Efficacy of new and existing chemical biopreparations in controlling apple red spider mite (*Panonychus ulmi* Koch)

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Abstract. This article provides information on the damage caused by the apple red spider mite (*Panonychus ulmi* Koch) in apple orchards and methods of combating it. Apple red spider mite (*Panonychus ulmi* Koch) is the most dangerous pest of orchards and other crops in other European countries. This pest can kill more than half of the crops in some fields. It is said that spider mite kills 6-10% of the total crop in normal years, and even 14% in some years. The apple red spider mite (*Panonychus ulmi* Koch) is more dangerous and harmful than other spider mites. In the world, more than 150 species of spider mites are recorded as the main pests of crops. Microbiological biopreparations Bioslip BV (*Beauveria bassiana*) was found to be a microbiological biopreparation with a strong effect on arachnids that cause damage in seed orchards at the rate of 3.0 l/ha. The effect of microbiological biopreparations can be achieved on the third-seventh and fourteenth-twenty-first day. The Bioslip BV (*Beauveria bassiana*) 3.0 l/ha biopreparation and Bioslip BT (*Bacillus thuringiensis*) (toxin crystals in 1 g) (1.0 l/ha) biopreparations taken for the experiment were analyzed from the 3rd day of use. According to the results of the conducted research, in the variant where Bioslip BV (*Beauveria bassiana*) 3.0 l/ha biopreparation was used, the biological efficiency was 44.2% on the 3rd day after using the biopreparation, 72.3% on the 7th day, and 72.3% on the 14th day. 73.9% on the 21st day. Bioslip BT microbiological biopreparation (*Bacillus thuringiensis*) (toxin crystals in 1 g) (1.0 l/ha) 86.7% on the 3rd day, 85.8% on the 7th day, 88.9% on the 14th day, and on the 21st it was 87.5%.

Keywords. Pest, spider mite, biopreparation, species, orchard, damage.

1 Introduction

Apple orchards make up 118,000 hectares or 44 percent (44%) of the total 269,500 hectares of orchards in Uzbekistan. In the last 3 years, investments in the amount of 750 million US dollars were attracted to the field of horticulture. Nowadays, the demand for new intensive gardens is also increasing [1]. In addition to the expansion of fruit and vegetable garden...
areas, the increasing number of pests causing severe damage is also an important problem [2].

Several types of spider mites cause damage in orchards. They are mainly considered to belong to two families, the first is four-legged spider mites (Tetranychidae) and two-legged spider mites (Eriophyidae). These spider mites can be seen in the field under a special magnifying glass and under a microscope under laboratory conditions [3, 4].

Several species of spider mite with a high level of harmfulness have been found to cause great damage in horticultural farms with fruits and vegetables. These are gray fruit spider mite (Bryobia redikorzevi Rech), hawthorn spider mite (Tetranychus viennensis Zacher), apple red spider mite (Panonychus ulmi Koch), ordinary spider mite (Tetranychus urticae Koch) and other gall-forming spider mites. Spider mites mainly develop and multiply at the base of spider webs [5-8].

Although several types of plant spider mites damage apple orchards and other agricultural crops, the most dangerous of them is the apple red spider mite (Panonychus ulmi Koch). The apple red spider mite is a plant-eating creature belonging to the class of arachnids (Arachnida), the family of acariform spider mites (Acariforms) [9, 10].

Apple red spider mite (Panonychus ulmi Koch) is the most dangerous pest of orchards and other crops in other European countries. This pest can kill more than half of the crops in some fields. In normal years, the spider mite kills 6-10% of the total crop, and in some years even 14% [11-14].

Many types of spider mites such as garden spider mite, pear spider mite, apple red spider mite cause serious damage in orchards. Spider mites cause damage by sucking leaves, young one-year branches, growing points and young fruits [15, 16]. Damaged fruits become stained and their quality decreases. And the branches lag behind in development, and their resistance to winter and cold decreases.

The apple red spider mite (Panonychus ulmi Koch) is more dangerous and harmful than other spider mites. More than 150 species of spider mites have been recorded as major pests of crops in the world [17, 18].

According to the research of other scientists, the apple red spider mite (Panonychus ulmi Koch) is distributed in almost all agricultural crops growing areas of the earth, phytophagous spider mites compared to other spider mites, all its development stages are related to plants [19, 20]. Spider mites have been found to damage 1,200 types of cultivated and other plants, and 150 of these plants have a high economic risk.

2 Materials and methods

In order to determine the biological effectiveness of the new chemical Entovidor (0.5 l/ha) biopreparation against the apple red spider mite (Panonychus ulmi Koch) in apple orchards, a 25 (twenty-five) hectare farm located on the territory of "Zevar" farm, Sariosia district, Surkhondarya region of Uzbekistan research was carried out in orchards of the Fuji variety of apples. According to it, in order to test chemical biopreparations, Entovidor (0.5 l/ha) biopreparation with the active substance (spiridiclofen) was taken.

