Approved:

General Director

«Ekor-SP» LLC

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REPORT ON DEMONSTRATION AND LABORATORY EXPERIMENTS TO STUDY THE EFFECTIVENESS OF FERTILIZERS BASED ON HUMUS SUBSTANCES.

Moscow / Rostow-on-Don
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The purpose of the experiment is to prove the biological effectiveness of the use of fertilizers based on humus substances "ECO-SP" in the formation of high plant productivity by conducting demonstration and laboratory tests on wheat, barley, oats, peas, and sunflower.

The task of the experiment is to conduct laboratory experiments in small containers, small-scale plots with the identification of the influence on the physiological processes of agricultural plants and the impact on the processes occurring in the soil.

The applied preparation is a liquid fertilizer with a high concentration of humic and fulvic acids, a set of macro-and microelements extracted by innovative production technology of the company "ECOR-SP" from lowland peat.

Test №1

Purpose: to substantiate the effectiveness of applying humus-based fertilizers "ECO-SP" to wheat, barley, oats, and sunflower by two methods

Scheme.

Option №1-control, without processing;
Option №2-pre-sowing soil treatment (5 liters per hectare);
Option №3-pre-sowing soil treatment (5 liters per hectare) + seed treatment before sowing.
The consumption of the working solution is 10 liters per 1 ton of seeds.
Working solution-0.2 l of the fertilizer per 10 liters of water.

The experiment was conducted in containers, an area of 0.022 sq. m. (0, 135x0. 165) each.

The number of grain seeds – 55 PCs. per container, sunflower-25 PCs.

Table 1. The experimental setup for validation of the effectiveness of application methods of fertilizers based on "ECO-SP" humic substances.

№	Crop	Variant №1	Вариант №2	Вариант №3
1.	Wheat	Check	soil preparation	Preparation soil and seed
2.	Barley	Check	soil preparation	Preparation soil and seed
3.	Avena	Check	soil preparation	Preparation soil and seed
4.	Sunflower	Check	soil preparation	Preparation soil and seed

