The study of the biological effectiveness of the "AKARAGOLD 72% em.k." drug for solving problems of environmental protection

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Abstract. This article describes the results of studying the biological effectiveness of the "Akaragold 72% em.k" chemical protection agent against the spider mite. It is an insect pest of agricultural crops, in particular, cotton. In addition to describing the biological effectiveness of the drug, the procedure for applying this chemical agent to the treated areas is also presented. It was found that the biological effectiveness of the AKARAGOLD 72% em.k. drug in the tested consumption rate of 0.3-.05 l/ha, it reaches the value of the accepted criterion for a positive evaluation of the drug for the control of spider mites on cotton crops, by the 3rd and 7th day after the treatment of plants. As a result of the research, the composition of the most effective, low-toxic and fast-acting new drug against the spider mite pest, the method of its application and norms have been developed. Thanks to this, practical results were obtained in obtaining a bountiful cotton harvest, saving natural resources and improving environmental efficiency.

1 Introduction

At the present stage of development of agricultural production in the Republic of Uzbekistan, increasing the yield of crops, including cotton, is very important.

However, cotton, like many agricultural crops, is subject to the colonization of many harmful insects, the most dangerous of which are the cotton bollworm. Several methods of struggle 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 the negative consequences of it, a competent approach is needed. One of the ways to solve this problem is the selection of the most effective, less toxic and fast-acting drugs.

To this end, in 2022, we tested AKARAGOLD 72% em.k. new drug to combat spider mites in cotton crops.

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2 Literature review

Cotton is one of the crops most affected by invertebrates. Back in 1931 prof. V.V. Yakhontov described an incomplete world fauna of invertebrates feeding on cotton, including 772 species, of which 751 species belong to the class of insects.

In the former Soviet Union on cotton V.V. Yakhontov registered 177 species of insects and mites, A.I. Petrov 219 species. This is a consequence not only of climatic conditions, but also of significant quarantine measures that prevent the penetration of harmful organisms.

Only a few of these species cause serious harm - about 10 species, but those that are assigned a secondary place in terms of harmfulness can, under especially favorable conditions, cause tangible damage to this crop. These pests include spider mite (Tetranychus urticae Koch), alfalfa or acacia aphid (Aphis craccivora) (medicaginis) Koch), melon aphid (Aphis gossypii Glove.), large cotton aphid (Acyrthosiphon gossypii Mordv.), alfalfa bug (Adelphocoris lineolatus Goeze) field bug (Lygus pratensis L.), tobacco thrips (Thrips tabaci Lind.), cotton bollworm (eliothis armigera Hb.), little ground cutworm karadrin (Laphigma exigua Hb.

The spider mite (Tetranechus urticae) is ubiquitous, and cotton crops are especially damaged by the pest in the conditions of the Fergana Valley, the north of the Surkhandarya region, the eastern part of the Kashkadarya region and the south of the Republic of Karakalpakstan [1].

A lot of works are devoted to the study of morphological features of the structure, developmental biology and measures to combat spider mites in Central Asia [2-4, 8-9]. It was noted that the earlier cotton crops are populated by the pest, the greater the yield loss. So, a crop shortage of 50-60% is noted when the crops are populated by a pest in June, the crop shortage in July is 35-40%, and in the later periods of settlement (August), crop losses are small 2-6%.

The pest appears on cotton crops in April-May, having previously multiplied on weeds and ornamental plants around cotton fields and on mulberry bushes.

The development of one generation takes 8-12 days in summer, 20-30 days in spring and autumn. For the entire growing season, the pest reproduces in 12-20 generations, which contributes to the development of resistance to the chemicals used (acaricides). In recent years, an increase in the resistance of the spider mite to a number of preparations from the groups of organophosphorus, perithroid and carbamate used in the protection of cotton has been noted [6].

Several control methods have been developed against spider mites. However, to date, the most effective is chemical, which currently requires a new approach.

Soil and climatic conditions. The Ferghana Valley extends to the intermountain depression of the same name and the slopes of the mountain frame facing it. The depression, which has an ovoid shape, reaches 370 km in length and 140-200 km in width. The absolute marks of the district vary from 330 m in the center of the depression to 5000-6000 m in its southern mountain range.

