Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(3): 1177-1179
Received: 01-03-2018
Accepted: 05-04-2018

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Effect of different doses of newer insecticides against sucking pests of okra

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Abstract
Field experiment was conducted to evaluate the efficacy of some new insecticides against sucking insect pest's viz., leafhopper, aphid, Thrips and whitefly in okra. Two sprays of different insecticides viz., BAS 450 01 I 300 SC, Chlorantraniliprole 18.5% SC, Cypermethrin 10% EC, at three different concentrations of BAS 450 01 I 300 SC@ 18.5, 12.5 and 6.5 g.a.i./ha were made at 1,3,5,7 and 10 days interval. All the treatments registered significantly lower population of sucking pests as compared to untreated control. BAS 450 01 I 300 SC@18.5 g.a.i./ha proved the best treatment for the control of the sucking pest, however, treatments viz., BAS 450 01 I 300 SC@ 12.5 g.a.i./h and Chlorantraniliprole 18.5% SC @ 25 g.a.i./ha were also observed to be effective treatments in most of the observations.

Keywords: aphid, leafhopper, whitefly and okra

1. 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) [4, 2].
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, 2003) [6], of which, the sucking pests comprising of leafhopper, *Amrasca biguttula 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) [5]. 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.

2. 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 *Kharif* season, 2016-17.The tested insecticides was first diluted to the desired concentration by using distilled water. Each insecticidal concentration was sprayed through knapsack sprayer after proper dilution of required water quantity. Daily observations of insect pest appearance was observed with respect to the date of sowing of the okra crop.
The observations on population of sucking insect pests (aphid, leafhopper, Thrips, whitefly) were made on three leaves, each selected randomly on 5 plants from top, middle and bottom canopy. The sucking insect pest's population was recorded before as well as 1, 3, 5, 7 and 10 days after each. Observations on whitefly adults were recorded without disturbing the plants to minimize the observational errors. Population of sucking pest was recorded from each net plot and population was worked out per leaf.

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	-

3. Results and Discussion

3.1 Efficacy of different doses of insecticides against sucking pests of okra

3.1.1 Aphid

The mean population of aphids of two sprays was calculated and results indicated that BAS 450 01 I 300 SC@18.5g.a.i./ha proved to be effective and superior over rest of the treatments and recorded the lowest population of aphids (4.72 aphid/ plant). The next best treatments were BAS 450 01 I 300 SC @12.5g. a.i./ha (5.31 aphid/ plant) were found statistically on par, followed by Chlorantraniliprole 18.5% SC @ 25g. a.i./ ha (7.54 aphid/plant), BAS 450 01 I 300 SC @ 6.5g.a.i./ha (8.04 aphid/plant) and Cypermethrin 10% EC@70g.a.i./ha (9.72 aphid/plant) respectively. There was maximum (16.35 aphid/plant) aphid population noticed in untreated control.

The efficacy of spinosad in reducing the aphid population has been documented by Stansly (2001) [7] who observed that spinosad gave effective control of aphids in cotton ecosystem.

3.1.2 Leafhopper

The overall mean population of leafhoppers of two sprays were calculated and results showed that BAS 450 01 I 300 SC @18.5 g.a.i./h was found the most effective as it recorded (2.00 jassid/ plant) and BAS 450 01 I 300 SC @12.5g.a.i./ha were found statistically on par, followed by Chlorantraniliprole 18.5% SC @ 25g.a.i./ ha (3.26 jassid/plant) and BAS 450 01 I 300 SC @6.5g.a.i./ha (3.53 jassid/plant). However Cypermethrin 10% EC @70g.a.i./ha (4.43 jassid / plant) recorded higher jassid population, respectively. There was maximum jassid population (10.05 jassid/plant) noticed in untreated control.

Begum and Patil (2016) [1]the overall mean population of leafhoppers of two sprays were calculated and results showed that imidacloprid 17.8 SL @ 40g.a.i./ha proved to be effective and superior over rest of the treatments and recorded minimum population of leafhoppers (2.47 leafhoppers/3 leaves).

