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EFFICACY OF INSECTICIDES AGAINST MUSTARD APHID *BREVICORYNE BRASSICAE* AND THEIR SAFETY TO COCCINELLID PREDATORS

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ABSTRACT

Field experiment was conducted during rabi 2018-19 to ascertain the efficacy of insecticides on mustard aphid *Brevicoryne brassicae* L., and their safety to the coccinellid predators. Insecticides viz., imidacloprid17.8SL (0.30 ml/ l of water), dimethoate 30EC (1 ml/ l of water), cypermethrin 10EC (0.6 ml/ l of water), chlorpyriphos 50EC+ cypermethrin 5EC (1ml/ l of water), profenophos 40EC+ cypermethrin 4EC (1ml/ l of water), neem oil (2ml/ l of water), dichlorvos 76 EC (1ml/ l of water), chlorpyriphos 20SC (0.5 ml/ l of water) were evaluated. Profenophos 40EC+ cypermethrin 4EC was found to be the most effective in reducing the aphid incidence. Neem oil and imidacloprid proved to be safe to the coccinellid predators viz., *Coccinella septumpunctata* (L.) and *Hippodamia variegata* (Goeze); while profenophos + cypermethrin was found to be the most toxic. Thus, imidacloprid can be used for the management of *B. brassicae* as it is the most effective and also safe to coccinellid predators.

Key words: *Brevicoryne brassicae*, *Brassica juncea*, insecticides, imidacloprid, profenophos, cypermethrin, coccinellids, *Coccinella septumpunctata*, *Hippodamia variegata*, safety

Mustard *Brassica juncea* is an important oilseed crop grown in the temperate areas of the Indian subcontinent. The cabbage aphid *Brevicoryne brassicae* L., is the most serious and destructive pest of this crop in the temperate regions of India (Rana, 2005; Basavaraju et al., 1995). This pest caused substantial losses in many crops which comprise the mustard and crucifers (Griffin and Williamson, 2012; Hines and Hutchison, 2013); and 35-75% reduction in the yield of mustard had been observed (Singh and Sharma, 2012; Khan et al., 2015). The infestation also led to 6% reduction in oil contents (Singh et al., 2007). The loss caused by aphids is due to direct feeding on leaves, inflorescence and stems as well as indirectly by transmitting diseases (Liu and Yue, 2001). Every effort is being made to raise yield adopting modern agricultural practices, such as the use of high yielding varieties, heavy manuring and assured irrigation, along with use of insecticides. These composite efforts are nullified if the crop is not protected from insect pests (Singh, 1986; Begum, 1995; Biswas and Das 2000). The present study evaluates the field efficacy of certain insecticides against *B. brassicae* and their safety against coccinellid predators.

MATERIALS AND METHODS

Field experiment was carried out at the Faculty of Agriculture, Wadura Campus, SKUAST-K. Mustard seeds var. KS 101 "Gulcheen" were sown manually in lines about 3 cm deep in furrows, keeping the row to row and plant to plant distances as 30 and 10cm, respectively. The furrows were covered with soil to level the opened furrows. Half of the recommended dose of nitrogenous fertilizer (60 kg N/ha) and full dose of phosphatic fertilizer (60 kg P_2O_5/ha) and potassic fertilizer (40 kg K_2O/ha) were applied at the time of ploughing and rest of the nitrogenous fertilizers were applied through top dressing at the time of flowering. The insecticides were sprayed at recommended doses with a knapsack sprayer. The mean number of aphids and coccinellid predators was recorded by counting the aphid and coccinellid's on whole plant (mostly on the upper 10 cm twig) from each of randomly five selected plants/ plot and same was expressed as number of aphids or coccinellids/ plant. Pretreatment counts were taken in all plots one day prior to the spraying, and the post-treatment ones after 1st, 3rd, 7th and 14th days of spraying of insecticides. Since the population of aphids decreased after the first spray, there was no need for 2nd application of the insecticides. The data obtained were subjected to statistical analysis and critical differences worked out to evaluate the significance.

