha ammonium sulphate during presowing cultivation and 150 kg/ha ammonium nitrate at the time of early spring fertilizing over frozen ground; chemical protection – single spraying in spring with fungicide (*Amistar*, 1 l/ha) against a complex of pathogens at the seed ripening stage; irrigation – vegetation short-term paddy watering at the milky ripeness stage – 25.05.2017.
8. Test schedule and terms of preparations use:
  - control (integrated plant protection IPP);
  - IPP + spring plants spraying at the beginning of the tubing stage with *BIO-GEL*, the rate being 1.5 l/ha (0.75% concentration) – 6.04.2017;
  - IPP + spring plants spraying at the beginning of the tubing stage with *BIO-GEL*, the rate being 1.5 l/ha (0.75% concentration) + spraying crops at the beginning of earing stage with *BIO-GEL*, the rate being 1.5 l/ha (0.75% concentration) – 06.04.2017 and 12.05.2017.
9. Test type: the size of sown area - 4×5 m<sup>2</sup>, discount area – 2×5 m<sup>2</sup>. Three times repeated tests. Systematic disposition.
10. Equipment used – manual knapsack sprayer. Working liquid consumption according to the specified concentration in the test scheme.
11. Methods of registration: at the stage of grain full ripeness model sheaves were selected to determine *BIO-GEL* effect on crop structural elements. Yield registration according to test variants was made on July, 7, 2017 by continuous threshing of discount areas (direct harvesting by KC-760, *Yanmar* small combine). Yield data are reduced to standard indicators (100% purity, 14% humidity).
12. 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 winter wheat yields. Significant

yield increase was obtained on single winter wheat vegetation spraying with *BIO-GEL* at the beginning of the tubing stage (table 1.1). The second spraying at the beginning of earing stage did not affect essentially the wheat yield (+1.5 c/ha). The best result (+7.7 c/ha, 12.7%) was obtained on spraying both at the tubing stage (1.5 l/ha) and at the beginning of the earing stage (1.5 l/ha). The *BIO-GEL* effect was positive but within error.

Table 1.1 Winter wheat yield depending on *BIO-GEL* application at different vegetation stages, c/ha

№	Experiment variant	Repeatability			On average	Increase compared to control	%
		I	II	III			
1	Control	58.3	60.0	64.1	60.8	-	-
2	<i>BIO-GEL</i> (tubing)	66.5	69.1	65.3	67.0	+ 6.2	10.2
3	<i>BIO-GEL</i> (tubing) + <i>BIO-GEL</i> (beginning of earing)	66.2	70.7	68.5	68.5	+ 7.7	12.7

HIP<sub>05</sub> = 4.7 c/ha

*BIO-GEL* organic fertilizer application in fertilizing winter wheat contributed to such factors as average ear productivity and the weight of 1000 grains (table 1.2).

Table 1.2 Elements of winter wheat yield structure depending on the stage of *BIO-GEL* application

№	Experiment variant	Ear length, cm	Grain number in ear, pc.	Grain weight in ear, g	Weight of 1000 grains, g
1	Control	9.1	35.0	1.53	43.7
2	<i>BIO-GEL</i> 2 (tubing)	9.9	44.6	2.08	46.4
3	<i>BIO-GEL</i> 2 (tubing) + <i>BIO-GEL</i> 2 (beginning of earing)	9.2	42.3	2.06	48.7 (+ 11.5 %)

13. Conclusions and recommendations: in order to increase winter wheat productivity crops should be sprayed with *BIO-GEL* at the stage of tubing, the rate being 1.5 l/ha (0.75% concentration), preferably in combination with chemical preparations (fungicides) which are commonly used to control winter wheat diseases at the tubing stage, which would reduce the cost.

14. The cost saving in variant 2: 1.5 l of *BIO-GEL* – 90 UAH; additional profit – 6.2 c/ha, which makes 2480 UAH at the purchase price of 4 UAH/kg. Thus, for each UAH invested in *BIO-GEL* the contingent profit makes more than 27 UAH.