3.1.3 Thrips

The mean population of thrips of two sprays was calculated, results showed that BAS 450 01 I 300 SC @18.5g.a.i./ha was found the most effective as it recorded (2.68 thrips / plant) and BAS 450 01 I 300 SC @12.5g.a.i./ha were found statistically on par, Followed by Chlorantraniliprole 18.5% SC @ 25g.a.i./ ha (3.78 thrips/plant), BAS 450 01 I 300 SC @6.5g.a.i./ha (3.76 thrips /plant) and Cypermethrin 10% EC @70g.a.i./ha (5.12 thrips / plant) respectively. There was maximum thrips population (9.97 thrips/plant) noticed in untreated control.

Begum and Patil (2016) [1] recorded that the mean population of thrips of sprays was calculated, results showed that imidacloprid 17.8 SL @ 40g.a.i./ha proved to be effective and superior over rest of the treatments and recorded the lowest population of thrips (1.41 thrips/3 leaves).

3.1.4 Whitefly

The mean population of whiteflies of two sprays was calculated, results indicated that BAS 450 01 I 300 SC @18.5g.a.i./ha had minimum whitefly population (0.68 whitefly / plant). BAS 450 01 I 300 SC@12.5g.a.i./ha, BAS 450 01 I 300 SC @6.5g.a.i./ha and Chlorantraniliprole 18.5% SC @ 25g.a.i./ ha were found statistically on par, followed by Cypermethrin 10% EC@70 g.a.i./ ha (1.86 whitefly / plant). There was maximum whitefly population (4.82 whitefly/plant) noticed in untreated control.

4. Conclusion

All the treatments registered significantly lower population of major sucking pests as compared to untreated control. BAS 450 01 I 300 SC @18.5g a.i./ha proved the best treatment for the control of sucking pests however, treatments viz. BAS 450 01 I 300 SC @6.5g a.i./ha and Chlorantraniliprole 18.5% SC @ 25g a.i./ ha were observed to be effective treatments in most of the observations.

Table 2: Bioefficacy of BAS 450 01 I 300 SC against aphid on okra

Treatment	Insecticide	Dose	Pre treatment	Post treatment population/plant					Mean
				1 Day	3 Days	5 Days	7 Days	10 Days	
T1	BAS 450 01 I 300 SC	6.5 g a.i./ha	10.16(3.33)	8.91(3.14)	7.88(2.97)	8.38(3.06)	6.63(2.75)	8.38(3.06)	8.04
T2	BAS 450 01 I 300 SC	12.5 g a.i./ha	9.10(3.07)	5.85(2.61)	4.43(2.32)	5.08(2.46)	4.98(2.44)	6.23(2.68)	5.31
T3	BAS 450 01 I 300 SC	18.5 g a.i./ha	9.18(3.16)	5.03(2.45)	5.88(2.61)	3.88(2.20)	4.13(2.25)	4.68(2.38)	4.72
T4	Chlorantraniliprole 18.5% SC	25 g a.i./ha	8.10(2.90)	7.63(2.89)	8.13(3.00)	7.73(2.94)	6.98(2.81)	7.23(2.86)	7.54
T5	Cypermethrin 10% EC	70 g a.i./ha	9.88(3.25)	10.38(3.35)	9.88(3.28)	9.95(2.29)	8.95(3.13)	9.45(3.22)	9.72
T6	Untreated control	-	16.38(4.16)	17.13(4.25)	16.95(4.23)	17.45(4.29)	16.70(4.20)	17.45(4.29)	17.14
Sem ±			0.30	0.14	0.09	0.09	0.11	0.07	
CD at 5%			NS	0.45	0.30	0.29	0.34	0.23	

