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ADVERSE EFFECT OF INSECTICIDES AND BIOPESTICIDE ON LADYBIRD BEETLE, *COCCINELLA SEPTEMPUNCTATA* LINN.

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ABSTRACT

The toxic effect of insecticides tested against *Coccinella septempunctata* Linn. revealed that l cyhalothrin (0.008%), profenophos (0.05%) and dimethoate (0.03%) were proved as highly toxic. The insecticides, *viz.*, acephate (0.037%), thiamethoxam (0.025%), imidacloprid (0.005%), diflubenzuron (0.05%) and novaluron (0.02%) were found moderately toxic, while NSKE (5.0%) and *M. anisopilae* (2×10^7 spores l^{-1}) were proved least toxic.

Key words: Insecticides, biopesticide, *Coccinella septempunctata* Linn., dimethoate, imidacloprid, thiamethoxam, acephate

INTRODUCTION

Clusterbean or Guar bean, *Cyamopsis tetragonoloba* (Linn.) Taub. is one of the major legume crops grown in arid and semi arid regions of the country. The crop possesses high value due to green pods and seeds, the former are used as vegetable as it is rich in protein content and the latter as source of gum. The insect pests are major constraints in the productivity of cluster bean. Among them; leaf hopper, *Empoasca motti* Pruthi; whitefly, *Bemisia tabaci* (Genn.), *Acaudaleyrodes rachipora* (Singh); aphid, *Aphis craccivora* Koch; pod borer, *Helicoverpa armigera* (Hub.), leaf perforator, *Dichomeris* inthes Meyr, *Maruca testulalis* Geyer; *Protaetia terrosa* G. & P. are important infesting cluster bean (Muralidharan *et al.*, 1999; Reddy and Rao, 2001; Arora and Kashyap, 2002; Khan *et al.*, 2002 and Singh, 2004). The chemical control has been suggested by some researchers to combat the insect pests of clusterbean (Singh, 2002) but these molecules of insecticides may prove detrimental to the natural biotic fauna present in the clusterbean ecosystem and need evaluation on scientific lines. One of the important natural enemies of sucking insect pests of clusterbean is the ladybird beetle, *Coccinella septempunctata* Linn. Therefore, an effort has been made to find out the adverse effect of some newer and commonly used insecticidal molecules to *C. septempunctata* predating upon sucking insect pests of clusterbean.

MATERIALS AND METHODS

The experiment was laid out in simple randomized block design with ten treatments each replicated thrice. The seeds of cluster bean (variety, RGC–936) were sown in the field on 10th July in *Kharif*, 2007 in the plots measuring 3.0×2.7 m^2 keeping 30 cm and 10 cm row to row and plant to plant distance, respectively.

There were eleven treatments including control (untreated), *viz.*, imidacloprid 17.8 EC 0.005 per cent, thiamethoxam 25 WG 0.025 per cent, diflubenzuron 25 EC 0.05 per cent, novaluron 10 EC 0.02 per cent, acephate 75 SP 0.037 per cent, l cyhalothrin 5 EC 0.008 per cent, profenophos 50 EC 0.05 per cent, *Metarrhizium anisopliae* @ 2×10^7 spores l^{-1}, NSKE (Neem seed kernel extract) 0.5 per cent and dimethoate 30 EC 0.03 per cent (standard check). The insecticides were applied when sufficient population of jassid, whitefly and aphid built up on the plants. The first spray was given on 14th August by using a foot sprayer and second application was made three weeks after first application. The re–build up of population was observed at this stage. The spray solution used for spraying the crop was 600 l ha^{-1}. The adverse effect of insecticides was assessed by recording the population of major natural enemy of the insect pests, *viz.*, lady bird beetle, *Coccinella septempunctata* (Linn.) in each treated plot. The population was recorded on ten randomly selected plants in each plot.

The statistical analysis (analysis of variance) of the data was carried out by transforming the percentage reduction data into angular transformation values (Gomez and Gomez, 1976).

RESULTS AND DISCUSSION

The effect of insecticides and bioagent on the population of major natural enemy of sucking pests, *viz.*, lady bird beetle, *Coccinella septempunctata* Linn. was

Table 1. Effect of insecticides and bioagent on the population of *Coccinella septempunctata* (Linn.)

