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Effect of different doses of newer insecticides against natural enemies of insect pest on okra

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Abstract
An experiment was conducted at Indira Gandhi Krishi Vishwavidyalaya, Raipur to study the impact of insecticides on the activity of coccinellids and spiders, a potential predator of sucking pests during kharif season to study the effect of insecticides (used to control the major sucking pest, leafhopper, white fly, aphid and thrips) on natural enemies of okra (Coccinellid and spider). Six chemical treatments *viz.*, BAS 450 01 I 300SC@6.5g.a.i./ha, BAS 450 01 I 300 SC@12.5g.a.i./ha, BAS 450 01 I 300 SC@18.5g.a.i./ha, Chlorantraniliprole 18.5% SC@25g.a.i./ha and Cypermethrin 10% EC@70g.a.i./ha along with a untreated control were field evaluated. Among the chemical treatments BAS 450 01 I 300 SC@12.5g.a.i./ha and BAS 450 01 I 300 SC@18.5g.a.i./ha found to be safer insecticides to natural enemies. While the molecules namely, Cypermethrin 10% EC@70g.a.i./ha were moderately safer to natural enemies while Chlorantraniliprole 18.5% SC@25g.a.i./ha was highly toxic which need to be avoided its usage in okra ecosystem.

Keywords: coccinellid, spider and okra

Introduction
Amongst the various vegetable grown Okra *Abelmoschus esculentus* L. (Moench) belongs to family Malvaceae, is an economically important vegetable crop grown in tropical and sub-tropical parts of the world. This crop is suitable for cultivation as a kitchen garden crop as well as on large high-tech commercial farms. It is grown commercially in India, Turkey, Iran, Western Africa, Yugoslavia, Bangladesh, Afghanistan, Pakistan, Burma, Japan, Malaysia, Brazil, Ghana, Ethiopia and the Southern United States. Vegetables constitute an important food item, supplying vitamins, carbohydrates and minerals needed for a balanced diet. (Randhawa, 1974; Masood Khan *et al.*, 2001) [2, 1].

There are several constraints in the cultivation of okra. Many of the pests occurring on cotton are also found on okra crop. As high as, 72 species of insects have been recorded on okra (Srinivas Rao and Rajendran, 2002) [5], of which, the sucking pests comprising of leafhopper, *Amrasca biguttula* (Ishida), whitefly, *Bemisia tabaci* (Gennadius) and mite, *Tetranychus urticae* (Boisduval) cause significant damage to the crop. Leafhopper, a polyphagous, pest has been a serious pest on okra causing heavy loss during these years. High population of leafhopper significantly sucks cell sap usually from ventral surface of the leaves and inject toxic saliva into plant tissues, turning the leaves to yellowish and curl upward (Singh *et al.*, 2008) [3]. Whitefly (*B. tabaci*) nymphs and adults remove significant amount of cell sap from the leaves to reduce the plant vigour. They are responsible for transmitting yellow vein mosaic virus also. Red spider mites scratch the leaf tissues and lap the oozing out sap. Heavy webbing caused by the mite make it difficult to control.

The crop sustains different insect fauna which serve to attract numerous predators (Bilal and Satti, 2012) [4]. To overcome these problems, identification of new molecules is the need of the hour so as to fit them in IPM practices. Natural enemies co-exist with the pests in a crop ecosystem. Heavy use of insecticides with high toxicity can control the pest effectively but it may have adverse effect on natural enemies' population. Hence, the effects of different insecticides on population of natural enemies were studied and results of present findings were discussed here under.

Materials and Methods
The experimental site was conducted at Horticulture farm, Department of Horticulture, College of Agriculture, Indira Gandhi Krishi Vishwavidyalaya (IGKV) Raipur, Chhattisgarh. During 2016-17 *Kharif* season to study the effect of insecticides (used to control the major sucking pest) on the population of natural enemies of okra (coccinellid and Spider). Super green variety of okra seeds were sown in the field with a spacing of 60×15 cm between rows and plants, respectively with a plot size of 5mx4m. = 20 m2 in a Randomized Block Design (RBD) consisting of six treatments and replicated four times. The crops were raised following all recommended agronomic practices. Pretreatment population was recorded at 24 hours before and post insecticide treatment after 1, 3, 5, 7 and 10 days of spray for natural enemies on randomly selected 5 plant/plot.

