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Influence of inoculants INTEX and OPTIMAYZ on productivity and quality of soybean varieties in the conditions of the northern steppe in Mykolaiv region

We defined the influence of INTEX and OPTIMAYZ inoculants on the formation of productivity and quality of Valjuta and Apollo soybean variety in the conditions of the northern steppe in Mykolaiv region.

Keywords: soybean, inoculation, productivity.

Today, the main key to success is the quality soybean seeds, cultivation of new technologies that allow plants to grow successfully throughout the growing season and ultimately give high yields and improve the quality indicators. Biologists claim that soy is at the top of the pyramid of vegetable protein and oils in the world. Biological characteristics give soy more attraction. Thanks to unique combination of soybean plants: two major biological processes of photosynthesis and nitrogen fixation, it largely provides its need in nitrogen, improves fertility and soil nitrogen balance, gives clean production, improves environment.

In recent years grade composition significantly was greatly expanded and potential soybean productivity was increased. However, realization of the genetic potential of modern varieties of culture in the production stays quite low, and the average yield in Ukraine in recent years is 1,2-1,9 t / ha [2]. Especially in conditions of inadequate moisture it is necessary quite responsibly with great care and attention to choose the most productive varieties of soybean that can realize their genetic potential to give the maximum possible yield even under low rainfall.

Many factors influence on the quality and yield, agricultural practices have also a special role.

The aim of our research was to determine the features of the formation of the productivity of soybean varieties Valjuta and Apollon depending on inoculants by preparations INTEX PEAT and OPTIMAYZ in the northern steppe in Mykolaiv region. In this regard, we have the following objectives:

- To determine the effect of inoculation on the growth, development and formation of the yield of soybean seeds;
- To justify the features of the formation of symbiotic and photosynthetic apparatus in soybean depending on inoculation;
- To give economic mark to efficiency of soybean growing depending on inoculation in conditions FG "Arcadia" Bratsk district in Mykolayiv region.

Hydrothermal conditions during the research were favorable for soybean cultivation. In household ordinary light loamy black soil is dominated in the forest with humus content 3,6-4,0%.

The research was carried out in a field two-factor experiment. In the experiment soybean varieties Valjuta and Apollon were seeded - medium early maturity group.

The experiment was laid on the following scheme:

factor A (soybean varieties): 1 - Apollo; 2 - Valjuta;

factor B (inoculation): 1. No processing; 2. Processing by INTEXPEAT inoculant; 3. Processing by Optimayz inoculant.

The experiment was repeated 4 times, areas were placed systematic.

In field research, we studied the dynamics of plant height in soybean varieties under the influence of inoculation. Plant height, we determined on major phases of growth and development. Plant height of soybean in variety Apollon during processing Optimayz inoculant was 69.7 cm, that is on 7.3 cm more, compared with the control. During processing INTEX REAT - 65.8 cm. The height of the central stalk in a variety of Valjuta during processing Optimayz inoculant was 59.7 cm, that is on 6.3 cm more than control variant during processing INTEX REAT - 57.8 cm, the increase was 4.4 cm in accordance.

A very important and critical feature for mechanical harvesting soybeans, along with a set of important features (compact branching, resistance to shattering

and lodging of plants, amicable maturing, and good drying on the vine) is the height of attachment of lower beans. Some scientists consider that the height of attachment of lower beans refers to greatly varying characteristics [4,6]. It was established that the height of beans of the lower tier by using Optimayz inoculants by years of research was the highest: variety Apollon - 11.3 cm, variety Valjuta - 11.6 cm, that is on 2.6 cm and 2.8 cm respectively more compared with the control. During using INTEXPEAT inoculants, height of attachment of the lower beans was in variety Valjuta 10.5 cm, in variety Apollon - 10,1 cm.

We studied the influence of inoculation on symbiotic nitrogen fixation and dynamics of the number and weight of nodules in soybean varieties Apollon and Valjuta on the flowering phase. The largest number of nodules in variety of Valjuta under the influence of INTEX REAT inoculant was observed in the phase of flowering - 61/60 pcs / plant, in variety Apollon - 55/50 pcs / plant. The largest number of nodules was at the end of the flowering phase using of Optimayz inoculant and was 61/56 and 59/57 pcs / plant in varieties Apollon and Valjuta in accordance. The largest mass of nodules on the same plant of soybean marked using Optimayz inoculant: variety Valjuta - 1.29 g, and in variety of Apollon - 1.27 g, which is on 0.17 g more compared with the control. When using INTEX REAT inoculant the index was 1.27 g in two varieties.

The end result in growing any agricultural crop the main indicator is the value of productivity. According Lysogorov S. D. and Ushkarenko V. O., the one of the factors that significantly affects the yield and quality of soybean grain, is variety [1, 7]. But the level of yield of variety depends on the action of complex conditions (level of fertility and moisture of the ground, biological potential of variety, agricultural technician, etc.).

Increased potential of productivity in account of the use of inoculants for seed treatment is scientifically-proven and natural way to increase the flow of nitrogen for legume crops and increase productivity [11, 12].

The use of inoculants based on resistant strains of mycorrhizal that take into account the peculiarities of each culture, enhances the natural ability of legumes to form a symbiosis with bacteria that promotes better assimilation of nitrogen. Established that inoculation of soybean seeds, even at the regular crop rotation and use of fertilizers give an increase of productivity to 10% [3, 5, 10].

One of the main conditions for obtaining high yields is the selection of varieties and and preplant seed treatment by inoculants. The effect of applying

inoculants INTEX REAT and Optimayz on the yield of soybean seeds is in the table 1.

In our experiment processing of soybean seed varieties Apollon and Valjuta by inoculants INTEX REAT and Optimayz significantly influenced on the level of productivity of soybean seeds (Table 1).