Fig. 1 - start of experiment

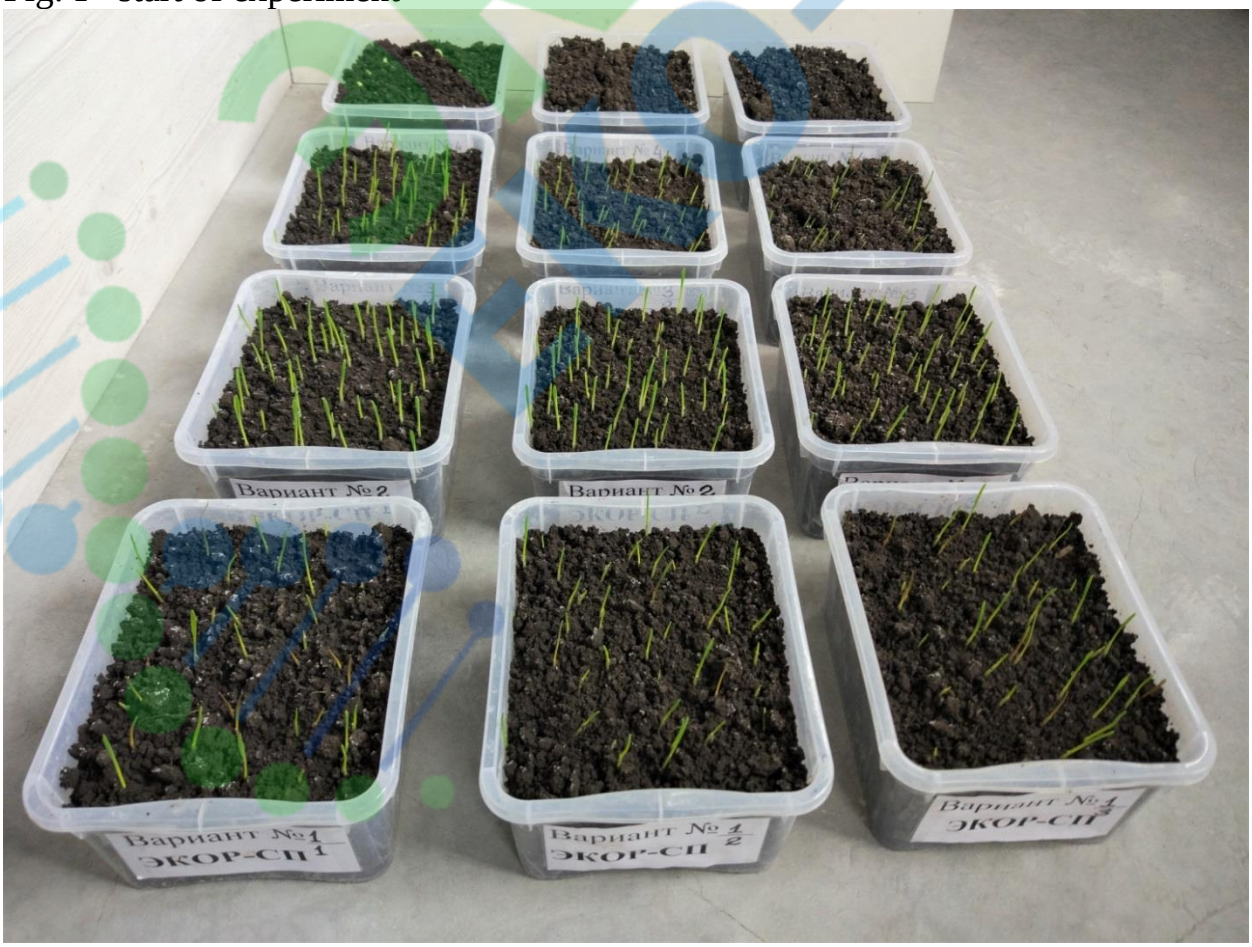

Fig 2 – process of experiment

Fig. 3 – Process of experiment

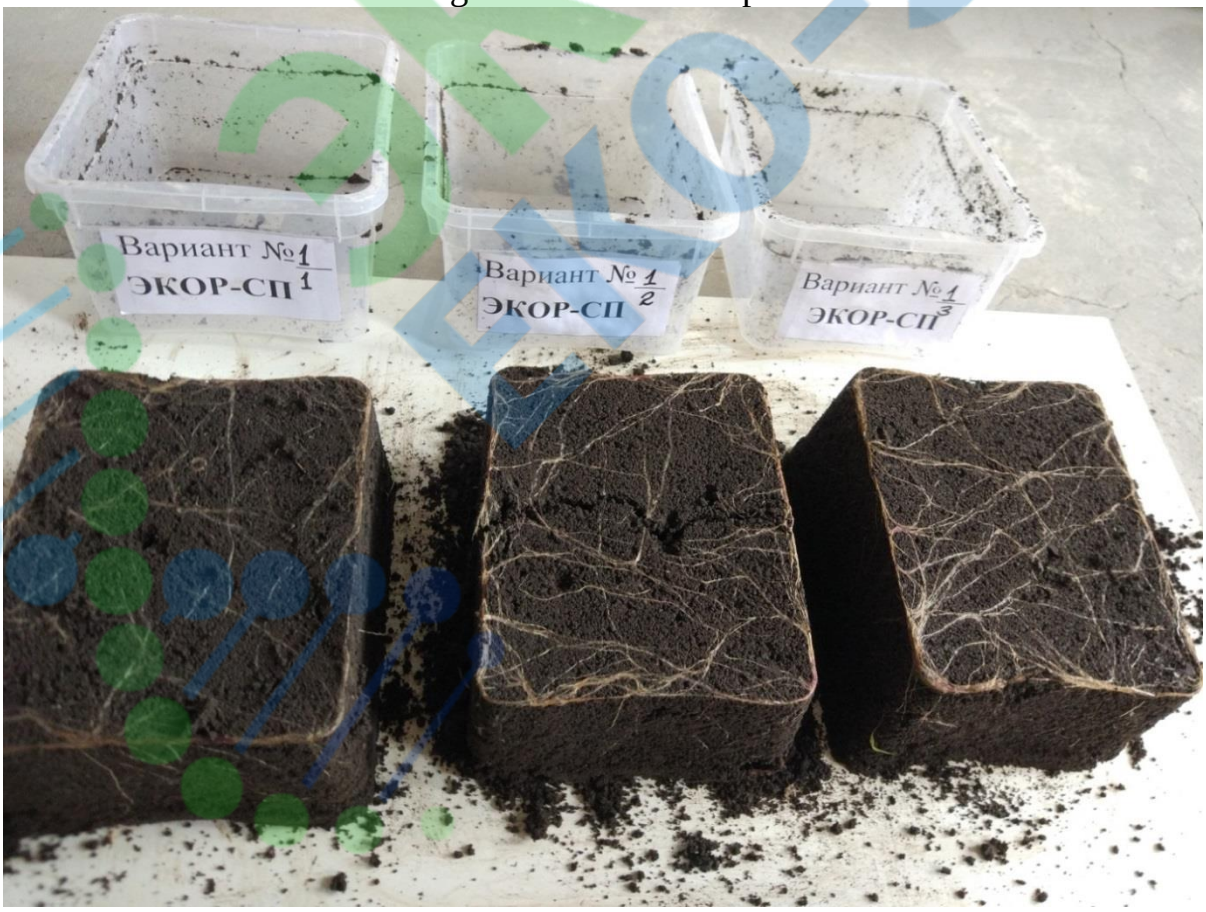

Fig. 4-Differences in the development of the root system of wheat.

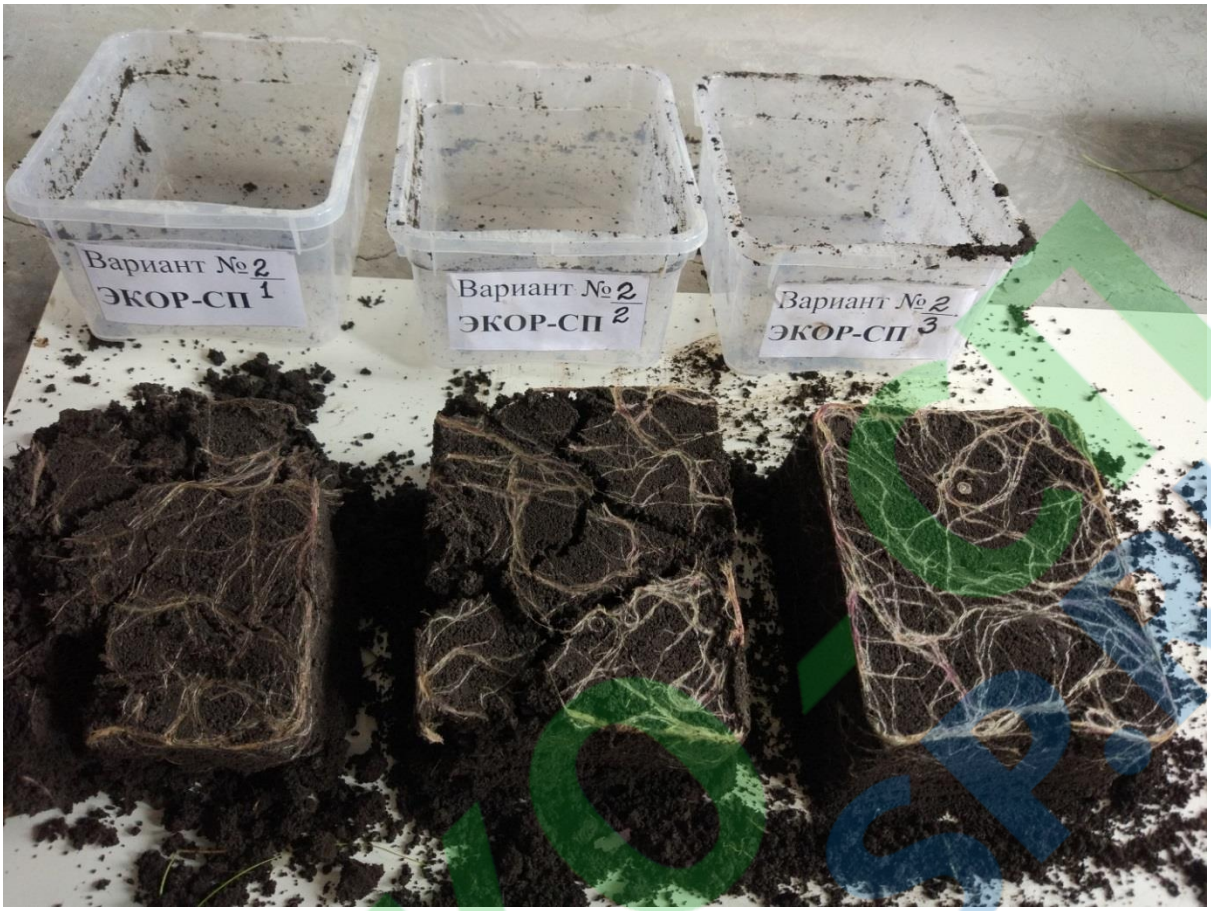

Fig.5 - Difference in the development of the root system of barley.

