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CHARACTERISTICS FOR THE ORGANIC FARMING ELEMENTS USAGE DURING THE SOYBEAN GROWING

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Abstract. *There was studied different the effect from the range of agrotechnical and biological systems of treating for soybean on the biological value of cultivar and it's protection from fungi diseases. There were determined the optimal connection of biological fungicides in the soybean treating complexes and also the usage of seeding's multing by the inoculants' and fertilizers' usage.*

Keywords: *soybean, multing, innoculants, organic farming, biological fungicides, fertilizers*

The most important part of modern protection systems are based on maximum chemical preparations usage, The organic farming is very active for today. The soil's rational usage, the use of rational usage and restoration of natural resources [4, 6].

The ecologization for the system of cultivar protection should be the special strategy of protection. It is necessary to manage the quantity of pest's population on the economic injury level by the usage of their natural antogonists and biological agents [3, 4, 7].

The agricultural biologization has many directions. It is action complex for the crop rotation using the covering cultivars (the choice of the best), mulch, plant remnants, machine-tractor operations, the biological preparations usage and etc. [5, 7, 9]

Soybean is the most valuable legume cultivar. It has the high content of proteins (38-40%) and oil (to 20%). It has a high usage in many branches of food industry, feed production. It is a good predecessor for spring crops and sugar beets. The soybean planting acreage constantly increase. It is widely used as a source of plant protein and oil. The usage of intensive technologies for this cultivar growing is based upon the high quality seeds providing and integrated plant protection from wild grass, pests and diseases. The increase of soybean planting acreage, the import of seeds the adventive varieties will inevitably come to soybean crop rotations increase and it's specific weight in the structure of planting acreage. It would come to intensive developing of pathogens for many diseases, especially in favourable agroecological zones to which belong the Western Foreststeppe. The wide integration ties with foreign countries and import of different sub-quarantine material into Ukraine, including the seeds will not exclude the quarantine organisms spreading-wild grass, pests and diseases, which may cause the serious ecological and economical harms to plant resources [4,5,7,9].

The analysis of literary sources [1-9] confirms that the problem of biological protection from pests in western region of Ukraine is not studied. So the following increasing and improving studies by this problem will give ability to adapt elements for biological protection from pests in western region of Ukraine is not studied. So the following increasing and improving studies by this problem will give ability to adapt elements for biological protection from pests in western region of Ukraine is not studied. So the following increasing and improving studies by this problem will give the ability to adapt elements for biological protection from pests.

The goal of research is intended to provide the range of agrotechnical and biological indexes of soybean and their effect on damage by fungi infections.

Methods of research. The research was provided in grey ashed heavy loamy soil with content in plow layer 1,8% of humus (as per Turin), 8-9 mg exchanged potassium and 5-7 mg/100g of soil mobile phosphorus.

The study of soybean multing made in the vegetative and field conditions. Postplanting surface mulch treating were 2 cm (300 cm^3). The mulching made together with fertilizer "Tukosumish". The mass fraction of nutrient matter (%): common nitrogen (N)-15±2; common phosphates (P_2O_5)-16±2, potassium (K_2O)-16±2; magnesium (MgO)- not more than 3.0, calcium carbonate (CaO) not more than 4.0. It equals 51 kg/ha of testing solution on 1 ha of gross weight on 350 kg. The testing variety is Xeniya.

The task for the yielding and disease damage of soybean sowing by the usage of mineral and microbiological preparations of phosphorous - potassium fertilizers, put in autumn plowing, nitrogen fertilizers put in autumn plowing, nitrogen fertilizers put in spring season during the pre- sowing cultivation inoculants on the base of strains Bradyrhizobium japonicum and biological fungicides of different nature.

The selective mediums are used for the fungi cultivars identification and their following extraction in pure culture.

The biometrical indexes determined by the way of samples chose from every 100 plants each, the yield is by the way of whole plant milling [1,6].

Research results. The vegetative researches by the mulch usage (crop straw) as the form of agrotechnical measure during the soybean growing and it's effect on the morpho-cultural and phytosanitary characteristics showed that the pre-sowing mulch of soil gave the improve of soybean gathering, decrease of contamination, but it has no positive effect on the intensity of disease appearing. So the after planting gave the best sprouts survival, decrease the contamination and make some decrease of the intensity of disease (Table 1).

