

## EFFICACY OF IMIDACLOPRID (CONFIDOR 200 SL) AGAINST APHIDS INFESTING WHEAT CROP

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### ABSTRACT

Imidacloprid (Confidor 200 SL) was evaluated either alone or with a fungicide (Tilt 0.01%) against wheat aphids. There were seven different treatments, including an untreated control. All the treatments were replicated three times in a similar field environment. Population of wheat aphids was recorded on randomly selected five plants in each plot at different intervals, both before and after the spraying. Confidor 200 SL @ 400 ml/ha treatment was found most effective against wheat aphids. However, mixing of Confidor 200 SL @ 100 ml/ha with Tilt @ 0.01 %, was found significantly least effective for wheat aphids control.

Key words: Confidor 200 SL / imidacloprid / wheat aphids / *Sitobion avenae* (F.) / *Rhopalosiphum maidis* (titch)

## INTRODUCTION

Wheat is one of the most important cereal crops and staple food for the majority of human population. In country like India, wheat is the second important food crop and contributes about 35% of the total food grain production, thus a major contributor to the agrarian economy of the country [10]. Wheat production in India ranks second internationally with 11.4% of the world's wheat production [7]. However, the production is heavily affected by several insect pests in field. In field, wheat crop is attacked by more than a dozen of insect pests since sowing till harvesting [2]. Among the major insect pests of wheat in India, aphids have gained economic importance of regular pests and reported from all major wheat growing regions [14, 15].

*Sitobion avenae* (F.), and *Rhopalosiphum maidis* (titch) (Homoptera: Aphididae), are the most important among nine different species of wheat aphids reported to infest wheat crop in wheat growing regions of India [4, 14]. In the recent past, wheat aphids have gained a status of regular pests. Under favorable conditions, wheat aphids reproduce at a faster rate, and may cause damage to 1-3% of total wheat production of the world [9]. Therefore, a regular monitoring of wheat crop during favorable environmental conditions of aphids breeding is mandatory. For control of sap-sucking insects like aphids, imidacloprid is being reported to be an effective insecticide [8, 1, 5]. Imidacloprid is a new class of chemical, which is different from other conventional insecticides in its mode of action. Imidacloprid is chloro-nicotinyl insecticide, which gives outstanding control against sucking insects [5]. Considering the efficacy of imidacloprid against sucking insects like aphids, and the damage caused by the aphids in wheat growing regions across the globe, the present investigations were carried out to evaluate imidacloprid (Confidor 200 SL) against wheat aphids in field environment.

## MATERIALS AND METHODS

The present investigations were carried out at the Crop Research Center of G.B. Pant University of Agriculture and Technology, Pantnagar, India. A field study was conducted to study efficacy of imidacloprid (Confidor 200SL) against foliar aphids of wheat.

Experimental design:

An experimental plot divided into three blocks (replications) was used in the study. One-meter wide border was left around the experimental field as well as in between the blocks. Block size was six rows of six-meter length. This experiment was conducted in a randomized design with seven treatments. Each treatment was

replicated three times. In each replication the following treatments were used: T1- Confidor 200 SL @ 100 ml/ha, T2- Confidor 200 SL @ 200 ml/ha, T3- Confidor 200 SL @ 400 ml/ha, T4- Confidor 200 SL @ 100 ml/ha + Tilt @ 0.01%, T5- Confidor 200 SL @ 100 ml/ha followed by Tilt @ 0.01%, T6- Tilt @ 0.01% followed by Confidor 200 SL @ 100 ml/ha, and T7- untreated control. Experimental field was prepared by ploughing after pre-irrigation. In each block, the wheat seeds of the variety UP2425 were sown on 9/12/2000. Seeds were sown by using a ferti-seed drill machine. Fertilizers were applied at the rate 120 Kg N, 60Kg P, and 40 Kg K per hectare at the time of sowing as well as after sowing. Weeds from the study field and surrounding areas were removed frequently with manual operations during the entire crop season.

Application of pesticides:

For the control of wheat aphids, Confidor 200 SL was sprayed with the help of a knapsack sprayer in different concentrations in compliance with the layout of experiment. In addition to this, mixing of Confidor 200 SL with Tilt 0.01 % and spray of Confidor 200 SL followed by Tilt 0.01 % and vice versa, were also carried out in order to study compatibility of imidacloprid with Tilt, and its impacts on aphid population. For population counts of wheat aphids, five plants were randomly selected in each plot. Aphid count was done one day before spraying. After spraying of pesticides, population counts of aphids were recorded at one, two, seven, and fourteen days of interval.

Statistical analysis:

All data sets were subjected to statistical analyses. An analysis of variance (ANOVA) test was used to compare data collected from each treatment during the experiment. Post hoc tests (LSD) for pairwise comparisons of means were also performed using the SPSS 14.0 statistical package [3].

