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PROTECTION OF GRAPE AMPELOCENOSES FROM PESTS IN THE CONDITIONS OF SOUTHERN UKRAINE

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Improving the technology of cultivation of grape ampelocenoses is very complex and multifaceted. However, the analysis of the literature shows the prospects of the search for the development and subsequent implementation of new energy-saving and environmentally friendly technologies for the creation of perennial plantations, growing grape berries, on the solution of which the future of Ukrainian viticulture and the efficiency of the industry depend.

Obtaining stable, environmentally and economically sound grape harvests depends not only on the biological potential of a particular area, but also on timely, scientifically based measures against pests.

Agricultural and mechanical measures, as well as entomophages, cannot reduce the number of pests at high population densities to economically insignificant thresholds. In this case, a reasonable use of chemical protection is required.

The analysis of the phytosanitary condition of grape plantations in the south of Ukraine under current management conditions shows that the main pests of grapes in the areas of industrial viticulture are bunch leaf moths, spider mites; secondary pests are four-legged mites (felt and leaf mites), cotton moth, Crimean mowing moth, grape mottle, leaf phylloxera, a complex of sucking pests (thrips and cicadas).

To prevent the existing problems, it is necessary to adhere to scientifically sound technology of crop cultivation and apply an improved protection system with the basics of integration of plant protection elements against nonspecific pests, which involves the integrated application of methods for the long-term regulation of the development and spread of pests to an imperceptible economic level based on the forecast, economic thresholds of harmfulness, its beneficial organisms, energy-saving and environmental technologies that provide

Key words: *grape ampelocenoses, leafhoppers, mites, pests, insecticides.*

Минкіна Г.О. Захист виноградних ампелоценозів від шкідників в умовах Півдня України

Удосконалення технології культивування виноградних ампелоценозів надто складна і багатогранна. Проте аналіз літературних джерел свідчать про перспективність пошуків для розробки та наступного впровадження нових енергозберігаючих та екологічно безпечних технологій створення багаторічних насаджень, вирощування врожаю ягід винограду, від вирішення яких залежить майбутнє українського виноградарства та ефективність галузі.

Отримання стабільних еколого-економічно обґрунтованих врожаїв винограду залежить не тільки від біологічного потенціалу конкретного масиву, а й від проведення своєчасних науково-обґрунтованих заходів проти шкідливих організмів.

Агротехнічні і механічні заходи, а також ентомофаги не можуть понизити чисельність шкідника при високій щільності популяції до господарський невідчутних порогів. В цьому випадку потрібне розумне використання хімічного методу захисту.

Аналіз фітосанітарного стану виноградних насаджень півдня України в сучасних умовах господарювання показує, що основу комплексу шкідливих комах винограду в районах промислового виноградарства складають – гронова листовійка, павутинові кліщі; другорядні – чотириногі кліщі (повстяний і листовий), бавовняна совка, скосарь кримський, пістрянка виноградна, листова форма філоксери, комплекс сосущих шкідників (трипсы і цикадки).

Для запобігання проблем, що склалися, необхідно дотримуватися науково-обґрунтованої технології вирощування культури і застосовувати удосконалену систему захисту

з основами інтеграції елементів захисту рослин від неспецифічних видів шкідників, що передбачає комплексне застосування методів для довгострокового регулювання розвитку та поширення шкідливих організмів до невідчутного господарського рівня на основі прогнозу, економічних порогів шкідливості, її корисних організмів, енергозберігаючих та природоохоронних технологій, які забезпечують надійний захист рослин і екологічну рівновагу довкілля, оскільки зменшення екологічної стійкості агроекосистем у першу чергу буде проявлятися через погіршення фітосанітарного стану агроценозів.

Ключові слова: *виноградні ампелоценози, листовійки, кліщі, школочинні організми, інсектициди.*

Statement of the problem. Improving the technology of cultivation of grape ampelocenoses is very complex and multifaceted. However, the analysis of literature sources indicates the prospects of the search for the development and subsequent implementation of new energy-saving and environmentally friendly technologies for the creation of perennial plantations, growing grape berries, on the solution of which the future of Ukrainian viticulture and the efficiency of the industry depend.

