

## Results of *BIO-GEL* organic fertilizer field tests on rice

Experimental site – Kherson Region, Skadovsk district, the Institute of Rice, NAAS, Ukraine, field No 1 of rice crop rotation.

1. Soil-climatic zone: southern steppe
2. Soil: dark chestnut alkaline combined with saline (30-50%), pH (water) of soil solution in a layer of 0-40 cm – 7.61; total salt content – 0.165 %; humus content (according to Tyurin) – 1.75 %; movable phosphorous forms (according to Machigin) – 3.09 mg/100 g soil; potassium exchange forms (according to Machigin) – 24.6 mg/100 g soil; easily hydrolyzed nitrogen (according to Tyurin-Kononova) – 4.49 mg/100 g soil.
3. Crop: the *Vicont* mid-season rice variety bred by the Institute of Rice, NAAS.
4. Precursor: rice (alfalfa layer rotation).
5. Seeding rate – 8 mln pc/ha, (230 kg seeds/ha), date of sowing – 28.04.2017. (initial flooding – 29-30.04). Sowing was performed by a mounted sowing machine (Amazone D9)
6. Agrotechnology used: common for rice cultivation on rice irrigated fields (basic soil cultivation – disking, 2 tracks to a depth of 12-14 cm; leveling paddy surface, presowing cultivation and soil rolling). Fertilizers: -  $N_{140+50}P_{30}$  – 500 kg/ha ammonium sulfate and 200 kg/ha sulfate ammophos during presowing cultivation and 110 kg/ha carbamide as vegetative fertilizing at the stage of rice full tillering, chemical protection against weeds – *Citadel*, 2.0 l/ha at the sprouting stage; repeated spraying with *Impact K* fungicide (1.0 l/ha) and *Piac 300 EC* (0.8 l/ha) against a complex of pests at the end of tillering stage and during tubing stage; watering – constant flooding from sprouting till full ripeness (19 000 m<sup>3</sup>/ha watering rate).
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) – 26.04.2017.
  - IPP + presowing seed treatment with *BIO-GEL*, 1.5 l/t (15 % concentration) – 26.04.2017 + spraying plants with *BIO-GEL* at the tillering stage, 1.5 l/ra (0.75 % concentration) – 21.06.2017.
  - IPP + presowing seed treatment with *BIO-GEL*, 1.5 l/t (15 % concentration) – 26.04.2017 + spraying plants with *BIO-GEL* 2 at the tillering stage, 1.5 l/ha (0.75 % concentration) – 21.06.2017.+ spraying plants with *BIO-GEL* 2 at the panicle formation stage, 1.5 l/ha (0,75 % concentration) – 10.07.2017.
8. Test type: the size of sown area - 2×10 m<sup>2</sup>, discount area – 2×10 m<sup>2</sup>. 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. 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 September, 22, 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).

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 rice yields. Significant yield increase was obtained both after only presowing seed treatment with *BIO-GEL* and after additional spraying rice plants at the tillering and tubing stages (table 2.1). Rice yield increase after vegetative sprayings at the tillering stage and both at the tillering and tubing stages, seeds being treated before sowing, was within error (+2.8 and +3.5 c/ha) compared to the variant where *BIO-GEL* was used only for presowing seed treatment.

Table 2.1 Rice yields 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	76.3	73.4	74.0	74.6	-	-
3	<i>BIO-GEL</i> 2 (seeds)	79.8	78.6	83.4	80.6	+ 6.0	8.0
4	<i>BIO-GEL</i> 2 (seeds) + <i>BIO-GEL</i> 2 (tillering)	80.1	86.6	83.5	83.4	+ 8.8	11.8
5	<i>BIO-GEL</i> 2 (seeds) + <i>BIO-GEL</i> 2 (tillering) + <i>BIO-GEL</i> 2 (tubing)	87.4	79.0	86.0	84.1	+ 9.5	12,7

HIP<sub>05</sub> = 5.8 c/ha

Table 2.2 Rice yield structure and biometric indicators depending on the stage of *BIO-GEL* use

№	Experiment variant	Average plant height, cm	Average plant density, pc.m/m <sup>2</sup>	Layering capacity	Panicle average productivity, g
1	Control	95	121	1.4	3.28
2	<i>BIO-GEL</i> 2 (seeds)	96	176	1.4	4.05
3	<i>BIO-GEL</i> 2 (seeds) + <i>BIO-GEL</i> 2 (tillering)	96	165	1.5	4.18
4	<i>BIO-GEL</i> 2 (seeds) + <i>BIO-GEL</i> 2 (tillering) + <i>BIO-GEL</i> 2 (tubing)	100	169	1.5	4.25 (+ 29 %)

11. Conclusions and recommendations: in order to increase rice productivity presowing seed treatment with *BIO-GEL* 2, the rate being 1.5 l/t (15% concentration), should be used. Spraying rice plants during vegetation period twice, the rate being 1.5 l/ha, increases productivity by up to 12.7%.

12. In variant 4 after a single spraying with *BIO-GEL*, the rate being not more than 0.4 l/ha and the price – 60 UAH/l, additional expenses amount to 24 UAH/ha. The yield increase of 6.0 c/ha at the purchasing price of 16000 UAH/t brings about 9600 UAH additional profit. Thus, with 1 UAH invested into the *BIO-GEL* organic fertilizer the contingent profit makes 400 UAH/kg.

After *BIO-GEL* double amount use during the vegetation period, the rate being 1.5 l  $\times$  2=3 l/ha, the expenses per a hectare, including seed treatment (0.4 l/ha) amount to 204 UAH.ha. The contingent profit on selling 12.7 c/ha makes 20320 UAH. Thus, 1 UAH invested in *BIO-GEL* brings about 100 UAH.