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Biological and chemical techniques of protection of cherry from pests

Goal. Develop biological and chemical technologies for protecting cherries from pests and conduct an economic assessment of their application. Methods. Generally accepted in entomology and plant protection - field studies of the peculiarities of biology and the dynamics of the number of dominant phytophagous cherries, the technical efficiency of biological and modern chemical means of limiting their number. Results The possibility of highly effective regulation of the number and harmfulness of phytophagous complexes on cherries has been investigated. New chemical preparations of neonicotinoid and anthranilamide groups were also tested - against cherry flies and cherry apricots. Conclusions The developed schemes of biological protection of the investigated culture give an opportunity to receive an environmentally friendly crop, suitable for the production of products for children and dietary nutrition. The economic assessment of the use of biological products shows that the cost of production decreased by 79.3% compared to the control, while the profit per hectare and the level of profitability - increased respectively by 9.6 and 8.3 times. With the use of the chemical method, these indicators were 11.1%; 14.5 and 10.7 times respectively.

Key words: bio- and chemical preparations, cherry, pests, technical and economic efficiency.

From the beginning of the XXI century. more and more talk about the expediency of protecting the environment during work in various sectors of agriculture, in particular in gardening. This point of view is based, first of all, on the desire to prevent the large-scale contamination of air, soil and grown fruit production, which adversely affects human health. In 1992, at the international UN summit on environment in Rio de Janeiro, a resolution was adopted on a long-term program for the development of the world community in the twenty-first century. It states that, as population growth increases, plant protection is an important component of stabilization for all states on the path to sustainable economic development and preservation of the environment for present and future generations. The main attention is focused on the importance of improving integrated plant protection systems and the development of non-chemical, environmentally safe methods [1, 10].

Undoubtedly, solving this problem is possible by giving preference to biological and substantial improvement of chemical methods.

It is known that more than 100 types of bacteria, 800 species of micromycetes and 300 species of nematodes are biological agents for pests. In the world, the production of biopreparations for the control of phytophages is 10% [3].

Enemopathogenic mushrooms began to be used in Brazil and China since 1970, but since 1990 this method of protection has been used more in practice, respectively, at 1 and 1.3 million hectares [6].

From 1962 to 2005, Hawaii, California and Florida used the classic forms of biological control, but it was found that the database does not have information on the environmental consequences of biosecurity and, in particular, for non-target organisms. Therefore, we proposed the creation of a new database [5].

A.J. Cherry and R.L. Gwynn discusses about problems and perspectives of the development of a biomedical process in Africa, focusing on the development of technologies with the use of its local agents and close and long-term cooperation on this issue with other countries and comprehensive state support [7].

In Sri Lanka, the most successful biological protection programs were previously based on the introduction of exotic natural enemies to control the number of pests especially valuable crops. However, in today's conditions, interest in the use of local natural enemies increases, which results in conducting research on the environ- ment of entomophages, the development of infrastructure and technology for their breeding for mass publications [8].

In Ukraine in the twentieth century. successfully used various biological pest control agents. At the beginning of the XXI century. research in the area of biosecurity was practically not carried out, and the share of bio-medicines in the IG was only 3% [9].

As a result of the long-term search of effective means of limiting the number and harmfulness of phytophagous cherries, various protection systems have been developed from them, which are based on a complex of preventive and fatal measures. At the forefront of protective programs - the chemical method, one of the most efficient and effective. But along with the positive properties of chemicals, there are serious disadvantages as well: the negative impact of pesticides on human health and the environment. In order to reduce the negative trends in the use of synthetic products on biota, it is necessary to in-depth study the effects and consequences on harmful organisms of a number of modern insecticides, which are characterized by low toxicity for mammals, as well as new mechanisms for protection against pests. Among these drugs should be insecticides based on thiamethoxam (actor 25%, inc. Actor 240 SC, hp), imidaclopodum (confidor 20%, cu, confidor maxi, inc.) , as well as another group of drugs - regulators of insect growth and development (105 CFU, CU, 050 EC, BC, Nomolt, BC, Rimon 10, CU). These groups are characterized by ecological safety (class III toxicity), long protective effect (21 and 28 days) and clear orientation, that is, they do not act on entomophages.

