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USE OF MICROBIAL SPECIMENS FOR INCREASE OF YIELD OF BUCKWHEAT

The purpose. To study efficiency of pre-seeding complex treatment of seeds of buckwheat with specimens Diazobacterin and Hetomik. **Methods.** Field, laboratory-analytical, statistical. **Results.** Effect of microbial specimens on growth, development and productivity of plants of buckwheat in conditions of field tests is studied. **Conclusions**. Complex inoculation of buckwheat with biological preparations Diazobacterin (on the basis of nitrogen-fixing bacteria of genus Azospirillum) and Hetomik (on the basis of fungus-antagonist Chaetomium cochliodes) promoted activation of growth and development of plants, increase of amount of florescence and raise of mass of grains for one plant. Increase of yield at complex treatment has made 32%.

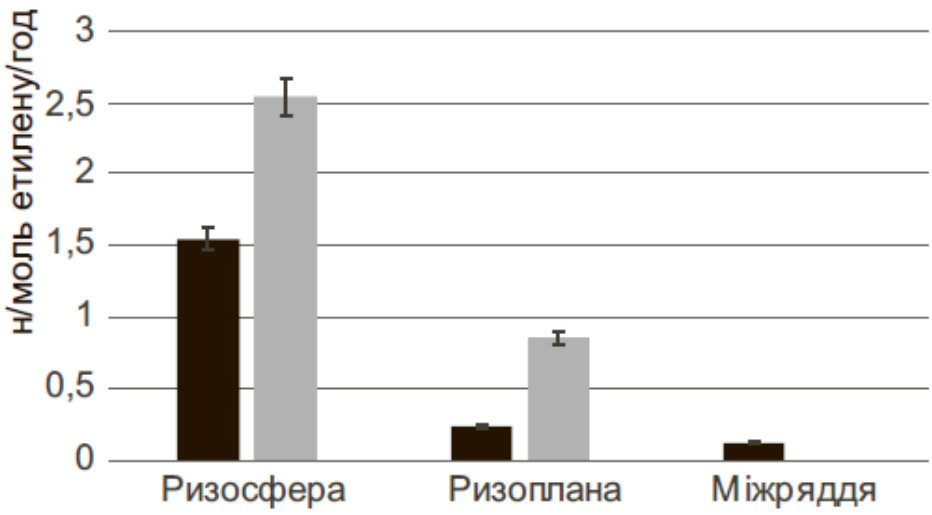
Key words: buckwheat, Diazobacterin, Hetomik, productivity.

Buckwheat is a valuable agricultural crop grown in Poland, France, Germany, Austria, Sweden, the USA, China, Japan, India and other countries. Buckwheat grains are used as a diet product due to the high content of proteins, fats, carbohydrates, mineral salts (iron, phosphorus, calcium, copper), organic acids (lemon, apple, oxalic), vitamins (P, PP, B1, B2, routine) [1, 2]. Buckwheat plants in the flowering phase can be raw material for the routine [3]. Of great importance is buckwheat as a honey that attracts insects-pollinators of crops [2]. For the formation of high buckwheat crops, a high-grade micro-nutrient input to the plant is required. Buckwheat, which is used for the manufacture of baby food products, should be grown without the use of pesticides and with minimum doses of mineral fertilizers [4]. In the early stages of vegetation, buckwheat plants are particularly susceptible to nitrogen and phosphorus intakes; the lack of these elements in mineral nutrition of plants can cause a delay in growth and development of the root system. Provision of buckwheat with all the necessary elements is possible due to the introduction of mineral fertilizers. Another, environmentally safe route is the use of microbial drugs. The diazobacterin preparation is based on nitrogen fixing bacteria Azospirillum brasilense, which, after introducing into the root zone of buckwheat, enters close

