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Symbiotic Activity And Productivity Of Soybean, Depending On The Methods Of Presowing Treatment Of Soybean Seeds In The Conditions Of Central Ciscaucasia.

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ABSTRACT

The purpose of the study was to study the application of soybean seed treatment with the bacterial preparation Nitrofix P containing bacteria from the genus - *Bradyrhizobium japonicum* and *Bradyrhizobium elkanii* in its pure form and in combination with the film former (CPSE) on the symbiotic activity and productivity of soybean in Central Ciscaucasia. It has been established that the additional application of film-forming agents to bacterial preparations increases the symbiotic activity, since in the Vilana variety under the conditions of the SSAU test station the number and weight of nodules increased in comparison with the control variant by 1.8-2.0 times, and in the case of the Duniza variety, in the conditions of the Armavir experimental station, the All-Russian Research Institute of Oil-crops (ARRIOC) was 1.3 -1.7 times. Seed treatment with Nitrofix P alone, and in combination with the film former, showed th effectiveness of these methods - the yield increment in these variants was 0.28-0.42 (Vilana variety) and 0.10-0.23 (Duniza variety) t / ha.

Keywords: soybean, mass, quantity, experience, option, yield, nodules, protein, oil, productivity.

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INTRODUCTION

One of the important elements of soybean cultivation technology is presowing seed inoculation with drugs of nodule bacteria.

Because of numerous stress factors, local forms of symbiotic soil nitrogen fixers often lose their activity. To increase nitrogen fixation, it is necessary to annually introduce active forms of microorganisms-nitrogen fixers of specialized direction (nodule bacteria - Bradirhizobium japonicum Kirchner). Inoculation of soybean seeds with bacterial preparations is mandatory not only when this culture is introduced in new territories, but even in those areas where soybean has already been cultivated, since seed treatment with specially selected, highly active strains of nodule bacteria substantially increases the yield of plants [1, 5, 6].

For introduction into production in the zone of unstable moistening, elements of the soybean growing technology for grain, which promote the growth of yield and improve the quality of seeds, such as seed treatment with bacterial preparations, and the use of these preparations in combination with film formers and growth stimulators, a theoretical and practical justification for these measures is necessary [2, 4, 7].

MATERIALS AND METHODS

In the conditions of Central Ciscaucasia at the experimental station of SSAU in 2008-2009 and Armavir experimental station ARRIOC in 2013-2015. Nitrofix P (a dry inoculum based on gamma-sterilized peat that contains nitrogen-fixing bacteria - Bradyrhizobium japonicum and Bradyrhizobium elkanii.) was tested in pure form and in combination with a film former containing trace elements - boron, molybdenum, cobalt , as well as a growth regulator - sodium humate based on soybean phosphatides.

Agrotechnics in the experiments was generally accepted for this zone. The predecessor is winter wheat, the norm is sowing 500 thousand seeds per 1 hectare. The repetition of the experiment is fourfold, the placement of the options is a randomized one. In the experiments, the regionalized varieties of Vilana (Experimental Station of SSAU) and Duniza (Armavir Experimental Station ARRIOC) were used. The treatment of seeds and plants with a biological preparation, as well as taking into account the yield of soybeans, was carried out according to the method of conducting field agrotechnical experiments [3].

RESULTS AND DISCUSSION

A sign of a good quality of inoculation and a guarantee of the effectiveness of this method is the number and weight of healthy nodules. Rounded large and rough nodules, located mainly on the main root, work most effectively, since they indicate a large number of living bacteria, and hence produced nitrogen. Small and smooth nodules on the root processes are not sufficiently effective. Analysis of the formation of the number and weight of nodules, depending on the treatment of seeds with the bacterial drug Nitrofics P, showed that the use of this method increases the number of nodules by 554-1155 per square meter in comparison with the control variant (Table 1).