1. The effect of soil's mulch on soybean cultivar and its resistance to infecting by fungi disease (variety Xeniya).

Variants	Seed germination (%)	Sprouts survival (%)	Dockage (%)	General disease intensity %		
				Ascochyta sojaecola	Fusarium oxysporum	Septoria glycines

Inspection	92	82	60	22,1	26,8	28,4
Soil's mulch before planting	93	84	52	26,8	31,2	28,6
After planting surface mulch input	89	86	32	21,3	25,4	27,8

The usage of different inoculants on the base of strain Bradyrhizobium japonicum showed the positive effect on the plant's growing. So by the usage of isolate B- with №5 was recorded by the increase of legume bacteria forming in 3 times, it was given the nitrogen fixation increase to 416,5 nmole C_2H_4/hour on plant. The inoculant usage increased the indexes of quantity for bean formation and average weight of seeds. There were registered the quantity of formed beans on 30-35% during the soybean seeds treating by inoculant on the isolate B base treating (Table 2).

The inoculant's usage also effects on the phytosynthetic properties on soybean plants. The best increase of photosynthetic activity was observed during the inoculant usage on the base of strain АР, inoculant on the base of isolate Б-with №5, and inoculant on the base of isolate Б-with № 17. It was caused by the increased content of chlorophyll in the scope of 25%, with design mg/100 g of sheet weight.

2. The effect of different strains *Bradyrhizobium japonicum* on the soybean plant nitrogen fixation (field research, variety Chernovitska 9)

Research variant	The quantity of nodule bacterium	Nitrogen activity nmole C_2H_4 / hour on plant	Chlorophyll, mg / on 100 g sheet weight		
			a	*b*	*a*+*b*
Inspection	16,6	283,4	79,16	30,91	110,07
Inoculant on the base of strain АР	17,6	414,5	108,81	31,19	140,00
Inoculant on the base of strain АМ	16,3	378,7	88,16	39,82	127,98
Inoculate on the base of isolate Б – with № 5	48,3	416,5	94,75	47,92	142,67
Inoculate on the base of isolate Б – with № 17	23,0	402,6	114,21	30,11	144,32
$НІР_{05}$	1,8	17,2			

The study of damaged soybean plants by fungi diseases during the usage of different preparations and fungicides in sets of soybean treating and its effect on the plant developing. These preparations showed that the positive effect on the plant's resistance to fungi diseases.

The treating seeds by the strains *Bradyrhizobium japonicum* were recorded its effect on the vegetative and physiological indexes, so they have effect on the intensity of soybean disease appearing (Table 3). The usage of inoculant on the base strain AP have provided the increase of plant's height (89,6 cm), weight of 10 seeds (15,3 g). Their harvest had increased in the comparison to inspected on 16,5%. This preparation usage gave the immune-protection characteristics and decrease of plant's infecting by fungi disease on 7% simultaneously. The used inoculant on the base of isolate Б-with № 17 have showed the best indexes of nitrogen fixation, bean forming and yield. This preparation had provided the biological efficiency in the scope 6,6-7.6%,

The usage of different fungicides and their composition in the sets of soybean treating have showed that Trichodermin and Gaubsin have helped with improve their vegetative and physiological indexes. Gaubsin usage have given the increase of symbiotic nodules in 5 times in comparison inspection and have increased the quantity of formed beans in 4 times. The Trichodermin have noticed the quantity increase of beans in 5,3 times. The higher efficiency against pest were received by the composition of biological preparations. The following combinations were: Thichodermin 1,5 l/t and Gaubsin 1.5L/t and Phytodoctor 1,0 l/t+ Trychodermin 1,5l/t have the biggest effect on the fungi infections and plant developing. Its biological efficiency was 86.6% and 81.4% respectively.

3. The efficiency of different strains *Bradyrhizobium japonicum* on the intensity of soybean fungi diseases appearing and the plant's developing (field experiment, variety Chernivetska 9)

Variety experiment	Quantity of nodule bacterium	Plant's height, cm	Average quantity of sprouts, pcs	Quantity of formed beans on plant, pcs	Weight 100 g of seeds, g	Yield, t/ha	Intensity of disease, %				Biological efficiency, %
							Mildew (Mucor hiemali)	Fusarium (Fusarium oxysporum)	Ascochyta blight (Ascochyta sojaecola)	Average	
Inspection	16,6	82,6	3,6	74,0	14,0	21,8	65,2	66,9	75,6	69,2	
Inoculant on the base of strain АР	17,6	89,6	4,4	81,0	15,3	25,4	62,4	58,2	72,4	64,3	7,0
Inoculant on the base of strain АМ	16,3	86,6	4,0	87,0	14,6	24,9	61,8	59,5	73,1	64,8	6,4
Inoculant on the base of isolate Б – with № 5	48,3	88,6	3,8	116,0	16,3	27,7	63,5	58,6	71,8	64,6	6,6
Inoculant on the base of isolate Б – с № 17	23,0	88,0	6,0	111,3	15,3	25,8	61,2	60,1	70,6	64,0	7,6
$НІР_{05}$	1,8	0,5	0,4	6,4	0,9	0,8					

