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Nitrogen-Fixing Activity of Soybean Plants in the Application of Complex Inlays Seeds.

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ABSTRACT

The paper examines the impact of the application of a comprehensive treatment of soybean seeds bacterial preparations Nitrofix P, containing in its composition of bacteria of the genus - *Bradyrhizobium japonicum* and *Bradyrhizobium elkanii* on the nitrogen-fixing activity and productivity of soybean varieties «Vilana» in unstable moistening zone.

Keywords: soybeans, weight of nodule, number of leaves, leaf area, yield of protein.

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INTRODUCTION

The main task of the modern crop is to meet human needs in proteins of plant origin. Among legumes special place in solving problems is given soy protein [3, 7].

Soybeans - the most valuable protein and oilseeds. Due to its unique chemical composition, it is widely used as food, feed and industrial crop. According to popular use in various sectors of the economy, it is superior to all other crops [5].

Soy is improving culture and a good precursor for crops in crop rotations. Due to the symbiotic nitrogen fixation is not only efficient in its use of nitrogen reserves from the soil, but also fills them due to accumulation in the roots and above-ground plant residues. Analysis of raw materials for the production of concentrated feed indicates that is necessary sharp increase in fees high-protein seeds of leguminous crops such as through the expansion of cultivated areas, and by increasing their yields [1, 4, 6].

Because of the many stressors local forms of symbiotic nitrogen-fixing soil lose their activity.

To enhance nitrogen fixation is necessary annual introduction of reactive nitrogen-fixing microorganisms specialized areas (nodule bacteria - *Bradyrhizobium japonicum* Kirchner).

Modern science has made great strides in learning symbiotrophic process of atmospheric nitrogen fixing rhizobia-rhizobia living on the roots of soybean plants. The process efficiency depends not only on the presence of bacteria, but their activity and virulence. High effectiveness in improving inoculation rhizobia-rhizobia reached VNIIMK scientists. Over 45 years of research in VNIIMK experiments, it was noted that there is an additional accumulation compared to the control at 0,1 inoculation nitragin besides yield increase from 0,6 to 3,7 t / ha (an average of 1,7 t / ha) to 6,7% (in average 2,3%) protein in seeds [1, 2, 8]. At the present stage of preparations based on nitragin, Nitrofix P - Brazilian inoculant on a sterile peat and Nitrofix G, argentine liquid inoculant is actively using the company «Soy Complex». In 1990-1994, N.F. Chayka and O.M. Shirinyan created CPIS (complex preparations inlaying seed), having in its composition specific adhesive №2 (nutrient substrate for bacteria), boron minerals, molybdenum, cobalt, and humate sodium. Specific adhesive №2 allows rhizobia remain viable up to 10 days after a seed treatment, and the addition of trace elements and sodium humate helps to activate the symbiotic process.

MATERIALS AND METHODS

An obligatory element of soybean cultivation technology is a pre-sowing seed inoculation drugs nodule bacteria. Modern agrochemicals market is a large variety of products for pre-treatment of seed and foliar plants.

The objective of research was to study the efficacy of a bacterial preparation Nitrofix P (dry inoculant based on gamma-sterilized peat) containing nitrogen-fixing bacteria - *Bradyrhizobium japonicum* and *Bradyrhizobium elkanii* pure and in complex with the film former №2 (nutrient substrate for bacteria), comprising incorporating minerals boron, molybdenum, cobalt and sodium humate (CPIS technology).

The studies were conducted under conditions of North - Caucasus region on an experimental station of the Stavropol State Agrarian University.

Preceded in rotation of crops - winter wheat, four-time repetition of experience, placement options - randomized. Seeding mechanized, performed drills SPC-6 soybean varieties «Vilana». The total area of the plot - 44,1 m², accounting – 29,4 m². The experiments were conducted in accordance with requirements.

