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EFFECTIVENESS OF THE DRUG "AKARAGOLD 72%" AGAINST COTTON SPIDER MITES

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Abstract: The article discusses the results of using a new insecticide «Akaragold 72%» em.k. to control spider mites on cotton crops. The drug «Akaragold 72%» em.k. manufactured by JV LLC "Ifoda Agro Kimyo Himoya" contains the active ingredients - propargite 66% and hexythiazox 6%.

Keywords: rate, consumption, preparation, drug, efficiency, accounting, processing, hexythiazox, spider mite, propargite, option, experience.

Introduction. At the current stage of development of agricultural production in the Republic of Uzbekistan, increasing the yield of agricultural crops, including cotton, is very important. However, cotton, like many agricultural crops, is susceptible to the settlement of many harmful insects. Several methods of control are used against them. But it should be noted that the most effective is the chemical method, although it has a number of disadvantages. In order to minimize its negative consequences, a competent approach is needed. One of the ways to solve this problem is to select the most effective, less toxic and fast-acting drug s. Cotton is one of the crops most affected by invertebrates. Spider mite (Tetranechus urticae) is widespread. It is especially common among cotton crops in the Fergana Valley, the north of the Surkhandarya and eastern part of the Kashkadarya regions and the south of the Republic of Karakalpakstan [1].

Several methods of control have been developed against spider mites. However, today the most effective is chemical, namely acaricides, which in modern conditions requires a new approach. Acaricides (from the Greek ἄκαρι - tick and Latin caedo - to kill), a group of chemicals used to control ticks in crop production and veterinary medicine. Acaricides are classified by the object of application, by the method of penetration: by the mechanism of action, by chemical composition and structure [2].

By the object of application:

- acaricides - drug s that destroy herbivorous mites;
- insectoacaricides - drug s that destroy insects and herbivorous mites.

By the method of penetration:

• contact - compounds that penetrate the body of mites after contact with the treated surface;

• contact with deep activity - drug s that can penetrate the body of mites both through the outer covers and with food;

• systemic - penetrate the body of mites with food.

By chemical composition and structure:

• tetrazines - active ingredient (a. i.) clofentizine, diflavidazine;

• sulfite esters - a. i. propargite;

• other substances - a. i. fenazaquine;

• thiazolidines - a. i. hexythiazox;

• phenoxypyrazoles – active ingredient fenproximate;

• organophosphorus compounds – active ingredient malathion;

• avermectins – active ingredient aversectin C, abamectin.

By mechanism of action:

• inhibition of oxidative phosphorylation – active ingredient propargite, fenazaquin;

• inhibitors of metamorphosis processes in herbivorous mites – active ingredient clofentizine, diflavidazine;

• inhibitors of chitin formation processes – active ingredient hexythiazox;

• inhibitors of nerve impulse transmission – active ingredient malathion, avermectin C, abamectin.

All specific acaricides are characterized by contact penetration and a long period of protective action. Acaricides can affect ticks by disrupting the nervous system, blocking lipid synthesis, and also by inhibiting specific enzymes that are important for the vital activity of ticks.

The active substances of this group are highly stable, and therefore they have a long waiting period on fruit and berry crops. The most effective is the alternation of specific acaricides with non-specific acaricides (insectoacaricides), which include drug s from the groups of organophosphorus compounds, synthetic pyrethroids, avermectins. Correct alternation of drug s reduces the likelihood of resistance in ticks and provides high efficiency. Most modern specific acaricides are low-toxic for warm-blooded animals and beneficial entomofauna.

Some active substances, such as propargite, fenazaquine, are characterized by high stability. Drug s based on them have a long period of protective action and a waiting period (the time from the last treatment to harvesting is measured in days). Drug s from the tetrazine group, on the contrary, are quickly destroyed in the soil (DT_{50} - about 30 days) and have a waiting period of 30 days on an apple tree, 60 days on grapes. Resistance is observed in all harmful organisms that are systematically controlled, including ticks. The development of acquired resistance leads to an increase in the frequency of plant treatments with drug s, as a result of which agricultural products and the environment can be contaminated. Due to the multiple mechanisms of action of specific acaricides, resistance to them develops more slowly. Measures to prevent the development of

resistance or to overcome it should be based on the formation of an assortment of acaricides, taking into account the study of the processes of resistance development to drug s in the population of herbivorous ticks. This will allow you to quickly predict the possibility of resistance and promptly choose the tactics of protective measures. Resistance of ticks to acaricides is a major problem. The development of resistance is often associated with metabolic resistance, which allows ticks to detoxify acaricides. This leads to the need to rotate acaricides with different mechanisms of action to reduce the chances of resistance development [3-5].

Materials and methods. A new drug «Akaragold 72%» em.k. was tested for spider mite control in cotton crops. Tests of the drug «Akaragold 72%» em.k. manufactured by JV LLC "Ifoda Agro Kimyo himoya" were conducted in the Experimental Production Farm of the Agricultural Services Center of the Andijan Region.