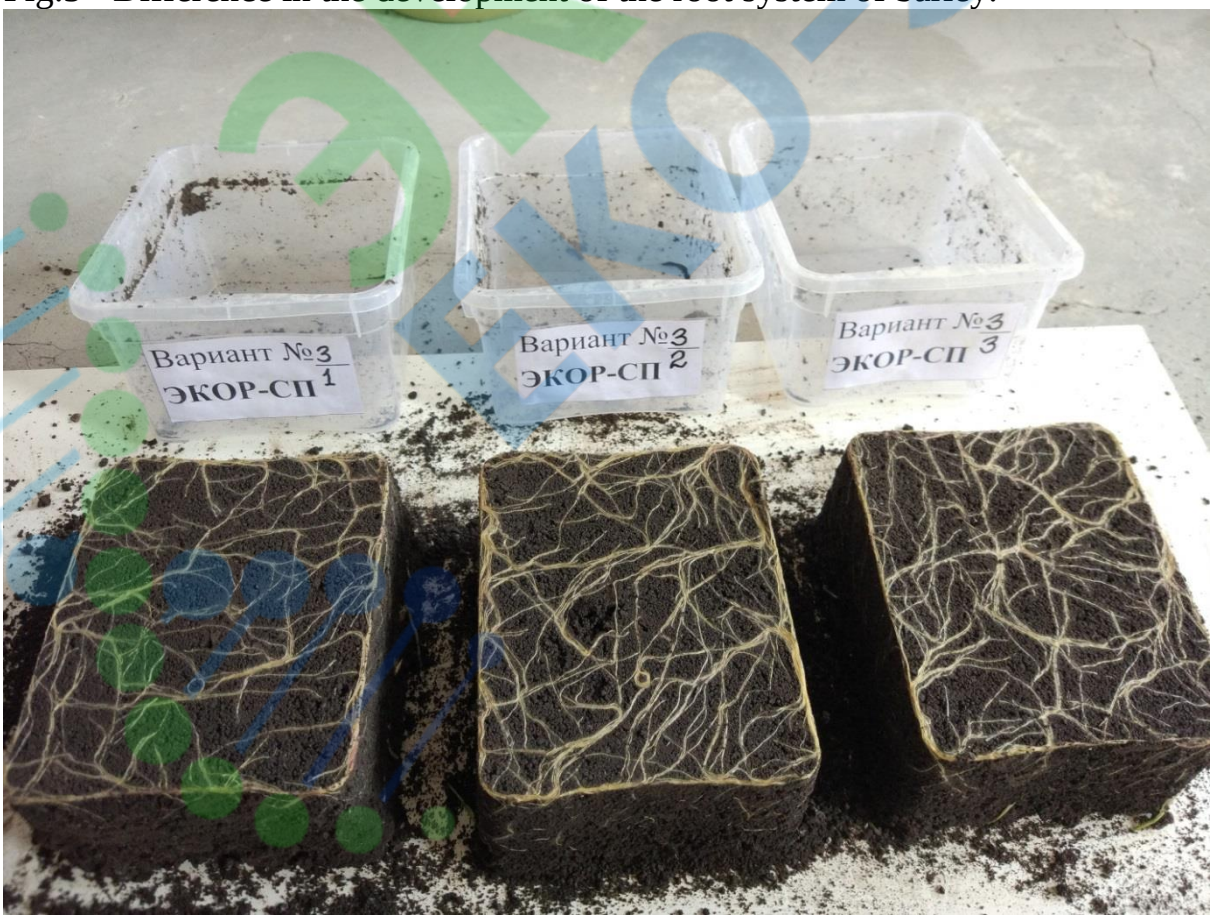

Fig. 6-Difference in the development of the root system of oats

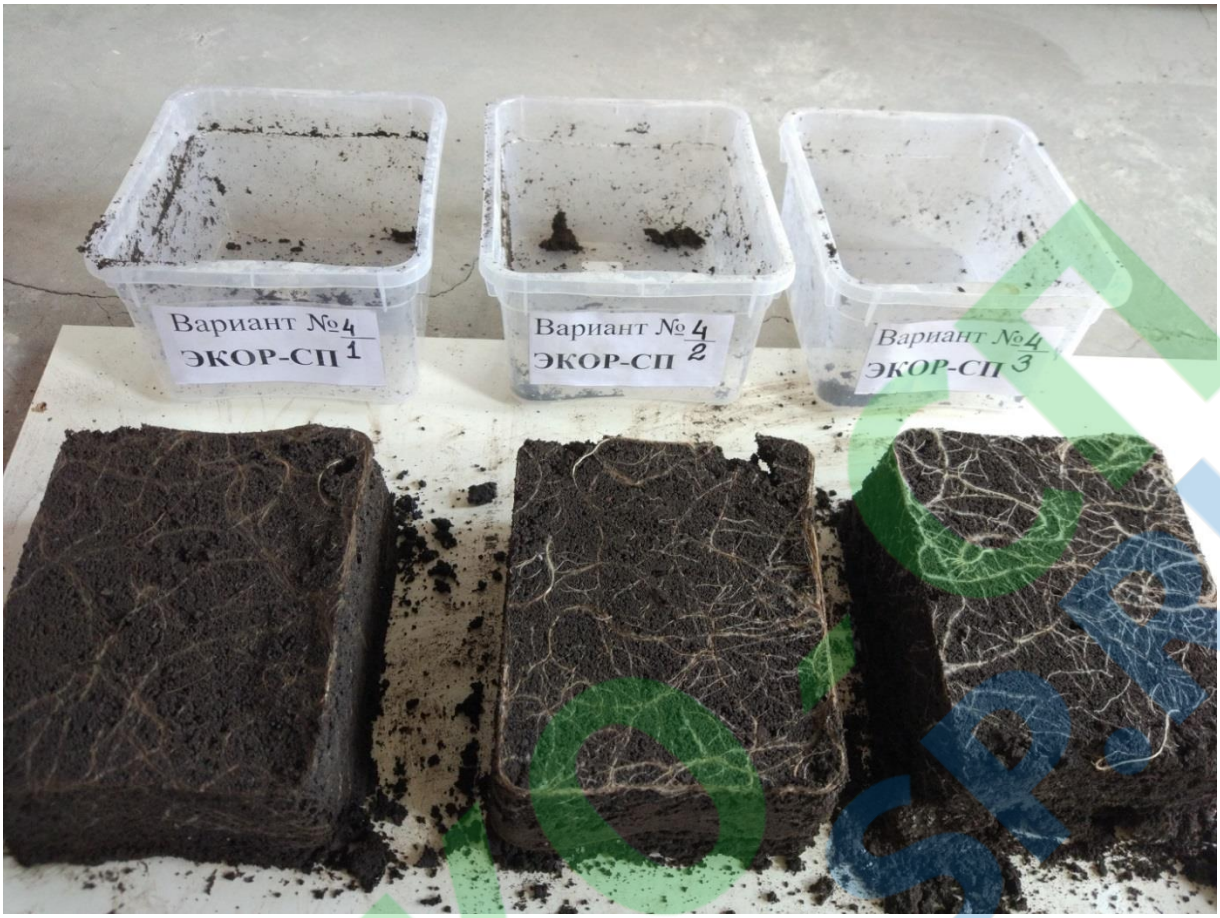

Fig.7 - Difference in the development of the sunflower root system.

Measurement methods:
The vegetative system of plants was measured by measuring the height of plants from the tillering node to the top point. The roots of the monoliths (after cutting the aboveground part, from the tillering node) were washed with water, and then their weight was determined.

Table 2. Effect of humus-based fertilizer "ECO-SP" on the growth of vegetative and root systems of plants.

culture	Параметры	Variant №1, check	%	Variant№2, soil preparation	%	Вариант №3, Soil and seeds preparation	%
wheat	high, cm	17	100	20	118	23	135
	root weight, gr	26	100	29	113	32	121
barley	high, cm	15	100	18	120	21	140
	root weight, gr	29	100	34	117	39	134
avena	high, cm	18	100	23	128	22	122
	root weight, gr	33	100	46	139	47	142
sunflower	high, cm	13	100	15	115	17	131
	root weight, gr	27	100	30	111	35	130

Conclusion. The use of fertilizers "ECO-SP" in the cultivation of crops has shown a positive impact on the development of both the vegetative mass and the root system of plants. In laboratory conditions, the best results were observed in option №3

with the 2-fold introduction of the fertilizer. For wheat, the increase in aboveground weight averaged 35%, root system = 21%; barley – 40% and 34%, respectively; oats – 22% and 42%, and sunflower – 31% and 30%.

Test №2.

Purpose: to study the effect of different concentrations of humus-based fertilizer "ECO-SP" during soaking on the germination energy and germination of winter wheat and pea seeds and to identify the optimal dosage of the fertilizer.

Variant №1: Check-check, without the fertilizer;
Variant №2: Mark A - concentration of water solution 0.5 l/200L of water;
Variant №3: Mark B-concentration of water solution of 1 l/200L of water;
Variant №4: Mark C-concentration of water solution 1.2 l/200L of water;
Variant №5: Mark D-concentration of water solution 0.8 l/200L of water;
Variant №6: Mark F -concentration of water solution 0.7 l/200L of water.

The experiment was conducted in containers, each one with an area of 0.01 sq. m. (0.1 m x 0.1 m).The number of wheat seeds - 20 PCs. per container, peas - 12 PCs.

Table 4. Scheme of the test in studying the effect of different fertilizer concentrations during soaking, on the germination of wheat and pea seeds.

№	Culture	Variant №1	Variant№2	Variant№3	Variant №4	Variant №5	Variant №6
1.	pea	check	Mark A	Mark B	Mark C	Mark D	Mark F
2.	barley	check	Mark A	Mark B	Mark C	Mark D	Mark F

Fig. 8 - start of experiment

Fig. 9 - start of experiment

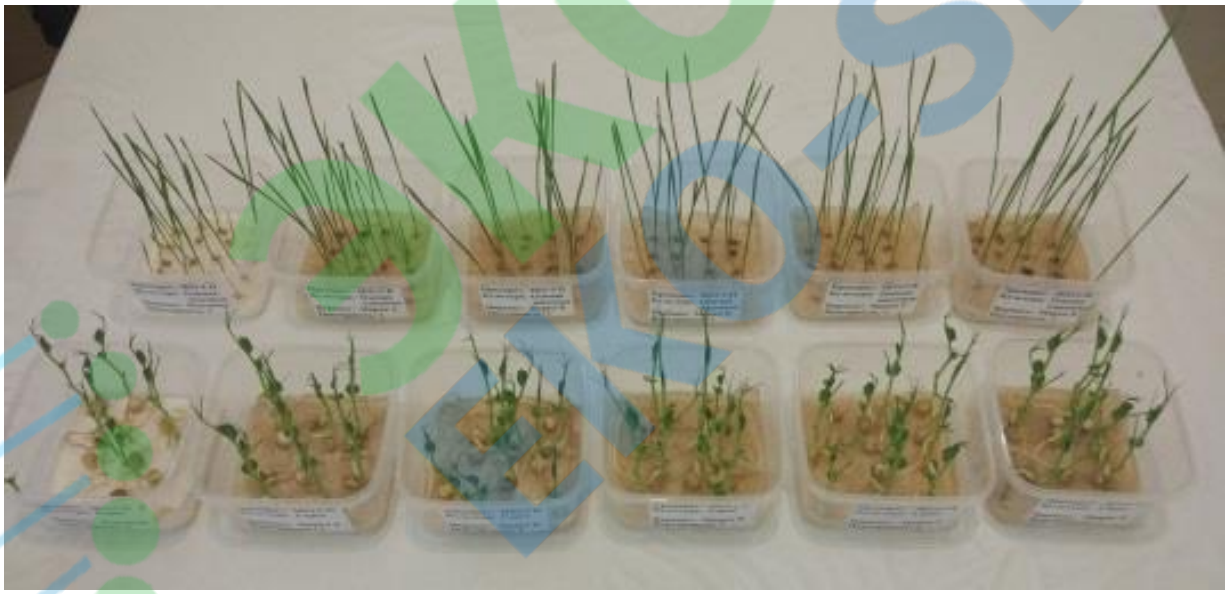

Fig. 10-implementation of the test.
The results of the experiments are presented in actual form.

