SECȚIUNEA II

Producerea şi aplicarea produselor de protecţie biologică în bază de entomofagi, substanțe biologic active, nanoparticule, microorganisme entomopatogene şi antagoniste pentru protecția culturilor agricole

CZU: 632.95:633.854.78(477) https://doi.org/10.53040/ppap2023.16

BIOFUNGICIDES COMPOSITIONS FOR SUNFLOWER PROTECTION

ANDRIYCHUK Tetyana*, SKOREIKO Alla**
Ukrainian science-research plant quarantine station Institute of Plant Protection, Chernivtsi, Ukraine
**https://orcid.org/0000-0002-7718-7964,*
***https://orcid.org/0000-0001-6336-0773,*
e-mail: tatyjana58@gmail.com

Summary. The results of following biofungicides usage on sunflower against Alternaria blight, Embellisia blight, phomosis, phomopsis in Western Region of Ukraine proposed in present paper. Among them were MicoHelp – liquid (fungi genus Trichoderma, bacterium *Bacillus subtilis*, Azotobacter, Enterobacter, Enterococcus, titer not less than $1,0\times10^9$ CFU/cm^3), (1,0l/t); Gliocladyn BT- liquid (*Gliocladium virens*, titer – $1,5\cdot10^9$ CFU/cm^3), (2,0 l/t); Trichopsin BT-liquid(fungi spores *Trichoderma viride T-4* and bacterium *Pseudomonas aureofaciens 306*;titer not less $2,0x10^{10}$ CFU/cm^3), (2,5l/t) separately or in combination with plant growing regulator Agrostimulin (25 ml/t).The researches results showed that the used preparations favored the plant disease defeating and increase yield crop on 11,2 – 16,1%.

Keyword: *sunflower, biofungicides, pathogens, diseases, protection*

Introduction. The occupation of serious part of Ukrainian Eastern Areas comes to remove sunflower crops to Western region. This climate has serious differences from Eastern Ukraine. It needs to study sunflower's disease in West and to optimize protection measures in the present region. Plant protection takes

important place among measures for sunflower yield increase and it's quality grow,

Traditional chemical protection methods for crop is ecologically dangerous. The losses from pests and diseases may consist of 18-25% in spite of systematic treating by chemical preparations.The pesticides remnants recorded on big areas of soil. The strong resistance to toxic chemicals appeared in pests.

The sowing protection ecologization became actual. It proposes biological protection methods for plant protection.The biological plant protection method is based upon the natural phenomenon, e.g. hyperparasitism and antibiosis (antagonism, phungistasis, suppressiveness). They regulate interrelations between saprofite, parasite and pathogen microbiota. The creating complex (combined) preparations is one of the perspective and modern directions for biological origin preparation usage. They joined growth stimulants and regulators, microelements, antistressants, complex of free amino acids, and also organisms -antagonists pathogenic microflora and their metabolism products.

These preparations results needs to study in special weather- climatic terms of crop growing, so the **purpose for our study** was to find the biofungicides impact in combination with growth regulator on yield and the most spread sunflower fungi diseases in Ukraine, Among these diseases were: Alternaria blight (*Alternaria alternata* (Fr.Fr) Keissl.),embelisia blotch (*Alternaria helianthi* Tub. et Nish.),fomosis (*Phoma oleraceae* var. *helianthi* Sacc.),Phomopsis (*Phomopsis helianthi Munt*.Cvet. et al) [1].

Materials and methods. The researches for disease spread reduce with biofungicide usage conducted on the base of Ukrainian Science- Research Pant Quarantine Station Institute of Plant Protection during 2019-2020. The station located on the third terrace of Prut river on relative height above river 15-25 m in Prut-Dniester interfluve. It closely borders with Prut- Siret interfluve. The suburbs of town Chernivtsi located in it. This territory is a part of Prut- Dniester plain built of horizontal strata as per geomorphological attributes. The UkrSRPQS IPP area is in the Novoselitsa cavus. The climate is moderate-continental. Summer is warm. The sum of active temperatures reached 2800-2900 ^{0}C. The average annual precipitation is 600 mm. The soils are grey sod-podzolic with humus content 2,8%; pH = 5,9. The hydrolytic activity is= 3,2 mg-eqv. 100g of soil content: P_2O_5 and K_2O (in mg on 100 g of soil), It consists of respectfully 25,0 and 17,5.

Soybean seedlings were after winter cereals in 2019, and after soybean seedling in 2020. Sunflower seeding conducted in third ten-days of April.

The disease record and evaluation degree for it's development on plants conducted on 10 plots. There were 40 plants by 1 row in 10 places. They located in equal distance by 2 fields diagonal. The quantity of every defeated plants accounted separately. The disease development determined as per generally approved techniques. [2, 3].