symbiotic bonds with the plant and increases the activity of the fixation process of molecular nitrogen. Pre-sowing inoculation of seeds with diazobacterin improves the nitrogen nutrition of the crop, which allows you to increase the yield of the crop and obtain high quality products [5]. Another, equally important aspect of the development of buckwheat plants is the full supply of phosphorus. For this important role is played by mycorrhiza fungi. Their hyphiles can absorb hard-to-reach phosphates and transport them over long distances, delivering them directly to the cells of the root [6, 7]. To improve the nutrition of plants and to protect against pathogens of root diseases on the basis of the mushroom antagonist C. cochliodes 3250, a microbial preparation chemistom, recommended for grains and legumes, sunflower, vegetable, hops, was created. In addition, the previously obtained data characterize C. cochliodes 3250 not only as a biological control agent capable of suppressing pathogens of root plant diseases, but also as a microorganism-endophyte penetrating at the root of plants, forming mycorrhiza and increasing the phosphorus content in crop plants [8] The purpose of the research is to study the effectiveness of pre-sowing complex treatment of buckwheat seed with microbial preparations diazobacterin and chemotherapy. Materials and methods of research. Field experiments were carried out on chernozem with low-glued leachate loamy loam on the forest (experimental field of the Institute of Agricultural Microbiology and Agro-Industrial Production of NAAS), which is characterized by the following agrochemical indicators: the content of humus in the arable layer is 3.56%, the pH of the salt extract - 5.2 - 5.6 %, nitrogen that is easily hydrolyzed - 95-100 mg (for Cornfield) per 100 g soil, mobile forms of phosphorus - 251 - 256 mg per 100 g soil (according to Kirsanov) and exchangeable potassium - 108-111 mg K2O per 1 kg of soil (for Kirsanov). The size of the sown area is 7.5 m2, the registration number is 6 m2, the repetition is 4 times. Agrotechnical cultivation is generally accepted for the Polissya area. Phosphate and potassium fertilizers were introduced in a dose of P30K45, nitrogen fertilizers were not introduced. For the study, seeds of buckwheat Antaria were used at a rate of 5 million seeds per hectare. The experiments were laid out according to the scheme: 1 - control (seed treatment with water), 2 - pre-seed treatment of seeds by chemist on the basis of 40 thousand colonies of forming units (KUO) per seed, 3 - pre-sowing inoculation of seeds with diazobacterin at a rate of 300 thousand KUO per seed , 4 - complex treatment with both biopreparations (on the basis of chemotherapy - 20 and diazobacterin 200 thousand CSU per seed). Field experiments were carried out according to BO methodology. Pospechova [9]. The activity of the nitrogen fixation process was studied in the soil of inter-row, rhizosphere and bacon in the acetylene method on a Chrom-4 gas chromatograph with a

flame-ionization detector. A column of 370 cm in length was filled with chromosorb on β-β'-oxydipropionitrile. The temperature of the thermostat was 50 ° C, the gas carrier - nitrogen, gas flow (ml / min): hydrogen - 30, nitrogen - 100, air - 500 [10]. Determination of phosphorus and nitrogen contents in plant samples of each field trial was performed in three analytical repetitions for the mean sample. The buckwheat plants were taken for analysis in the flowering phase, seeds - in the period of complete maturity at the moisture content of seeds 14 - 15%. The content of nitrogen in grain was determined using an infrared spectrophotometer ICS-4250. The content of phosphorus in groats and buckwheat leaves was determined photometrically by the Denise method in the modification of A. Levytsky [10].

The calculations and statistical processing of the results were carried out using generally accepted methods using the Microsoft Excel software. Research results. We have established that pretreatment of buckwheat seed with microabsorption of diazobacterin promotes activation of the fixation of molecular nitrogen in the root zone of the buckwheat seed (figure). According to the data obtained, the use of diazobacterin provides increased nitrogen activity in the root zone of culture: in ricoplanium buckwheat nitrogen activity increases by 3.7, in rhizosphere - by 1.6 times. Also, the content of nitrogen in the grain of the crop is comparatively controlled by an increase of 11.2% (Table 1). Bioactive agent of a microbial preparation - nitrogen-fixing bacteria are able to enter into close symbiotic bonds with plants and improve nitric feeding of buckwheat. The use of diazobacterin for complex treatment also had a significant effect on the nitrogen content.



Нітрогенезна активність у кореневій зоні гречки посівної за дії мікробного препарату діазобактерин (польовий дослід 2015 р.): ■ — контроль (без обробки); ■ — інокуляція діазобактерином

1. Уміст азоту в зерні гречки за дії мікробного препарату діазобактерин

Варіант досліду	N, % від маси сухої речовини
Контроль (обробка водогінною водою)	1,33±0,06
Інокуляція діазобактерином	1,48±0,07
Обробка хетоміком	1,37±0,07
Комплексна обробка	1,47±0,06

