

## BIOLOGICAL PROTECTION OF VEGETABLE CROPS AS AN ELEMENT OF AGROPHYTOCENOSES ECOLOGIZATION

### Summary

*In the publication the role of products for biological plant protection against noxious organisms is shown in structure formation and vegetable crops agrophytocenoses stabilization, their quantitative and qualitative composition. It is pointed out that application of biological pesticides with different mechanism of action exerts a positive effect on plant growth and development, facilitates the phytosanitary situation improvement in vegetable crops and decreases the negative influence on the environment.*

**Key words:** food products, biopesticides, bio-stimulators, disease resistance, phytosanitary monitoring, agrocenosis optimization, agriculture ecologization

## BIOLOGICZNA OCHRONA UPRAW WARZYWNYCH JAKO ELEMENT EKOLOGIZACJI AGROCENÓZ

### Streszczenie

*Przedstawiono rolę środków do biologicznej ochrony roślin przed szkodnikami w strukturze formowania i stabilizacji agrofitycenozy upraw warzywnych, ich skład ilościowy i jakościowy. Zauważono, że biologiczne pestycydy o różnej zasadzie działania zaprawy użytkowej mają pozytywny wpływ na wzrost i rozwój rośliny, ułatwiają poprawę sytuacji fitosanitarnej w uprawach warzywnych i zmniejszają negatywny wpływ na środowisko.*

**Słowa kluczowe:** artykuły spożywcze, biopestycydy, biostymulatory, odporność na choroby, kontrola fitosanitarna, optymalizacja agrocenozy, ekologizacja rolnictwa

The production of ecologically pure food products is the most important direction of modern agriculture development. A wide introduction of agriculture ecologization is one of real possibilities of this challenging task. Science and practice show that a significant improvement of crops productivity cannot be achieved without the use of mineral fertilizers and plant protection products, but their ecological friendly application is possible only with the rational use [1, 2].

In this respect, it should be noted that for ecologically oriented agriculture the most appropriate is the biological protection, involving the use of biopesticides, bio-stimulators, disease resistance inducers etc. They are directed mainly to restoring and enhancing the natural mechanisms of agricultural crops agrophytocenosis. This aspect is relevant when solving the tasks of vegetable crops protection against pests using the biological method, because it allows to get ecologically clean vegetable products without the residues of pesticides and radionuclides [3].

By transition to the organic agriculture principles, the role of phytosanitary monitoring for economically significant plant diseases and phytophages reducing the plant productivity and production quality is increased. To solve the problems of phytosanitary improvement of agrophytocenoses of vegetable crops cultivated in organic farming system, it is necessary to develop the domestic production of biopesticides, compensate their deficit and reduce monetary costs to purchase them.

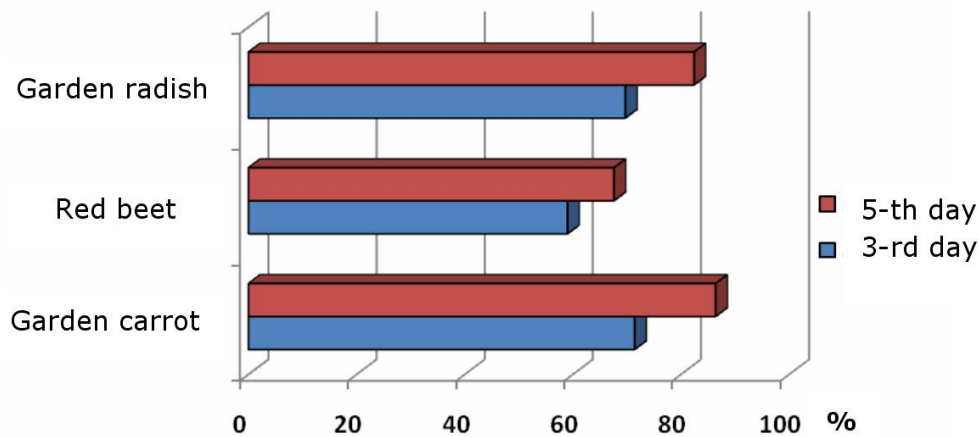
Recently, the new biological preparations in the pesticide market of Belarus which have passed the production test to control pests and diseases of vegetable crops are included in the "State register of pesticides ..." and recommended for a wide application in production [4].

With the aim of vegetable crops phytosanitary state of

agrocenosis optimization, product quality and the environmental state improvement, we conducted a multi-year testing of a number of biological products to protect vegetable crops against pests and diseases.

From the available assortment of biological preparations to control vegetable crops bacterial diseases, in particular, white-head cabbage, the domestic biopreparation Phytoprotectin, 1 (titer 4-7 x 10<sup>9</sup> spores/ml *Bacillus subtilis*) was tested. The results of biological product production testing have shown the sequence of its application, starting with seeds, root system of seedlings and vegetative plants treatment, have contributed to good cabbage plants growth and development and provided with high efficiency. Thus, the field germination of seeds when soaking in 2,0% Phytoprotectin, 1 working solution for 24 hours has made 86,8%, and seedlings black leg severity decreased by 44,5%, for this, the healthy seedlings output per 1 m<sup>2</sup> has made 23,8% compared to control. Complex application of biological preparations (seedlings root system treatment + two times growing plants spraying) has reduced cabbage severity by bacteriosis by 55,0%, black spot - 52,3%, which allowed to get yield increase of 54,0 cwt·ha<sup>-1</sup>. The economic efficiency amounted to 23,7%.

