

Impact of Acetamiprid 20% SP Against Natural Enemy Populations (*Coccinella Spp.*) At Different Doses and Evaluation for Phytotoxicity on Cabbage Crop



Agricultural Science

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ABSTRACT

The present experiment was conducted to check the Impact of acetamiprid 20% SP against natural enemy populations (*Coccinella spp.* and Spiders) at different doses and evaluation for phytotoxicity on cabbage crop at

Vegetable Research Centre of G.B. Pant University of Agriculture and Technology Pantnagar, U.S. Nagar, Uttarakhand during April 2014-15. The data of first spray indicated that, the per cent reduction of aphid in the treatment T4- acetamiprid 20%SP @150g/ha has shown best control (83.05%) followed by T3- acetamiprid 20%SP @100g/ha (81.04%) followed by T2- acetamiprid 20%SP @75g/ha (77.97%), T5- Dhanpreet 20%SP (77.91%) and least control was found in T1- acetamiprid 20%SP @50g/ha. But the results of second spray are slightly different and almost similar results were found in T4 (79.87%), T3 (79.71%), T5 (79.28%), T2 (78.28%) because of residual effect of first spray and least control was found in T1 (64.87%). While the "per cent increase in yield over control" was in treatments T4 (178.50 q/ha), followed by T3 (176.75 q/ha) followed by T2 and T5 (173.25 and 172.75 q/ha) and least yield was observed in T1 (154.25%). Even though highest control was observed in treatment T4 but results were satisfactory with T2 and T5 treatments and can be recommended as to lower the impact on natural enemies.

Introduction:

Cole vegetables being cultivated in winter season meeting dietary requirements of people throughout world. Among Cole vegetables, *Brassica oleracea* var. capitata Linn. is a popular and economically cultivated in large scale as it is nutritionally rich source of Ca, P, Na, K, S Vitamin A, Vitamin C and dietary fibre values (Vanlaldiki, *et al.* 2013). In the world, India is second largest producer of cabbage followed by China producing 68.70 lakh tonnes with an area of 3.1 lakh ha and an average productivity of 22.20 MT/ha (Anon., 2009). The cabbage is highly economical crop being attacked by many insect pests comprising lepidopteran defoliators and hemipteran sucking pests attributed to much lower yield (Vanlaldiki, *et al.* 2013).

Hence, farmers are oriented towards extensive use of chemical insecticides to cultivate lucratively, as other agronomic practices will not regulate satisfactorily over the major pests (Haseeb *et al.*, 2004). In later 1990s, numerous novel insecticides comprising avermectins, spinosyns, pyrazolines, neonicotinoids and Insect Growth Regulators (IGRs) have been registered for controlling pests on crucifer crops and proved effective and are assumed to be relatively safer to beneficial arthropods (Roberto J. Corderom, *et al.*, 2007) but the latter statement is not always proving true (Schneider *et al.*, 2003).

One of novel insecticide group extensively using against sucking pests is neonicotinoid throughout India. The effects of neonicotinoids on natural enemies have largely researched on imidacloprid and revealed to be generally toxic (Grafton-Cardwell and Gu 2003) to several natural enemies in laboratory and field residue bioassays. Acetamiprid is proposed to be toxic to some natural enemies but relatively non-toxic to others based on some laboratory and field residue bioassay research (Grafton-Cardwell and Gu 2003, van de Veire and Tirry 2003).

With the use of acetamiprid, five predator taxa out of the 14 analyzed in 1997 were significantly reduced but the predator: prey ratios have no significant differences between acetamiprid and the control. While in 1998, two predator taxa out of the 12 analyzed

were considerably reduced whereas Predator: prey ratios were significantly lower in the acetamiprid plots compared to the control (Steven E. Naranjo and David H. Akey, 2004).

