International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(3): 894-896

Received: 10-03-2017
Accepted: 11-04-2017

Purushotam Sharma
Department of Agricultural Entomology, S.K.N. College of Agriculture Jobner, Jaipur, Rajasthan, India

Dr. KC Kumawat
Department of Agricultural Entomology, S.K.N. College of Agriculture Jobner, Jaipur, Rajasthan, India

Dr. SK Khinchi
Department of Agricultural Entomology, S.K.N. College of Agriculture Jobner, Jaipur, Rajasthan, India

Virendra Kumar
Department of Agricultural Entomology, S.K.N. College of Agriculture Jobner, Jaipur, Rajasthan, India

Baddhri Prasad
Department of Agricultural Entomology, S.K.N. College of Agriculture Jobner, Jaipur, Rajasthan, India

Correspondence
Purushotam Sharma
Department of Agricultural Entomology, S.K.N. College of Agriculture Jobner, Jaipur, Rajasthan, India

Toxic effect of different insecticides on coccinellid beetle, *Coccinella septempunctata* in cabbage ecosystem

Purushotam Sharma, Dr. KC Kumawat, Dr. SK Khinchi, Virendra Kumar and Baddhri Prasad

Abstract
The data on toxic effect of insecticides on the population of *C. septempunctata* (linn.) in the applications at different intervals based on population revealed that acephate (0.05) and fipronil (0.01) were found highly toxic to *C. septempunctata.* The next toxic treatments were indoxacarb (0.01), chlorantraniliprole (0.005), emamectin benzoate (0.005) and flubendiamide (0.01) which ranked in middle order of toxicity. The spinosad (0.01) and pyridalyl (0.015) were proved to be the least toxic.

Keywords: Coccinellid, toxic effect, insecticides cabbage

Introduction

Cabbage, Brassica oleracea var. capitata L. is one of the important cruciferous vegetable crops grown in India. It is grown more or less in all the states and is used as salad**,** boiled vegetable, in curries, pickling as well as dehydrated vegetable. The total area under cultivation of cabbage in India is 372 thousand hectares with an annual production to the tune of 8534 thousand tonnes with productivity of 18.3 metric tonnes [3]. The total area under cultivation of cabbage in Rajasthan is 346 hectares with an annual production to the tune of 7588 tonnes. [1]. China is major cabbage producing country with 47 per cent of world followed by India with 12 per cent of world production [2].

To evolve effective management strategy it is pertinent to study the abiotic factors of environment in relation to pest population. The study was aimed in order to find out the correlation of diamondback moth population and natural enemies in cabbage ecosystem with the abiotic parameters to know the hospitable conditions for insect development. Insecticides are used widely to control the insect pests of vegetables because of th***e*** easy adoption, effectiveness and immediate control. Indiscriminate and irrational use of chemical insecticides at higher dosages results in resurgence, resistance and residual problems. The diamondback moth is a first crop pest reported to be resistant to DDT and now to almost insecticides including biopesticides. The judicious use of chemicals with novel mode of action needs to be implemented to manage this insect pest. There are many insecticides which have different mode of action than the conventional ones. The diamide insecticides such as chlorantraniliprole and flubendiamide a new class of insecticides that selectively target insect ryanodine receptor (RyR), a distinct class of homo-tetrameric calcium release channel which play pivotal role in calcium homeostasis in numerous cell types. Similarly the pyrroles, and phenyl pyrazole insecticides block the GABA and glutamate gated chloride channels. These novel insecticides in conjuction with other IPM approaches may play a pivotal role in devising effective management strategy against diamondback moth.

A perusal of literature from all sources of information revealed that a meagre work has been done on seasonal the adverse effect on natural enemies in cabbage ecosystem in Rajasthan.

Experimental

Materials and methods

The experiment was laid out in a simple randomized block design (RBD) with ten treatments (insecticides) including control, each replicated thrice. The plot size was 2.25 x 2.25 m^2 with row to row and plant to plant spacing of 45 x 45 cm, respectively.

