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EFFECTIVENESS OF SOME INSECTICIDES AGAINST CABBAGE APHID, *BREVICORYNE BRASSICAE* (LINNAEUS) (APHIDIDAE: HOMOPTERA)

Muhammad Aslam[1] and Munir Ahmad[2*]
[1]University College of Agriculture, Bahauddin Zakariya University, Multan 60800, Pakistan, [2]Department of Agricultural Entomology, University of Agriculture, Faisalabad, Pakistan.
* Present Address: Central Cotton Research Institute, Multan, Pakistan.

Abstract: Efficacy of Confidor (imidacloprid) 200 SL @ 100 ml ha^{-1}, Endosulfan (endosulfan) 35 EC @ 1500 ml ha^{-1}, Advantage (carbosulfan) 20 EC @ 750 ml ha^{-1}, Polo (difenthiuron) 500 SC @ 500 ml ha^{-1} and Trebon (ethophenprox) 30 EC @ 500 ml ha^{-1} was studied against cabbage aphid, *Brevicoryne brassicae* (L.) during February 2000 on pointed-head Chinese cabbage (*Brassica rapa* cv. gr. *perkinensis*) and round-head cabbage (*Brassica oleracea* var. *capitata*). All tested insecticides controlled the aphids effectively on both the crops, however Confidor, Endosulfan and Trebon application resulted in better control on pointed-head Chinese cabbage. On round-head cabbage, Trebon proved better than other insecticides. Maximum control of aphid was observed three days after application of all the insecticides on pointed-head Chinese cabbage and majority of the insecticides on round-head cabbage. Number of aphids started increasing in all treatments except that in Trebon after three days of application in round-head Chinese cabbage. When no insecticide was applied, increase in aphid population was 4.5 and 3.1 times the initial population within seven days in plot of round-head cabbage and pointed-head Chinese cabbage, respectively.

Keywords: *Brassica rapa* cv. gr. *perkinensis, Brassica oleracea* var. *capitata, Brevicoryne brassicae*, insecticides.

INTRODUCTION

Cabbage Aphid, *Brevicoryne brassicae* (Linnaeus) is one of the serious pests of pointed-head Chinese cabbage (*Brassica rapa* cv. gr. *perkinensis*) and round-head cabbage (*Brassica oleracea* var. *capitata*) crops. Adults and nymphs feed by sucking plant juices, causing yellowing and curling of leaves, and wilting and stunting of plants. In case of severe infestation yield may decrease up to 80% [Atwal 1976]. Cabbage aphids also transmit a number of viruses of brassica crops like cauliflower and turnip mosaic viruses, which can be managed by effective control of aphid [Chowfla and Baruah 1990]. Different aspects including population dynamics of aphids [Raworth 1984, Veda and Shaw 1988], its biological control agents and economic threshold level have been studied [Bath and Singh 1989, White *et al*. 1995]. Aphids may have up to forty-five generations per year. Due to high reproductive capacity of aphids and as a result of extensive insecticide application, it has developed resistance against certain insecticides [Garg *et al.* 1987, Sweeden and McLeod 1997], which forced the researchers to find out new and effective insecticides for its better control [Halimie *et al.* 1992, Narkiewicz 1995, Freuler *et al.* 2001].

The objective of this study was to compare the efficacy of some insecticides against cabbage aphid infesting pointed-head Chinese cabbage at flowering stage and on leaves of round-head cabbage.

MATERIALS AND METHODS

The study was conducted at the Vegetable Research Farm, University of Agriculture, Faisalabad, Pakistan during February, 2000. Pointed-head Chinese cabbage and round-head cabbage were planted in the field. The trials were laid out in a Randomized Complete Block Design with three replications. Plot size for each crop was 5m x 5m with six beds in each. Plant-to-plant and row-to-row spacing for both crops was 0.3m and 0.74m, respectively.