The central part of the Ferghana depression is an accumulative plain, composed of deposits of young floodplain terraces of the Syr Darya and associated alluvial fans deposited with them. This lowest part of the depression is surrounded by adyrs, which are ridges of ridges with absolute elevations up to 1000-1200 m. Behind the adyr strip there is a zone beyond the adyr plains. In southern Fergana, in contrast to the northern one, there are several (up to 3) parallel ridges of frontal ridges (3000 m), between which there are depressions. The slopes of the main ranges facing the Fergana Valley form the middle and high mountains. The relative orographic isolation of the Ferghana depression and its extreme north-eastern position on the territory of the republic determine the originality of nature. The plain and foothill parts of the district, which are part of the republic, have the lowest average

temperature in January compared to other foothill districts of Uzbekistan (within -20 -40). The duration of winter is 3.5 months. The absolute minimum temperature is 26 - 27o, in some places up to -30o. Mid-July temperature - 26 - 28o. Temperature maximums - 40 - 42o. The sum of positive temperatures is 4300 - 4600o. The amount of precipitation in the west is less than 100 mm, and in the east - 300-350 mm. The central part of the district is located within an exceptionally dry zone, where grain crops are not provided with soil moisture at all (HTC - less than 0.10).

The main waterway that irrigates the Ferghana Valley is the Syr Darya River. The district is characterized by the development of zones from desert to glacial-nival. The desert zone extends to the central part of the district. The basis of the zone is formed by desert-type landscapes. In the altitude range from 1200 - 1300 m above sea level, a foothill zone is developed - a zone of gray soils. The mid-mountain zone within the Uzbek part of the district is represented on the southern slope of the Kuramyn Range. Landscapes - forming here are xerophytic shrubs. The main tracts of irrigated agriculture in the Ferghana District are concentrated in the desert and foothill zones.

Soils on the territory of the region are distributed in close dependence on the lithological and geomorphological features of the area in the altitude range from 350 m in the south to 3000 and more meters in the north.

In the modern valley of the Naryn and the Syrdarya, meadow floodplain soils, bog-meadow and marsh soils, irrigated meadow soils on the floodplain, irrigated meadow solonchak soils on the floodplain terrace are developed. Irrigated gray soils and gray-brown desert soils are confined to the surface of pre-adyr proluvial plains. The Naryn-Karadarya interfluve is characterized by irrigated gray soils, meadow and marsh-meadow soils.

There are gray-brown desert and meadow soils.

Thus, the Andijan region is characterized by desert, foothill, mid-mountain and high-mountain high-altitude landscape zones.

Place of testing. Trials of AKARAGOLD 72% em.k. LLC “Ifoda Agro Kimyo Himoya” Uzbekistan was carried out in the pilot production facility of the Andijan Regional Center for Agro-Services. Andijan region.

Preparation: AKARAGOLD 72% em.k. LLC “Ifoda Agro Kimyo Himoya” Uzbekistan. Active ingredient: Propargit 66% + geksitiozoks 6%.

Culture. Cotton sowing - March 2022. By the beginning of the count, the height of the plants was 40-45 cm, the density was 95-98 thousand plants per 1 ha. The plants were in the budding and flowering phase.

Pest: Spider mite.

The soil. The soils of the experimental plots are old-irrigated, light gray soils. Irrigation does not cause soil salinization. The depth of groundwater is 1.5-1.8 m.

Agricultural technology. By the beginning of the tests, agrotechnical measures generally accepted for this crop were carried out.

Type of experience. Tests of the drug were carried out in the volume of a large-plot field experiment.

Area of experimental plots. The size of the plots was 1 ha for each variant of the experiment in triplicate.

Table 1. Experience scheme.

No.	Experience Options	Consumption rate of the preparation, l/ha
1.	AKARAGOLD 72% em.k.	0.3
2.	AKARAGOLD 72% em.k.	0.5
3.	Him Gold k.e (standard)	0.5
4	Control (no processing)	-

The rate of consumption of the working fluid. The consumption rate of the working fluid during the tests was 300 l/ha.

Terms and conditions for the use of drugs. The treatment of plants against pests with the working solution of the drug was carried out in the morning, at an air temperature of 20-220C, a wind speed of 1-2 m/s, and a relative air humidity of 55%.

Method of application of the drug. The use of the drug was carried out by continuous spraying of plants on experimental plots with working solutions.

Type and brand of sprayer. Tractor TTZ 80.11, sprayer OVKh-1.

Accounting. Pest counts on experimental plots were carried out in accordance with the "Guidelines for testing insecticides, acaricides and molluscicides in crop production" [5] and the work program before the treatment of plants with drugs (preliminary accounting), then on the third, seventh and fourteenth days after treatment.

The biological effectiveness of the drug was evaluated by the percentage of pest reduction, reflecting the effect of the test drug on pests. The criterion for a positive assessment of the drug for pest control is the biological effectiveness of at least 95.0% for sucking pests (whitefly) of cotton and at least 85% for gnawing pests (cotton bollworm) [5].