The study medication INTEX REAT increased the yield of soybean varieties Apollon on 1.0 kg / ha or 6.7%. In variety Valjuta growth in soybean grain yield was 1.1 t / ha (6.9%) compared with control plots version.

Table 1

Influence studied inoculants on soybean yield seed varieties

Varieties	Inoculant	Years or studies		Average, c/ha	Increase before control	
		2013	2014		c/ha	%
Apollon	1.Control	17,6	11,1	14,3	–	–
	2.INTEX PEAT	18,8	11,9	15,3	1,0	6,7
	3.Optymaiz	19,4	12,8	16,1	1,8	12,6
Valjuta	1.Control	16,7	15,2	15,9	–	–
	2.INTEX PEAT	17,6	16,4	17,0	1,1	6,9
	3.Optymaiz	18,9	17,7	18,3	2,4	15,0

HIP 0,95, c/ha factors: 2013: A – 0,25 B – 0,31,

Interaction AB – 0,44.

2014: A – 0,2 B – 0,24,

Interaction AB – 0,34.

Where factor A – varieties,

B – inoculants.

The best yield increase was obtained by processing seed inoculant Optimayz. So variety Apollon yield increase in average years of studies was 1.8 kg / ha (12.6%) in soy variety Valjuta the increase was the largest and was 2.4 kg / ha (15%).

So, the best result was obtained by the use of inoculant Optimayz. Our studies confirmed that inoculation of soybean seeds in the northern steppe can produce tangible results of increase productivity.

Getting through the inoculation the increase of productivity on 6,7-15,0% indicates a considerable effectiveness of this technological process. It is also important that this event is ecological clean.

The accumulation of all nutrients in soybean grain, including protein, depends on many agrotechnical factors. Not last role among these factors occupies variety. Soy, as it is known, is a culture that is grown for getting, primarily, vegetable protein. For the selection of varieties, except the level of harvest, the quality indicators seed culture have important value.

The main biochemical component of soybean is protein. Of all the world's arable crop one of the most high-protein is soya. According to various authors in the seeds of this culture an average 38-42% protein variation of this indicator from 30 to 50% can accumulate [11, 12].

Our results showed that preplant treatment of seed by inoculants has positive effect on grain protein content in soybeans (Table. 2), compared to control plots version.

Table 2

Influence of inoculation on protein

Varieties	Inoculants	The protein content in grain, %		
		2013 y.	2014 y.	Average
Apollon	1.Control	32,41	31,01	31,71
	2.INTEX PEAT	33,11	32,05	32,58
	3.Optymaiz	34,19	33,21	33,70
Valjuta	1. Control	32,02	31,62	31,82
	2.INTEX PEAT	33,32	32,20	32,76
	3. Optymaiz	33,89	33,71	33,80

In average, over the years of research in grain protein content soybean varieties ranged 31,71-33,80%. The highest protein content observed during the processing inoculant Optimayz: in variety Valjuta - 33.80%, in variety Apollon - 33.70%.

Somewhat lower values of protein it was obtained by contribution a variant inoculant INTEXPEAT, Valjuta - 32.76%, Apollon - 32.58%.

Analyzing table 2 we can conclude that the use of inoculants not only increases soybean yield in general, but also increases the protein content in grain.

The highest increase in protein content was obtained by using inoculant Optimayz: a variety Valjuta - 33.80%, which is 1.9% more compared with the control.

The use of inoculation (pre-treatment of seeds) increased protein content in grain, soya and accordingly its conditional gathering (Table 3).

Table 3

Content and collection of protein in the grain soybean varieties depending on studied inoculants (average for 2013-2014).

Varieties	Inoculants	The protein content, %	Conditional gathering of protein	
			c/ha	% before control
Apollon	1.Control	31,71	4,53	–
	2.INTEX PEAT	32,58	4,98	9,93
	3.Optymaiz	33,70	5,42	19,64
Valjuta	1. Control	31,82	5,05	–
	2.INTEX PEAT	32,76	5,56	10,09
	3. Optymaiz	33,80	6,18	22,37

In our studies Inoculants increased grain protein content in soybean varieties and their conventional gathering. The largest gathering conventional grain protein soybean watched a variant using inoculant Optimayz - 5.42 kg / ha in a variety of Apollon and 6.18 kg / ha in a variety of Valjuta.

In the control in varieties Apollon and Valjuta gathering of protein was 4.53 and 5,05ts / ha. During using inoculant INTEX REAT gathering protein increased in variety Apollon on 9.93%, in variety Valjuta on 10.09%.

The highest conventional gathering protein we observed in variety Valjuta, because of the genetic characteristics of the variety.

So, we have received data show that inoculation of soybean seeds in the northern steppe can produce tangible results in growing soybeans.

During processing inoculant Optimayz gathering oil in variety Valjuta was 3.43 t / ha, variety Apollon - 3.00 kg / ha, which is on 0,89 t / ha and 1.13 t / ha more as compared with the control. Using an inoculant INTEX REAT: in varieties Apollon and Valjuta oil content was 19.29% and 19.19%.

As a result of calculation of economic efficiency of the influence inoculation on the yield of soybean seeds it was found that use of preparation was most economically expedient during the pre-treatment of preparation Optimayz: net income increased to 998 UAH. / ha, the cost of 1c of seeds decreased to 195.7 UAH / kg, and the level of profitability was the highest and was 129.8% in variety Valjuta, during processing inoculant INTEXPEAT in variety Apollon 104.4%.

Based on experimental data obtained in the field and laboratory studies of agroformations of the northern steppe in Mykolaiv region it is offered for soybean crop to grow high quality variety of soybean Valjuta and to use inoculant Optimayz for seed treatment before sowing.

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