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Studies of some insecticides and bio pesticides on foraging behaviour of honey bees in mustard (*Brassica juncea* L.)

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The foraging behaviour of honey bees *viz.*, *Apis dorsata*, *Apis florea*, *Apis cerana indica* and *Apis mellifera* were recorded on mustard crop. The observations on visiting of honey bees showed that the neem product, achook was found least toxic to honey bees due to their higher visits *i.e.* 3.00, 4.33, 4.33, 6.33 and 6.66 per three minutes per sq. m area just after, after 24, 48, 72 hours and after 5 days of application followed by bioneem *i.e.* 2.00, 3.00, 3.66, 5.66 and 6.33 visits, respectively. Nimbicidine also provided 1.33, 2.33, 3.00, 5.33 and 5.66 visits of honey bees 3 minutes in one square metre area in comparison to rest of the treatments. While maximum visits were recorded in untreated plot *i.e.* 6.66, 7.00, 7.33, 8.00 and 7.33 visits. Thus, achook and bioneem were found safer to honey bees and recommended to the farmers for the control of aphids (*Lipaphis erysimi*) in mustard crop.

Key words : *Apis dorsata, Apis mellifera, Brassica juncea* and Malathion

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INTRODUCTION

The mustard, *Brassica juncea* (L.) is known to be often cross pollinated crop up to the extent of 30 per cent (Ram and Singh, 1998). Flowering *Brassica* are not only visited by a large number of insects pollinators especially honey bees for nectar and pollen but they also attract insects which feed upon flowers and developing seeds causing serious economic losses. Consequently, the insecticides are to be applied for crop protection which severely harm to the pollinating species (Mayer, 1980). Indian mustard (*Brassica juncea*) is an important oilseed crop, which constitutes approximately 80 per cent of total production of rapeseed and mustard in India (Yadav *et al.*, 1985). Mustard aphid attacks this crop at the time of flowering and pod formation so it requires application of insecticides to combat the pest. But the impact of the insecticides on the flowering activity of wild honey bees pollinators which mostly come from neighbouring wild habitats or hives on the contaminated crops have not received much attention. Thus, the present studies were therefore, undertaken with a view to find out the adverse effects of some insecticides on foraging activity of honey bees, *Apis dorsata*, *Apis florea*, *Apis cerana indica* and *Apis mellifera* visitors to *Brassica juncea* var. Varuna.

RESEARCH METHODOLOGY

This study was carried out at C.S. Azad University of Agriculture and Technology, Kanpur. To evaluate the effect of insecticides, their commercial formulations were sprayed with the help of Ganesh hand sprayer on the field plots of 5x3 metre size of Indian mustard (*Brassica juncea* L. *var*. Varuna) during its peak flowering period. The spray was made between 1000-1200hrs during the maximum activity period of honey bees. Each spray was replicated thrice and the observations on the number of foraging of bees were recorded by visual count just after, 24 hrs, 48 hrs, 72 hrs and 5 days of insecticidal application in 1 sq. m area for 3 minutes in treated and control plots between 1000-1200 hrs . The population of bees was recorded on the basis of visual counts as adopted by Swaminathan and Bharadwaj (1982).

RESEARCH FINDINGS AND ANALYSIS

When the insecticide were applied on the flowering stage of crop, the floral tips retained relatively less amount of insecticidal deposits than leaves and stems thus the foraging bees coming to contact with floral parts may receive sub lethal amount of toxicants. Visual observations on foraging honey bees immediately after application of insecticides revealed a

Table 1: Effect of insecticidal treatments on bee pollinators visiting flowering mustard

Treatments	Dose (%)	Mean bee visitors at different intervals after spray					Seed yield	
							kg/ 15 sq. m.	kg/ha
		Just after	After 24 hrs	After 48 hrs	After 72 hrs	After 5 days		
Achook	0.75	3.00 (1.87)	4.33 (2.20)	4.33 (2.20)	6.33 (2.61)	6.66 (2.68)	2.871	1914
Bioneem	0.75	2.00 (1.58)	3.00 (1.87)	3.66 (2.04)	5.66 (2.48)	6.33 (2.61)	2.864	1909
Nimbicidine	0.75	1.33 (1.35)	2.33 (1.68)	3.00 (1.87)	5.33 (2.41)	5.66 (2.48)	2.849	1899
Endosulfan	0.07	1.171 (1.20)	1.66 (1.47)	2.00 (1.58)	3.00 (1.87)	4.66 (2.27)	2.757	1838
Malathion	0.05	0.66 (1.07)	1.33 (1.35)	1.66 (1.47)	2.33 (1.68)	4.33 (2.20)	2.727	1818
Biolep	0.75kg/ha	1.33 (1.35)	2.33 (1.68)	2.66 (1.78)	4.66 (2.27)	5.66 (2.48)	2.831	1887
Dipel	0.75kg/ha	1.66 (1.47)	2.00 (1.58)	2.00 (1.58)	4.33 (2.20)	5.00 (2.35)	2.808	1872
Control		6.66 (2.68)	7.00 (2.74)	7.33 (2.80)	8.00 (2.92)	7.33 (2.80)	2.927	1952
S.E. ±		0.252	0.250	0.165	0.213	NS		6.45
C.D. (P=0.05)		0.540	0.537	0.355	0.458	-	-	13.84

NS= Non-significant

temporary decline in the foraging activity in treated fields but the data were not consistent to document a decline pattern. This may be attributed to the wind charged with smell of drifting and evaporation of insecticides all over the field.

The data presented in Table 1 indicate that the number of foraging bees were found that neem product, achook was least toxic against honey bees by giving highest visits *i.e.* 3.00, 4.33, 6.33 and 6.66 per three minutes per sqm area just after, after 24 hrs, 48 hrs, 72 hrs and 5 days of insecticidal application followed by bioneem visits *i.e.* 2.00, 3.00, 3.66, 5.66 and 6.33, respectively. Nimbicidine also provided 1.33, 2.33, 3.00, 5.33 and 5.66 visits per 3 minutes per sq. m area in comparison to the remaining treatments but the maximum 6.66, 7.00, 7.33, 8.00 and 7.33 visits were found in untreated plot. The decrease was in number of pollinators visits due to toxic and repellent effect of different insecticides suppressing the yield of mustard crop. The lowest crop yield (1818 kg/ha) was obtained in malathion treated plots because this was more toxic against bee pollinators. Endosulfan, dipel and biolep were less toxic to pollinators than malathion so their yield was little bit higher than malathion providing *i.e.* 1838, 1872 and 1887 kg/ha, respectively. The spray of nimbicidine, bioneem and achook were less toxic which provided higher yield *i.e.* 1899, 1909 and 1914 kg/ha which were near to 1952.00 kg/ha in control plots. Dhaliwal *et al.* (1996) tested the effect of neem based insecticide *viz.*, achook, nimbicidine with endosulfan and were found most effective. Muranjan *et al.* (2006) tested seven individual insecticides and chlorpyriphos was found to be slightly toxic to *A. cerana indica*. Kavita *et al.* (2006) reported that spiromesifen was found to be safe to honey bee for 3 hours contact where as triazophos and dicofol caused more than per cent mortality to bees.

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