Maintaining the optimal phytosanitary condition of plantations is an important link in the system of efficient production of sweet grape berries. Obtaining stable, environmentally and economically sound grape yields depends not only on the biological potential of a particular area, including the varietal composition, level of agricultural technology, and bush shape design, but also on timely, scientifically-based measures against pests.

Plant protection against pests, diseases and weeds takes a significant place in the technology of growing grape crops (30-40% of total costs), as the negative impact of pests on the grape plant is expressed in a significant decrease in quality and partial or complete loss of yield, which is one of the factors limiting the stable development of the industry. Annually, the yield losses of perennial plantations from pests amount to 60.4%, of which the shortfall in yield from diseases is 34.5%, and from pests – 26.3%.

Analysis of recent research and publications. Modern protection of grape plantations is aimed not so much at the destruction of individual harmful species as at the overall optimization of the phytosanitary condition of plantations. The implementation of this approach requires obtaining objective information about the condition of the vine and the degree of harmfulness of phytophages, taking into account the influence of all factors (abiotic, biotic and anthropogenic) on the state of their populations [1].

Only on the basis of such information is the question of the use of plant protection products decided, taking into account environmental and economic justification. Thus, monitoring the species diversity of arthropods in grape ecosystems in order to identify the most harmful species among the new ones and timely development of protective measures to reduce their number is an urgent issue.

Baranets L.O. notes that climate warming optimizes the characteristics of environmental indicators for insects, promotes their reproduction and distribution [2]. That is, the main negative effect of global warming is an increase in the number of phytophages, a change in the structure of their populations, the level of harmfulness and acclimatization zones. According to the forecasts of Ukrainian scientists Baranets L.O., Mezerniuk T., Shevchenko I.V., Perepelytsia O., Stankevych S.V., the violation of the ecological stability of agroecosystems leads, first of all, to the restructuring of the species structure and changes in the zones of insect phytophagous damage, an increase in the generation of certain insect species and the number of dominant pests, as well as an increase in the likelihood of emergencies in the agro-sphere associated with the mass reproduction of polyphagous pests [1, 2, 6].

Analysis of the phytosanitary condition of grape plantations in the south of Ukraine in modern conditions shows that the main complex of harmful insects of grapes in the areas of industrial viticulture is made up of bunch leaf moths, spider mites; secondary ones are four-legged mites (felt and leaf mites), cotton moth, Crimean mower, grape mottle, leaf form of phylloxera, complex of sucking pests (thrips and cicadas) [6].

As a result of the research, 39 species of pests belonging to 7 orders, 19 families and 32 genera were identified on grapevines. The largest number of species falls on the orders of Hymenoptera – 17 (46.5%), Lepidoptera – 8 (24.3%) and Diptera – 6 (29.2%). The identified pest species have different economic importance, and not all of them are equally distributed in the study area. Of these, the main and most harmful species that can cause significant damage to grapes are bunch leaf miner, various mites (especially grape itch), phylloxera, various species of cicadas (especially white cicada), cotton moth and various thrips (especially grape thrips). Minor species that can cause some damage in some years include the Crimean mowing machine, brown-gray smoky moth, grape and biennial leafhoppers, grape moth, dark scabbard, etc. [1, 5, 8].

Objective. The aim of the research was to analyze and determine the complex of pests in the areas of industrial viticulture and the effectiveness of drugs against bunch leaf miner and ticks.

The objectives of the research were to design a system of protection of grape ampelocenoses based on minimizing the use of chemical methods of regulating the number of harmful insects.

Summary of the main research material. The list of the most harmful species of grapevine, the number of which is controlled, includes bunch leaf moths, mites, leaf phylloxera and some others.

Scoops, moths, leafhoppers, moths, bears (American white butterfly), bronze moths, borers, beetles, weevils develop in separate foci in vineyards, which should be especially taken into account when growing young plantations and grape nurseries. Of the many pests of the vine, let's consider the most harmful ones, which are controlled by various methods of protection. Leafhoppers are represented by three species: bunch, biennial and grape, belonging to the family Tortricidae, order Lepidoptera.