As a model for this biopreparation, Errow 1.8% (0.4 l/ha) active substance (abamectin) biopreparation was taken. Because both of these biopreparations are recommended for spider mites in other crops. Studies were conducted to determine their biological effectiveness by comparing them with each other. Research is carried out using widely used methods and techniques for identifying agricultural pests. Entomological calculations and observations using Bey Bienko and Kopaneva detectors; Fasulati methods in determining the density, meeting, dominants of pests; based on The level of harmfulness of pests was determined according to the Tansky method [7-14].
Agrotoxicological experiments were carried out according to Gar's methodological manuals, Abbott's formula and Khojaev's methodological instructions [7]. In small-scale experiments, biopreparations were sprayed with the help of a motorized hand device at the rate of 800-1000 l/ha working liquid, depending on the condition of the orchards. In large-scale field experiments, 1000 l/ha working fluid was used with the help of special centralized sprayers. The effect of chemical biopreparations on entomophages was studied [20].

3 Results and discussion

Apple red spider mite (Panonychus ulmi Koch) is considered to be the dominant species of spider mites in apple orchards. Biopreparation Entovidor against this pest reached 100% biological efficiency when applied at 0.4-0.6 l/ha when 5.3-6.7 mite red spider mite was encountered on one leaf [14]. In 2017, in Tehran region, experiments with entovidor biopreparation (0.5 l/ha) against apple red spider mite were conducted on "Golden delicious" apple variety.

Observations were made on the 3rd, 7th, 14th, and 21st days in order to determine the effect of the entovidor biopreparation (0.5 l/ha) against the apple red spider mite (Panonychus ulmi Koch). The number of apple red spider mites (Panonychus ulmi Koch) on one leaf was determined using the Henderson-Tilton formula. The results of the conducted research showed that after the use of entovidor biopreparation (0.5 l/ha), the biological efficiency increased by 82% by the 14th day [11].

Experiments on the control of apple red spider mite (Panonychus ulmi Koch) were conducted in Polish apple orchards in the Extension Center of Tashkent State Agrarian University (Figure 1). Entovidor biopreparation was applied to apple trees before flowering (03-0.4 l/ha). When Entovidor biopreparation is used in the fight against the apple red spider mite (Panonychus ulmi Koch), it has been proven experimentally that the time of effect is 2-6 weeks [8].

Figure 1. Accounting the eggs of the apple red spider mite (Panonychus ulmi Koch).
Entovidor biopreparation (spirodiclofen) from acaricides with a new mode of action was applied to the eggs of apple red spider mite (*Panonychus ulmi* Koch) in 2004-2008. Experiments were conducted in Serbian apple orchards, according to which the biological efficiency was 89-86% [3].

Envidor biopreparation applied to the apple red spider mite (*Panonychus ulmi* Koch) in egg, larval and nymphal periods in apple orchards has a strong effect on lipid biosynthesis and egg laying of female spider mites. Expected results can be achieved if this biopreparation is applied to apple orchards during flowering and fruit development [2].

Envidor biopreparation can be applied to the eggs of apple red spider mite (*Panonychus ulmi* Koch) at a rate of 0.3-0.4 l/ha at a temperature of 5 °C to 25 °C. According to our conducted research, Entovidor (0.5 l/ha) biopreparation was applied to apple red spider mite (*Panonychus ulmi* Koch) eggs, larvae and nymphs in apple orchards.

Errow 1.8% (0.4 l/ha) biopreparation was taken as a standard for this biopreparation. From the day of use of the biopreparations taken for the experiment, the control observations were analyzed from 3 days. Before treatment, in the variant where the biopreparation Entovidor (0.5 l/ha) was used, the average number was 6.8 pieces per leaf, and in the variant where Errow 1.8% (0.4 l/ha) was used, it was 7.2 pieces.

In order to determine the biological effectiveness of the Bioslip BV (*Beauveria bassiana*) 3.0 l/ha biopreparation against common spider mite (*Tetranychus urticae* Koch) in orchards, apple fuji in the territory of the Extension Center DUK located in Qibray district of Tashkent region of Uzbekistan researches were conducted in a garden of 1 hectare. According to it, 3.0 l/ha biopreparation Bioslip BV (*Beauveria bassiana*) was taken for the purpose of testing microbiological biopreparations. Bioslip BT (*Bacillus thuringiensis*) (toxin crystals in 1 g) (1.0 l/ha) was taken as a model for this biopreparation. Because both of these biopreparations are recommended for spider mites on other crops. Studies were conducted to determine their biological effectiveness by comparing them with each other. Research is carried out using widely used methods and techniques for identifying agricultural pests.

