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THE INFLUENCE OF BIOPREPARATIONS ON THE CONTROL OF THE *MYZUS PERSICAE* (SULZER) SPECIES IN THE POTATO AGROECOSYSTEM

Maria Georgiana OPRIȘIU, Flori-Alina BUZDUGEANU, Anamaria Roberta IABLONCIK, Ramona ȘTEF, Alin CĂRĂBET
University of Life Sciences "King Mihai I" from Timisoara

Abstract: Pests represent a major pressure on the quantity and quality of potato plants. In potato cultivation, in addition to the most damaging disease, late blight, the most important pests are aphids due to the large number of viruses they transmit. The green peach aphid (*Myzus persicae*) poses a threat to potatoes because it is capable of causing serious damage (directly by depriving the plant of essential nutrients), transmitting viruses (potato Y virus, cucumber mosaic virus, and PVY), and easily developing resistance to insecticides. To achieve optimal potato yields, it is necessary to control the *Myzus persicae* species. The aim of the study was to test the effectiveness of bioinsecticides in controlling the green peach aphid. The experiment was conducted in the Belinț locality (Timiș County). Bioinsecticides used to combat the green peach aphid included Kabon, Bitoxybacilin, and Konia K Plus. The evaluation of product effectiveness was determined at 24 hours, 5 days, and 10 days. At the time of applying the biological treatments, the population density of *Myzus persicae* was 52-86 individuals per 10 potato plants. Konia K Plus bioinsecticide showed the highest effectiveness in reducing the *Myzus persicae* population (resulting in positive differences from the average in all three assessments). The lowest mortality of the green peach aphid in the potato crop was recorded in the variant treated with Kabon.

Introduction

The potato is native to the Americas, specifically from the high and humid regions of Peru, Colombia, and Ecuador. It was spread worldwide by navigators. Potato cultivation occupies the largest areas in Asia, Europe, and Africa. In Romania, potatoes have been cultivated in recent years on an area ranging from 260 to 285 thousand hectares, with an average yield ranging from 12.2 to 15.9 tons per hectare.

Potatoes are of great importance, both as a food plant and as an industrial and fodder plant. In human nutrition, tubers are used, which have a high starch content and a pleasant taste. For animal feeding, tubers are used, especially for pigs and dairy cows, and also the vines and pulp.

It is a profitable crop due to its high production capacity and the fact that after early potatoes, a second harvest can be obtained from the same area.

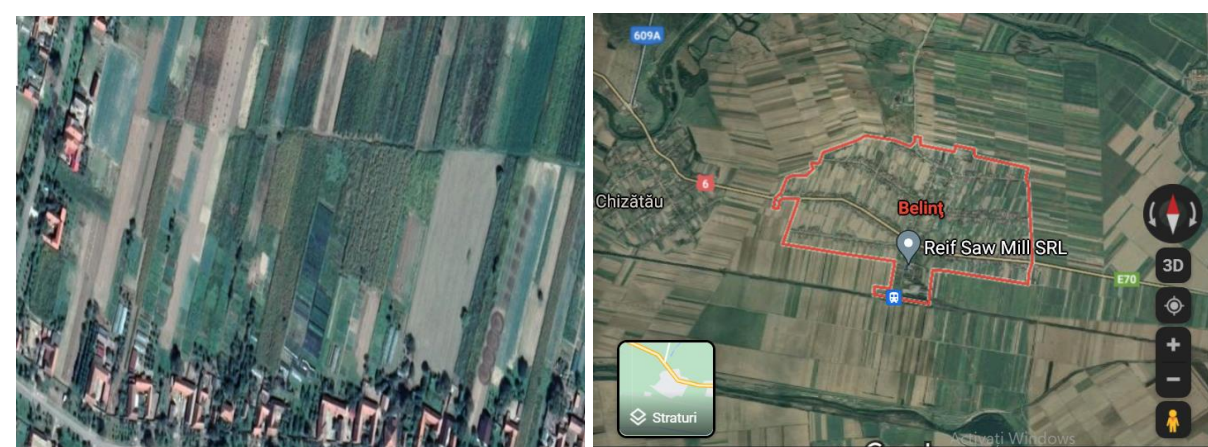
Potatoes are a good predecessor for other crops because, being a root crop, they leave the soil loose and free of weeds.