4. The effect of different biological fungicides in the soybean treating complexes on intensity of fungi disease appearing and the plant disease developing (field experiment, variety Chernivetska 9)

Variety experiment	Quantity of nodule bacterium	Plant's height. cm	Quantity of sprouts, pcs	Quantity of formed beans on the plant, pcs	Weight 100 g of seeds	Yield, t/ha	Intensity of disease %				Biological efficiency, %
							Mildew (Mucor hiemali)	Fusarium (Fusarium oxysporum)	Ascochyta blight (Ascochyta sojaecola)	Average	
Inspection	19,0	56,0	3,8	33,4	13,7	20,8	58,9	68,3	72,5	66,9	
Phytodoctor 1,0 l/t	28,3	82,8	5,2	82,3	15,0	24,5	12,4	11,5	17,6	13,8	79,3
Gaubsin 2,0 l/t	100,3	80,8	5,4	136,0	14,5	25,2	16,2	11,4	16,7	14,8	77,9
Tryxodermin 2,0 l/t	38,6	80,0	5,2	85,0	15,0	24,9	18,7	16,8	20,4	18,6	72,1
Tryxodermin1,5 l/t + Gaubsin 1,5 l/t	65,0	71,0	5,6	177,3	15,4	26,9	11,2	11,7	14,4	12,4	81,4
Phytodictor 1,0 l/t +Tryxodermin 1,5 l/t	37,0	65,2	6,2	100,0	17,0	27,1	6,1	9,4	11,4	9,0	86,6
HIP_{05}	28,4	9,4	0,8	14,2	0,4	0,7					

The fertilizer have used as agrotechnical measure and immunoprotective element. This element is provided the resistance to the fungi diseases. This problem showed the range of regularities. The fertilizer's compound (so for PK and so NPK) and inoculant (rhyzotorphyn strain 634) have provided so the yield increase and so decrease of plant disease on the general infection background (Table 5).

The mineral fertilizers usage in the following norm $N_{30}P_{30}K_{30}$ have provided the soybean yield increase -0,40t/ha. There were received the additionally 0.23 t/ha during the seed's previous treating by bacterial preparation rhyzotorphyn (strain 634). There was additional yield increasing 0,93 t/ha during the usage of mineral fertilizers $N_{90}P_{90}K_{30}$in compound with inoculation of bacterial preparation, The plant's infection were decreased too on 10-15% in comparison with inspected.

5. The soybean yield and resistance to diseases in dependence upon the amount of fertilizing and inoculation by bacterial preparation (field experiment, variety Xeniya)

Amount of fertilizer	Yield t/ha	Deviation from inspected, +/-		Frequency of species dividing (%)		
		by fertilizing	by inoculation	Fusarium blight	Ascochyta blight	Dowhymildew
$N_0P_0K_0$	2,02	-	-	46,9	53,6	25,7
$N_0P_0K_0$+634Д	2,21	-	+0,19	45,4	51,2	25,4
$P_{30}K_{30}$	2,28	+0,23	-	44,7	49,6	24,7
$P_{30}K_{30}$+634Д	2,48	+0,26	+ 0,20	43,5	47,4	24,5
$P_{60}K_{60}$	2,57	+0,45	-	41,4	46,9	23,9
$P_{60}K_{60}$ +634Д	2,79	+0,50	+ 0,24	41,8	44,5	23,4
$P_{90}K_{90}$	2,72	+0,67	-	38,6	42,4	22,6
$P_{90}K_{90}$+634Д	2,97	+0,78	+ 0,28	38,4	39,8	21,4
$N_{30}P_{30}K_{30}$	2,43	+0,40	-	44,8	49,4	23,7
$N_{30}P_{30}K_{30}$+634Д	2,64	+0,43	+0,20	43,2	48,7	23,4
$N_{60}P_{60}K_{60}$	2,67	+0,62	-	41,1	44,8	23,1
$N_{60}P_{60}K_{60}$+634Д	2,74	+0,59	+0,14	39,2	43,1	22,8
$N_{90}P_{90}K_{90}$	2,85	+0,76	-	37,4	41,3	22,4
$N_{90}P_{90}K_{90}$+634Д	2,96	+0,82	+0,11	36,5	38,5	21,1
$HIP_{0.5}$ t/ha	0,19	-	-			

Conclusions

There were received the substantial increase of yield and decrease of harmfulness of fungi diseases without chemical preparations but through the correct choice of compounds biological and agrotechnical measures in the scope of organic farming by the experiment's results.