The calculation of biological effectiveness was performed according to the Abbott formula, modernized by Henderson and Tilton:

$$E = 100 \cdot \frac{T_a \cdot C_v}{T_v \cdot C_a}$$

where:

E - biological efficiency, in terms of pest numbers, adjusted for control, %

T_v - the number of living individuals before processing, experience;

T_a - the number of living individuals after processing, experience;

C_v - the number of living individuals before processing, control;

C_a - the number of live individuals in the control, in subsequent counts.

The results of calculating the biological effectiveness of the test preparation and the standard are shown in Table 2.

3 Results

The biological effectiveness of the drug Acaracid Gold 72% a.e. was evaluated by the percentage of pest reduction, reflecting the effect of the test drug on the experimental object. The criterion for a positive assessment of the drug for the control of experimental pests is the biological effectiveness of at least 95.0% for sucking pests of cotton and at least 85% for cotton bollworm [5].

The calculation of biological effectiveness was performed according to the Abbott formula, modernized by Henderson and Tilton:

$$E = 100 \cdot \frac{T_a \cdot C_v}{T_v \cdot C_a}$$

where:

E - biological efficiency, in terms of pest numbers, adjusted for control, %

Tv - the number of living individuals before processing, experience;

Ta - the number of living individuals after processing, experience;

Cv - the number of living individuals before processing, control;

Ca - the number of live individuals in the control, in subsequent counts.

The results of calculating the biological effectiveness of the test preparation and the standard are shown in Tables 1-3.

As a result of the calculations of biological effectiveness, the tested drug and the standard at the accepted consumption rates, the following data were obtained:

Spider mite.

At the rate of consumption of the AKARAGOLD 72% em.k. 0.3 l/ha drug, the average biological efficiency in terms of accounting was 95.3% on the third day after treatment, 96.3% on the seventh day and on the fourteenth day after treatment this figure decreased and amounted to 81.9%.

At the rate of consumption of the AKARAGOLD 72% em.k. 0.5 l/ha drug, the average biological efficiency in terms of accounting was 91.0%, 95.4% and 95.9%, and the biological efficiency of the reference preparation Chem Gold k.e (standard). averaged 95.9%, 97.3% and 82.4% (Table 2).

Table 2. Biological efficacy of AKARAGOLD 72% em.k. In the fight against the pest spider mite on cotton crops.

№	Experience Options	Consumption rate, l/ha		Average number per plant, ind.				Biological efficiency, % by days of accounting		
		Preparation	working fluid	before processing	after processing by days of accounting					
					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	Him Gold k.e (standard)	0.5	250	24.2	1.0	0.7	4.7	95.9	97.3	82.4
4	Control (no processing)			23.7	24.0	25.7	26.2	-	-	-

Thus, the biological effectiveness of the AKARAGOLD 72% em.k. drug in the tested consumption rate of 0.3-.05 l/ha, it reaches the value of the accepted criterion for a positive evaluation of the drug for the control of spider mites on cotton crops, by the 3rd and 7th day after the treatment of plants.

Table 3. Information on the results of the tests and the conclusion - a recommendation based on the results of the insecticide AKARAGOLD 72% em.k. Crops – cotton; an object - spider mite; tested doses - 0.3-0.5 l/ha.

Efficiency, % (max.) and accounting period	Mode of application	The maximum allowable number of treatments	Phytotoxicity	Recommendation "Include in the List" (Indicate the consumption rate, terms and other features of the application), "Continue testing" (indicate the norms), "Withdraw from further testing" (indicate the reason)
95.2-96.3% Day 7	continuous spraying	1	non phytotoxic	Include AKARAGOLD 72% em.k. LLC "Ifoda Agro Kimyo Himoya" Uzbekistan in the List of drugs allowed to control spider mites at a rate of 0.3-0.5 l/ha, at a rate of working fluid consumption of 250-300 l/ha by the method of continuous treatment of plants with a tractor sprayer.

4 Conclusions

For one of the most important agricultural crops in Uzbekistan, in order to combat one of the most common pests of cotton, a new effective chemical protection against spider mites has been carefully studied. The conditions, dosages and order of application of this preparation are shown depending on the periods of cotton growth and weather. The norms necessary for the most effective application were also determined. By the company "Ifoda Agro Kimyo Himoya" Uzbekistan, the AKARAGOLD 72% em.k. drug included in the List of drugs for the fight against spider mites. The permitted rate of the drug is 0.3-0.5 l/ha, and the rate of consumption of the working fluid is 250-300 l/ha for continuous treatment of plants with a tractor sprayer.

When crops are sprayed with AKARAGOLD 72% em.k. in the form of an emulsion in the amount of 0.3-0.5 l/ha within 7 days, 95.2-96.3% destruction of pests is achieved. Also, the absence of phytotoxic properties of this drug confirms its environmental friendliness.

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