Table 1: The details of insecticidal application on each treatment

Treatment	Name of insecticides	Dosage *a.i.*(g)
T1	BAS 450 01 I 300 SC	6.5
T2	BAS 450 01 I 300 SC	12.5
T3	BAS 450 01 I 300 SC	18.5
T4	Chlorantraniliprole 18.5% SC	25
T5	Cypermethrin 10% EC	70
T6	Untreated control	-

Results and Discussion

Effect of different treatments on the population of coccinellid adults and grubs in okra

The observations on coccinellids were recorded after first spray revealed that, a non-significant difference among various treatments indicating that the predator was spared in all the treatments. The overall mean population of coccinellids after first spray each spray indicated that untreated control (0.27 cocccinellids/plant) and BAS 450 01 I 300 SC @12.5g.a.i./ha and BAS 450 01 I 300 SC @18.5g.a.i./ha (0.24, and 0.21 cocccinellids/plant) recorded relatively higher population of coccinellids. Chlorantraniliprole 18.5% SC@ 25g.a.i./ ha and Cypermethrin 10%EC@70g.a.i./has pared lower predator Population compared to other treatments.

The occurrence of coccinellids after second spray in different treatments followed more or less similar pattern as that of first spray. Based on the overall mean population of coccinellids after second spray untreated control (0.42 cocccinellids/plant), (T3 and T2) recorded higher coccinellid populations followed by BAS 450 01 I 300 SC @18.5g.a.i./ha. On the contrary, Chlorantraniliprole 18.5% SC (T4) @ 25g.a.i./ha spared minimum coccinellid population.

Effect of different treatments on the population of Spider in okra

The observations on the occurrence of spiders after first spray revealed that there was non-significant difference between the treatments. The overall mean population of spiders after the spray showed that the untreated control recorded higher population (0.37 spider/plant) the (T1,T4,T2 and T3) also spared good number of spider population. However, Cypermethrin 10% EC@70g.a.i./ha recorded relatively lower number of spiders. The observations on the occurrence of spiders after second spraying revealed non-significant difference among the various treatments. Although BAS 450 01 I 300 SC @6.5g.a.i./ha (0.22 spider/ plant) and Chlorantraniliprole 18.5% SC@ 25g.a.i./ ha, (0.23 spider/plant) recorded lower population compared to other treatments in second sprays. In general, untreated control T6 (0.44 spiders/plant), T3 (0.28 spiders/plant) and T2 (0.25 spiders/plant) treatments registered higher population as compared to other treatments.

Influence of new molecules on the occurrence of Coccinellids population per plant in okra

Table 2

Treatment	Insecticide	Dose	First spray							Second Spray						
			1 DBS	1 DAS	3 DAS	5 DAS	7 DAS	10 DAS	Mean	1 DBS	1 DAS	3 DAS	5 DAS	7 DAS	10 DAS	Mean
T_1	BAS 450 01 I 300 SC	6.5 g a.i./ha	0.32 (1.15)	0.17 (1.08)	0.05 (1.02)	0.25 (1.11)	0.22 (1.10)	0.25 (1.11)	0.21	0.32 (1.15)	0.15 (1.07)	0.12 (1.05)	0.27 (1.12)	0.17 (1.08)	0.25 (1.11)	0.21
T_2	BAS 450 01 I 300 SC	12.5 g a.i./ha	0.25 (1.11)	0.15 (1.07)	0.12 (1.05)	0.32 (1.15)	0.27 (1.12)	0.32 (1.15)	0.24	0.35 (1.16)	0.22 (1.10)	0.17 (1.08)	0.25 (1.11)	0.22 (1.10)	0.25 (1.11)	0.24
T_3	BAS 450 01 I 300 SC	18.5 g a.i./ha	0.22 (1.10)	0.05 (1.02)	0.15 (1.07)	0.27 (1.12)	0.27 (1.12)	0.32 (1.15)	0.21	0.37 (1.17)	0.22 (1.10)	0.15 (1.06)	0.27 (1.12)	0.25 (1.11)	0.32 (1.14)	0.26
T_4	Chlorantraniliprole 18.5% SC	25 g a.i./ha	0.25 (1.11)	0.15 (1.07)	0.12 (1.05)	0.22 (1.10)	0.25 (1.11)	0.17 (1.08)	0.19	0.35 (1.16)	0.12 (1.05)	0.12 (1.06)	0.15 (1.06)	0.22 (1.10)	0.32 (1.14)	0.21
T_5	Cypermethrin 10% EC	70 g a.i./ha	0.15 (1.07)	0.12 (1.05)	0.15 (1.07)	0.17 (1.08)	0.22 (1.10)	0.25 (1.11)	0.18	0.32 (1.15)	0.15 (1.07)	0.12 (1.06)	0.25 (1.11)	0.27 (1.12)	0.25 (1.11)	0.23
T_6	Untreated control	-	0.32 (1.15)	0.25 (1.11)	0.15 (1.07)	0.22 (1.10)	0.32 (1.15)	0.35 (1.16)	0.27	0.37 (1.17)	0.37 (1.16)	0.45 (1.19)	0.47 (1.20)	0.45 (1.20)	0.42 (1.19)	0.42
	Sem CD at 5%		0.02 NS	0.03 NS	0.03 NS	0.03 NS	0.02 NS	0.03 NS	0.02 NS	0.02 NS	0.03 NS	0.04 NS	0.05 NS	0.04 NS	0.04 NS	0.03 NS

