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Research Article

Effectiveness of Some Insecticides Against Potato Aphids

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Abstract

The research indicates the result of a study on the use of some new insecticides from various chemical classes to evaluate the effectiveness of some insecticides from various chemical classes on potato against potato aphids which was conducted in 20th, may 2025, in Research farm, green house and laboratory of Peoples Friendship University of Russia (RUDN) in the conditions of the weather zone of Moscow oblast on potato crops and in conditions of mass development of potato aphids in Moscow city. Potato aphids are a serious problem in the world and especially in Russian Federation. The main aim of research was to evaluate the Effectiveness of four new insecticides against potato aphids. The area of one plot was 100 m^2 the insecticides were repeated two times on Potato aphids, the location of the plots were randomized. The result of the study showed that the most effective drug against potato aphids was Flupyradifurone at a consumption rate of -1000 g/ha and the least effective was Pymetrozine at a consumption rates of – 300 g/ha. Insecticides from different chemical classes showed against potato aphids, the highest value of the preserved crop over the study period was noted with the drug Flupyradifurone with a consumption rate of 1000 g/ha and amounted to 20,6 c/ha. Flupyradifurone indicated the highest efficiency against potato aphids on the 3rd day of application - 78%, and reached maximum efficiency on the 7th accounting period - 95.6%. In second place in terms of efficiency was the Dinotefuran at the level of 73% and 90% of phytophage death on the 3th and 7th day of accounting, respectively.

Keywords

Potato Aphid, Insecticide, Effectiveness, Chemical Control, Plant

1. Introduction

The Potato (Solanum Tuberosum) origin is from north America then has been distributed throughout the universe and is one of the main food sources around the world. According to the FAO, potato production were 470 million metric tons in 2022 globally, major producers of potatoes in the world are such as China, India, Russia, and Ukraine (FAOSTAT, 2022) [1].

In Russia and in the CIS (Commonwealth of Independent States) countries, potatoes are 35% of agricultural productions. Over the observed period from 2013-2021 the potato production in Russia was at its highest level of production in 2015 about over 25 million metric tons according to (Russian fruit-inform, 2021) [2].

Potatoes are affected by various biotic and abiotic that lead to losses of yield (Bond, 2014). One of the main pests of potato, which have been noted in recent years in the Moscow region are the potato aphids. Potato aphids are relatively large, 1.7-3.6 mm long, the body of wingless females is green, rarely brown-red, potato aphids can stop the growth of plants and cause the death of the plant, the symptoms of aphid attack that leaves become deformed and twisted, shoots become curved and curling (Koirala, 2020) [3].

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The damages of aphids are up to 80% in potato plants (Xu and Gray, 2020) [4].

As result of the active feeding of the aphids, the yield decreases and their sowing qualities deteriorate. In addition, aphids are capable of transmitting more than 31 types of viral plant diseases. [5].

Potato aphids cause the greatest harm during the period of flowering. The buckthorn aphids ranks second in its abundance on the potato plants in Moscow. In 2020, 43 names of medical products based on active ingredients from three chemical classes are authorized for use in Russian Federation (State Catalog of Pesticides and Agricultural Chemicals Authorized for Use on in Russian Federation and its supplements (M, 2020. P 826) [6].

Chemical pest management have been used from thousands years ago by many civilization the major revolution in using of pesticides occurred during the 18th 19th century. Today the chemical pests control is one of the main type of pest management in agriculture, chemical control is an economical method this method control the pests in short time and does not need more workers [7].

A recent research was done in Central Potato Research Station in India by (Mohd Abas Shah et al, 2024), against the peach-potato aphids, They used from Flupyradifurone, diafenthiuron and pymetrozine and reduced the aphid incidence by more than 80% throughout the period [8].

(J. K. Patel et al, 2024) recorded at 14 days interval. Flupyradifurone 200 SL @ 0.1% and Pymetrozine 50 WG @ 0.06% significantly reduction of aphid 77.82% and 68.18% respectively [9].

Compare to (Mohd Abas Shah et al, 2022) and (J. K. Patel et al, 2024), our study indicated 90% of the population of the potato aphids were controlled by insecticides in total [10].

2. Materials and Method

This research was done in farm of RUDN University in Moscow region to evaluate the effectiveness of some insecticides from various chemical classes on potato. The experiment data were analyzed and using a randomized block design (RBD), as it outlined by Gomez (1984). [11] Aphid counts and assessment of the biological effectiveness of the preparations were carried out: before treatment, on the 3rd, 7th day after treatment in accordance with the "Methodological guidelines for registration tests of insecticides in agriculture in Russian Federation" [12].

The experimental design included a control (without the use of insecticides), as well as 4 insecticide options from different chemical classes: 1) Control (without treatment); 2) Pymetrozine – 300 g/ha; 3) Flupyradifurone – 1000 g/ha; 4) Diafen-thiurone – 500 g/ha; 5) Dinotefuran – 150 g/ha; 6): the experiment was repeated two times, the plots were arranged systematically, the plot area was 30 m^2 (2*15), the working solution consumption was 210 l/ha. The experiment was singlefactorial. The area of one plot was 100 m^2, the experiment was repeated two times, the plots were arranged randomly. Pests were counted by mowing with an entomological net, harvesting was done by direct combining with a SAMPO-500, and the data were mathematically processed according to B. A. Dospekhov (1985) [13].

3. Results & Discussion

Potato aphids are relatively large, 1.7-3.6 mm long, the body of wingless females is green, rarely brown-red (Figure 1).