The sunflower seeds were treated by biological preparations suspension: MicoHelp (1l/t); Gliocladyn BT (2l/t); Trichopsyn BT (2,5 l/t) and in combination with growth Agrostimulin, for possible study for disease causative agent and yield increase. The trials provided as per Table1. Plants were sprayed by these preparations during growing (at phase star), Non-treated seeds were for control.

Table 1. Trial scheme

№ variant	Pre-sowing seed treatment	Seed treatment at phase star
1	Control -without treatment	-
2	Mico-Help-1,0 l/t	MicoHelp-1,5l/ha
3	Gliocladyn BT-2,0 l/t	Gliocladyn BT-10 l/ha
4	Trichopsyn BT- 2,5l/t	Trichopsin BT-8,0 l/ha
5	MicoHelp-1,0l/t+Agrostimulin -25ml/t	MicoHelp-1,5l/haAgrostimulin -20ml/t
6	Gliocladyn BT-2,0 l/t+Agrostimulin -25ml/t	Gliocladyn BT-10,0 l/ha+Arostimulin -20ml/ha
7	Trychopsin BT-2,5l/t+Agrostimulin -25 nml/t	Trychopsin BT-8.0l/ha+Agrostimulin -20 ml/ha

MicoHelp is a biological fungicide. Fungi-antagonists of Trichoderma, viable bacterium cells *Bacillus subtilis*, Azotobacter, Enterobacter, Enterococcus, biologically active products of microorganisms- producents activity. The general number of viable cells is not less than $1,0\times10^9$ CFU/cm^3.It uses against causative agents of genus Rhizoctonia, Phytophthora, Pythium, Verticillium, Sclerotinia, Fuzarium [4, 5, 8]. The rate for seeds treating is 1,0 l/t, for growing plants spraying is 1,5 l/ha.

Gliocladyn BT is a biofungicide, It is based upon fungi -antagonist *Gliocladium virens*. It shows antagonism during the direct contact with other

fungi. It defeats and destroys spores and phytopathogens vegetative cells. It produces some biologically active agents.[6, 8]The liquid Gliocladyn BT is $1,5 \cdot 10^9$ КУО/см^3 CFU/cm^3. The preparation inhibits the development of causative agents white mold and charcoal rot, bare patch, fusarium. The rate for seeds treating is 2,0 l/t; for growing plants spray is 10 l/ha..

Trychopsin BT is an insectofungicide with growth stimulating activities. The preparation's active matter is fungi mycelium, spores *Trichoderma viride T-4* with rhizospheric bacterium *Pseudomonas aureofaciens 306* with titer not less than $2,0x10^{10}$ КУО/см3 CFU/cm^3 and also biologically active matters. They create producer- strains. They use for agricultural crops protection against helminthosporiosis, late blight, fusariosis, fusariosis, scab, dry rot [4, 5, 7, 8].The rate for seeds treating is 2,5 l/t; for growing plants spray is8,0 l/ha.

Agrostimulin is a plant growth regulator (water-alcohol solution. The active matter is 2,6-dimethylpyridine-1oxide, 25 g/l+Emystim C, 1 g/l with metabolism product of symbiote fungi *Cylindrocarpon magnusianum*). The rate for seeds treating is 25 ml/t; during the growing rate is 20 ml/ha [9].

Results and discussions. Weather conditions differed non-significantly in 2019-2020 (Table2). May was cold so in 2019 so in 2020. The air average month temperature deviation consisted of 0,1 and -2,0°C, respectively. It continued the sunflower sprouting period from 12 days through 14 respectively.

.

Table 2. Weather indexes during the growing period 2019-2020

Month	Air average month temperature, °C					Average month precipitation, mm				
	rate	real		deviation ±°C		rate	real		deviation ±°C	
		2019	**2020**	**2019**	**2020**		**2019**	**2020**	**2019**	**2020**
March	2,7	6,8	5,6	+4,1	+2,9	32	23	40	74	125
April	9,2	10,0	10,1	+0,8	+0,9	47	48	19	102	39
May	14,9	14,8	12,9	-0,1	-2,0	76	129	131	171	174
June	18,0	21,8	19,4	+3,8	+1,4	88	99	130	112	147
July	19,8	20,3	20,3	+0,5	+0,5	96	75	85	79	89
August	19,1	21,4	21,2	+2,3	+2,1	75	36	27	47	36
September	14,3	16,4	17,2	+2,1	+2,9	50	25	104	50	208

Short term heavy precipitation in June consisted of 112% in 2019 and 147%(in 2020) deviation from rate and rapid temperature increased favored the

Alternaria blight and embellisia blotch spread (see Table3).It's development in control variant consisted of 36,7and 45,5% in 2019, respectfully and 42,8% and 53,6% in 2020, respectfully.