The Bioslip BV (*Beauveria bassiana*) 3.0 l/ha biopreparation and Bioslip BT (*Bacillus thuringiensis*) (toxin crystals in 1 g) (1.0 l/ha) biopreparations taken for the experiment were analyzed from the 3rd day of use. According to the results of the conducted research, in the case where Bioslip BV (*Beauveria bassiana*) 3.0 l/ha biopreparation was used, the biological efficiency was 44.2% on the 3rd day after using the biopreparation, 72.3% on the 7th day, 72.3% on the 14th on day 73.9%, and on day 21 it was 60.2%. From the 21st day of the study, the amount of the pest began to increase again (Table 1).

In our model variant, the biological efficiency of Bioslip BT (*Bacillus thuringiensis*) (toxin crystals in 1 g) (1.0 l/ha) was 86.7% on the 3rd day, 85.8% on the 7th day, 85.8% on the 14th day 88.9%, and on the 21st it was 87.5%. In this option, the indicator of biological efficiency also decreased after 21 days. In this case, the effect of microbiological biopreparation on the eggs and nymphs of spider mites was low.
Table 1. Biological effectiveness of Bioslip BV (*Beauveria bassiana*) 3.0 l/ha biopreparation against common spider mite (*Tetranychus urticae* Koch) (June 10 2022).

<table>
<thead>
<tr>
<th>Variants</th>
<th>App. norm, l/ha</th>
<th>Number of pests per leaf</th>
<th>Biological efficiency (%) in days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number before application</td>
<td>Number of pests in post-application over days</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bioslip BV</td>
<td>3.0</td>
<td>53.1</td>
<td>33.3</td>
</tr>
<tr>
<td>Bioslip BT</td>
<td>1.0</td>
<td>49.6</td>
<td>29.8</td>
</tr>
<tr>
<td>Control</td>
<td>-</td>
<td>88.6</td>
<td>66.7</td>
</tr>
</tbody>
</table>

According to the results of the conducted research, in the version where the new Entovidor (0.5 l/ha) biopreparation was used, our observations were the highest on the 3rd day after the use of the biopreparation, that is, the biological efficiency was 89.2%, if it did, by the 7th day it was 82.8%. By the 14th day of our observation, the biological efficiency was 74.1%, and on the 21st day it was 69.0%. From the 21st day of the study, the amount of the pest began to increase again (Table 2).

Table 2. Biological effectiveness of Entovidor (0.5 l/ha) biopreparation against apple red spider mite (*Panonychus ulmi* Koch) (August 15, 2019).

<table>
<thead>
<tr>
<th>Variants</th>
<th>App. norm, l/ha</th>
<th>Number of pests per leaf</th>
<th>Biological efficiency (%) in days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Number before application</td>
<td>Number of pests in post-application over days</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Entovidor</td>
<td>0.5</td>
<td>6.8</td>
<td>0.9</td>
</tr>
<tr>
<td>Errou 1.8%</td>
<td>0.4</td>
<td>7.2</td>
<td>1.2</td>
</tr>
<tr>
<td>Control</td>
<td>-</td>
<td>8.3</td>
<td>10.2</td>
</tr>
</tbody>
</table>

In our next model variant, Errow 1.8% (0.4 l/ha) was the highest on the 3rd day after treatment, that is, the biological efficiency was 86.4%, while on the 7th biological efficiency was 79.8% per day. By the 14th day of our observation, the biological efficiency was 72.1%, and on the 21st day it was 68.6%. It was found that the indicator of biological efficiency in this option also decreased after 21 days. It was observed that the chemical biopreparation had little effect on the eggs and nymphs of the pest.

4 Conclusions

According to the results of the conducted research, in the fight against the apple red spider mite (*Panonychus ulmi* Koch) in fruit orchards, taking into account its bioecology and life, carrying out countermeasures with the use of effective chemical means in managing their number. is an important factor. When carrying out chemical control measures against apple
red spider mite (*Panonychus ulmi* Koch), high biological efficiency can be achieved by using Entovidor biopreparation at the rate of consumption per hectare (0.5 l/ha). In the fight against the apple red spider mite (*Panonychus ulmi* Koch) in apple orchards, timely implementation of agrotechnical measures in late autumn and early spring, and the use of low-toxic chemicals for the environment and beneficial insects during the growing season, the crop can be saved. High biological efficiency can be achieved by applying biopreparation Bioslip BV (*Beauveria bassiana*) (3.0 l/ha) to apple red spider mite (*Panonychus ulmi* Koch).

References