The active ingredients of the drug "Akaragold 72%" em.k. are propargite (66%) and hexythiozox (6%). The empirical formula of propargite is $C_{19}H_{26}O_4S$, molecular weight is 350.5. The IUPAC name of propargite is 2-(n-tert-butylphenoxy)-cyclohexylpropargyl sulfite.

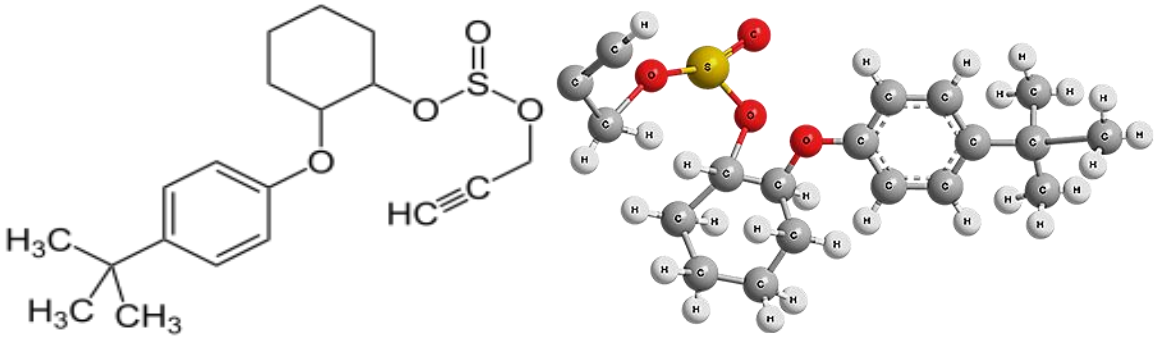

Figure 1. Structural formula of propargite

Colorless oily liquid. Boiling point at 1.3 Pa (0.01 mm Hg) is 90 °C. Insoluble in water, soluble in most organic solvents. Solubility in water at 20 °C is 0.215 mg / l, specific density is 1.113 g / ml. Propargite has acaricidal activity. Effect on pests is contact. Has a damaging effect on mobile stages of ticks (larva, nymph, adult), but does not have an ovicidal effect (does not affect eggs). mitochondrial ATP synthase inhibitors. Propargite, like all compounds of group 12 of the IRAC classification, inhibits oxidative phosphorylation by suppressing the enzyme involved in the synthesis of mitochondrial adenosine triphosphatase (ATP). Such compounds belong to the group of modulators of metabolic processes. Propargite is resistant to moisture because it quickly penetrates the wax coating of leaf blades. The period of protective action of acaricides with the active substance propargite is from 14 to 21 days [6].

The pests stop feeding and soon die. Propargite effectively regulates the number of herbivorous mites belonging to the families of spider mites, gall mites, and tetrapods on plants [6].

As a preventive measure against the formation of populations resistant to propargite, it is recommended to alternate it with acaricides whose active ingredients belong to group 23, group 21, and group 6 according to the IRAC classification. Propargite is obtained by the interaction of 4-tert-butylphenoxy-2'-hydroxycyclohexyl ether with thionyl chloride to form chlorosulfite, which then reacts with propargyl alcohol in the presence of pyridine [7].

The IUPAC name of hexythiazox is trans-5-(4-chlorophenyl)-N-cyclohexyl-4-methyl-2-oxothiazolidine-3-carboxamide. Empirical formula - $C_{17}H_{21}O_2N_2S$, molecular weight 352.9, melting point - 108.0 °C.

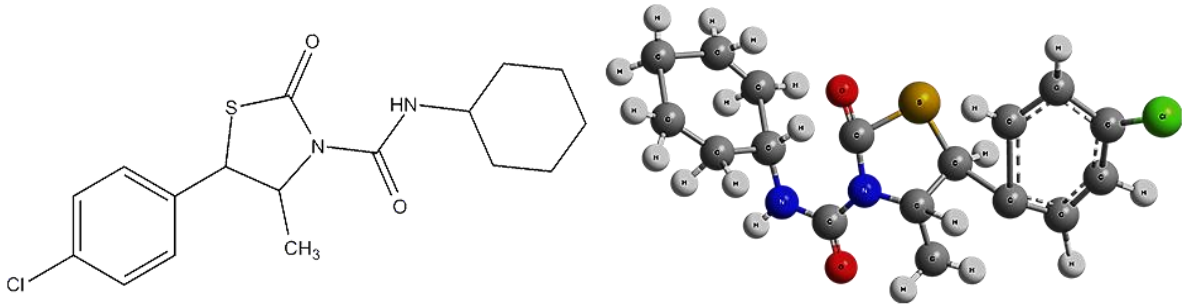

Figure 2. Structural formula of hexythiazox

Hexythiazox is the active ingredient of acaricides, belongs to substances of hormonal action with a high ovicidal effect. Hexythiazox is colorless crystals. Stable to the effects of light; air, heating, in acidic and alkaline environments. Insoluble in water, soluble in most organic solvents. Solubility at 20 °C in water - 0.5 mg/dm^3, in chloroform - 1379 g/dm^3. Hexythiazox has acaricidal activity, is a compound with hormonal action and has translaminar activity. Toxicological action is contact-intestinal, inhibits the enzyme catalyzing the polymerization of chitin. Hexythiazox has an acaricidal effect on ticks in the egg, larval, and nymph stages. It does not destroy adult individuals [8].

