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Effect of insecticides on the incidence of honey bee, *Apis cerana indica Fab.* on mustard bloom under semi-arid region of Rajasthan

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Abstract : Effect of nine insecticides studied on the incidence of *Apis cerand indica Fab.* in mustard ecosystem revealed significant difference among the treatments. Higher population of the bees was recorded in neem extract (0.2 and 0.035%) and cartap hydrochloride (0.04 and 0.08%). Malathion (0.025 and 0.05%), dimethoate (0.015 and 0.03%), Imidacloprid (0.025%), acephate (0.025%) and ethofenprox (0.002%) ranked in moderate group of toxicity registering moderate population of bees. Low population of bees was recorded in acephate (0.05%), imidacloprid (0.05%), ethofenprox (0.004%) and cypermethrin (0.001 and 0.002%).

Key words : Apis cerana indica, Insecticides, Field evalution.

Introduction

Insecticides used for the control of insect-pests are hazardous to the bees. When these insecticides are sprayed on blooming crops, they result in mortality of honey bees that visit the bloom. This practise results in poor pollination and also reduces the yield of honey considerably. Knowledge of relative safety of insecticides during flowering and young fruit stage is essential to obtain maximum benefit from bee pollination. The present study has been aimed to find out the susceptibility of *Apis cerana indica* Fab. to some commonly and recently used insecticides.

Materials and Methods

The experiment was conducted for two consecutive *rabi* seasons during 1999-2000 and 2000-2001 at Agronomy Farm of S.K.N. College of Agriculture in randomized block design with four replications. The seeds of variety Pusa bold were sown in the plots measuring 4×3m having row to row and plant to plant distance of 0.03m and 0.10m, respectively. All recommended agronomical practices were followed from time to time as per Package and Practices Booklet of the region. Nine insecticides each with two concentrations were sprayed twice on the crop with Aspee Foot Sprayer using 833 litres of spray per hectare at an interval of 15 days starting from 21st January and 22nd January in 2000 and 2001, respectively (Table-1). Population of foraging honey bees was recorded during the peak foraging time (between 12 Noon to 1PM) for 5minutes on 10 randomly selected and tagged plants per plot one day before and 1,3,7,10 and 15 days after each sprying. The data thus obtained were pooled together and transformed into $\sqrt{x + 0.5}$ values and subjected to analyses of variance.

Results and Discussion

The results presented in Table-1 indicated that population of *A.c. indica* was significantly different among the treatments at all the time intervals and the insecticides lowered its population significantly in comparison to untreated control. The treatment of 0.2 per cent neem extract was found least toxic registering maximum population followed by neem extract (0.4%), endosulfan (0.02 and 0.035%), and cartap hydrochloride (0.04 and 0.08%). The present results are in agreement with that of Sontakke and Dash (1996) who reported the number of honey bee visits were normal after treatment with neem products. These investigations also corroborate with those of Singh (1968), Kapil and Lamba (1974), Mishra and Verma (1982), Deshmukh (1991) and Singh *et al.* (1997) who reported endosulfan (0.02 and 0.07%) as safer

Table 1. Effect of insecticides on the visit of *Apis cerana indica* Fab. in mustard