The first spray was done on 3 December 2015, by using a knapsack sprayer. Second insecticidal application was made three weeks after first spray and third insecticidal application was made three weeks after second spray. The observations on the natural enemies was recorded one day before application of insecticides (pre-treatment population) and one, three, seven and fifteen days after application of treatments (post-treatment application). The second and third spray was done after rebuild of population and again the observation were recorded at one day before and one, three, seven, and fifteen days after the application of treatments. The adverse effect of insecticides was thus assessed by recording the population of ladybird beetle in each treated plot. The data obtained one day before and one, three, seven and fifteen days after spray were transformed into $\sqrt{X + 0.5}$ values and were subjected to analysis of variance.

Table 1: Details of insecticides used

S. No.	Insecticides	Formulations	Trade Name	Conc. (%)
1.	Spinosad	45 SC	Tracer	0.01
2.	Indoxacarb	14.5 SC	Avaunt	0.01
3.	Chlorantraniliprole	18.5 SC	Coragen	0.005
4.	Emamectin benzoate	5 SG	Proclaim	0.005
5.	Chlorfenapyr	10 SC	Lepido	0.01
6.	Fipronil	5 SC	Regent	0.01
7.	Flubendiamide	39.35 SC	Fame	0.01
8.	Acephate	75 SP	Asataf	0.05
9.	Pyridalyl	10 EC	Pleo	0.015
10.	Control (Plain water)			

Results and discussion

In the present investigation the toxicity of insecticides was assessed on the basis of reduction of natural enemy population. Since, the lady bird beetle, *Coccinella septempunctata* L. has been recorded as the major natural enemy in cabbage ecosystem, the observations on adverse effect of insecticides was recorded on the same. The data on toxic effect of insecticides on the population of *C. septempunctata* revealed that all the insecticides were found more or less toxic (Table 2). The treatment of acephate (0.05%) and fipronil (0.01%) were observed highly toxic which were supported by the findings of Kikuchi *et al.* (2013) [7] who reported that fipronil was harmful to natural enemies of cabbage. The treatment of chloratraniliprole (0.005), indoxacarb (0.01), flubendiamide (0.01), chlorfenapyr (0.01) and emamectin benzoate (0.005) were observed moderately toxic against the natural enemies. These results were corroborated with the findings of [5, 7] who reported that these insecticides were moderately toxic to natural enemies. The treatment of spinosad (0.01) and pyridalyl (0.015) were observed least toxic to natural enemies. These findings are in agreement with that of [5], who reported that indoxacarb and pyridalyl as relatively safer for natural enemies.

Table 2: Effect of insecticides on the population of Coccinella septempunctata L. (per ten plants) on cabbage crop during Rabi, 2015-16