## RESULTS

Before one day of spraying, the number of aphids per tiller was ranged from 9.07 (Confidor 200 SL @ 400 ml/ha) to 12.46 (Confidor 200 SL @ 100 ml/ha + Tilt @ 0.01%) treated plots (Figure 1.). However, in all the treatments, the populations of wheat aphids were not significantly different from each other.

After one day of spraying, maximum number (11.07) of aphids were found in the plot treated with Confidor 200 SL @ 100 ml/ha + Tilt @ 0.01% when mixed together, while the minimum (1.40 aphids/tiller) was observed in Confidor 200 SL @ 200 ml /ha treated plot. All the concentrations of Confidor 200 SL (100, 200, and 400

ml/ha), Confidor 200 SL @ 100 ml/ha followed by Tilt @ 0.01 %, and Tilt @ 0.01% followed by Confidor 200 SL @ 100 ml/ha, as well as untreated control varied non-significantly with each other. However, it varied significantly with Confidor 200 SL @ 100 ml/ha + Tilt @ 0.01% when mixed together, which was non-significantly different from control. In all other treatments, after 2, 7, and 14 days of spraying, aphid population varied non-significantly, however the population of aphids decreased with time interval after spray (Figure 1.).

Overall mean revealed that the highest concentration of Confidor 200 SL (400 ml/ha) was found most effective, while, Confidor 200 SL @ 100 ml/ha + Tilt @ 0.05 % was found the least effective treatment in suppressing aphids population (Table 1). The spray of Confidor 200 SL @ 100 ml/ha + Tilt @ 0.05 % was not significantly different from control (Table 1). In terms of mean number of aphids after spray, the overall position of different treatments with respect to their effectiveness was as follows: Confidor 200 SL @ 400 ml/ha > Tilt @ 0.01 followed by Confidor 200 SL @ 100 ml/ha > Confidor 200 SL @ 100 ml/ha followed by Tilt @ 0.01 % > Confidor 200 SL @ 200 ml/ha > Confidor 200 SL @ 100 ml/ha > untreated control > Confidor 200 SL @ 100 ml/ha + Tilt @ 0.01 % when mixed together.

**DISCUSSION**

The results of this field study clearly reveals that the Confidor 200 SL @ 400 ml/ha treatment was most effective against wheat aphids. It could be due to the comparatively higher concentration of insecticide than other treatments. In addition to the treatment Confidor 200 SL @ 400 ml/ha, the moderate dose of Confidor 200 SL (200 ml/ha) was also effective in suppressing the aphid populations. Other authors, notably Hernandez et al. [8], Altmann & Elbert [1], and Elbert et al. [5], also reported similar observations on the efficacy of imidacloprid against aphids infesting different crops.

Due to a different mode of action, and systemic as well as contact insecticidal properties, imidacloprid is effective against insecticide resistant populations of many species of aphids and mites. Vostrel [17] found 100% mortality in resistant population of wheat aphids when treated with imidacloprid. In a similar study on effectiveness of imidacloprid and other insecticides, Tolmay et al. [16] found that the seed treatment of imidacloprid increased the grain yield in Russian wheat aphid resistant as well as susceptible wheat cultivars. Gray et al. [6] found that imidacloprid-treated oat or wheat plants reduced adult longevity and fecundity of three cereal aphid species as compared to non-treated plants.

In all cases (except mixing of Confidor 200 SL @ 100 ml/ha with Tilt @ 0.01 %), Confidor 200 SL was found compatible with fungicide Tilt 0.01 %. Similarly, Pike et al. [11] observed compatibility of imidacloprid with fungicides used in the seed treatments of wheat. These authors reported that the imidacloprid treatment, singly