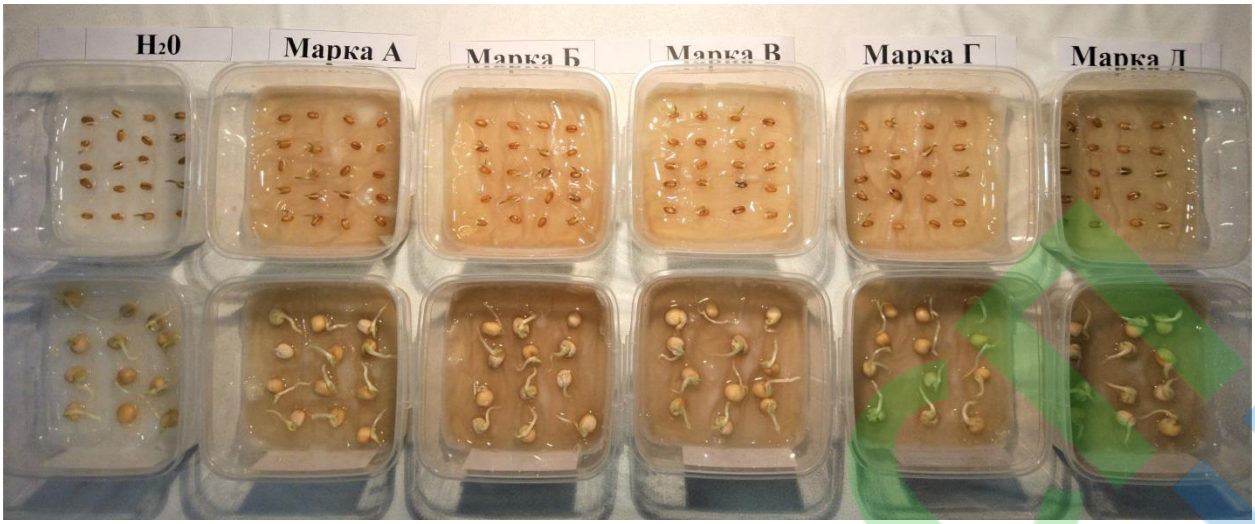

Fig. 11-General view of wheat and pea germination on the 2nd day.

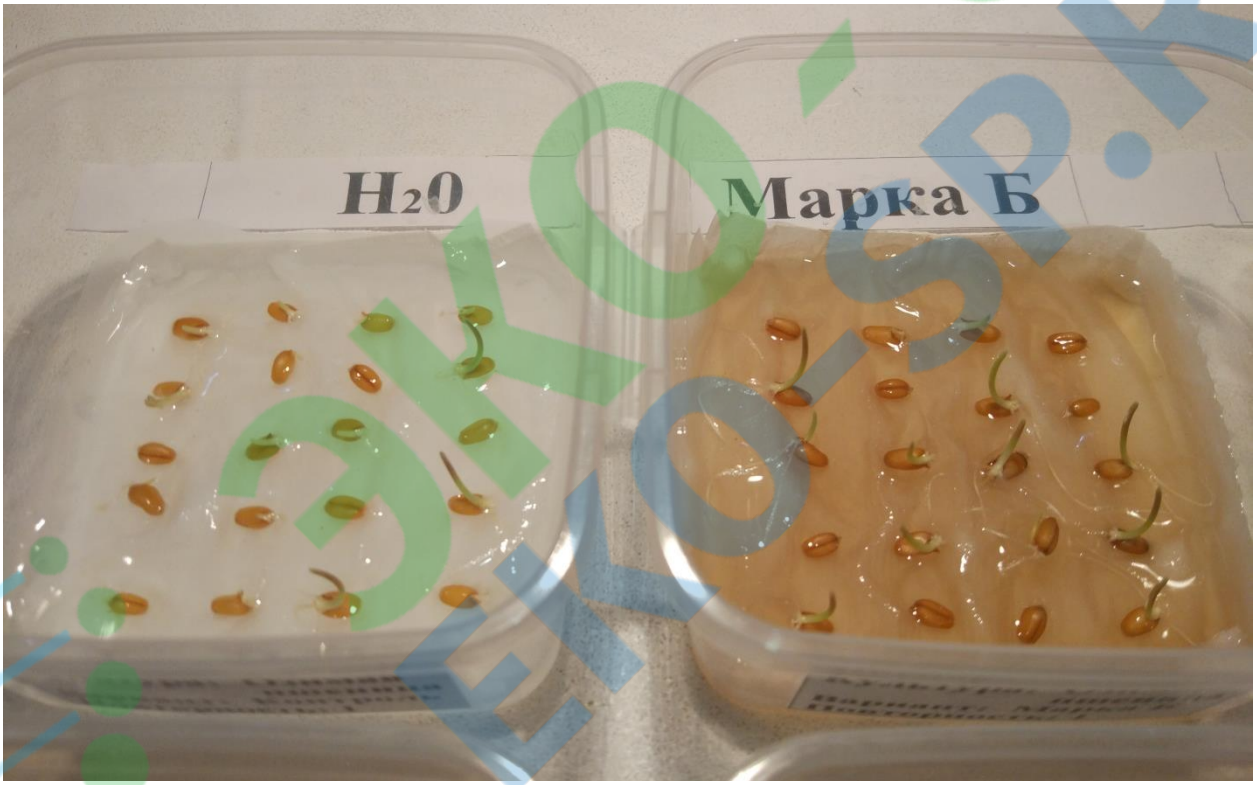

Рис. 12 - Семена озимой пшеницы 2-й день проращивания.

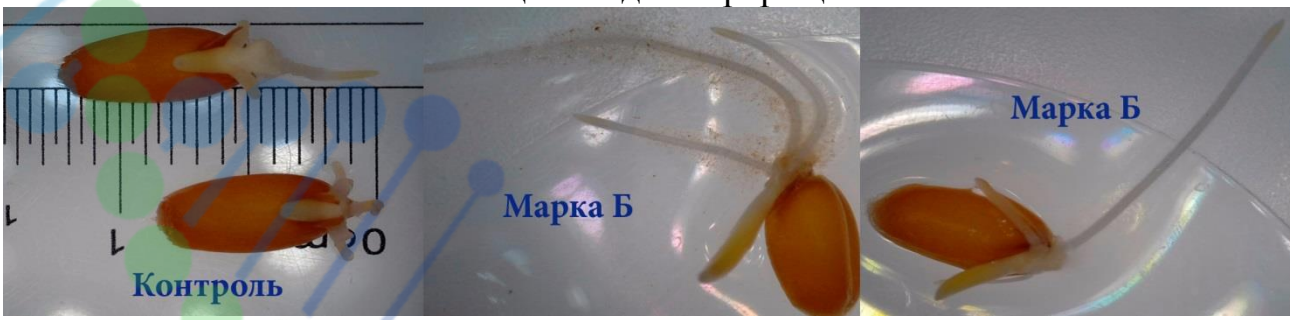

Fig. 13-winter wheat Seeds on the 2nd day of germination.

Fig. 14-pea Seeds on the 2nd day of germination.