Good results are obtained with the biological preparation Phytoprotectin, 1 for garden carrot crops protection against brown leaf spot. Threefold spraying of carrot plants with the biological preparation at the rate of application 6,0 l·ha<sup>-1</sup> has improved the phytopathological condition of crops. The disease development record data at root formation stage indicate that the degree of plants damage by the pathogen *Alternaria dauci* D. et Ed. decreased from 42,0 to 24,2%. Carrot crops treatment by Phytoprotectin, 1 also contributed to the decrease of crop root severity by black rot and bacteriosis, improving marketability.



Source: own work / Źródło: opracowanie własne

Fig. 1. Biological efficiency of a biological preparation Baciturine I for root crops protection against a pest complex  
Rys. 1. Skuteczność preparatu biologicznego Baciturine I do ochrony roślin korzeniowych przed szkodnikami

In a variant with the biological preparation application, carrot crop yield increased by 36,0 cwt·ha<sup>-1</sup>, their severity by black rot decreased 2,5 times, bacterioses - 1,3 times. The output of standard production was 69,0%, the economic efficiency – 18,2%.

It is noted that Phytoprotectin, I exerts not only antibiotic effect on phytopathogens, but also has been stimulating as evidenced by more developed biomass of foliage and plant height which increased the control plants by 3,0-4,0 cm.

An equally important problem in phytosanitary state of vegetable crops agrocenoses optimization includes pest control, product quality and the environmental state improvement. It is determined experimentally that the application of bacterial preparations having the insecticidal properties and also plant origin insecticides allows to get the environmentally friendly production.

In our researches the domestic, insecticidal action of biological preparations has been tested: Baciturin, I (a titer is not less than 4 mlrd. viable spores/ *Bacillus thuringiensis*, var. *darmstadiensis*) and NeemAzal-T/S, EC (azadirachtine A, 10 g·l<sup>-1</sup>) against a pest complex on root crops. In the framework of exploratory research, a biological preparation Baciturin, I was tested with red beet and garden radish for determining its biological and economic efficiency to control phytophages and expanding the range of the insecticide application on vegetable crops (Fig. 1). Rules of Baciturin, I application allowed for a single garden root crops treatment at the rate of 3,0 l·ha<sup>-1</sup>. As a result of done researches it is determined that a biological preparation in red beet decreased beet flea beetle number by 59,0-67,5%, what allowed to save additionally 31,0 cwt·ha<sup>-1</sup> of root yield.

Similar studies were carried out in garden radish. The obtained results have shown that under Baciturine, I influence cabbage moth number decreased by 86,7%, cruciferous flea beetles – 78,5%. For this, the preparation application against pests ensured the crop safety and extra yield from 11,1 to 24,0% at the cost of plant severity decrease at growth stage during vegetation.

The biological insecticide Baciturine, I also was tested for garden carrot crops protection against carrot psyllids at the same rate with the working solution rate use of 300 l·ha<sup>-1</sup>. Based on carrot plants damage by phytophage record data on the 5-th day after treatment it is determined that the preparation biological efficiency amounted to 86,4%. Root

damage before harvest in a variant with Baciturine, I application was at 4,6% level, whereas in the control - 13,0%.

To control carrot fly in the crops, the biological efficiency of Neem-Azal- T/S EC at the rate 2,5 l·ha<sup>-1</sup> was evaluated. Single treatment of vegetative plants by the biological preparation at the stage of root formation beginning decreased root damage by carrot fly larvae in the yield from 25,6% in the control and to 2,0% - in the trial variant.

Thus, the biological plant protection against noxious organisms plays an important role in structure formation and stabilization of cultivated crop agrophytocenoses, their qualitative and quantitative composition. The phytosanitary activities using the biological plant protection products have a positive effect on plants growth and development, their recovery and are one of the components of organic (ecological) farming.

Biological protection is especially relevant for vegetable production both for open and protected ground, and it can be considered as a decisive alternative to chemical protection, whose excessive use leads to negative consequences and toxic residues accumulation in products and the environment.

## References

- [1] Prakticheskie rekomendatsii po vedeniyu ekologicheskii chistogo selskogo khozyaistva v Respublike Belarus/ Sost.: S.A. Tarasenko, A.V. Sviridov. Minsk-Grodno-Vileyka, 2006, 296 s. Practical recommendations on ecological friendly agriculture in the Republic of Belarus / Compiled: S.A. Tarasenko, A.V. Sviridov. Minsk-Grodno-Vileyka, 2006, 296 p.
- [2] Chistik O.V.: Obshchaya i radiatsionnaya ekologiya: monografiya / O.V. Chistik, S.E. Golovaty, S.S. Pozniak. Minsk: MGEU imeni A.D. Sakharova, 2012, 313 p./ Chistik O.V.: General and radiation ecology: monography / O.V. Chistik, S.E. Golovaty, S.S. Pozniak. Minsk: MSEU named after Sakharov, 2012, 313 p.
- [3] Integrirovannaya sistema zashchity ovoshchnykh kultur i kartofelya ot vreditel'ey, bolezney i sornyakov: rekomendatsii / S.V. Soroka i [dr.] / Integrated system of vegetable crops and potato protection against pests, diseases and weeds: recommendations / S.V. Soroka i [dr.]. Minsk: Kolorgrad, 2017, 235 p.
- [4] Gosudarstvennyy reestr sredstv zashchity rasteniy (pestitsidov) i udobreniy, razreshennykh k primeneniyu na territorii Respubliki Belarus: spravochnoe izdanie / avt. sost. L.V. Pleshko [i dr.]. Minsk, 2014, 628 s. / State plant protection products (pesticides) register permitted for application on the territory of the Republic of Belarus: Manual / Author-compiler L.V. Pleshko [i dr.]. Minsk, 2014, 628 p.