Table 1: Effect of treating soybean seeds with a bacterial preparation on symbiotic activity

Variant	Experimental Station SSAU		Armavir Experimental Station ARRIOC	
	Number of nodules, pcs / m^2	Weight of nodules, g / m^2	Number of nodules, pcs / m^2	Weight of nodules, g / m^2
Control (without treatment)	1 048	12,5	1 803	16,5
Nitrofix P, 2l / t	1 602	17,7	2 248	22,6
Nitrofix P, 2kg / t + film former (CPSE)	1 945	21,4	2 410	25,1

The weight index of nodules depending on the variety also increased by 6.1 - 7.2 g / m^2 in comparison with the control variant. Complex processing of Nitrofix P seeds in combination with the film former facilitated

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the activation of symbiosis, so the number of nodules increased by 44.9 - 46.1%, and the mass of raw nodules by 41.6 - 34.3% compared to the control. The formation of nodules depending on the treatment of seeds with a bacterial preparation is shown in Fig. 1.

1 - Control; 2 - Nitrofix P, 2 l/t; 3 - Nitrofix P, 2 kg / t+film-former.

Figure 1: Development of nodules depending on the treatment of soybean seeds with a bacterial preparation (Experimental station of StGAU, 2008-2009, Vilana variety)

The quantity and quality of the crop are complex indicators that are formed in the process of cultivation of the crop. They depend on the variety, soil type, agrotechnics and meteorological conditions, and their parameters vary depending on their interaction.

The results of the effect of seed treatment with rhizobial preparation on the productivity of soybean varieties of Vilana and Duniza are presented in Tables 2 and 3.

Table 2: Effect of treating soybean seeds with a bacterial preparation on soybean yield

Variant	Harvest, t / ha		Harvest increase, t / ha	
Place of the experiment	Experimental Station SSAU	Armavir Experimental Station ARRIOC	Experimental Station SSAU	Armavir Experimental Station ARRIOC
Control (without treatment)	2,06	1,60	-	-
Nitrofix P, 2l / t	2,34	1,70	0,28	0,10
Nitrofix P, 2kg / t + film former (CPSE)	2,48	1,83	0,42	0,23
HCP_{05}	0,16	0,09		

In variants where the seeds were treated with Nitrofix P, yields were higher, depending on the variety, as compared to the control variant by 0.10-0.23 t / ha. The highest yield of soybeans was obtained in a variant with the use of Nitrophis II in combination with a film former containing in its composition an adhesive based on soybean phosphatides and microelements (technology of complex seed encrustation): 0.42 t / ha - Vilana varietyand 0.23 t / ha - Duniza variety.

Table 3: Effect of seed treatment with bacterial preparations on the collection of oil and protein, t / ha

Variant	Content, %		Receive t/ha	
	oil	protein	oil	protein
Experimental Station SSAU				
Control (without treatment)	22,3	38,2	0,41	0,70
Nitrofix P, 2l / t	22,4	39,5	0,47	0,83
Nitrofix P, 2kg / t + film former	22,5	40,4	0,50	0,90

(CPSE)				
Armavir Experimental Station ARRIOC				
Control (without treatment)	21,4	42,1	0,29	0,57
Nitrofix P, 2l / t	21,7	43,4	0,32	0,64
Nitrofix P, 2kg / t + film former (CPSE)	21,4	43,9	0,34	0,69

Seed treatment with Nitrofix P, especially in combination with the film former, had a positive effect on protein content in soybean seeds, increasing its content by 1.8-2.2%. The presowing treatment of seeds with a bacterial preparation did not affect the content of oil in soybean seeds. The maximum protein harvest was noted when the bacterial preparation was combined with film formers, compared with the control it was higher by 21.0 - 28.5%.

CONCLUSIONS

It has been established that the treatment of soybean seeds with a bacterial preparation increases the symbiotic activity of soybean plants. Application processing Nitrofiks preparation in powder form, especially in combination with the film former, on integrated seed incrustation technology has a positive effect on the quantity and mass of the raw tubers.

The obtained results show that the complex application of the bacterial preparation Nitrofix P with the film former (CPSE) in the treatment of seeds promotes an increase in the yield by an average of 14.3-20.3%. It should be noted that the collection of protein and oil in seeds with the use of a bacterial preparation, in combination with a film former due to an increase in yield increases by 17.4 - 22.3%.

Thus, taking into account the short duration of active symbiosis, especially under unfavorable conditions, the identification of factors influencing the activation of this process is of great importance in ensuring the intensity of the production process of soy.

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