S. No.	Treatments	Conc. (%) or dosage	*C. septempunctata* population after								
				First appliction				Second application			
			Pre–treatment	One day	Three days	Seven days	Fifteen days	One day	Three days	Seven days	Fifteen days
1.	Imidaclorpid	0.005	10.00 (3.24)	8.00 (2.92)	6.00 (2.55)	8.33 (2.97)	9.67 (3.19)	7.67 (2.86)	5.00 (2.35)	8.00 (2.92)	8.33 (2.97)
2.	Thiamethoxam	0.025	9.67 (3.19)	7.67 (2.86)	5.00 (2.35)	7.67 (2.86)	9.00 (3.08)	8.67 (3.03)	4.67 (2.27)	8.00 (2.92)	8.33 (2.97)
3.	Diflubenzuron	0.05	9.33 (3.14)	8.33 (2.97)	5.67 (2.48)	8.00 (2.92)	9.67 (3.19)	8.00 (2.92)	5.67 (2.48)	8.33 (2.97)	8.67 (3.03)
4.	Novaluron	0.02	9.33 (3.14)	8.33 (2.97)	6.00 (2.55)	8.33 (2.97)	9.33 (3.14)	8.00 (2.92)	5.33 (2.41)	8.33 (2.97)	8.00 (2.92)
5.	Acephate	0.037	9.00 (3.08)	7.67 (2.86)	5.00 (2.35)	7.33 (2.80)	9.67 (3.19)	8.33 (2.97)	5.67 (2.48)	8.00 (2.92)	8.67 (3.03)
6.	l cyhalothrin	0.008	8.67 (3.03)	6.67 (2.68)	3.67 (2.04)	5.67 (2.48)	8.67 (3.03)	8.33 (2.97)	4.67 (2.27)	7.00 (2.74)	7.33 (2.80)
7.	Profenophos	0.05	9.00 (3.08)	7.00 (2.74)	4.00 (2.12)	6.33 (2.61)	9.00 (3.08)	8.00 (2.92)	5.00 (2.35)	7.67 (2.86)	8.00 (2.92)
8.	Dimethoate	0.03	9.33 (3.14)	8.33 (2.97)	5.33 (2.41)	8.33 (2.97)	9.00 (3.08)	8.67 (3.03)	4.33 (2.20)	8.00 (2.92)	8.67 (3.03)
9.	NSKE	5.0	10.67 (3.34)	10.00 (3.24)	7.33 (2.80)	9.67 (3.19)	10.00 (3.24)	10.00 (3.24)	7.67 (2.86)	9.33 (3.14)	9.00 (3.08)
10.	*M. anisopliae*	2×10^7 spores l^{-1}	10.00 (3.24)	9.67 (3.19)	8.33 (2.97)	6.67 (2.68)	8.33 (2.97)	8.33 (2.97)	7.33 (2.80)	7.67 (2.86)	8.00 (2.92)
11.	Untreated	–	9.00 (3.08)	9.33 (3.14)	9.00 (3.08)	9.33 (3.14)	10.67 (3.34)	10.33 (3.29)	9.67 (3.19)	9.33 (3.14)	9.67 (3.19)
S. Em. ±			0.09	0.05	0.04	0.06	0.07	0.06	0.05	0.05	0.07
CD (P = 0.05)			NS	0.15	0.12	0.17	0.21	0.18	0.15	0.15	0.21

assessed on the basis of reduction in its population at different intervals after application of insecticides and bioagent (Table 1).

First application

The pre–treatment population of *C. septempunctata* was ranged from 8.67 to 10.00 per ten plants which differed non–significantly in different plots. One day after application of insecticides, the population of this predator differed non–significantly in NSKE and *M. anisopliae* treated plots over untreated check. The maximum reduction in population was recorded in cyhalothrin and profenophos, these treatments were at par each other. The other treatments ranked in middle order with respect to the reduction of *C. septempunctata* population.

After three days of application, the maximum population was recorded in *M. anisopliae* which was found at par with untreated check. The next less toxic insecticides were NSKE and novaluron which differed significantly with each other. The minimum population was recorded in l cyhalothrin and profenophos which could be regarded as the most toxic insecticides. More or less a similar trend of toxicity caused by different insecticides was noticed after seven days of application of insecticides, however, *M. anisopliae* was at par with l cyhalothrin, profenophos and NSKE was found at par with untreated check.

After fifteen days of application, the population of *C. septempunctata* was increased in numbers. The population in NSKE, diflubenzuron, acephate, imidacloprid and novaluron was found at par with untreated check. The minimum population was observed in *M. anisopliae*, cyhalothrin, thiamethoxam, profenophos and dimethoate.

Second application

Statistically, a little difference in toxicity has been observed after first day of application of insecticides and bioagent. NSKE and *M. anisopliae* harboured maximum population of *C. septempunctata* which was found at par with untreated and differed significantly over rest of the treatments. The rest of the insecticides were in a non significant group to reveal toxicity to *C. septempunctata*. After three days of application, *M. anisopliae* and NSKE showed less toxicity which differed significantly over untreated check. The minimum population was recorded in dimethoate, l cyhalothrin and profenophos which were at par each other, the latter two treatments also found at par with novaluron. Rest of the treatments ranked in middle order. After seven days, the NSKE with maximum population was found at par with untreated and significantly superior over rest of treatments. Minimum population was recorded in l cyhalothrin, *M. anisopliae* and dimethoate which were found at par each other. Rest of the treatments ranked in middle order. After fifteen days, the NSKE, *M. anisopliae*, novaluron, diflubenzuron and acephate were found to reveal maximum population of *C. septempunctata*, which were non–significant with each other. The NSKE was found at par with untreated check. The remaining treatments forming a non significant group revealed minimum population of *C. septempunctata* in this observation.

The overall effect of insecticides in both the application was found to be more or less similar. On the basis of population of *C. septempunctata*, NSKE and *M. anisopliae* was found least toxic, whereas, the l cyhalothrin, profenophos, dimethoate were highly toxic. The rest of the insecticides, *viz.*, thiamethoxoam, acephate imidacloprid, diflubenzuron and novaluron were found moderately toxic. These results corroborate with that of Rana and Srivastava (2001) who reported that acephate was moderately toxic to *C. septempunctata.* The moderate toxicity of dimethoate (0.03%) and endosulfan (0.07%) were also reported by Rathod and Bapodra (2002). Further, the imidacloprid was observed safer insecticide by Srinivasa Babu and Sharma (2003). Further, the imidacloprid was observed safer insecticide by Srinivasa Babu and Sharma (2003). The treatment of NSKE (5.0%) and *M. anisopliae* (2×10^7 spores l^{-1}) were observed least toxic to *C. septempunctata.* These findings are in agreement with that of Rathod and Bapodra (2002) who reported that neem based products were least toxic.

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