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Efficiency of biofertilizers as stimulating factor for development of crops at the first stages of ontogenesis

Purpose. Determine the effectiveness of using the pure bacterial culture of Bacillus sp. 523 and the drug «Humin plus», which is a complex organic-mineral humic universal micronutrient I for biological agents to stimulate growth and development of crops in early ontogeny. Methods. Laboratory, statistical. Results The positive influence of the investigated strain and the drug "Humin plus" on the similarity, energy, friendliness and speed of germination of winter rye seeds was revealed. Conclusions The combined use of the drug organ- complex mineral fertilizers humic universal (watering during the growing season) and pure bacterial culture (inoculation) stimulates the growth and development of crops in early ontogeny, improves plant resistance to pathogens, which positively affects the quality of the crop.

Keywords: black soil ashed, organic farming system, pure culture strain Bacillus sp. 523, complex organomineral humic universal microorganisms, inoculation of seeds.

An important factor in soil fertility of soil is introducing new teh¬nolohiy, including organic farming, which involves the application and observance of natural biological laws: the accumulation of organic matter in the soil by une¬sennya organic fertilizers, sediments (peat, silt, sapropel), using Peace Lagging remains and green fertilizers (siderates), etc. These laws are an alternative to the use of chemicals. The concept of organic farming needs to increase the principle of alternativeity at the expense of biological components [9]. Soil microorganisms play an important role in biochemical transformations of substances on terrestrial ecosystems, in particular, agrophytocenoses. Human activity contributes to the enhancement of their bio-geochemical function, therefore, it is possible to regulate the activity of microorganisms primarily to increase the availability of nutrients and plant protection [2, 5]. Introduction Organic Earth-robstva now impossible without broad ristaniya Viko-microbial drugs or artificial enrichment pound agronomically useful microorganisms that positively influence the growth, development and mineral nutrition ros¬lyn and can inhibit the development fitopa- toheniv. Activation of aboriginal microflora is possible under the conditions of use of organo-mineral fertilizers on the basis of peat and humic preparations. Organic skla¬dayetsya of peat humic and fulvic acids from, bitumen, cellulose, lignin and mineral - mainly of silicon, calcium, iron, aluminum and mikro¬elementiv. The organic matter of peat and hu¬minovi acids, which are the source of physiologically active substances that increase the life processes of living organisms belonging to the past and largely vplyva¬yut on soil fertility [1, 6]. The purpose of research - to identify efektyv¬nist universal application of humic fertilizers «Humin plus» and clean the bacteria Bacillus sp., In particular strains 523, as biolohich¬nyh means to stimulate the growth and development of crops in the early on-tohenezu. Research methods. Definition efek¬tyvnosti ahrozahodiv use of biological function of increasing productive plants in organic farming systems conducted in the following areas: artificial enrichment of soil strain 523, isolated from mikrobiotseno- mouth podzolic chernozem sys¬temoyu with organic farming, and drug «Humin plus», which is Complex organomineral humic universal microfertilizer. The strain selection was based on generalized data from studies of the soil microbiology laboratory of the NSC "IAA named after O.N. Sokolovsky "for antagonistic, nitrogen-fixing properties and properties", which stimulate growth [7, 8]. In the laboratory study, the optimal forms of the introduction of bacterial culture and preparation (separately and in combination) were studied using the method of pre-planting of seed dressing and watering the soil. The following indices were used to assess the effect of the investigated strain and the drug Humin plus on germinating seeds of winter rye: similarity, energy, friendliness and germination rate [3, 4, 10, 11]. For this, the seeds were planted on soil plates. Each petri dish was filled with

25 seeds, pre-soaked in water during the day, which dipped 1 cm. In the process of seed germination, a constant temperature of 25 ° C was maintained. Scheme of experiment is shown in Table. 1. Under similarity, the number of seeds sprouted for 7 days, as a percentage of the total number of seeds taken for sprouting, is understood; Under the energy of germination - the number of seeds that sprouted in the first 3 days. Germination was determined as a percentage of the total number of seeds taken for germination. The germination compatibility was calculated according to the formula: D = P / A, (1) where D - the germination friendliness (the average percentage of seeds seeded per 1 day of germination),%; P - complete similarity,%; A - number of days of germination; The rate of germination - by the formula:

Where C - duration of germination (average rate of germination of 1 seed), days; A - number of seeds that sprouted for 1 day; B - the number of seeds that sprouted in the 2nd day; In - number of seeds that sprouted in the 3rd day; G - the number of seeds that sprouted in the 4th day, etc. The effect of the used bacterial cultures and humic fertilizers on the development of roslin in the beginning of development is evidenced by the rate of deviation of the data from the control soil (H20). To test the effectiveness of the protective function of the antagonistic properties of the strain 523 bacillus antagonists and the drug "Humin plus", a bioass in seeds of maize infected with Fuzarium oxysporum var. Orthoceras 400, which is a phytopathogen. The obtained data are statistically processed by the method of dispersion analysis using the program Statistica 6.0. Research results. The effectiveness of using the bacillus 523 strain for artificial enrichment of soil and humic microfertilizer «Humin plus» by the method of pre-sowing inoculation and soil watering of vegetative plants in the early stages of development was determined by similarity, energy, friendliness and germination rates. The similarity and energy of germination are the main indices of the quality of seeds, which directly affect the productivity of crops, which is especially important for the organic system of land cultivation [3, 4]. The similarity of the seeds is its ability to form normally developed sprouts. Determine the similarity of the laboratory (for germination in the laboratory, which contribute to optimal germination of most seeds of the studied culture) and field (in the field). The average similarity and growth energy compared to control was higher by 16.4% in the case of pre-sowing inoculation of seed 523. By irrigation during vegetation, the growth of these indicators was also observed at 13.4% compared with the control in the variant using Bacterial culture (Fig. 1). In the variant with the use of "Humin plus" the growth of similarity and germination energy in the conditions of pre-seed treatment of seeds was increased by 6.7% on a par with the control (see Fig. 1).

1. Scheme of laboratory experiment

Fig. 1. Influence of the use of the preparation Humin plus and strain 523 on the similarity and energy of the growth of the seeds (average per repetition),%, NIR05 = 2.0: - rye in winter - inoculation, germination similarity; - rye in winter - mowing, germination similarity; - - rye in winter - inoculation, germination energy; - - rye ozym - irrigation, germination energy

Fig. 2. Influence of the use of the preparation "Humin plus" and strain 523 on the friendliness and growth rate of the seeds (mean repeat),%: nnv; - rye in winter - inoculation, sprouting rate; Sms - rye in winter - watering, germination rate; - rye in winter - inoculation, germination friendliness; - »- - rye in winter - watering, germination friendliness

In an embodiment of the combined use of the drug and shta¬mu 523 «Humin plus» for irrigation 2. Biotest on seed corn treated drug "Humin plus» and strain 523 Fig. 3. Effect of combined drug treatment «Humin plus» and bacterial culture to 523 sub-INCREASING stability corn to pathogens: a) 1 - control 2 - drug «Humin plus» + strain 523 b) 1 - control 2 - strain 523, 3 - drug «Humin plus» + strain 523 rye winter under During the growing season, the growth of the studied indices was observed correspondingly by 15.4% compared with the control and by 8.7% in the variant where the application ridges only strain 523. For a more accurate description seed us additional indicators are calculated in the speed and friendliness seed germination. The rate of seed germination vyzna¬chayut the sum of average number of seeds, which rises daily and friendliness prorostan¬nya - the average number of seeds, It has a positive effect on strain 523 and Humin plus, as well as their combined use. It should be noted that the germination-friendliness rate was higher in most variants with watering the drug and bacterial suspension. In the variant with inoculation, this figure exceeded control by 18.15% (Fig. 2). The inoculation rate of the germination was slightly better by the strain 523 - the index was higher than control by 19%. In the variant with watering the drug "Humin plusw + strain 523, the indicator exceeded the control by 21% (see Figure 2). The productivity of plants and the quality of grain are affected by such an indicator as the degree of disease. For an organic system of land cultivation, which provides for the

prohibition of the use of any chemical means of crop protection, ecologically safe methods of control of populations of pathogenic microorganisms become relevant. A special place in it belongs to microbial drugs based on microorganisms with antagonistic properties. We conducted Biotest zarazheno¬mu on seed corn drug «Humin plus» and strain 523. According to the data set humic stimulating effect of the drug on the initial phases of plant development on indicators roots length and number of seeds neproroschenyh - vidpo¬vidno 22 and 27% compared to Control (Table 2). Pre-sowing inoculation with pure bacterial culture of bacillus 523 stimulates the growth of agricultural plants. However, its leading property is associated with antagonisms [7] (Table 2). According to the data obtained, the stimulatory effect of the strain 523 suspension on the similarity of corn seed in terms of the length of the roots was established. The investigated strain stimulated their growth by 39.25 mm in comparison with the control. It has been established that the use of the preparation "Humin plus" with the simultaneous addition of strain 523 significantly inhibits the pathogenic factor. Research results from infected seed corn indicate that for the combined effects of bacterial culture and pre¬paratu «Humin plus» increases its stiy¬kist to pathogens (Fig. 3).

Conclusions

Combined application of the complex universal plant growth regulator Humin plus (irrigation during vegetation) and bacterial culture (inoculation) stimulates the growth and development of crops at the onset of ontogenesis, promotes increased resistance of plants to phytopathogens, Which has a positive effect on the quality of the crop.

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