Highly effective protection of sweet cherry by chemical insecticides is impossible due to their limited number. For this crop, 7 preparations are recommended, or 13.8 times less than apple (97 names) [4].

In modern conditions, in the structure of perennials plantations, along with grain, a significant place is occupied by pottery cultures, among them cherries, for which the urgent need is the development and introduction of modern improved and ecologically oriented systems of protection against fruit-damaging and leaf-eating pests.

Methods and materials. The research was carried out in 2001 - 2003 and 2011 - 2014 in the industrial plantations of the state-owned enterprise of the research farm (DP DD) "Novosilky" of the Institute of Horticulture of NAAS on the cherry-tree of the district-type Nijhnost. The placement of experimental sites is renamed, by block method. The plot size is 360 m2 (in 4 replies). For the account, 100 fruits of the harvest and leaf sockets were taken, indicating their damage by the cherry fly and the population of the caterpillars and leaf-rollers. Record of population by cherry aphidis performed visually, looking at each tree leaves on shoots length of 0.5 m (2 shoots from 4 sides of the crown).

The bacterial preparations (in the form of a liquid) were applied: gaupsin, lepidocide, bitoksibacillin (BTB) with a titre of 2.5 billion live spores / ml, and an actoffite preparation prepared on the basis of an extract of soil actinomycetes Streptomyces avermitilis, and mixtures of these preparations , as well as chemical insecticides of neonicotinic (volyam flexi, confidor, calypso) and anthranilamide (exicure with addition of adjuvant codaside) groups. Two sprays were carried out with bioproducts at intervals of 10 - 12 days, and chemical insecticides - 21 days against each generation in critical periods of pest development. The calculations of the aphids, the flutterers and leaf turners were carried out before and after 5 days after the treatments, and the fruits of the worm fly during harvesting. The effectiveness of insecticides against aphids was determined by the Henderson and Tilton formula, and against the other pests - by the formula:

$$Е=100(К-Д/К),$$

where E is the efficiency,%; K is the number of live animals or the percentage of damaged fruits on the control; D - the number of live specimens or the percentage of damaged fruit in the experiment.

The economic efficiency of the studied systems was established according to the method [2]. The calculations were carried out on the basis of technological maps and methodical recommendations regarding norms and prices valid at the agricultural enterprises of the Pravoberezhny Forest-steppe of Ukraine.

Research results. In the complex of insects that are harmful to cherries, leafworms are of economic importance - the Gloucesters (Archips crataegana Hb.), Curvature Curonidae (Pandemis ribeana Hb.), Curvature (Pandemis heparana Den e u Schiff.); Flounder - Winter (Operophthera brumata L.), Striped fruit (Erannis defoliaria Cl.); black cherry aphid (Myzus cerasi F.); cherry fly (Rhagoletis cerasi L.).

After 5 days after a one-time treatment of sweet cherry, tire mixes of the studied drugs drove caterpillars: flounder - 82 - 90 and leaf roller - 75 - 89% (Table 1). The remaining survivors were sedentary, poorly fed, lagged behind control and then killed. On the 10th day after spraying 100% of caterpillars died.

The results of the experiments indicate that the joint application of bacterial preparations with actoofity and actofyte was highly effective against cherry apricots. The pest colonizes 5 to 6 apical leaves. After 5 days after treatment, the bacterial drugs suppressed the activity of the cherry aphid, the larvae did not respond to external stimuli, stopped feeding and soon fell off the leaves. Actophyte acted like that. However, its effects appeared twice as fast as bacterial drugs. The effectiveness of BTB, lepioside, and aphid goupsin with actofitum was 72 - 79, and the actoophyte separately - 60%.