Grape and biennial leafhoppers cause damage sporadically, while bunch leafhoppers are characterized by high numbers and harmfulness in all viticulture zones. Species differ in morphological characteristics, developmental biology and lifestyle. The number and harmfulness of the species depends on timely and high-quality protective measures. In the conditions of Ukraine, it develops in three generations, and in some years gives a fourth optional (not complete, partial) generation.

Long-term monitoring has shown that in the main viticultural zones of southern Ukraine, the periods of butterfly flight do not overlap and there are clearly distinguished periods of mass flight (with one or two or three peaks). Each cycle – butterfly – egg – caterpillar – pupa – constitutes one generation of the pest.

Significant differences in the calendar timing of the development of the leafhopper population in different agroclimatic zones of crop cultivation do not allow us to recommend and apply one typical protection scheme. In this regard, for effective protective measures against bunchy leaf miner, the following provisions should be followed:

– the beginning and number of bunch leaf butterfly flights in specific areas can be most accurately determined using pheromone traps. Knowing the biology of the pest, you can calculate the timing of caterpillar and egg hatching, and determine the timing of protective spraying;

– the first treatment is carried out at the beginning of the hatching of the first generation of caterpillars in the second decade of May, the need to repeat the treatment depends on the duration of the protective effect of the drugs used and the density of the pest population. Sudden changes in weather conditions can significantly weaken or even interrupt the summer of butterflies, especially the first generation, so regular pheromone monitoring is necessary;

– at high pest density, all subsequent treatments should be carried out in accordance with the indications of pheromone traps when the number of pests is above the economic threshold of harmfulness (ETH). For technical varieties, the EHL is 20 butterflies per day of mass flight of the pest and 10 captured males for table varieties. For the second and third generations, the pest population decreases due to high harmfulness to 10 and 5, respectively.

Based on the pheromone monitoring data, the economic threshold of the pest's harmfulness is calculated by counting the pest's spider nests and caterpillars. On technical varieties, the number of caterpillars may be 8-10 individuals per 100 bunches; for table grapes and varieties of the nutmeg group, the population rate should not exceed 5-7 caterpillars per 100 bunches;

– the treatment period is determined by the dynamics of catching males (butterflies) in pheromone traps and is timed to coincide with the beginning of mass hatching of caterpillars. Traps are hung in the plots in the first decade of April and inspected daily. Taking into account the density of butterflies, as well as the biology of the pest, the timing of caterpillar hatching and oviposition is calculated. Usually, the period coincides with the treatment against a complex of fungal diseases in the second decade of May (from 15 to 20). The second treatment is carried out if necessary, 7-10 days after the first, depending on the duration of the protective effect of the drugs and the density of the pest population;

– treatments against subsequent generations of the pest are planned according to the signals of pheromone traps when the number of pests is above the economic threshold of harmfulness, which is 20 butterflies per day for technical varieties and 10 for table varieties. For the second and third generations, the thresholds for the number of trapped pests are reduced due to their high harmfulness to 10 and 5, respectively;

– treatments are usually carried out during the period of mass hatching of caterpillars, since from this moment until they reach the age of I-II, they are most susceptible to the action of most insecticides of the organophosphorus and pyrethroid groups. In case of using preparations from the group of regulators of chitin synthesis and insect growth, treatments are carried out during the period of mass flight of pest butterflies, before or during mass egg-laying.

When carrying out protective measures, it should be borne in mind that the most harmful and dangerous are the first generation caterpillars, which can destroy 25-35% of flowers on infested inflorescences. The second generation destroys about 5% of green berries, the third – about 2% of ripe grapes. Within each generation, the most viable and harmful caterpillars are those that hatch first.

On average, farms in the south of Ukraine carry out 2 to 4 treatments during the grape growing season. The insecticides used to protect against bunchy leaf moths differ in their mechanism of action and period of application. Some – pyrethroids, neonicotinoids and organophosphate compounds – destroy the caterpillars directly and are used during the period of mass hatching. Others – drugs from the group of regulators of chitin synthesis and insect growth – are used during the period of mass flight and oviposition of the pest.