Potato production is diminished by the presence of weeds, pathogens, and pests. In potato cultivation, besides the most damaging disease, late blight, the most important pests are aphids due to the large number of plant viruses they transmit (more than 300 species are known to be vectors of about 600 plant viruses). Pests represent a major pressure on the quantity and quality of potato plants. The green peach aphid (*Myzus persicae*) is distributed worldwide and is one of the most important polyphagous pests, attacking hundreds of plants from over 40 plant families, including a wide range of vegetables and ornamental crops grown both in the field and in greenhouses. *Myzus persicae* can reach a very high population density due to the large number of generations and extraordinary fecundity. It is capable of causing severe damage directly by depriving the plant of essential nutrients, resulting in wilting, deformation, premature leaf senescence, and delayed growth. It also acts indirectly through honeydew, which promotes the establishment of plant pathogens (Grey and Gildow, 2003; Girousse et al., 2005; Pegadaraju et al., 2005). In addition, *Myzus persicae* is an important vector for approximately 100 plant viruses, greatly exacerbating the potential for aphid damage (Blackman and Eastop, 2000).

As a result, ensuring potato crops and yields under the conditions of ensuring all technological links is conditioned by crop protection against attacks by pests. To obtain optimal potato yields, it is necessary to carry out useful and precise control of pests.

Material and method

The aim of the study was to biologically control the species *Myzus persicae* in potato cultivation. The studies were conducted in the western part of Romania, in the locality of Belinț in Timiș County, in the year 2023.



The variety used in the experiment was the Marabel seed potato, a semi-early variety.

The experiment aimed at controlling the *Myzus persicae* species and included four treatment groups arranged using the randomized block design method, with three repetitions. The harvestable plot for each treatment was 30 square meters.

The experimental treatments differed in the bioinsecticide applied. The bioinsecticides were applied on May 27, 2023. The effectiveness of the insecticides was evaluated by determining the number of larvae (nymphs) and adults on May 28, 2023, June 1, 2023, and June 5, 2023. Observations were made on 10 plants per treatment.

To control the green peach aphid in potato cultivation, the following bioinsecticides were used: Kabon, Bitoxybacilin and Konia K Plus.

Varianta	Denumire produs comercial	Substanță activă	Doză (l/ha)
Varianta 1	Netratat	-	-
Varianta 2	KABON	50% sare de potasiu din extract de uleiuri vegetale	0,900
Varianta 3	BITOXYBACILIN	<i>Bacillus thuringiensis</i> 1,0x10 ⁹ CFU/cm ³	1.0
Varianta 4	KONIA K PLUS	săruri de potasiu ale acizilor grași	0,900

$$\text{Abbott \%} = \left(1 - \frac{n \ln T}{n \ln C}\right) \times 100$$

n - insect population; T- treated variant; C- untreated (control)