S.No.	Treatments		Pre-treatment population	Mean* number of bees / 10 plants / 5 minutes days after treatment									
				1		3		7		10		15	
1.	Endosulfan 35 Ec	0.02	37.50	22.25	(4.76)	24.25	(4.96)	28.50	(5.38)	31.25	(5.63)	32.50	(5.74)
2.	Endosulfan 35 Ec	0.035	38.75	19.50	(4.48)	22.50	(4.79)	27.25	(5.19)	29.50	(5.47)	30.25	(5.54)
3.	Malathion 50 Ec	0.025	36.25	16.50	(4.12)	19.00	(4.41)	20.00	(4.52)	22.25	(4.76)	24.25	(4.97)
4.	Malathion 50 Ec	0.05	35.50	16.50	(4.12)	18.00	(4.28)	20.50	(4.57)	22.00	(4.73)	23.00	(4.84)
5.	Dimethoate 30 Ec	0.015	37.75	14.20	(38.86)	18.00	(4.28)	19.00	(4.40)	20.25	(4.55)	21.00	(4.63)
6.	Dimethoate 30 Ec	0.03	36.50	13.50	(3.74)	13.75	(3.77)	15.25	(3.96)	17.25	(4.21)	18.25	(4.33)
7.	Ethofenprox 10 Ec	0.002	36.75	11.25	(3.41)	11.50	(3.45)	13.25	(3.76)	15.50	(3.99)	16.50	(4.12)
8.	Ethofenprox 10 Ec	0.004	35.75	11.50	(3.45)	12.00	(3.53)	12.75	(3.62)	14.75	(3.89)	14.75	(3.89)
9.	Cartap hydrochloride	0.04	37.00	23.25	(4.86)	25.50	(5.09)	27.00	(5.24)	28.50	(5.38)	29.00	(5.43)
10.	Cartap hydrochloride	0.08	38.25	22.25	(4.82)	24.25	(4.97)	25.50	(5.09)	27.25	(5.26)	27.50	(5.29)
11.	Cypermethrin 10 Ec	0.001	35.75	12.00	(3.52)	12.00	(3.52)	14.00	(3.79)	15.25	(3.96)	15.50	(3.99)
12.	Cypermethrin 10 Ec	0.002	37.25	12.00	(3.52)	13.25	(3.70)	13.25	(3.69)	15.00	(3.93)	15.00	(3.92)
13.	Imidacloprid 17.8 SL	0.025	36.50	13.00	(3.67)	13.50	(3.73)	15.00	(3.93)	16.00	(4.05)	15.50	(4.05)
14.	Imidacloprid 17.8 SL	0.05	35.75	12.00	(3.52)	12.25	(3.56)	13.50	(3.73)	14.50	(3.87)	15.00	(3.92)
15.	Neem extract	0.2	37.25	32.25	(5.72)	33.75	(5.85)	35.50	(5.99)	37.00	(6.12)	38.00	(6.19)
16.	Neem extract	0.4	36.75	29.25	(5.39)	31.25	(5.63)	33.50	(5.83)	34.25	(5.89)	35.75	(6.02)
17.	Acephate 75 SP	0.025	37.00	12.50	(3.59)	13.00	(3.67)	22.50	(3.93)	16.25	(4.08)	16.50	(4.12)
18.	Acephate 75 SP	0.05	36.25	9.25	(3.10)	10.25	(3.26)	12.00	(3.53)	12.75	(3.63)	13.50	(3.73)
19.	Control		35.75	39.25	(6.30)	40.25	(6.38)	41.75	(6.52)	43.00	(6.59)	43.75	(6.65)
	SEm		-		0.03		0.01		0.02		0.02		0.02
	CD at 5%		-		0.07		0.02		0.07		0.04		0.04

* Average of four replications based on 2 years data.
Figures in parentheses are $\sqrt{x} + 0.5$ transformed value.

and less toxic to honey bees. The work on toxicity of cartap hydrpchloride to honey bees is not avalilable, hence, it could not be compared and discussed.

The treatments of malathion (0.25 and 0.05%), dimethoate (0.015 and 0.03%), imidacloprid (0.025%), acephate (0.025%) and ethofenprox (0.002%) ranked in the group of moderate toxicity to *A.c. indica* in the present experiment. The present result regarding toxicity of malathion to *A.c. indica* do not corroborate with those of Kapil and Lamba (1974) and Deshmukh (1991) who reported malathion as highly toxic to honey bees resulting in minimum visits. Contrary to the present investigation, Thakur and Kashyap (1989) reported malathion at 0.05 per cent least toxic registering maximum visits of the bees. The treatment of dimethoate existed in moderate toxic group in present investigation, do not get support from the observation of Singh *et al.* (1989), Thakur and Kashyap (1989) and Rana and Goyal (1991) who reported this insecticide as highly toxic to bees registering minimum population, whereas, Hammeed *et al.* (1973) found dimethoate as relatively safer to bees.

The treatment of acephate (0.05%) was found most toxic followed by imidacloprid (0.05%), ethofenprox (0.004%) and cypermethrin (0.001 and 0.002%) resulting in minimum visits and low population of the bees. The present results corroborate with those of Prakash and Kumaraswami (1984) and Singh *et al.* (1987) who reported cypermethrin as most toxic to honey bees. The work on the toxicity of acephate, imidacloprid and ethofenprox is not available, therefore, the present results could not be compared and discussed.

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