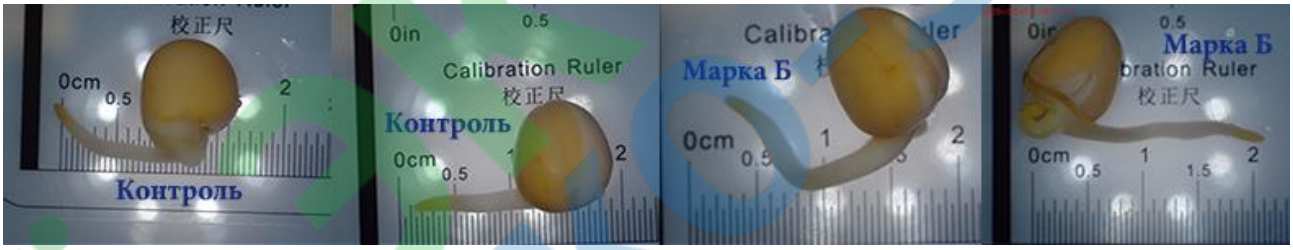

Fig. 15-pea Seeds on the 2nd day of germination.

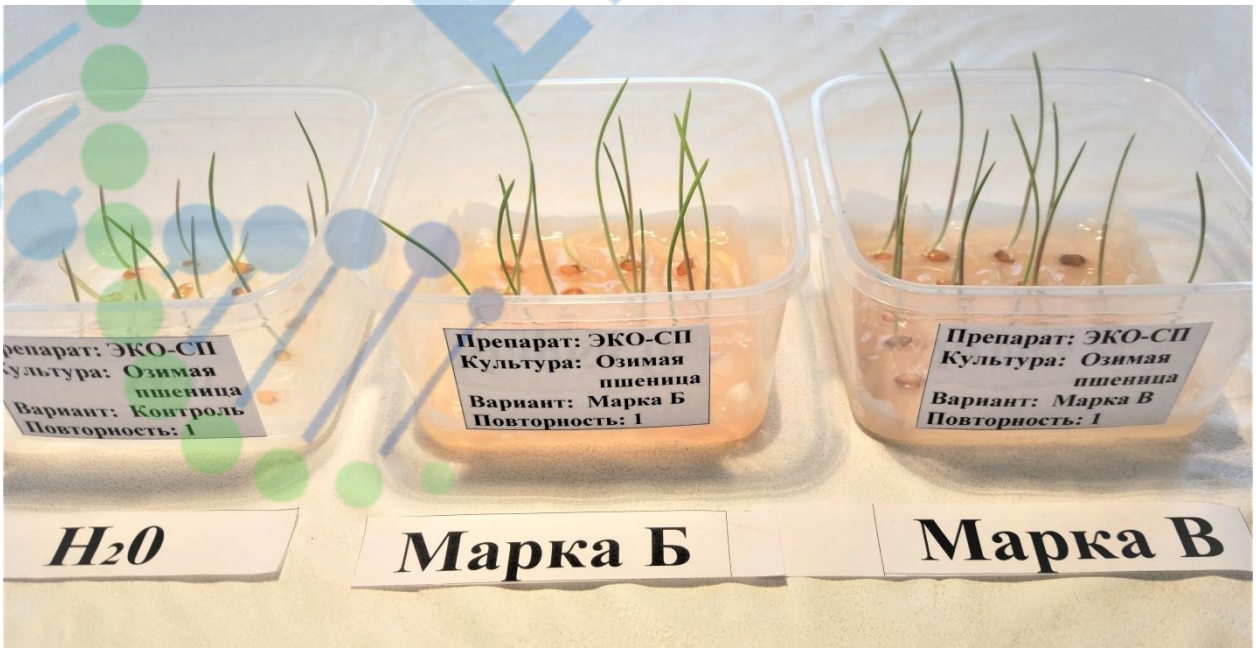

Fig. 16-winter wheat Seeds 4th day of germination

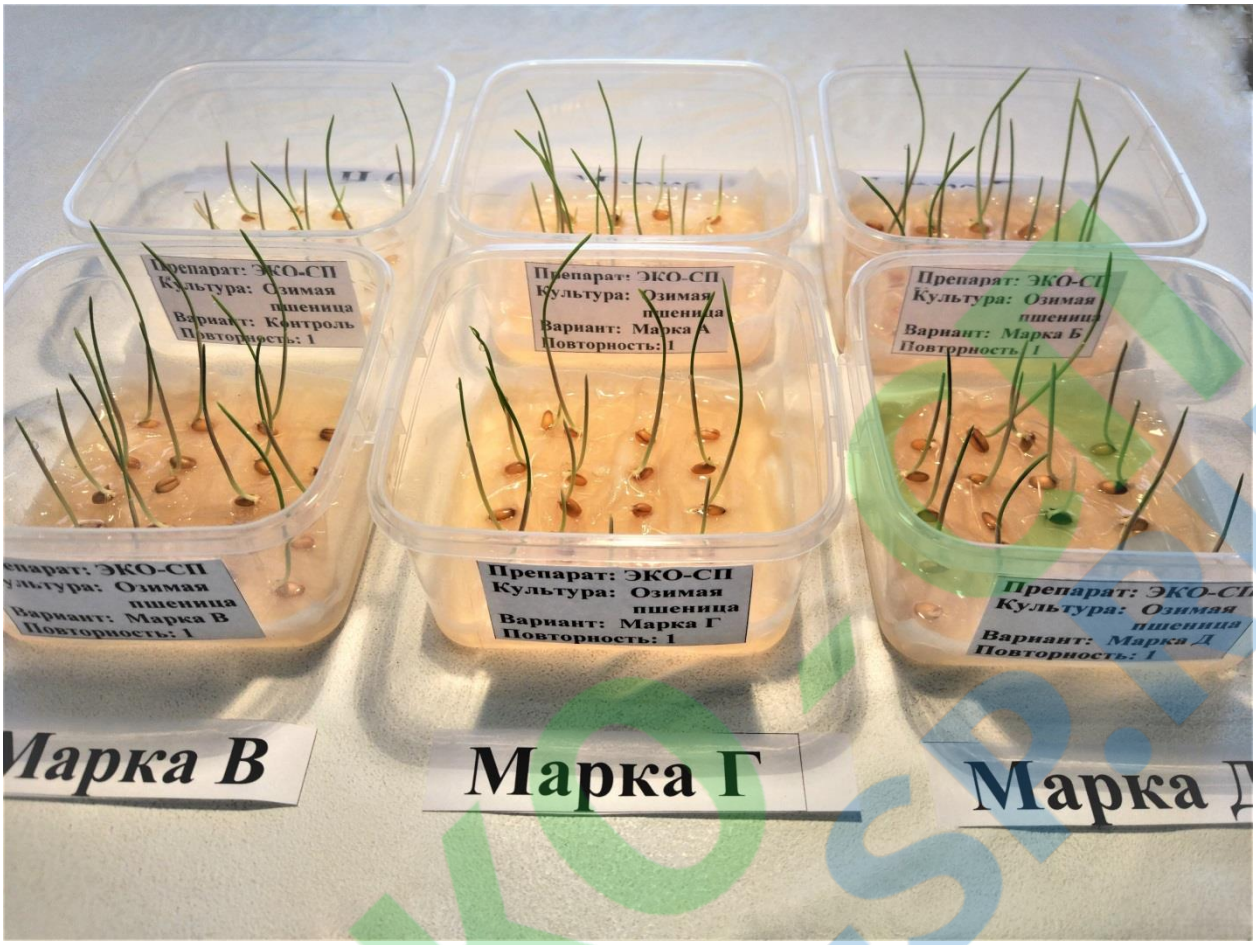

Fig. 17-winter wheat Seeds on the 4th day of germination.