When using drug s with the active substance hexythiazox, there is an urgent need for measures to prevent the formation of resistance. As a preventive measure for the formation of resistant populations to propargite, it is recommended to alternate it with acaricides whose active substances belong to group 21, groups 1 21 and group 6 according to the IRAC classification [9].

The soils of the experimental plots are light gray soils. Irrigation does not cause soil salinization. The depth of groundwater is 1.5-1.8 m. Before the tests, generally accepted agrotechnical measures for cotton were carried out. By the beginning of the counts, the height of the plants was 40-45 cm, the density of standing was 95-98 thousand plants per 1 ha. The plants were in the budding and flowering phases.

The drug was tested in the volume of a large-plot field experiment against spider mites. The plot size was 1 ha for each variant of the experiment in triplicate. The consumption rate of the working fluid during the tests was 300 l/ha. The treatment of plants against pests with a working solution of the drug was carried out in the morning,

at an air temperature of 20-22^{0}C, a wind speed of 1-2 m/s, and a relative humidity of 55%. The application of the drug was carried out by continuous spraying of plants on experimental plots with working solutions on a TTZ 80.11 tractor, an OVH-1 sprayer. The pest population counts on the experimental plots were conducted in accordance with the "Methodological Guidelines, 2006" and the work program before treating the plants with the drug s (preliminary count), then on the third, seventh and fourteenth days after treatment [10].

The biological effectiveness of the drug was assessed by the percentage of reduction in the pest population, reflecting the effect of the tested drug on the pests. The biological effectiveness was calculated using the Abbott formula, modernized by Henderson and Tilton:

$$\mathbf{E = \{(Ta * Cv) * 100\%\} / Tv * Ca}$$

where: **E** is the biological effectiveness, expressed in the pest population, adjusted for the control, %; **Tv** is the number of live individuals before treatment, experiment; **Ta** is the number of live individuals after treatment, experiment; **Cv** is the number of live individuals before treatment, control; **Ca** is the number of live individuals in the control, in subsequent counts [11].

Results and discussion. The biological efficiency of the drug «Akaragold 72%» em.k. was assessed by the percentage reduction in the pest population, reflecting the effect of the test drug on the experimental object. The criterion for a positive assessment of the drug for combating experimental pests was biological efficiency for sucking pests of cotton of at least 95.0% and at least 85% for the cotton bollworm [8-11].

The results of calculating the biological efficiency of the test drug and the standard are given in Tables 1, 2.

Table 1. Consumption of drug s in experiments

№	Experimental variants	Application rate of drug , l/ha
1.	Akaragold 72% em.k.	0,3
2.	Akaragold 72% em.k.	0,5
3.	Khim Gold k.e (standard)	0,5
4	Control (without treatment)	-

As a result of calculating the biological efficiency of the test drug and the standard at the adopted application rates, the following were obtained.

At an application rate of 0.3 l/ha of the drug «Akaragold 72%» em.k., the average biological efficiency by the accounting periods on the third day after treatment was - 95.3%, on the seventh day it was - 96.3% and on the fourteenth day after treatment this indicator decreased, amounting to - 81.9%.

Table 2. Biological efficiency of "Akaragold 72%" em.k.

№	Experimental variants	Application rate, l/ha		Average number per plant, specimens				Biological efficiency, % by days of recording		
		Drug	Working liquid	Before treatment	After treatment by days of recording					
					3	7	14	3	7	14
1	Akaragold 72% em.k.	0,3	250	25,0	1,2	1,0	5,0	95,3	96,3	81,9
2	Akaragold 72% em.k.	0,5	250	37,5	2,7	2,0	1,7	93,3	95,2	95,9
3	Khim Gold em.k. (standard)	0,5	250	24,2	1,0	0,7	4,7	95,9	97,3	82,4
4	Control (without treatment)	-	-	23,7	24,0	25,7	26,2	-	-	-

At the application rate of 0.5 l/ha of the drug «Akaragold 72%» em.k., the average biological efficiency by the accounting periods were 91.0%, 95.4% and 95.9%, respectively, and the biological efficiency of the reference drug "Khim Gold k.e" (standard). on average amounted to 95.9%, 97.3% and 82.4%, respectively (Table 2).

Thus, the biological efficiency of the drug "Akaragold 72%" em.k., in the tested application rates of 0.3-.05 l/ha, reaches the value of the accepted criterion for a positive assessment of the drug for combating spider mites on cotton crops, by the 3rd and 7th day after plant treatment.

Conclusion. The drug «Akaragold 72%» em.k. developed by JV LLC "Ifoda Agro Kimyo Himoya", is an effective pesticide that can be included in the list of drugs approved for the control of spider mites.

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