



Comparative Study of Different Insecticide Efficiencies against the Population of Winter Wheat Aphids (*Sitobian avenae*)

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Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

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ABSTRACT

Wheat is one of the most important crop in India, it is 2nd most grown crop after the maize across all over the world. From last few decades the one of most common serious pest named *Sitobian avenae* of hemiptera genus deteriorate the grains of winter wheat. It is the regular pest of winter wheat, which can cause up to the 40 percent of crop yield loss. The effectiveness of six pesticides as foliar applications against *Sitobian avenae* population was assessed at their recommended doses. The insecticides used, thiamethoxam 25% WG, imidacloprid 17.8 SL, monocrotophos 36 SL, quinalphos, lambda-cyhalothrin and the mixture solution of two insecticides thiamethoxam 12.6 % and the lambda cyhalothrin 9.5% ZC with their recommended field doses. However, one plot was also observed where no chemical treatment was given. Application of thiamethoxam 25 WG resulted significant control over the aphid's population whereas the quinalphos was observed as less effective against the population of *Sitobian avenae*. It can be resulted that the thiamethoxam among all the chemical control applications could be highly effective or efficiently insecticide for restricting the growth of winter wheat aphids in field.

Keywords: *Sitobian avenae*; winter wheat aphids; thiamethoxam; lambda-cyhalothrin; wheat pests; wheat pesticides; monocrotophos; imidacloprid; wheat pest control.

1. INTRODUCTION

Wheat (*Triticum aestivum*) is the one of the highest cultivatable crops. It has its place in the Poaceae family and it is the second most cultivated cereals crop after maize [1]. The winter wheat adversely affected with infestation of several pests. Out of these pests aphid named *Sitobian avenae*, belongs to the Aphididae family is major pest which cause severe loss of winter wheat yield [2]. They can suck the cell sap and reduce the vigor of plant [3,4]. On average aphids can cause nearly 30 to 40 percent damage to crop productivity [5,6]. Nowadays one of the most used methods to control the pest are the chemical controls known as pesticides or insecticides [7]. These pesticides play a vital role in controlling of pests in crop by killing or inhibiting them. However, their indiscriminate administration has been the most important factor in serious health issues [8]. Moreover, this can also lead to the insecticide resistance developing in the winter wheat aphids' populations [9]. The aim of study is to compare the efficiency of different commonly used chemical based insecticides at the flowering stage. The insecticides such as Imidacloprid, Monocrotophos, Thiomethoxam 25 % EC, Lambda Cyhalothrin nad their combination were adminstrated in field. However, one plot did not recived any chemical treatment considered as untreated.

2. MATERIALS AND METHODS

This research was done during the rabi season of 2021 at Lehra Dhurkot village which located in the district Bathinda, Punjab in northern part of India. In this research total 7 plots were selected. Out of these 6 plots received separate administration of insecticides named as plot T1 to T6 during trail, and remained plot was not received any treatment of insecticides. Here 24 hours prior to the administration of the insecticides 10 spikes of wheat were selected randomly from each plot and marked by binding the threads, the number of aphids was counted at every marked spike and their mean value calculated by using formula $\text{Mean} = \frac{\text{Sum of Observation}}{\text{Total numbers of Observations}}$. For calculating the mean value the sum of all the population of aphid was divided with the total no of observation in each plot separately . The different doses of insecticide in the 500 liter/ha of water were adminstrated during the flowering stage of wheat when the population of aphids were more than the

threshold level [10]. The detail of administrated insecticides is given below:

- T1: Thiamethoxam 25 WG 500 ml/ha
- T2: Imidacloprid 17.8 SL 100 ml/ha
- T3: Quinalphos 1600 ml/ha
- T4: Monocrotophos 36 SL 1000 ml/ha
- T5: combination of thiamethoxam 12.6 and lambda-cyhalothrin 9.5 ZC 150 ml/ha
- T6: Lambda-cyhalothrin 5% EC 500 ml/ha
- T7: Untreated

According to the forementioned detail of treatments, each plot received foliar spray according to the local farmer practices, observation of these plots was recorded on the 1,3,7 and 25 DAS (days after spray). After this, the observed values of aphid's population before and after the foliar spray treatments was compared in the laboratory by the mean value and percentage of their mortality.

3. RESULTS AND DISCUSSION

Each plot was received the T1 to T7 treatments separately. In the treatment T1, the insecticide thiamethoxam 25% WG at dose of 500 ml/ha used. In this analysis of research, the highest efficiency of Thiamethoxam (T1) followed by the Imidacloprid in (T2), lambda cyhalothrin in (T6) was observed after the period of 15 day. Whereas the treatment with Quinalphos in (T3) was less efficient among all insecticides, having mean population of aphids (4.56) after the 15 days of application, while the un-treated plot was the highest no of mean population of aphids (8.296). Plot treated with combination of thiametoxam 12.6% and lambda cyhalothrin 9.5% ZC showed average impact on aphids population, mean value of 0.37 observed after 15 DAS. The efficiency of insecticides was accordingly T1>T2>T6>T5>T4>T3>T7. The data on insecticidal activity of the insecticides on the wheat aphids at 1,3,7, and 15 days after the foliar application of insecticides are given the Table 1. The mean population of aphids before the application of insecticides 24 hours before the application of insecticides were 6.8,6.6,7.2 in fields treated with Imidacloprid 17.8 SL Monocrotophos 36 SL, Thiamethoxam 12.6 + Lambda Cyhalothrin 9.5% ZC respectively whereas plots administrated with Thiamethoxam 25% WG, quinalphos 25% and Lambda cyhalothrin 5% EC had 6.4,7.5 and 6.9 respectively. The data gives the clear information about the superior efficiency of these insecticides over the non-treated plot. The minimum mean

Table 1. Effectiveness of different insecticides against the population of aphids in winter wheat field

Sr. No	Insecticide	Dose MI,g/ha	Mean population of Aphids					Mean
			DBS	1DAS	3DAS	7DAS	15DAS	
1	Imidacloprid 17.8 SL	100	6.8	2.61	1.31	1.04	0.52	2.41
2	Monocrotophos 36 SL	1000	6.6	6.6	4.79	2.09	0.90	4.18
3	Thiamethoxam 12.6+ Lambda Cyhalothrin 9.5 % ZC	150	7.2	5.80	1.86	0.54	0.37	3.15
4	Thiamethoxam 25% WG	500	6.4	2.75	1.68	1.20	0.67	2.45
5	Quinalphos 25% EC	1600	7.5	5.47	4.16	3.02	2.66	4.56
6	Lambda cyhalothrin 5% EC	500	6.9	5.22	3.09	2.68	2.07	3.99
7	untreated	0	6.5	7.34	7.85	8.95	10.84	8.29
8	Mean		7.74	5.11	3.53	2.78	2.57	

*DBS= Days before spray, *DAS= Days after spray

population of aphids (2.41) was recorded in the T1 and maximum in T3 among the insecticide administrated plots. Apart from this, the T2, T6, T5, and T4 the mean population of aphids were (2.45), (3.99), (3.15), (4.189) respectively [11,12].

4. CONCLUSION

It is concluded that mean population of winter wheat aphid was lowest on all chemical treatment but plot treated with thiamethoxam 25 WG was highest efficient against the aphids followed by imidacloprid 17.8 SL, lambda cyhalothrin 5% EC whereas higher densities were found on quinalphos 25% EC and untreated field.

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COMPETING INTERESTS

Author has declared that no competing interests exist.

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