S. No.	Treatments	Conc.	First spray					Second spray				Third spray				Mean
			Pre-treat	One day	Three day	Seven day	Fifteen day	One day	Three day	seven day	Fifteen day	One day	Three day	seven day	Fifteen day	
1.	Spinosad	0.01	12.33	10.00	9.33	10.00	13.33	9.00	8.33	9.67	13.67	9.33	9.67	10.33	13.33	10.64
			(3.58)	(3.24)	(3.13)	(3.24)	(3.72)	(3.08)	(2.97)	(3.19)	(3.76)	(3.13)	(3.19)	(3.29)	(3.72)	
2.	Indoxacarb	0.01	12.67	11.00	11.33	12.67	13.67	10.33	11.00	12.67	14.33	11.67	12.00	13.33	13.67	12.33
			(3.62)	(3.39)	(3.44)	(3.62)	(3.76)	(3.27)	(3.39)	(3.63)	(3.85)	(3.48)	(3.53)	(3.72)	(3.76)	
3.	Chlorantra	0.005	12.33	10.33	9.33	9.67	13.33	9.33	8.67	9.33	13.67	9.67	9.33	9.67	13.67	10.64
	Niliprole		(3.58)	(3.29)	(3.13)	(3.19)	(3.72)	(3.13)	(3.02)	(3.13)	(3.76)	(3.19)	(3.13)	(3.19)	(3.76)	
4.	Emamectin benzoate	0.005	12.33 (3.58)	10.67 (3.34)	9.33 (3.13)	10.00 (3.24)	13.33 (3.72)	10.33 (3.27)	9.00 (3.08)	9.67 (3.19)	13.33 (3.72)	10.33 (3.29)	10.67 (3.34)	11.00 (3.39)	13.33 (3.72)	11
5.	Chlorfenapyr	0.01	12.00	10.67	9.33	9.67	13.67	9.67	8.67	9.33	13.67	9.67	10.00	10.33	13.33	10.76
			(3.53)	(3.34)	(3.13)	(3.19)	(3.76)	(3.19)	(3.02)	(3.13)	(3.76)	(3.19)	(3.24)	(3.29)	(3.72)	
6.	Fipronil	0.01	12.00	5.67	6.00	7.33	13.33	6.67	5.33	7.00	13.33	6.33	6.00	7.33	13.33	8.43
			(3.53)	(2.48)	(2.55)	(2.80)	(3.72)	(2.68)	(2.41)	(2.74)	(3.72)	(2.61)	(2.55)	(2.80)	(3.72)	
7.	Flubendiamide	0.01	12.33	10.67	9.67	10.33	13.00	9.67	9.33	10.33	13.67	9.00	9.33	10.00	13.67	10.84
			(3.58)	(3.34)	(3.19)	(3.29)	(3.67)	(3.19)	(3.11)	(3.29)	(3.76)	(3.08)	(3.11)	(3.24)	(3.76)	
8.	Acephate	0.05	11.67	5.33	6.67	7.00	12.33	6.33	5.67	6.67	13.33	6.67	5.67	6.67	13.00	8.23
			(3.49)	(2.41)	(2.68)	(2.74)	(3.58)	(2.61)	(2.48)	(2.68)	(3.72)	(2.68)	(2.48)	(2.68)	(3.67)	
9.	Pyridalyl	0.015	12.67	11.00	11.00	13.00	13.67	10.33	11.33	13.33	14.33	11.00	12.67	13.33	13.33	12.38
			(3.63)	(3.39)	(3.39)	(3.67)	(3.76)	(3.27)	(3.41)	(3.72)	(3.85)	(3.39)	(3.63)	(3.72)	(3.72)	
10	Control	-	12.67 (3.63)	12.33 (3.58)	12.67 (3.62)	13.00 (3.67)	13.67 (3.76)	11.67 (3.48)	12.67 (3.62)	13.67 (3.76)	14.33 (3.85)	12.00 (3.53)	12.67 (3.63)	13.33 (3.72)	13.67 (3.76)	12.95
	S.Em±		0.05	0.05	0.04	0.04	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.04	0.05	
	C.D.(P= 0.05)		NS	0.16	0.14	0.12	0.15	0.16	0.16	0.15	0.14	0.16	0.14	0.13	0.16	

Data are presented are mean of three replications.

Figures in the parentheses are $\sqrt{X + 0.5}$ values

Acknowledgements

I am very grateful to our group members and Advisor for their great support to conducted experimental trial.

References

1. Anonymous. Directorate of Horticulture, Government of Rajasthan, Jaipur, Rajasthan, 2010.
2. Anonymous. Food and agriculture organization. FAO. Org, 2012.
3. Anonymous. National Horticulture Board. www.nhb.com, 2013.
4. Bliss CI. Angles corresponding to percentage. *Plant Protection*, 1937, 12, Leningrad.
5. Chakraborty G, Somchoudhary AK. Effect of pyridalyl against *Plutella xylostella* (L.) on cabbage and natural enemies. Journal of Crop and Weed. 2011; 7(1):142-145.
6. Gomez KA, Gomez AA. Problem data: Statistical Procedures for Agricultural Research (IIygb nd). John wiley and sons, New York, 1976, 272-315.
7. Kikuchi Y, Yara K, Krikrathok C, Shimoda T. Effect of insecticides on the survival of the diamondback moth, *Plutella xylostella* (L.) and the native parasitoid *Cotesia vestalis* (Halliday). Annual report of society of Plant Protection of North Japan. 2013; 64:182-185.