RESULTS AND DISCUSSION

The insecticides viz; imidacloprid 17.8 SL (0.30 ml/ l of water), dimethoate 30EC (1ml/ l of water), cypermethrin 10EC (0.6ml/ l of water), chlorpyriphos 50EC+ cypermethrin 5EC (1ml/ l of water), profenophos 40EC+ cypermethrin 4EC (1ml/ l of water), neem oil (2ml/ l of water), dichlorvos 76 EC (1ml/ l of water), chlorpyriphos 20SC (0.5 ml/ l of water) were evaluated

Table 1. Efficacy of insecticides against mustard aphid *B. brassicae* and their safety to predators

Treatment	Pre-treatment (1DBT)	Mortality (%) 1 DAT	3 DAT	7 DAT	14 DAT	Cumulative mean % mortality)
Imidacloprid 17.8SL	60.30	*63.46 (52.79) **62.94	*85.74 (67.79) **85.38	*94.25 (76.09) **93.94	*99.01 (84.24) **98.93	85.62
Dimethoate 30EC	43.20	*58.03 (49.59) **57.43	*83.19 (65.77) **82.76	*91.83 (73.35) **91.37	*98.31 (82.49) **98.17	82.84
Cypermethrin 10EC	64.07	*30.39 (33.44) **29.39	*45.99 (42.69) **44.64	*62.65 (52.30) **60.58	*96.52 (79.21) **96.25	58.89
Chlorpyriphos 50EC+ Cypermethrin 5EC	71.23	*47.83 (43.74) **47.08	*72.86 (58.58) **72.18	*87.14 (68.95) **86.43	*97.15 (80.25) **96.93	76.24
Profenophos 40EC+ Cypermethrin 4EC	53.23	*72.64 (58.44) **72.25	*88.17 (69.85) **87.87	*95.87 (78.24) **95.64	*100.00 (90.00) **100.00	89.17
Neem oil	70.46	*12.68 (20.85) **11.43	*28.48 (32.24) **26.69	*65.71 (54.13) **63.82	*81.75 (64.68) **80.32	47.16
Dichlorvos 76 EC	54.06	*31.45 (34.09) **30.47	*66.09 (54.37) **65.24	*73.37 (58.91) **71.89	*86.49 (68.41) **85.45	64.35
Chlorpyriphos 20 EC	82.76	*42.21 (40.50) **41.38	*68.19 (55.64) **67.39	*82.49 (65.23) **81.52	*95.78 (78.10) **95.45	72.17
Control	70.83	*1.42 (6.82)	*2.45 (8.96)	*5.23 (13.19)	*7.25 (15.59)	4.09
CD (p=0.05)		0.34	0.75	0.66	0.81	