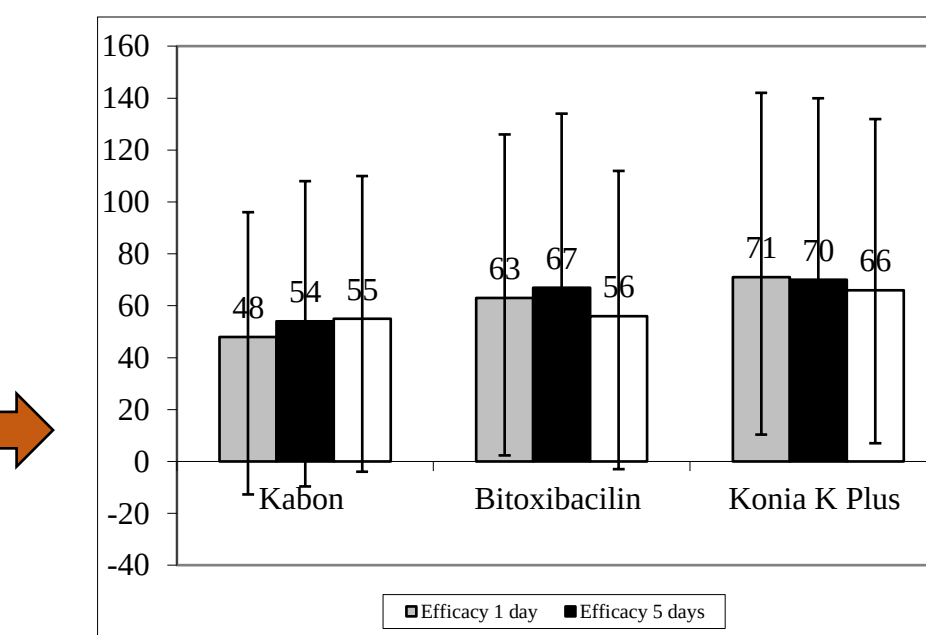
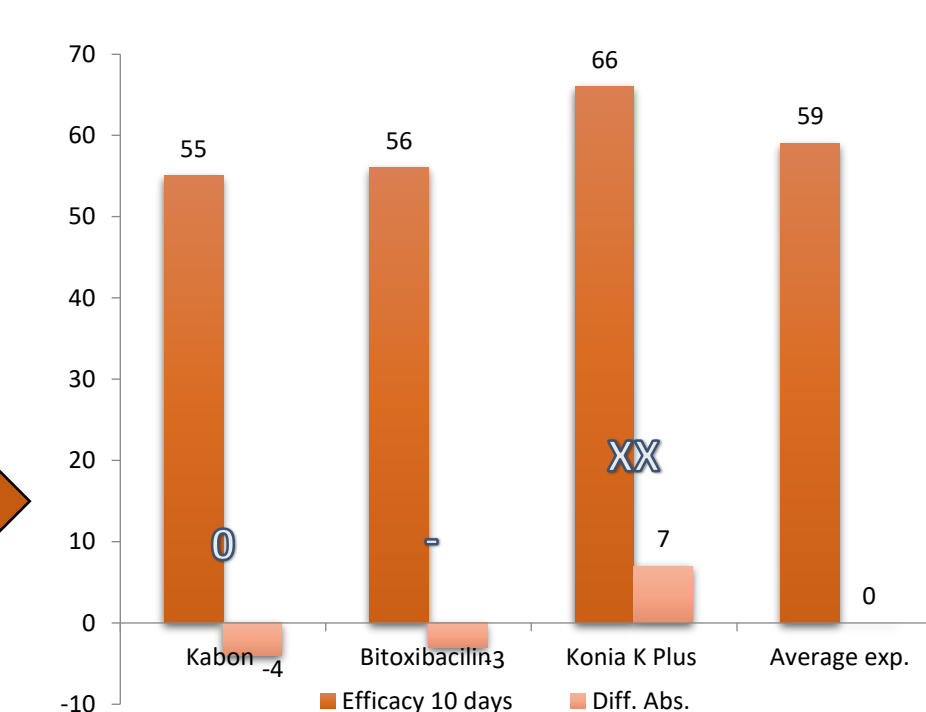
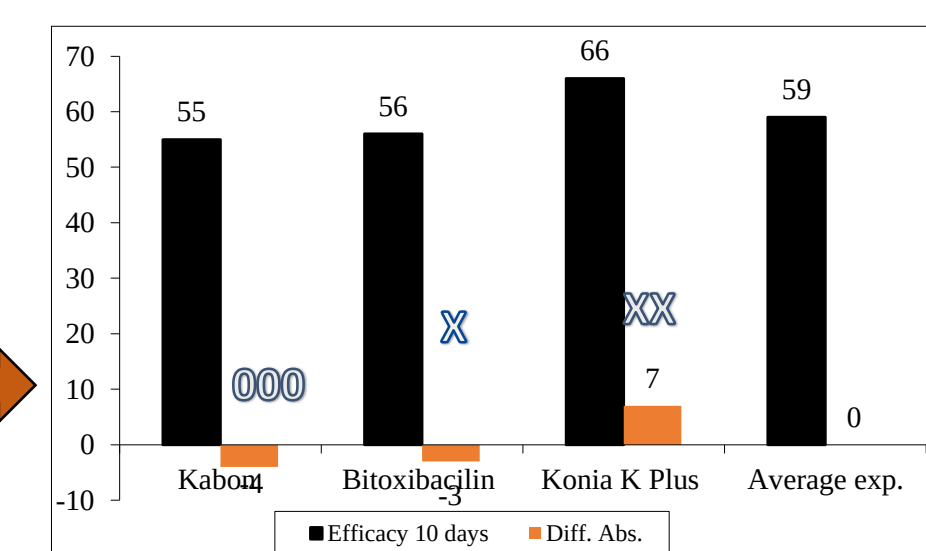