References.

1. Babych A.O., Kolishyck S.I., Semchov A.V.(2007) Urozhainist nasinnya soyi zalezhno vid doz mineralnych dobryv, inoculatsii ta stimulyatoriv rostu v umovach Lisostepu Ukrainu. [Soybean seed yield in dependence upon the dosage of mineral fertilizers, inoculation and stimulator growth.] Materialy tretyoy Vseukr.konf. 3 serp. 2000 Instytut kormiv UAAN. [Proceedings of third all-Ukrainiam conference 3-rd of August 2000 Institute of fodder crops.] Vinnytsya P.27-28.

2. Bachmat O.M., Chynnyk O.S.(2007) Vplyv diyi dobryv na urozhainist soyi [The effect of mineral fertilizers influence on the soybean seed yield.] The collection of scientific works State Agrarian and Engineering Universtiy in Podillya, 4, 3-11.

3. Degoduyck Ye.G., Sayko V.F., Korniychuk M.F. and others (2007)Vyroschuvanya ecologichno chystoy profuctii roslynnytstva [The growing of environmentally safe products of crop.]. Urozhay. P.320

4. Grykun O. (2005) Zahyst posiviv soyi vid shkydnykiv, chvorob ta burjaniv.[The soybean sowing protection from pests, diseases and tare.] Proposytsiya -№6 P.70-76.

5. Dospechov B.A. (1985) Metodika polevogo opyta s osnovami statisticheskogo obrabotki resultatov issledovaniy.[Methodology of field researchers (with foundamentals of statistic treating researches results.]-M:Agropromizdat P:351

6. Kuleshov A.V., Bilyck M.O., Dovgan S.V. (2011) Phytosanitarnyi monitoring i prognosis. Navchalnyi posibnyk. [Phytosanitary monitoring and prognosis. Study guide.] Charkiv: Espada. P.608.

7. Persykova F.T. (2000) Effectivnost agrotechnicheskych priyemov pri vyraschivanii soyi. [The efficiency of agrotechnical techniques during the soybean sowing.]. Agrarna nauka №4 P.10-12

8. Petibskaya V.S.(2001) Soya: kachestvo, ispolzovaniye , produktsiya [Soybean: quality, usage, production]. M: Agrarnaya nauka.P. 64.

9. Kyryk M.M., Pikovsky M.Yo., Koshevsky I.I., Taranucho Yu. M., Golovshyi P.G., Lych S.V., (2014) Chvoroby soyi. Rekomendatsii schodo diagnostyky ta zasobiv zakhystu [Soybean disease. Recommendations for diagnostics nand protective measures.]. K. Delta Design, P.26.

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ХАРАКТЕРИСТИКА ПРИМЕНЕНИЯ ЭЛЕМЕНТОВ ОРГАНИЧЕСКОГО ЗЕМЛЕДЕЛИЯ ПРИ ВЫРАЩИВАНИИ СОИ

М. П. Соломийчук, Н. Н. Кирик, О. И. Панимарчук

Аннотация. *Изучено влияние ряда агротехнических и биологических систем ухода за соей на биологические показатели культуры и защиту от грибных инфекций. Установлены оптимальные сочетания биологических фунгицидов в комплексах обработки сои, а также применение мульчирования посевов, использование инокулянтов и удобрений.*

Ключевые слова*: соя, мульчирование, инокулянты, органическое земледелие, биофунгициды, удобрения*

ХАРАКТЕРИСТИКА ЗАСТОСУВАННЯ ЕЛЕМЕНТІВ ОРГАНІЧНОГО ЗЕМЛЕРОБСТВА ПРИ ВИРОЩУВАННІ СОЇ

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Анотація. *Вивчено вплив ряду агротехнічних і біологічних систем догляду за соєю на біологічні показники культури та захист від грибних інфекцій. Встановлено оптимальні поєднання біологічних фунгіцидів у комплексах обробки сої, а також застосування мульчування посівів, використання інокулянтів та добрив.*

Ключові слова: *соя, мульчування, інокулянти, органічне землеробство, біофунгіциди, добрива*