* Figure is parenthesis in square root transformed values

Influence of new molecules on the occurrence of Spider population per plant in okra

Table 3

Treatment	Insecticide	Dose	First spray							Second Spray						
			1 DBS	1 DAS	3 DAS	5 DAS	7 DAS	10 DAS	Mean	1 DBS	1 DAS	3 DAS	5 DAS	7 DAS	10 DAS	Mean
T_1	BAS 450 01 I 300 SC	6.5 g a.i./ha	0.35 (1.20)	0.32 (1.15)	0.27 (1.12)	0.37 (1.17)	0.42 (1.19)	0.37 (1.17)	0.35	0.28 (1.12)	0.18 (1.08)	0.15 (1.07)	0.25 (1.11)	0.20 (1.09)	0.28 (1.12)	0.22
T_2	BAS 450 01 I 300 SC	12.5 g a.i./ha	0.37 (1.17)	0.25 (1.11)	0.17 (1.08)	0.32 (1.14)	0.27 (1.12)	0.25 (1.11)	0.27	0.28 (1.12)	0.25 (1.11)	0.25 (1.11)	0.23 (1.10)	0.25 (1.11)	0.25 (1.11)	0.25
T_3	BAS 450 01 I 300 SC	18.5 g a.i./ha	0.32 (1.15)	0.22 (1.10)	0.25 (1.11)	0.35 (1.15)	0.25 (1.11)	0.22 (1.10)	0.27	0.38 (1.17)	0.25 (1.11)	0.23 (1.10)	0.25 (1.11)	0.28 (1.12)	0.28 (1.12)	0.28
T_4	Chlorantraniliprole 18.5% SC	25 g a.i./ha	0.37 (1.17)	0.22 (1.10)	0.27 (1.12)	0.37 (1.16)	0.32 (1.14)	0.27 (1.12)	0.30	0.35 (1.16)	0.18 (1.08)	0.15 (1.07)	0.15 (1.06)	0.25 (1.11)	0.30 (1.13)	0.23
T_5	Cypermethrin 10% EC	70 g a.i./ha	0.22 (1.10)	0.15 (1.07)	0.22 (1.10)	0.35 (1.15)	0.32 (1.14)	0.27 (1.12)	0.26	0.28 (1.12)	0.18 (1.08)	0.23 (1.10)	0.25 (1.11)	0.28 (1.12)	0.25 (1.11)	0.25
T_6	Untreated control	-	0.37 (1.17)	0.37 (1.17)	0.35 (1.16)	0.42 (1.19)	0.37 (1.17)	0.35 (1.16)	0.37	0.38 (1.17)	0.38 (1.16)	0.48 (1.20)	0.50 (1.21)	0.45 (1.20)	0.43 (1.19)	0.44
	Sem CD at 5%		0.03 NS	0.03 NS	0.04 NS	0.05 NS	0.04 NS	0.04 NS	0.03 NS	0.02 NS	0.03 NS	0.05 NS	0.04 NS	0.04 NS	0.04 NS	0.03 NS

* Figure is parenthesis in square root transformed values

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