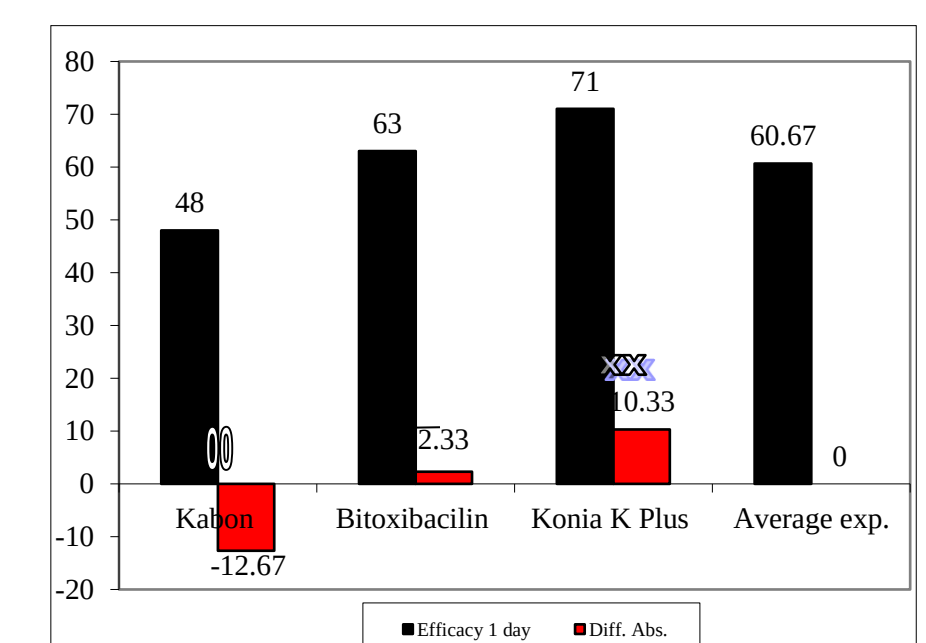
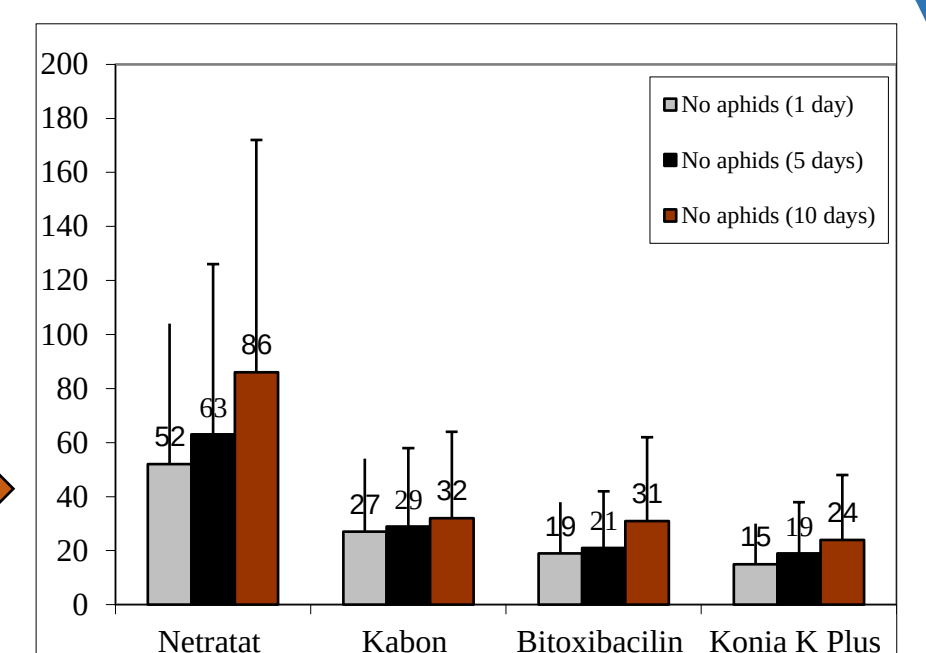
Results and discussions