Treatment with the chemistum contributed to an increase in phosphorus content in buckwheat leaves by 13.9% compared to control (Table 2), which indicates the active absorption of phosphorus from the soil by plants. In the complex application of microbial preparations chemistom and diazobacterin phosphorus content in the leaves increased by 17.9%. The complex content of phosphorus in buckwheat grew (by 6.5%). The obtained results indicate that pretreatment of seed with microbial preparations had a significant effect on the content of phosphorus in both leaves and in grain of culture. An increase in the height of buckwheat plants under the action of microbial preparations is one of the signs of the positive effect of treatment on the conditions of plant growth. Thus, the plant height for using chemotherapy increases by 12%, for the complex application of microbial preparations - by 20.7% (Table 3). For buckwheat plants, it is characteristic to react with an increase in the vegetative mass and an increase in growth processes on favorable growth conditions [1]. In addition, C. sochliodes 3250 (a microbial agent chemistom) produces phytohormone substances of auxin and gibberellin nature that stimulate the growth of stems and roots.

One of the factors necessary for effective mechanized harvesting of buckwheat is the high placement of fruit inflorescences [11]. In our case, the height of attachment of the first inflorescence was 35.19 - 49.23 cm, depending on the variant. Treatment with chemotherum significantly influenced this indicator (see Table 3). Diazobacterin and chetomic contributed to an increase in the number of inflorescences, which is a positive factor for the production of this crop (see Table 3).

2. Уміст фосфору у рослинах і зерні гречки за впливу мікробних препаратів (польовий дослід, 2014 р.)

Варіант досліду	Органи рослин (листки)	Зерно
	P_2O_5, % від маси сухої речовини	
Контроль (обробка водогінною водою)	1,51±0,03	1,08±0,001
Інокуляція діазобактерином	1,59±0,03	1,08±0,002
Обробка хетоміком	1,72±0,01	1,09±0,004
Комплексна обробка	1,78±0,01	1,15±0,001

An analysis of the structure of the buckwheat crop shows an increase in the number of grains (up to 83.59 pcs.) And their mass (up to 2.39 g) per plant for complex pre-planting treatment with biopreparates. As is known, the main component of the total crop is the productivity of one plant [11]. It is logical that the high-density (weight of 1000 grains), with the use of chemistom and diazobacterine, has the highest value and is 29.65 g (see Table 3).

3. Характеристика морфобіологічних показників рослин гречки за дії мікробних препаратів (польовий дослід, 2015 р.)

Морфобіологічні показники	Контроль (обробка водогінною водою)	Обробка хетоміком	Інокуляція насіння діазобактерином	Комплексна обробка мікробними препаратами
Висота, см: рослин	72,77±3,2	81,5±4,29	67,62±6,99	87,83±1,68
прикріплення першого суцвіття	37,34±3,95	35,19±2,7	49,23±3,18	38,19±4,48
Кількість, шт.:				
суцвіть	7,8±0,3	13,04±1,2	14,51±1,43	15,93±1,24
зерен на 1-й рослині	38,68±4,36	67,28±5,72	49,04±5,47	83,59±5,73
Маса зерен на 1-й рослині, г	1,06±0,1	1,46±0,1	1,27±0,2	2,39±0,4
Крупноплідність, г	25,31±1,4	29,05±1,8	28,62±2,4	29,65±1,8

4. Урожайність гречки сорту Антарія за передпосівної обробки біопрепаратами

Варіант досліду	Урожайність, т/га		Середня урожайність за 2014–2015 рр.	
	2014 р.	2015 р.	т/га	% до контролю
Контроль (обробка водогінною водою)	1,915	2,449	2,182	–
Інокуляція діазобактерином	2,359	2,496	2,428	11,3
Обробка хетоміком	2,229	2,685	2,457	12,6
Комплексна обробка	2,624	3,167	2,896	32,7
$НІР_{05}$	0,126	0,361		

The main integral indicator of the quality of influence on plants is yield. Growth of crop for pre-sowing inoculation with diazobacterin was 11.3%, for chetomic treatment 12.6% (Table 4), for complex action of diazobacterin and chemotherapy - 32.7% for control.

Conclusions

Integrated buckwheat inoculation with diazobacterin biopreparations (based on nitrogen-fixing bacteria of Azospirillum genus) and chetomic (on the basis of Chaetomium cochliodes fungus antagonist) contributed to the intensification of growth of plants, the increase in the number of inflorescences and the increase in the mass of grains from one plant . Growth in crop for integrated processing was 32%.

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