Researches results proposed in table 3. It confirmed the biological preparations combinations with growing stimulant Agrostimulin (variants 5-7) against diseases positive impact. Plants defeating by Embellisia blotch, Alternaria blight and Phomopsis decreased to 20,5-23,7; 27,1-28,0; 5,8-7,0% in 2019, in comparison with control (36,7; 45,5; 11,1%).The same situation observed in 2020. Embelisia blotch development consisted of 25,6-28,4, Alternaria blight was 32,1-34,9, Phomopsis was 18,5-22,5% (in compare with control: 42,8; 53,6; 31,5%).

Table 3. Sunflower plant defeating at the end of growing in v. Eney. (phase of yellow basket, UkrSRPQS)

№ of variant	2019			2020		
	Disease development, %			Disease development, %		
	Embelisia blotch	Alternaria blight	Phomopsis	Embelisia blotch	Alternaria blight	Phomopsis
1	36,7	45,5	11,1	42,8	53,6	31,5
2	27,1	35,8	6,7	35,0	42,1	22,5
3	26,8	33,3	6,5	34,2	38,6	20,4
4	28,5	34,4	7,2	30,1	37,5	23,1
5	20,5	28,0	5,8	25,6	32,1	18,5
6	22,4	26,7	6,6	27,8	34,3	20,7
7	23,7	27,1	7,0	28,4	34,9	22,5

The sunflower seeds really received yield appeared different during the studies years. (table 4). The postsoybean sunflower sowing location favored the infectious background increase. It was predecessor in 2020. It caused the yield decrease. The crop yield was highest in 2019 (without treating) in comparison with 2020 on 36 t/ha. The used preparations showed the same impact character on yield crop.

Table 4. Sunflower's productivity dependance from biofungicide usage and growth stimulants plants in v. Eney (UkrSRPQS).

№ of variant	2019		2020	
	Yield, t/ha	% to control	Yield, t/ha	% to control
1	3,21	-	2,85	-
2	3,44	107,2	3,05	107,0
3	3,40	105,9	3,15	110,5
4	3,43	106,5	3,08	108,1
5	3,57	111,2	3,22	113,0
6	3,68	114,6	3,31	116,1
7	3,64	113,4	3,28	115,1

The highest sunflower yield recorded for biofungicides combinationMicoHelp, Gliocladyn BT, Trychopsyn BT with growing stimulants Agrostimulin (variants 5,6,7, respectfully). The sunflower yield increased on 11,2-13,4% in 2019, and on 13,0-16,1%.in 2020.

Conclusions. The usage of biological preparations MicoHelp, Gliocladyn BT, Trychopsin BT in specified rates in composition with growing stimulant allowed to increase crop yield and decrease level for their dangerous disease spread.

References

1. Andriichuk T., Skoreiko A., & Kuvshynov O. (2021). Evaluation of phytosanitary condition of sunflower crops in the Western Forest-Steppe of Ukraine.*Interdepartmental Thematic Scientific Collection of Phytosanitary Safety*, (67), 73-84. https://doi.org/10.36495/1606-9773.2021.67.73-84
2. Trybel S.O. (2001) Metodyky vyprobuvannia i zastosuvannia pestytsydiv. [Techniques for testing and usage of pesticides,] Kyiv , P.448.
3. Zin Noor A., Badaluddin. A. (2020) Biological functions of Trichoderma spp. for agriculture applications. *Annals of Agricultural Sciences*. 65 (2), 168-178. doi: 10.1016/j.aoas.2020.09.003.
4. Napitupulu T.P., Ilyas M., Kanti A., Sudiana I.M. (2019) In vitro evaluation of Trichoderma harzianum strains for the control of

Fusarium oxysporum f. sp. cubense. *Plant. Pathol. Quarantine*. 9, P. 152-159.
5. Lahdenperä, Marja-Leena. (2006) *Gliocladium catenulatum* as an antagonist against grey mould on strawberry. In: *NJF Report*, Nordic Association of Agricultural Scientists. 2 (10), P. 15.
6. Samavat S., Heydari A., Zamanizadeh H.R., Rezaee S., Alibadi A.A.(2014.) A comparison between *Pseudomonas aureofaciens* (Chlororaphis) and *P. fluorescens* in biological control of cotton seeding damping–off disease. *Journal of Plant Protection Research*54 (2), P. 115-121.
7. Pertot I., Alabouvette C., Esteve E. H.; Franca S The use of microbial biocontrol agents against soil-borne diseases. Focus Group SOIL-BORNE DISEASES Mini-paper P. 1-11. – file:///C:/Users/tatajana/Desktop/8_eip_sbd_mp_biocontrol_final.pdf.
8. Zhyla M., Shkil M., Stronskyi Y. (2018) Morphological characteristics of organs of the immune system of rats for determining the toxicity of the preparation “Bioton”. *Scientific Messenger of Lviv National University of Veterinary Medicine and Biotechnologies*. . V, 20, № 88. P. 29-35 doi: 10.32718/nvlvet8805