24 hours after the application of the biological treatments in the four experimental variants, it was determined that the population of *Myzus persicae* was represented by 113 individuals/10 plants. In the second evaluation, conducted 5 days after the application of the bioinsecticides, a slight increase in the population of *Myzus persicae* was observed, with the number of individuals reaching 132. The number of nymphs per 10 plants increased in all experimental variants, with the average population ranging from 19 to 63 individuals/10 plants. At 10 days after the application of the bioinsecticides, the same trend of increasing *Myzus persicae* population (173 individuals) was observed in the four experimental variants. The most numerous population was recorded in the untreated variant (86 individuals/10 plants). In the variants treated with Kabon and Bitoxybacilin, the number of individuals was approximately equal, at 32 and 31/individuals/ 10 plants, respectively.

Twenty-four hours after application, the three biological products Kabon, Bitoxybacilin, and Konia K Plus reduced the population of *Myzus persicae* by 48-71%, with these results being highly significant compared to the untreated control. Kabon bioinsecticide at 0.9 l/ha (48%) did not exhibit high efficacy in controlling the *Myzus persicae* species, compared to the average experience (60.67%), and the result was significantly negative. The product Bitoxybacilin, based on *Bacillus thuringiensis*, caused a mortality of 63% in the peach green aphid. The absolute difference of 2.33% from the average experience did not result in statistical differences. The Konia K Plus bioinsecticide reduced the aphid population by 71%, and the absolute difference of 10.33% from the average led to significantly positive results.

Five days after the application of the bioinsecticides, the potato crop was protected in percentages ranging from 54-70%. All treatments significantly affected the aphid population compared to the untreated control. The efficacies of the bioinsecticides varied compared to the average experience, with differences obtained ((-9.67) – (6.33)) resulting in both negative and positive significances. At 5 days after treatment, Konia K Plus caused a mortality of 70% in aphids, a result that was significantly positive compared to the average. The bioinsecticide Bitoxybacilin also produced significantly positive results. The potassium salt-based product, Kabon, controlled only 54% of the aphid population, with a difference of -9.67 being significantly negative compared to the average experience.

The efficacy of the bioinsecticides in aphid control, in the third evaluation conducted at 10 days after treatment, ranged from 55-66%. All treatments showed very significantly positive differences compared to the untreated control. At 10 days after application, the bioinsecticide Konia K Plus provided the best protection for the potato crop against aphids, with a distinct positive difference of 7% compared to the average experience. The 56% control rate recorded in the variants where the Konia K Plus bioinsecticide was applied did not result in statistical differences compared to the average.



Conclusions

The treatments with the bioinsecticides Kabon, Bitoxybacilin, and Konia K Plus significantly controlled the population of *Myzus persicae* compared to the untreated control. The bioinsecticides used in the experiment effectively protected the potato crop against the attack of the aphid *Myzus persicae* in the first 24 hours after application. The efficacy of the bioinsecticides Kabon, Bitoxybacilin, and Konia K Plus decreased as the period from the time of treatment application increased. Konia K Plus bioinsecticide exhibited the highest efficacy in reducing the population of *Myzus persicae*, showing positive differences compared to the average in all three evaluations. The lowest mortality of the peach green aphid in the potato crop was recorded in the variant treated with Kabon.