RESULTS AND DISCUSSION

It was found that the treatment of bacterial fertilizer soybean seeds Nitrofix P (Table 1) increases the activity of nitrogen-fixing plants and obtain the highest yield of soybean plants.

Table 1: Effect of preplant a complex treatment on yield and quality of soybean seeds, variety «Vilana» (experimental station SSAU), 2008-2009.

Indicators	Control (no treatment)	Nitrofix P, 2 l / t (standard)	Nitrofix P, 2 kg / t + film former (CPIS)
The number of nodules, number / plant	6,2	18,3	24,3
Crude weight of nodules, mg / plant	20,2	40,2	50,3
Leaf area cm ²	160,8	185,2	197,4
Yield, t / ha	2,06	2,34	2,48
Protein, %	38,2	38,6	39,4
Protein yield, t / ha	0,71	0,81	0,88

In the embodiment where the treated soybean seeds before sowing with preparation Nitrofix without film former P number of nodules was higher compared to the control one 12.1 pieces per plant, and their mass is greater by 20 mg. The area of leaves due to create favorable conditions for the growth and development of soybean plants also increased to 24,4 cm². As a result, in this embodiment, the yield was higher than the control at 0,28 t / ha, and the protein yield is 0,1 t / ha. In processing soybean seed by seed incrustation complex technology (CPIS) these figures are significantly increased not only in comparison with control variant, but also in comparison with the standard.

CONCLUSION

It was found that the processing of soya seed inoculant promotes the active formation of nitrogen-fixing bacteria. The most active nodules formed in the version with a complex inlays of seeds: in comparison with the control variant of the mass was higher by 2,4 times, as compared with the standard 1,3-fold.

The development of nodules promotes active use of atmospheric nitrogen and increases the nitrogen nutrition that allows the plants to generate the highest soybean leaf area.

Provision of plants by molybdenum and other trace elements contained in the composition of the film former, not only stimulate the activity of rhizobia, increasing the number and weight of nodules, but also increases the yield and protein content in the seeds. In connection with this embodiment in the collection of protein using seed incrustation a complex control variant was higher at 0,07 – 0,17 t / ha.

REFERENCES

- [1] Baranov V.F., Kohegura A.V., Lukomets V.M. Soybeans in the Kuban. - Krasnodar, 2009. - 321 p.
- [2] Petibskaya V.S. Soybean: chemical composition and use. - Maikop, 2012. - 432 p.
- [3] Agafonov O.M., Shabaldas O.G. Impact of the use of drugs that stimulate the activity of nitrogen-fixing plants, growth regulators and foliar fertilization on the yield of soybean // VII International conference of young scientists and specialists. -Krasnodar: VNIIMK, 2013. - P. 5-8.
- [4] Tilba V.A. Shabaldas O.G. The use of biological nitrogen as a means biologization farming systems // Vestnik APK Stavropolya 2015; p 96 -101.
- [5] Ivan Vasil'evich Kapustin, Vitaly Anatol'evich Grinchenko, Dmitry Ivanovich Gritsay, and Elena Ivanovna Kapustina. Res J Pharm Biol Chem Sci 2016;7(2):338-343.
- [6] Natal'ja Jur'evna Sarbatova, Vladimir Jur'evich Frolov, Olga Vladimirovna Sycheva and Ruslan Saferbegovich Omarov. Res J Pharm Biol Chem Sci 2016;7(2):534-538.
- [7] Olga Georgievna Shabaldas, Natalia Nikolaevna Glazunova, Olga Viktorovna Mukhina and Elena Borisovna Drepa. Res J Pharm Biol Chem Sci 2016;7(2):721-724.
- [8] Natalya Anatol'evna Dovgotko, Marina Vladimirovna Ponomarenko, Evgeny Valer'evich Rusanovsky, Skiperskaya Elizabeth Viktorovna, and Tokareva Galina Viktorovna. Res J Pharm Biol Chem Sci 2016;7(2):527-533.