The data for 2001-2005 show that the degree of damage of cherry fruit fly of the Tigray variety in unpicked trees ranged from 1 to 15.3%. Therefore, this grade is classified as moderately damaged. The study of bakery mixtures of bacterial preparations with actofit showed the promise of their use against cherry flies. After 2 times the spray of sweet cherries by tank mixtures of the above preparations, the proportion of worm fruits decreased from 7 to 15% for efficacy from 50 to 93%. The chemical insecticide aktellik, 50% BC, had a lower efficiency against scabies and cherry flies and higher against aphids. The protection of cherries on the basis of the combined application of bacterial preparations with actophyte allowed to keep from 1 to 2,4 t / ha of fruit.

Among the research biopreparations, the special value is given by gaopsin, made on the basis of unspoiled bacteria Pseudomonas. Its advantage is the combination of entomocidal (fetal pest and aphid) and antagonistic (sputum, fruit rot) activity.

As a result of the economic evaluation, it was found that in the versions using biopreparatov (BTB + actoffit), the production costs per hectare compared to the control increased by 16.5%, namely the protection of plants - 3.8%, the collection of additional the harvest is 12.7%. However, due to the increase in yields by 2.1 times, the cost of 1 ts of products decreased by 79.3%, while the profit per hectare and the level of profitability were higher respectively by 9.6 and 8.3 times.

The use of our improved schemes for the protection of cherry orchards provides the opportunity to rationalize protective measures and achieve significant savings in labor and labor. Spraying the sweet cherry with microbial preparations has greatly contributed to the increase of the economic efficiency of this method of using insecticides.

For the evaluation of the technical efficiency of new chemical preparations against the dominant pest - cherry flies, it has been established that the highest protective effect (79.2% on average) was reached for the use of insecticide exicure 100 SC, p. e. with a rate of consumption of 0.35 l / ha, which is close to the standard confidor 20% k.e. - 75.8% (Table 2). The lower efficacy against the pest among the new assortment was exci- brite (0.65 ml / g) and voli-flexi (61.9 and 63.9%), while in the standard version for spraying the calypso leaves this figure dropped to 59.7 % Extract (0.65 l / ha, 98.9%) and the reference drug confidor (97.1%) were highly effective against cherry aphids.

The economic appraisal of the use of drugs with the highest technical efficiency (excurle, 0.35 l / ha) against major pests indicates that production costs per hectare compared to controls increased by 35.1%, in particular, plant protection - 22.3%, for the extra harvest - 12.8, but the cost of 1 ts of products decreased by 11.1%. Due to the increase in livestock (by 1.6 times) and the commercial quality of fruits (the first variety - 79.2%), the profit per hectare and the level of profitability were higher respectively by 14.5 and 10.7 times. The results of experiments indicate that the use of microbiological insecticides, provided that they are registered, plays an important role in preventing the resistance of the main species of harmful fauna to chemical preparations, which results in a high protective effect against the pests of Lepidoptera, Diptera, Homoptera, restricts the negative impact of pesticides on the environment. Chemical insecticides can be recommended to protect cherries from pests only after they are registered.

Conclusions

It is possible to limit the number and damage of phytophagous fruit and leaves on cherry trees with the help of biopreparations. The use of microbiological drugs in the system of protection provides the obtaining of environmentally friendly fruits, suitable for the production of products for children and dietary nutrition. The combined use of BTB, Gaupson, lepidocide with actophyte on the latter provided effective protection against the complex of flounders and leafworms - by 82-90 and 75-89%, respectively, cherry apricots - 60-79 and cherry flour - 50-93% . Among the new chemical products, an exiceric insecticide (0.35 and 0.65 l / ha) was found to be highly effective against cherry flies and cherry apple (79.2 and 98.9% respectively). The economic evaluation of the use of biological products shows that the cost of products decreased by 79.3% compared with the control variant, the profit per hectare and the level of profitability were higher respectively by 9.6 and 8.3 times, and for the application the chemical method, these indicators were 11.1%; 14.5 and 10.7 times.

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