For pointed-head Chinese cabbage, aphid population was counted by using a white plastic sheet measuring 15.24 cm x 22.86 cm at flowering stage. The sheet was marked by drawing lines at 2.54 cm distance along the length and width, resulting in 54 squares of 6.45 cm^2 each. In each plot ten main branches, taking one from each plant, were randomly selected and tagged. Apical 15cm length of each branch was beaten gently 10 times with a stick on the plastic sheet, and aphids falling on the sheet were counted [Aslam and Munir 2001]. For round-head cabbage, three outer leaves from each of the ten randomly selected cabbage heads per plot were taken and number of aphids was counted on them. Five insecticides, viz., Confidor (imidacloprid) 200 SL @ 100 ml ha^{-1}, Endosulfan (endosulfan) 35 EC @ 1500 ml ha^{-1}, Advantage (carbosulfan) 20 EC @ 750 ml ha^{-1}, Polo (difenthiuron), 500 SC @ 500 ml ha^{-1} and Trebon (ethophenprox) 30 EC @ 500 ml ha^{-1} were applied twice at an interval of 10 days, starting from 40 - 50% pod formation stage of pointed-head Chinese cabbage and 40 - 50 days after transplanting on round-head cabbage. Number of aphids was counted a day before treatment from 60 randomly chosen plants in the field and 1, 2, 3, 7 and 10 days after insecticides application on 10 plants in each plot of both crops. Data were analyzed by using Analysis of Variance technique, and mean separation was done by Duncan's Multiple Range Test (DMR) [Little and Hill 1978] at 0.05 probability level.

RESULTS AND DISCUSSION

Data presented in the tables are average number of aphids for two insecticide applications on 15 cm main branch of pointed-headed Chinese cabbage and three outer leaves of round-head cabbage, respectively. The mean number of aphids per 15 cm of a branch and per leaf before insecticide application was 6.8 $\pm$ 0.9 and 3.5 $\pm$ 0.4 on pointed-head Chinese cabbage and round-head cabbage, respectively.

POINTED-HEAD CHINESE CABBAGE (*Brassica rapa* cv. gr. *Perkinensis*)

Number of aphids was non-significantly different between Endosulfan and Confidor, and among Advantage, Polo and Trebon treated plots after one day of insecticide application (Table 1).

Table 1: Mean number of aphid (*Brevicoryne brassicae*) and its mortality on 15 cm main branch of pointed-head Chinese cabbage (*Brassica rapa* cv. gr. *Perkinensis)* at different intervals after insecticide treatments+.

Treatment	Dose ml ha^{-1}	No. of Aphids (Days after Treatment)*				
		1	2	3	7	10
Confidor (imidacloprid) 200 SL	100	2.0 c (70.0)$	0.9 c (86.7)	0.4 d (94.0)	1.7 c (74.8)	4.3 b (36.3)
Endosulfan (endosulfan) 35 EC	1500	1.6 c (76.3)	0.6 c (91.1)	0.9 cd (86.7)	1.1 c (83.7)	1.7 c (74.8)
Advantage (carbosulfan) 20 EC	750	3.8 b (43.7)	2.9 a (57.0)	2.1 bc (68.9)	3.2 b (52.6)	2.8 bc (58.5)
Polo (difenthiuron) 500 SC	500	4.3 b (36.3)	2.4 ab (64.4)	2.7b (60.0)	3.3 b (51.1)	4.0 b (40.7)
Trebon (ethophenprox) 30 EC	500	4.0 b (40.7)	2.1 b (68.9)	1.8 bcd (73.3)	1.7 c (74.8)	2.9 bc (57.0)
Control	-	5.1 a	1.2 c	11.0 a	30.3 a	18.1 a

+ Means followed by the same letter in columns are not significantly different (P=0.05, DMRT).
* Average of two insecticide applications.
$ Numbers in parentheses are percent mortality calculated on the basis of average number of aphids (i.e. 6.8 ± 0.9) in the field before treatment.

Number of aphids varied from 3.8 to 4.3 in the last three treatments, which was significantly lower than that in control plots and higher than that in plots sprayed with Endosulfan and Confidor. Two days after treatment, plots treated with Confidor, Endosulfan and control had non-significantly different number of aphids, which was lower than that in plots treated with other insecticides. Plots treated with Advantage had the highest number of aphids. After three days of treatment, number of aphids was significantly different in all the treatments. Minimum number of aphids was observed in Confidor followed by that in Endosulfan, Trebon Advantage and Polo treated plots in ascending order. Seven days after treatment, the difference in number of aphids was non-significant among Endosulfan, Confidor and Trebon treated plots, which had lower number of aphids than the plots treated with Polo and Advantage. Number of aphids was non-significantly different between plots treated with Polo and Advantage. Ten days after treatment, Endosulfan treated plots had the lowest number of aphids. Confidor and Polo treated plots had non-significantly different and higher number of aphids than that in plots treated with Advantage and Trebon. Plots treated with Advantage and Trebon had non-significantly different number of aphids, which was lower than that in Confidor and Polo and higher than that in Endosulfan treated plots.