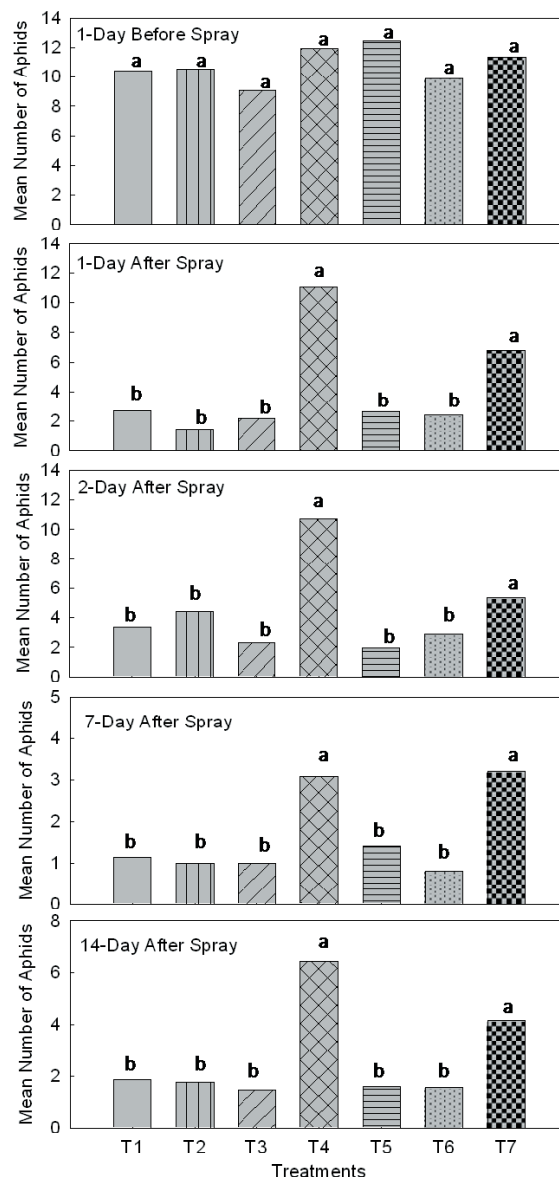


Figure 1. Effect of different treatments of Confidor 200 SL against wheat aphids populations. Different treatments include: T1- Confidor 200 SL @ 100 ml/ha, T2- Confidor 200 SL @ 200 ml/ha, T3- Confidor 200 SL @ 400 ml/ha, T4- Confidor 200 SL @ 100 ml/ha + Tilt @ 0.01%, T5- Confidor 200 SL @ 100 ml/ha followed by Tilt @ 0.01%, T6- Tilt @ 0.01% followed by Confidor 200 SL @ 100 ml/ha, and T7- untreated control.

**Table 1. Pairwise comparisons of different treatments of Confidor 200 SL used against aphids infesting wheat crop**

(I) Treatments	(J) Treatments	Mean Difference (I-J)	P Value	95% Confidence Interval	
				Lower Bound	Upper Bound
T1 (1.865)	T2 (1.783)	0.083	0.962	-3.512	3.677
	T3 (1.465)	0.400	0.819	-3.194	3.994
	T4 (6.450)	-4.585*	0.015	-8.179	-0.991
	T5 (1.600)	0.265	0.880	-3.329	3.859
	T6 (1.585)	0.280	0.873	-3.314	3.874
	T7 (4.133)	-2.268	0.204	-5.862	1.327
T2	T3	0.318	0.856	-3.277	3.912
	T4	-4.668*	0.013	-8.262	-1.073
	T5	0.183	0.917	-3.412	3.777
	T6	0.198	0.910	-3.397	3.792
	T7	-2.350	0.188	-5.944	1.244
T3	T4	-4.985*	0.009	-8.579	-1.391
	T5	-0.135	0.938	-3.729	3.459
	T6	-0.120	0.945	-3.714	3.474
	T7	-2.668	0.138	-6.262	0.927
T4	T5	4.85*	0.011	1.256	8.444
	T6	4.865*	0.010	1.271	8.459
	T7	2.318	0.194	-1.277	5.912
T5	T6	0.015	0.993	-3.579	3.609
	T7	-2.533	0.158	-6.127	1.062
T6	T7	-2.548	0.155	-6.142	1.047

Note: Different treatments include: T1- Confidor 200 SL @ 100 ml/ha, T2- Confidor 200 SL @ 200 ml/ha, T3- Confidor 200 SL @ 400 ml/ha, T4- Confidor 200 SL @ 100 ml/ha + Tilt @ 0.01%, T5- Confidor 200 SL @ 100 ml/ha followed by Tilt @ 0.01%, T6- Tilt @ 0.01% followed by Confidor 200 SL @ 100 ml/ha, and T7- untreated control.

\* represents significant difference in treatment means at the 0.05 level (LSD). Mean number of aphids recorded after spray in each treatment is given in ( ).

or in combination with fungicides used for wheat seed treatment protects wheat plants from the infestation of Russian wheat aphid. Singh & Venkateshwarlu [13] studied the effects of imidacloprid seed treatment when used alone or in combination with different fungicides on different species of wheat aphids, and found no adverse effect on seed germination, plant health and grain yield. As a result of the imidacloprid seed treatment, the crops remained free of aphid populations for a longer duration. In the treatment, when Confidor 200 SL @ 100 ml/ha with fungicide Tilt @ 0.01 %, Confidor 200 SL were mixed together before application, Confidor 200 SL was found incompatible with Tilt 0.01 %. In mixing, aphid incidence was found higher than the untreated control, which might be due to some sort of antagonistic properties of Tilt to Confidor 200 SL, thereby incompatibility of these two chemicals were unable to control aphid population. However, it needs further investigations in field and laboratory studies.

## CONCLUSIONS

In this study, Confidor 200 SL @ 400 ml/ha treatment was found most effective against wheat aphids. However, mixing of Confidor 200 SL @ 100 ml/ha with Tilt @ 0.01 %, was found significantly least effective for wheat aphids control.

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