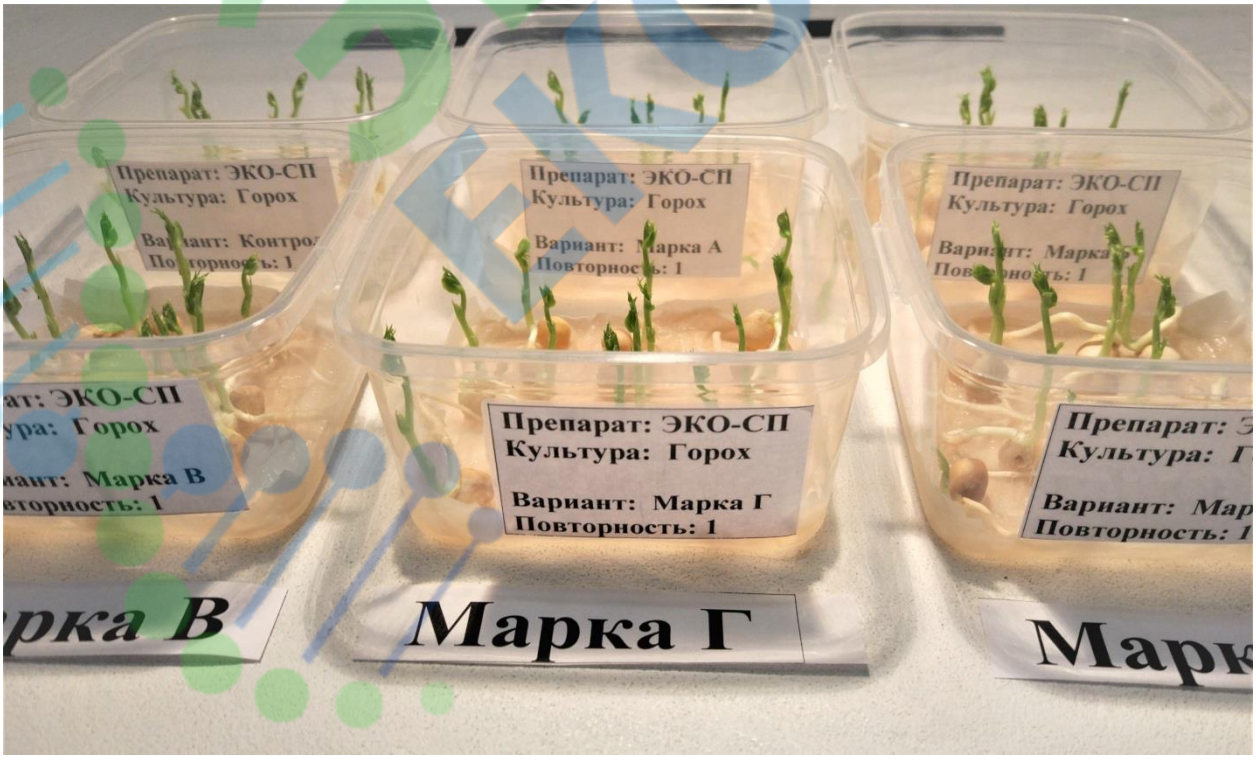

Fig. 18-pea Seeds on the 4th day of germination.

Table 5. Influence of humic fertilizer "ECO-SP" on germination energy and laboratory germination of winter wheat and pea seeds.

variants	Germination energy, % (number of sprouts seeds on day 2)		Laboratory germination rate,% (number of sprouts seeds on day 4)	
	winter wheat	peas	winter wheat	peas
Control (without processing)	15	58	65	83
Seeds processed mark A solution	40	62	70	92
Seeds processed mark B solution	**50**	**83**	**80**	**100**
Seeds processed mark C solution	45	78	75	100
Seeds processed mark D solution	40	83	70	90
Seeds processed mark F solution	35	75	75	90

Methods for determining germination energy and laboratory germination ability. Counting of normally sprouted seeds was performed twice: the first time the germination energy was determined, and the second time the laboratory germination rate was determined. Normally developed seedlings were those that had well developed important structures.

Conclusion. The most effective results, when soaking seeds of winter wheat and peas, were demonstrated by an aqueous solution of fertilizer based on humus substances "ECO-SP" with a concentration of 1 liter per 200 liters of water.

Additional material:

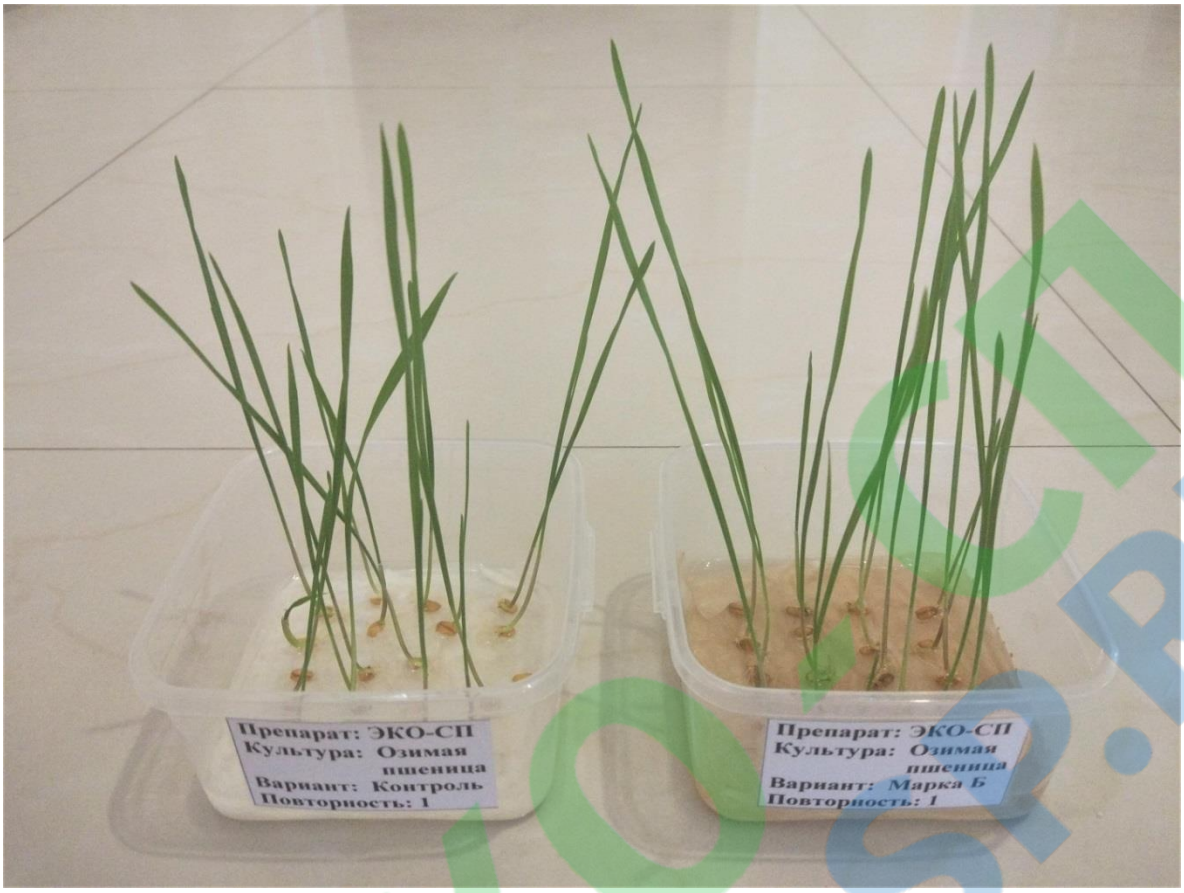

Fig. 19-Germination of winter wheat seeds on the 10th day, concentration of Mark B.