All the insecticides reduced the aphid population compared to that in control plots, but Endosulfan consistently proved overall better than other

treatments up to 10 days after application. Confidor application resulted in better control up to seven days followed by Trebon. However, Trebon provided more consistent control than Confidor up to 10 days after application.

Table 2: Mean number of aphid (*Brevicoryne brassicae*) and its mortality on three outer leaves of round-head cabbage (*Brassica oleracea* var. *capitata*) at different intervals after insecticide treatments+.

Treatment	Dose ml ha^{-1}	No. of Aphids (Days after Treatment)*				
		1	2	3	7	10
Confidor (imidacloprid) 200 SL	100	1.0 b (71.4)$	0.5 d (85.7)	0.7 c (80.0)	5.0 d (-42.8)	10.3 a (-194)
Endosulfan (endosulfan) 35 EC	1500	0.7 b (80.0)	1.8 b (48.5)	0.4 d (88.6)	7.8 b (-122)	8.8 b (-151)
Advantage (carbosulfan) 20 EC	750	0.9 b (74.3)	1.3 c (62.8)	0.07 e (98.0)	6.3 c (-80)	8.0 b (-128)
Polo (difenthiuron) 500 SC	500	3.2 a (8.5)	3.4 a (2.8)	1.3 b (62.8)	8.1 b (-131)	8.7 b (-148)
Trebon (ethophenprox) 30 EC	500	1.0 b (71.4)	1.4 c (60.0)	0.2 de (94.3)	2.0 e (42.8)	2.9 c (17.1)
Control	-	3.8 a	3.9 a	3.7 a	10.8 a	3.4 c

+ Means followed by the same letter in columns are not significantly different (P=0.05, DMRT).
* Average of two insecticide applications.
$ Numbers in parentheses are percent mortality calculated on the basis of average number of aphids (i.e. 3.5 $\pm$ 0.4) in the field before treatment.

ROUND-HEAD CABBAGE (*Brassica oleracea* var. *capitata*)

Aphid population was severely suppressed by all insecticides, except Polo after one day of treatment (Table 2). There was no significant difference in number of aphids between control and Polo treated plots. Mean number of aphids in plots treated with other insecticides was non-significantly different. After two days of insecticide application, number of aphids was lowest where Confidor was applied and the highest in Polo treated plots. Number of aphids was non-significantly different between Advantage and Trebon treated plots. The number of aphids in these treatments was significantly lower than that in Endosulfan and higher than that in Polo treated plots. Three day after treatment, number of aphids was lowest in plots treated with Advantage and highest in those treated with Polo. Number of aphids was significantly different in Trebon, Endosulfan and Confidor treatments, being higher in Confidor followed by Endosulfan and Trebon treated plots. After seven days of treatment, Trebon treated plots had the lowest and Endosulfan and Polo treated plots had the highest number of aphids. Number of aphids was significantly different between Confidor and Advantage treated plots, which was higher than that in plot treated with Trebon and lower than that in plots treated with Endosulfan and Polo. After 10 days of application, number of aphids was non-significantly different in plots treated with Advantage, Polo and Endosulfan. Number of aphids in these treatments was significantly lower than that in Cofidor and higher than that in Trebon treated plots. Number of aphids started increasing in all treatments,

except that in Trebon, after three days of application. This indicates that application of the products tested, except Trebon will have to be repeated after seven days.

The results indicate that Trebon and Advantage have persistent effect, as the mortality of aphids was relatively higher in these treatments than in others. It is also evident that for quick knock down of aphids, Trebon and Advantage should be used. In untreated plots aphid population increased, within seven days, by 4.5 and 3.1 times the population before treatment on pointed-head Chinese cabbage and round-head cabbage, respectively. Aphid population build up was slower on round-head cabbage than that on pointed-head Chinese cabbage. This could be due to the reason that initial population was lower on round-head cabbage.

The results supported the findings of the earlier workers [Garg *et al.* 1987, Halimie *et al.* 1992, Narkiewicz 1995, Sweeden and McLeod 1997] who reported the use of insecticides for effective cabbage aphid, *Brevicoryne brassicae* control. Repeated application for early and efficient control was suggested by Freuler *et al*. [2001]. It was also found in the present study for the control of aphids on round-head Chinese cabbage.

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