In recent years, in the south of Ukraine, there has been a significant increase in the number and increased harmfulness of grapes by sucking pests, which in case of mass reproduction can cause great damage to plantations. The main sucking pests that damage grape plantations include: mites of different trophic groups, cicadas, thrips and leaf phylloxera.

The grapevine is an attractive plant for mites to feed and reproduce. These are small invertebrate insects belonging to the type of arthropods (Arthropoda), class Arachnidae, subclass Acari. There are more than 17 species of mites belonging to different trophic groups in Ukrainian vineyards. The most harmful among them are phytophagous mites belonging to the order Acariformes and including four genera: four-legged spider mites (Tetranychidae) – common spider mite, garden spider mite, Turkestan spider mite, less often red fruit mite, etc. brown mites (Bryobiidae) – brown fruit mites; flat-bodied or flat mites (Tenuipalpidae) – grape flat-bodied mites and other gall four-legged mites (Eriophyidae) – felt (itchy), bud and leaf (wrinkled) mites.

The activity of mites leads to damage to the vegetative and generative organs of the plant, causing various pathological changes, resulting in reduced bush productivity and sugar content of berries, and deteriorating winter hardiness of plants. Yield losses range from 25 to 60%, depending on the degree of damage.

The most widespread in all areas of grape cultivation are spider mites and grape felt mites. The grape bud mite is characterized by very high harmfulness, which develops in separate foci. In recent years, there has been a significant spread of leaf mites. There are no varieties that are resistant to mite damage, but individual grape varieties differ in their response to damage.

The massive development of the mite population is facilitated by unfavorable weather conditions for the development of grapes – a prolonged cold spring, which restrains the growth rate of annual shoots. The first visual signs of pest development in vineyards are observed in the third decade of May. The shoots developing from damaged buds are stunted, they form fewer inflorescences, the leaves are small, with necrotic spots, which generally leads to a loss of 30-60% of the yield.

To prevent the growth of the threshold number of pests, along with agrotechnical methods, plantations are protected with insecticides, forming their composition in such a way as to reduce the populations of both leafhoppers and mites. The chemicals used for this purpose have different efficacy, and therefore in each case the formation of the optimal scheme of plantation protection should be carried out individually for each individual variety, plantation areas, the number of pests, and their condition (Table 1).

Table 1

Effectiveness of insecticides against grape pests, %

Drugs	The bunch leaf beetle			Ticks.
	1st generation	2nd generation	3rd generation	
B-58 new, 2.0 l/ha	93,3	93,1	93,1	97,5
Buldock, 0.3 l/ha	88,9	89,5	85,7	74,6
Match, 1.0 l/ha	88,8	86,7	88,1	63,9
Talstar, 0.2 l/ha	95,0	92,7	90,5	96,1
Fertilizer, 0.2 l/ha	91,7	89,6	88,3	52,0
Control (number)	16,8	17,7	19,6	8,2

The most effective treatment against this type of mites is acaricide treatment in the phase of bud swelling – opening of the upper scales (during spring migration). Repeated treatment, if necessary, is recommended before flowering of grapes, during the period of migration of mites.

Any protection system cannot be permanent; it is improved from year to year, taking into account changes in climatic conditions, infectious stock, features of zonal agricultural technology, and the experience gained in the course of new research results. The protection system can also use other drugs recommended by the periodical "List of pesticides and agrochemicals allowed for use in Ukraine", which is updated every year with new drugs that are more effective and safe for the environment.

Conclusions. Thus, the analysis of the monitoring of grape ampelocenoses in the south of Ukraine shows that over the past decade there have been significant changes in the spread of a number of pests that have gained a biological advantage in plantations and therefore create a tense phytosanitary situation, which is significantly deteriorating every year. To prevent the existing problems, it is necessary to adhere to scientifically sound crop cultivation technology and apply an improved protection system with the basics of integrating plant protection elements against nonspecific pests, which involves the integrated application of methods for the long-term regulation of the development and spread of pests to an imperceptible economic level based on the forecast, economic thresholds of harmfulness, its beneficial organisms, energy-saving and environmental technologies that provide.

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