These findings suggest that effects may be species- and system-dependent and in need of further investigation. So the present investigation conducted to evaluate impact of chemicals on natural enemies. This research will be of great useful in choosing the most suitable insecticides to use in an IPM program for crucifer crops.

Materials and Methods:

The experiment was conducted at Vegetable Research Centre of G.B. Pant University of Agriculture and Technology Pantnagar, U.S. Nagar, Uttarakhand. The cabbage crop was transplanted on 25th February 2014. The trials were laid out in a Randomized Complete Block Design with four replications and five treatments in each. Plot size for each treatment was 5m x 5m with intra and inter row spacing of crop is 50 cm. In each plot, ten plants were selected at random leaving the border row and tagged before recording the data. The observation was counted from three leaves, one each from top, middle and bottom from each tagged plant were minutely observed for aphid population with the help of a magnifying glass (10x). Total of two sprays were taken first on 14.04.2014 and second on 29.04.2014 after reaching ETL.

Chemicals: To study the impact of insecticide on population natural enemies in cabbage crop the acetamiprid 20% SP used at five different doses viz., @50g/ha (10g.ai/ha), @75g/ha (15g.ai/ha), @100g/ha (20g.ai/ha), @150g/ha (30g.ai/ha), and the Standard check - Dhan preet® (Acetamiprid 20%SP)@75g/ha (15 g.ai/ha) for comparison and an Control treatment (unsprayed). The data on population of Coccinella and spiders were recorded on one day before insecticidal application (PTC) as well as 3, 7, 10 and 14 days after spraying.

Whereas to evaluate phytotoxicity three different doses of Acetamiprid 20 %SP insecticide were used i.e., @75g/ha (15

g.a.i/ha), @150g/ha (30 g.a.i/ha) and @300g/ha (60 g.a.i/ha) and The effect of doses were recorded on 1, 3, 5, 7, 10 and 14 days after spraying for phytotoxic symptoms like Leaf injury on tips/surface, Wilting, Vein clearing, Necrosis, Epinasty, Hyponasty etc. and data were recorded.

Results and discussion:

Results of the field trial revealed that cabbage sprayed with acetamiprid 20%SP at @ 75 g /ha and acetamiprid 20%SP at @ 150 g /ha did not show any phytotoxic effect like leaf tip injury, vein clearing, wilting, necrosis, epinasty and hyponasty. The phytotoxic rating of zero in all the doses was observed on 1, 3, 7, 10 and 14 DAS (Table 1). The experiment conducted by using Acetamiprid (Tristar) provided excellent efficacy against aphids of different crops like lettuce, apple, cantaloupe, Chinese cabbage, potatoes, turnip, collard, broccoli, tomato and strawberry. But no phytotoxicity was observed in any crop and it supports present research results. (Ely Vea and Cristi L. Palmer 2015).

Table 1: Evaluation of Acetamiprid 20% SP for phytotoxicity on Cabbage during summer 2014

Sl. No.	Treatments	Leaf injury on tips/surface	Wilting	Vein clearing	Necrosis	Epinasty	Hyponasty
1.	Acetamiprid 20% SP @ 75 g /ha	0	0	0	0	0	0
2.	Acetamiprid 20% SP @ 150 g/ha	0	0	0	0	0	0
3.	Acetamiprid 20% SP @ 300g/ha	2.3	1.1	0	0	0	1.6
4.	Untreated control	0	0	0	0	0	0