Safety to the predators *C. septumpunctata* and *H. variegata*

Treatment	Pre treatment no. (1 DBS)	*Mortality (%) 1 DAS	3 DAS	7 DAS	14 DAS	Cumulative mean	Pre treatment no. (1 DBS)	Mortality (%) 1 DAS	3 DAS	7 DAS	14 DAS	Cumulative mean
Imidacloprid 17.8SL	4.067	9.73 (18.14)	15.62 (23.27)	19.66 (26.32)	22.87 (28.56)	16.97	2.60	7.82 (16.19)	12.84 (20.97)	20.65 (27.05)	26.95 (31.26)	17.07
Dimethoate 30EC	3.80	19.31 (26.02)	36.77 (37.30)	56.08 (48.47)	84.12 (66.51)	49.07	2.40	25.11 (30.05)	44.43 (41.78)	61.16 (51.44)	86.28 (68.39)	54.25
Cypermethrin 10 EC	4.13	22.76 (28.42)	41.95 (40.35)	62.89 (52.45)	90.28 (71.82)	54.47	2.33	25.76 (30.48)	51.27 (45.71)	65.65 (54.11)	91.41 (72.93)	58.53
Chlorpyriphos 50EC+ Cypermethrin 5EC	3.93	28.78 (32.43)	49.12 (44.48)	76.32 (60.86)	94.89 (76.92)	62.27	2.13	34.34 (35.86)	56.15 (48.51)	80.97 (64.15)	90.48 (72.04)	65.48
Profenfos 40EC+ Cypermethrin 4EC	4.07	31.35 (34.03)	57.26 (49.16)	83.62 (66.11)	100.00 (90.00)	68.06	2.47	35.14 (36.33)	62.09 (51.98)	89.43 (71.13)	100.00 (90.00)	71.67
Neem oil	4.47	7.43 (15.81)	11.12 (19.46)	15.63 (23.28)	17.89 (25.01)	13.02	2.40	4.29 (11.91)	8.59 (16.98)	13.98 (21.95)	22.57 (28.33)	12.36
Dichlorvos 76 EC	4.20	17.46 (24.66)	33.26 (35.19)	50.72 (45.39)	77.75 (61.86)	44.79	2.00	20.13 (26.63)	40.27 (39.36)	56.70 (48.84)	79.86 (63.33)	49.24
Chlorpyriphos 20EC	4.53	14.66 (22.48)	27.94 (31.89)	47.09 (43.32)	70.60 (57.15)	40.07	2.13	19.02 (25.81)	34.35 (35.86)	53.36 (46.91)	75.16 (60.11)	45.47
Control	3.93	2.55 (9.18)	2.56 (9.19)	5.11 (13.04)	5.13 (13.05)	3.84	2.13	1.57 (7.19)	2.05 (8.22)	3.14 (10.19)	4.09 (11.66)	2.72
CD (p=0.05)		1.96	2.04	1.02	1.29			2.33	3.34	2.97	2.66	

*Mean of 3 replications; **Mean of corrected values; DBT= Days before treatment; Values in parentheses arc sine transformed values; DAT= Days after treatment;

against mustard aphid *B. brassicae*. The spray was carried out during the peak period of aphids and the data was recorded one day before treatment (DBT) and then on 1st, 3rd, 7th and 14th day after treatment (DAT). The data on the efficacy of the treatments given in Table 1 reveal significant reduction in incidence after 1, 3, 7, and 14 days after treatment (DAT). The maximum reduction of 72.64% was observed with profenophos 40EC+ cypermethrin 4EC at 1st DAT, which increased to 88.17, 95.87 and 100.00% at 3rd, 7th and 14th DAT, respectively with the maximum cumulative mean of 89.17% among all the treatments. These findings agree with those of Kumar et al. (2018) on profenophos 40EC+ cypermethrin 4EC. It was followed by imidacloprid 17.8SL and dimethoate 30EC. The cumulative mean % mortality in these two treatments was recorded as 85.62 and 82.84, respectively. These treatments were found significantly different from each other and also were significantly different from profenophos 40EC+ cypermethrin 4EC. Patel et al. (2018) found that imidacloprid 17.8SL and dimethoate 30 EC proved to be effective against mustard aphid. The results were further confirmed by Yadav and Singh (2016) indicating that imidacloprid 17.8SL was most effective among all the tested treatments followed by dimethoate 30 EC against mustard aphid *B. brassicae*.

Two species of coccinellid predators viz; *C. septumpunctata* and *H. variegata* were found predating *B. brassicae; C. septumpunctata* counts one day before spray and reduction after 1, 3, 7 and 14 days after spray given in Table 1 revealed that *C. septumpunctata* was least affected with neem oil and imidacloprid; and 9.73, 15.62, 19.66 and 22.87% reduction was observed with imidacloprid at 1, 3, 7 and 14 days after treatment, with the cumulative mean of 16.97%. These were relatively safer to *C. septumpunctata*, while profenophos 40EC + cypermethrin 4 EC was the most inimical. With regard to *Hippodamia variegate*, the least reduction was observed again with neem oil and imidacloprid. These results agree with those of Dotasara et al. (2017) on imidacloprid 17.8SL and neem oil with the coccinellid predators. Ahmad et al. (2011) reported that imidacloprid was the safest insecticide against natural enemies (coccinellids) as compared to other insecticides. Chaudhary et al. (2016) also confirmed that imidacloprid proved safer. The toxicity of profenophos 40EC+ cypermethrin 4EC was confirmed by Satpathi et al. (2016).

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