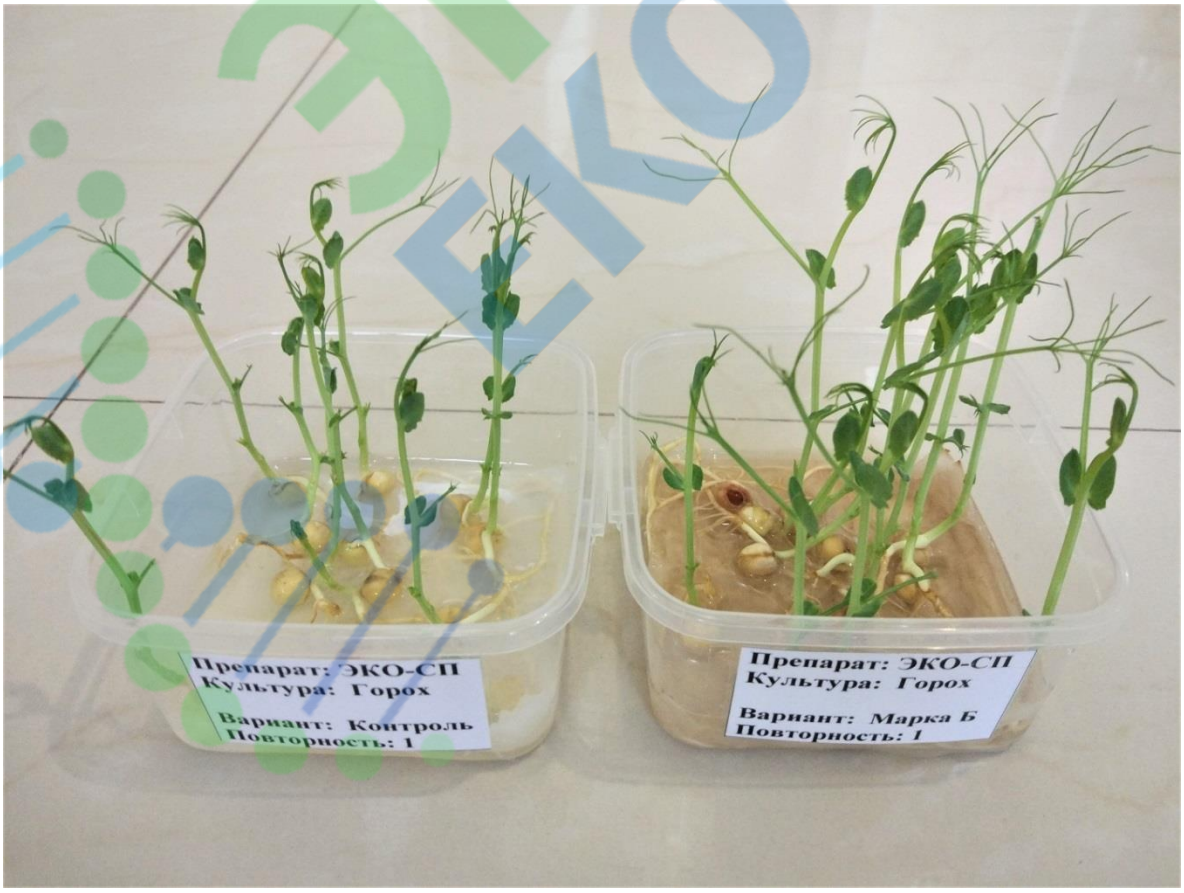

Fig. 20. sprouting of pea seeds on the 10th day, the concentration of Mark B.

Опыт № 3

Purpose: organization and conduct of demonstration experiments to identify the optimal dosage of application and fix the impact on the development of agricultural plants of fertilizers based on humus substances "ECO-SP" of brand A and Brand B.

Table 6. Scheme of experience with the use of Mark A and Mark B fertilizes

№	Variants	Wheat, л/га	Barley, л/га	Sunflower, л/га
1.	Control	-	-	-
2.	Brand A for vegetation	0,5	0,5	0,5
3.	Brand A for vegetation	1,3	1,3	1,3
4.	Mark A in the soil	3,0	3,0	3,0
5.	Mark A in the soil	5,0	5,0	5,0
6.	Mark B in the soil	1,0	1,0	1,0
7.	Mark B in the soil	2,0	2,0	2,0
8.	Mark B in the soil	3,0	3,0	3,0
9.	Mark B in the soil	4,0	4,0	4,0
10.	Mark B seed treatment	0,1	0,1	0,1
11.	Mark B seed treatment	0,2	0,2	0,2
12.	Mark B seed treatment	0,5	0,5	0,5
13.	Mark B for vegetation	0,1	0,1	0,1
14.	Mark B for vegetation	0,3	0,3	0,3
15.	Mark B for vegetation	0,5	0,5	0,5
16.	Mark B for vegetation	0,7	0,7	0,7
17.	Mark B for vegetation	1,0	1,0	1,0

Fig. 21Start of experiment

Fig.22 – start of test

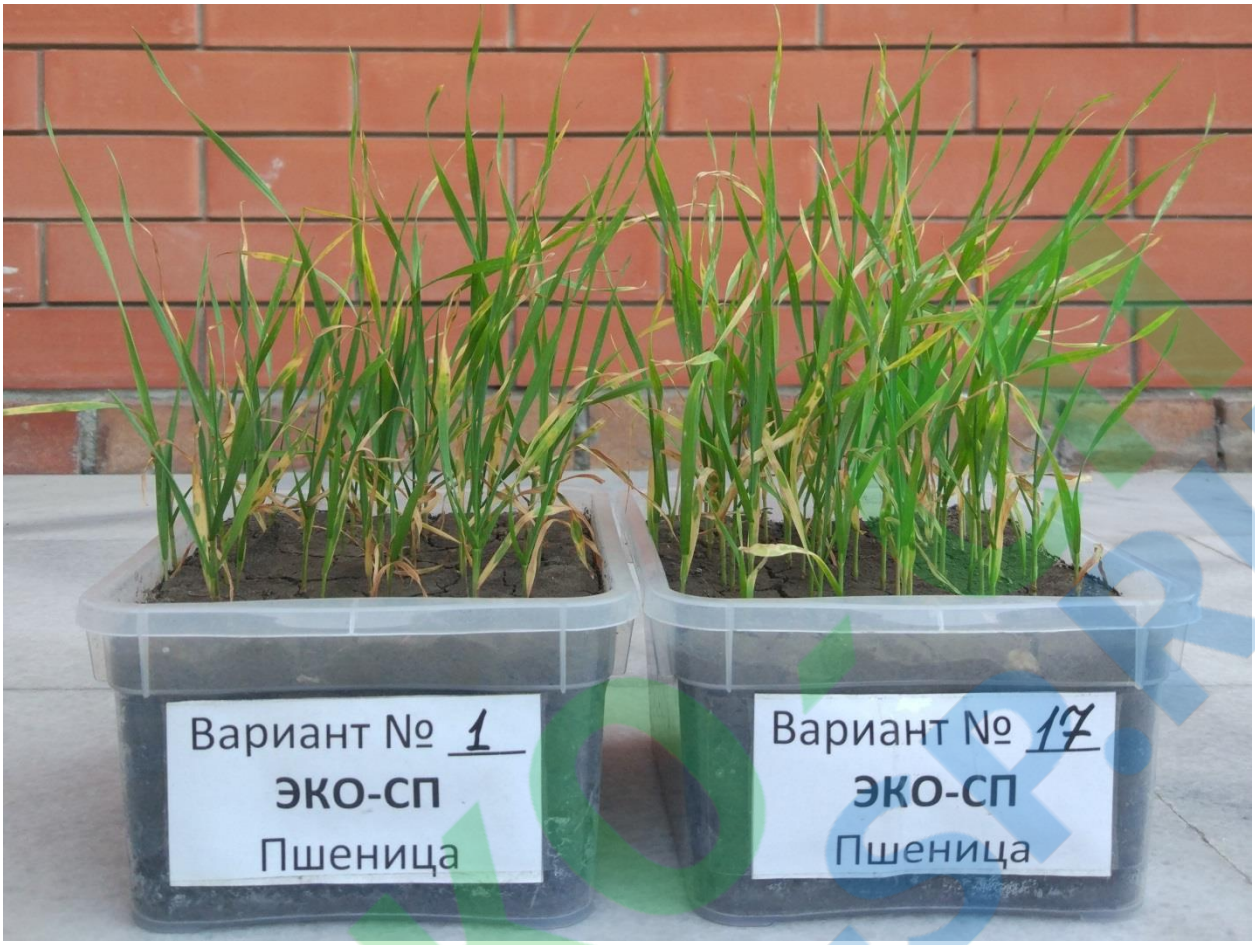

Fig. 23. Differences in the development of the vegetative system of winter wheat

Fig. 24. Differences in the development of the root system of winter wheat.