* Mean observations recorded at 1, 3, 5, 7, 10 and 14 days after each spraying

Observation on effect of natural enemies among all the treatments imposed, the Treatment T1- Acetamiprid 20%SP @ 50g/ha recorded the highest mean coccinellid population (1.10) followed by T2- Acetamiprid 20%SP @ 75 g /ha (0.90) which was on par with standard check Dhanpreet 20%SP (0.60) at 14 DAS and other treatments. After second application also the above two doses registered more mean coccinellids than that of other treatments. The population of coccinellids noticed in Acetamiprid 20%SP @ 75 g /ha (1.00) has shown on par result with the standard check, Dhanpreet 20%SP @ 75 g /ha (1.00). In the untreated check, the mean coccinellid population was 2.20 and 2.60 per plant respectively after first and second spray after 14 DAS [Table 2 (Graph 1) & Table 3 (Graph 2)]. Hence acetamiprid 20%SP may not have harmful effect on natural enemies at different doses chemicals in the cabbage plant, so it may recommend using in cabbage to control insect pests. The results are supported by Roberto J. Corderom, *et al.*, 2007, partially supported by Grafton-Cardwell *et al.* (2003) and Steven E. Naranjo *et al.* 2004.

Table 2: Effects of Acetamiprid 20%SP on population of Coccinellids in Cabbage crop (Summer 2014) – I spray.

S. No	Treatments	Dose (g / ha)	Number of coccinellids per plant				
			PTC	3DAS	7DAS	10DAS	14DAS

1	Acetamiprid 20%SP	50	1.00	0.70 (1.12) ^b	1.00 (1.22) ^b	1.10 (1.30) ^b	1.20 (1.30) ^b
2	Acetamiprid 20%SP	75	1.20	0.77 (1.14) ^b	1.00 (1.22) ^b	0.90 (1.14) ^c	0.80 (1.14) ^c
3	Acetamiprid 20%SP	100	1.00	0.40 (0.94) ^c	0.60 (1.04) ^c	0.40 (0.94) ^d	0.40 (0.94) ^d
4	Standard Check: Dhanpreet 20%SP	75	1.00	0.60 (1.04) ^b	0.60 (1.04) ^c	0.80 (1.14) ^c	0.60 (1.04) ^c
5	Acetamiprid 20%SP	150	1.20	0.30 (0.94) ^c	0.80 (1.14) ^c	0.60 (1.04) ^c	0.40 (0.94) ^d
6	Control		1.57	2.22 (1.64) ^a	2.00 (1.58) ^a	1.80 (1.51) ^a	2.20 (1.64) ^a

*Mean of Four replications; PTC-Pre treatment count; DAS-Days after spraying.

Values in parentheses are $\sqrt{x+0.5}$ transformed values of four replications.

In a column means followed by a common letter are not significantly different by DMRT (P=0.05)

Table 3: Effects of Acetamiprid 20%SP on population of Coccinellids in Cabbage crop (Summer 2014) –II Spray

S. No	Treatments	Dose (g / ha)	Number of coccinellids per plant				
			PTC	3 DAS	7 DAS	10 DAS	14 DAS
1	Acetamiprid 20%SP	50	1.20	1.00 _b (1.22)	1.40 _b (1.37)	1.30 (1.37) ^b	1.60 (1.44) ^b
2	Acetamiprid 20%SP	75	0.80	0.80 _b (1.14)	1.20 _b (1.26)	1.00 (1.22) ^c	1.00 (1.22) ^c
3	Acetamiprid 20%SP	100	0.20	0.80 _b (1.14)	0.80 _c (1.14)	0.60 _d (1.04)	0.60 (1.04) ^d
4	Standard Check: Dhanpreet 20%SP	75	0.60	0.60 _{bc} (1.04)	0.80 _c (1.14)	0.80 _{cd} (1.14)	1.00 (1.22) ^c
5	Acetamiprid 20%SP	150	0.40	0.60 _{bc} (1.04)	0.80 _c (1.14)	0.80 _{cd} (1.14)	0.60 (1.04) ^d
6	Control		2.20	2.40 _a (1.70)	2.60 _a (1.76)	2.20 (1.64) ^a	2.60 (1.76) ^a

*Mean of Four replications; PTC-Pre treatment count; DAS-Days after spraying

Values in parentheses are $\sqrt{x+0.5}$ transformed values of four replication.

In a column means followed by a common letter are not significantly different by DMRT (P=0.05)

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