Figure 1. *Potato aphids have attacked on potato plant that leaves become deformed and twisted, shoots become curved and curling.*

As the result of study has shown the number of potato aphids before treatment varied from 25 to 40 specimens/1 plant. After treatment, depending on the experimental variant, 0t 1 to 60 specimens/1 plant. Against potato aphids, some insecticides from the class of systemic butenolide and neonicotinoid Flupyradi-furone, Dinotefuran, Diafenthiurone and Pymetrozine have been used. The results are presented in (Figure 2) [14].

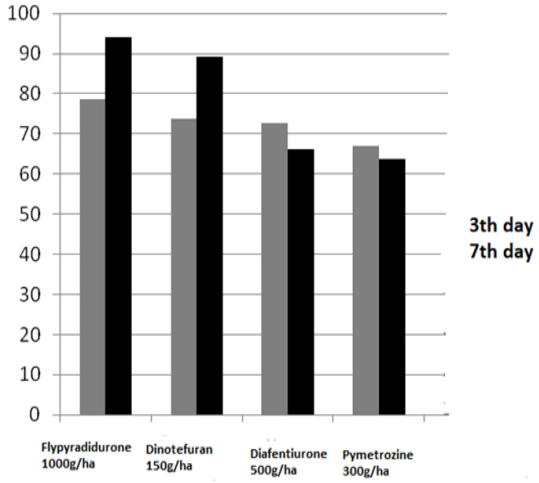

Figure 2. *Indicates the effectiveness of insecticides against potato aphids.*

Flupyradifurone preparation with a consumption rate of – 1000 g/ha showed the highest efficiency against potato aphids on the 3rd day of application - 78%, and reached maximum efficiency on the 7th accounting period - 95.6%. In second place in terms of efficiency was the Dinotefuran preparation with a consumption rate of 150 g/ha, 73% and 90% of phytophage death on the 3rd and 7th day of ac-counting, respectively. The results of the tests of insecticides from different chemical classes showed that against potato aphids, the highest value of the pre-served crop was noted with Flupyradifurone with a consumption rate of 1000 g/ha and amounted to 20.6 c/ha, which exceeded the control by 445.6%. Dinote-furan, with a consumption rate of 150 g/ha, was inferior (Table 1) [15].

Table 1. *Indicates effectiveness of some insecticides against potato aphids in 2024.*

Insecticides	Consumption Rates	Productivity C/ha	Saved Harvest		Effectiveness of Insecticides	
		2024 year	C/ha	%	3rd	7th day
Flupyradifurone	1000 g/ha	25,1	20,6	326,8	78%	95,6%
Dinotefuran	150 g/ha	24,6	20,1	435,6	74%	90%
Diafenthiurone	500 g/ha	20,2	15,7	424,4	72%	60%
Pymetrozine	300 g/ha	20	15,5	322,4	66%	64%
Control	-	5	-	-	72.5%	78.9%
HCP	-	2,94	-	-		

And the least effectiveness has been recorded by Pymetrozine that was at the level of 63%. The results of the tests of insecticides from different chemical classes showed that against potatoes aphids the highest value of the preserved crop over a year period was noted with four insecticides with a consumption and amounted to 20,6 c/ha, Dinotefuran with a consumption rate of 150 g/ha was slightly inferior (Table 1). [16].

In variants with insecticides from the class of Azomethine pyridine - Pymetrozines and from class of thiourea insecticides Diafenthiurone, the value of the preserved yield was 5.0 and 4.5 c/ha, respectively [17].

4. Conclusions

In the conditions of the weather zone of Moscow oblast on potato crops in condi-tions of mass development of potato aphids, it is advisable to use preparations from the class of systemic butenolide and neonicotinoid or organophosphorus com-pounds, which have a longer period of protective action in comparison with pyre-throid preparations.

The results of the studies showed that the most effective drug against potato aphids was Flupyradifurone at a consumption rate of 1000 g/ha and the least effective was Pymetrozine – 300 g/ha. insecticides from different chemical classes showed that against potatoes aphids the highest value of the preserved crop over the study period was noted with the drug Flupyradifurone with a consumption rate of 1000 g/ha and amounted to 20,6 c/ha.

Flupyradifurone has shown the highest efficiency against potato aphids on the 3rd day of application - 78%, and reached maximum efficiency on the 7th accounting period - 95.6%. In second place in terms of efficiency was Dinotefuran which were at the level of 73% and 90% of phytophage death on the 3rd and 7th day of ac-counting, respectively.

Abbreviations

RUDN People Friendship University of Russia

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Author Contributions

Zafar Nazari: Conceptualization, Resources, Writing - original draft, Formal Analysis

Astrakhanova Tamara: Data curation, Methodology

Data Availability Statement

Not applicable.

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Conflicts of Interest

The authors declare no conflicts of interest.

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Biography

Zafar Nazari studied plant protection at the Kabul University and graduated in 2018, then worked as a Manager of plant protection in ministry of Agriculture Irrigation and Livestock of Afghanistan. He got a scholarship in 2020 from Russia and got his master degree in plant protection from Stavropol State Agrarian University and graduated in 2022, Russia. He is now a 3th year PhD student at People Friendship University of Russia. He has published more than 5 research articles as a Postgraduate student at People Friendship University of Russia, Agrobiotechnology Department. He completed his Master Degree in Plant protection from Stavropol State Agrarian University in 2022, and Bachelor degree of Agriculture in Plant Protection from Kabul University.