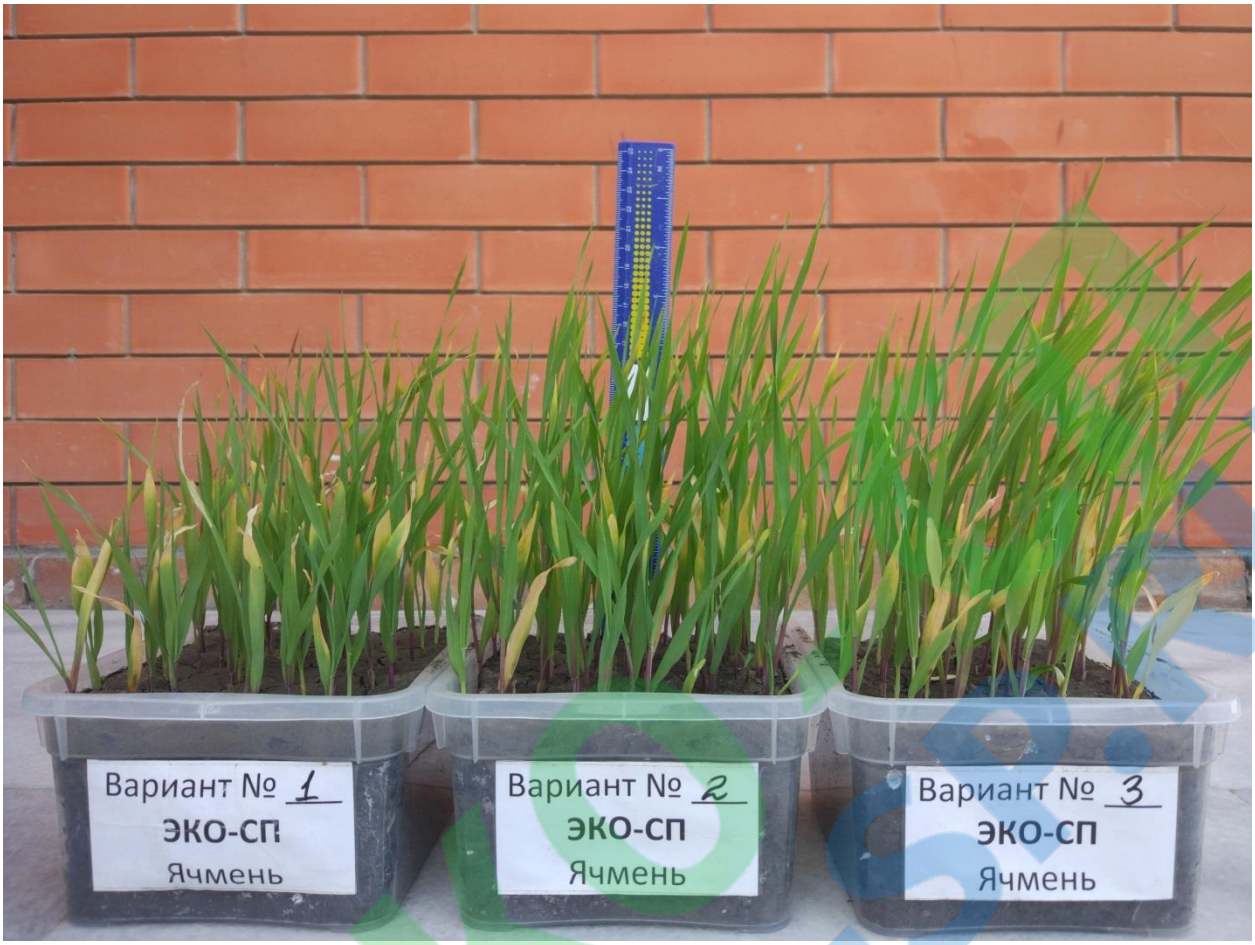

Fig. 25. Differences in the development of the vegetative system of barley.


Fig. 26. The Difference in the development of the root system of barley.

Fig. 27. Differences in the development of the vegetative system of sunflower.

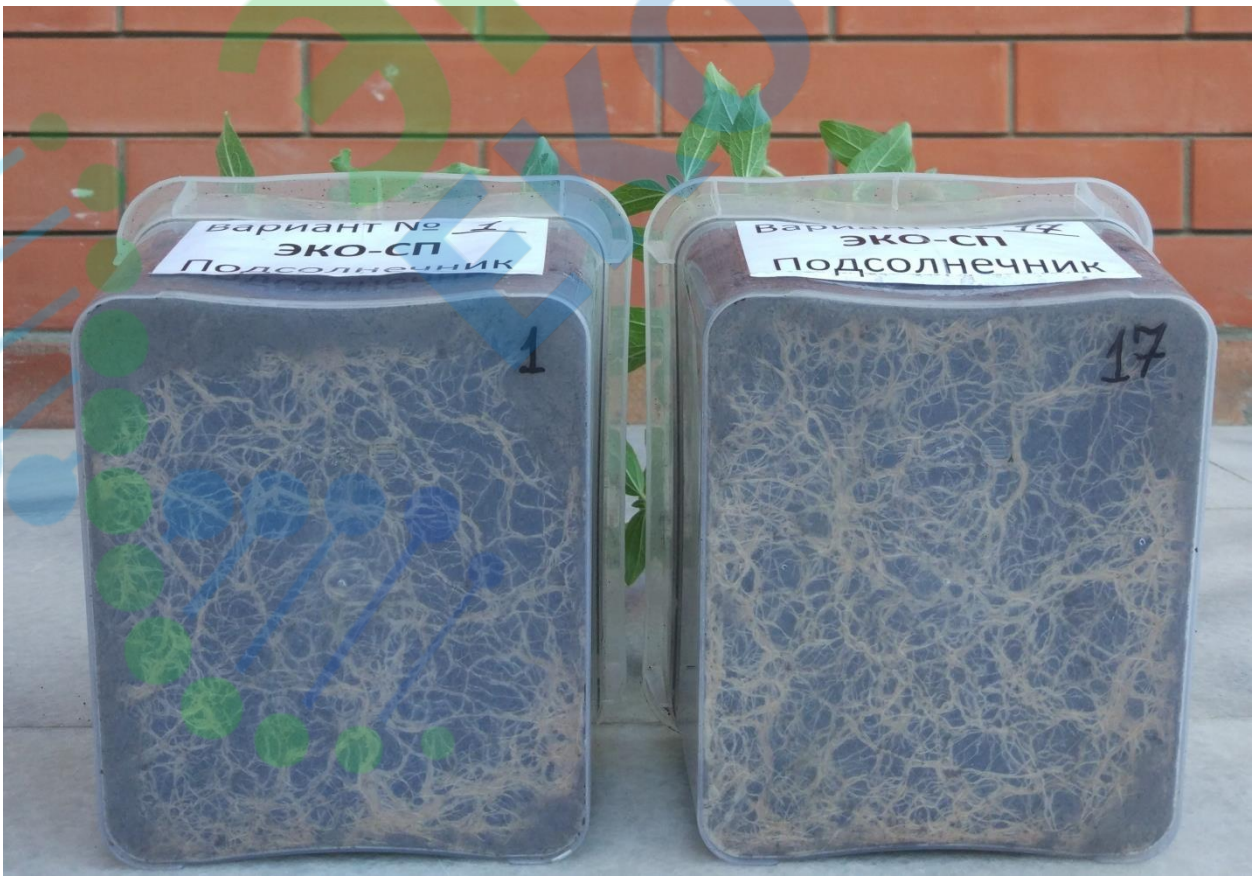

Fig. 28. Differences in the development of the sunflower root system.

Table 7. Influence of various dosages and methods of application of fertilizers based on humus substances "ECO-SP" preparations of Brand A and Brand B on the growth of vegetative and root systems of plants.

Culture	parameters	Variant №1, without the drug	%	Variant 3, Mark A, for vegetation, 1.3 l / ha	%	Variant №17, Mark B, without vegetation, 1 L/ha	%
wheat	высота, см	12	100	14	117	15	125
	вес корней, г	29	100	35	121	38	131
barley	высота, см	14	100	19	136	23	164
	вес корней, г	31	100	38	123	42	135
sunflower	высота, см	14	100	17	121	18	129
	вес корней, г	35	100	44	126	46	130

The methodology of the measurements.
The vegetative system of plants was measured by measuring the height of plants from the tillering node to the top point. The roots of the monoliths (after cutting the aboveground part, from the tillering node) were washed with water, and then their weight was determined.

Findings: During the implementation of the experiment in the variants with the introduction of the fertilizer «ECO-SP», an increase in the growth of vegetative mass and the root system of plants was observed. The best results were observed in variants №3 (preparation A) and №17 (preparation B). When the fertilizer applying to vegetate plants at a dosage of 1.3 and 1 l/ha (Table 7), the plants formed a more powerful vegetative mass and had a larger by 20-31% root system, comparing to the control.

CONCLUSION:
Demonstration and laboratory experiments of the company "ECOR-SP" allowed us to obtain positive, confirmed results of the fertilizer biological effectiveness.

The use of different doses and different methods of applying fertilizers based on humus substances "ECO-SP" when growing crops in laboratory conditions, allowed us to identify the most effective and cost-effective scheme.

General Director “Eco-SP” Ltd **Korostelev A.Y.**