* Figure is parenthesis in Square root transformed values

Table 3: Bioefficacy of BAS 450 01 I 300 SC against Leafhopper on okra

Treatment	Insecticide	Dose	Pre treatment	Post treatment population/plant					Mean
				1 Day	3 Days	5 Days	7 Days	10 Days	
T_1	BAS 450 01 I 300 SC	6.5 g a.i./ha	5.18(2.33)	3.73(2.15)	2.98(1.99)	3.73(2.17)	2.98(1.99)	4.23(2.26)	3.53
T_2	BAS 450 01 I 300 SC	12.5 g a.i./ha	5.55(2.35)	3.05(2.97)	1.73(1.64)	1.55(1.59)	1.63(1.61)	2.88(1.95)	2.17
T_3	BAS 450 01 I 300 SC	18.5 g a.i./ha	3.48(2.01)	2.23(1.78)	2.33(1.82)	2.13(1.76)	1.15(1.45)	2.18(1.78)	2.00
T_4	Chlorantraniliprole 18.5% SC	25 g a.i./ha	5.18(2.39)	4.03(2.21)	3.03(1.99)	2.78(1.93)	2.45(1.85)	4.03(2.23)	3.26
T_5	Cypermethrin 10% EC	70 g a.i./ha	7.95(2.99)	5.95(2.63)	4.68(2.37)	3.93(2.21)	3.43(2.09)	4.18(2.26)	4.43
T_6	Untreated control	-	10.95(3.45)	9.45(3.23)	9.83(2.28)	10.33(3.36)	11.08(3.47)	9.58(3.25)	10.05

Sem ± CD at 5%		0.32NS	0.130.40	0.070.23	0.060.20	0.080.25	0.120.38	

* Figure is parenthesis in Square root transformed values.

Table 4: Bioefficacy of BAS 450 01 I 300 SC against thrips on okra

Treatment	Insecticide	Dose	Pre-treatment	Post treatment population/plant					Mean
				1 Day	3 Days	5 Days	7 Days	10 Days	
T_1	BAS 450 01 I 300 SC	6.5 g a.i./ha	5.78(2.49)	3.03(1.99)	3.53(2.12)	2.45(1.85)	4.53(2.34)	5.28(2.50)	3.76
T_2	BAS 450 01 I 300 SC	12.5 g a.i./ha	5.53(2.48)	1.75(1.65)	3.03(2.00)	2.35(1.82)	2.98(1.98)	4.58(2.35)	2.94
T_3	BAS 450 01 I 300 SC	18.5 g a.i./ha	4.23(2.16)	2.78(1.93)	2.15(1.77)	1.65(1.62)	3.33(2.06)	3.48(2.11)	2.68
T_4	Chlorantraniliprole 18.5% SC	25 g a.i./ha	5.63(2.49)	2.88(1.95)	3.38(2.09)	2.88(1.96)	4.63(2.36)	5.13(2.46)	3.78
T_5	Cypermethrin 10% EC	70 g a.i./ha	6.38(2.63)	4.38(2.28)	5.13(2.46)	4.58(2.35)	5.38(2.51)	6.13(2.66)	5.12
T_6	Untreated control	-	10.73(3.42)	11.73(3.56)	9.73(3.27)	9.98(3.310	8.58(3.08)	9.83(3.27)	9.97
Sem ± CD at 5%			0.37NS	0.120.38	0.070.23	0.070.23	0.100.30	0.090.29	

Table 5: Bioefficacy of BAS 450 01 I 300 SC against whitefly on okra

Treatment	Insecticide	Dose	Pre treatment	Post treatment population/plant					Mean
				1 Day	3 Days	5 Days	7 Days	10 Days	
T_1	BAS 450 01 I 300 SC	6.5 g a.i./ha	1.88(1.55)	1.08(1.42)	0.85(1.34)	1.08(1.43)	0.83(1.34)	1.63(1.61)	1.09
T_2	BAS 450 01 I 300 SC	12.5 g a.i./ha	1.53(1.50)	0.88(1.34)	0.65(1.27)	0.83(1.34)	0.63(1.26)	0.83(1.32)	0.76
T_3	BAS 450 01 I 300 SC	18.5 g a.i./ha	1.33(1.44)	0.95(1.37)	0.73(1.29)	0.53(1.22)	0.40(1.17)	0.78(1.33)	0.68
T_4	Chlorantraniliprole 18.5% SC	25 g a.i./ha	1.83(1.55)	2.18(1.77)	1.80(1.66)	1.65(1.62)	1.33(1.50)	1.85(1.68)	1.76
T_5	Cypermethrin 10% EC	70 g a.i./ha	1.95(1.64)	2.25(1.79)	1.93(1.69)	1.85(1.67)	1.48(1.56)	1.80(1.67)	1.86
T_6	Untreated control	-	5.35(2.40)	4.85(2.33)	5.10(2.39)	5.03(2.38)	4.45(2.29)	4.65(2.33)	4.82
Sem ± CD at 5%	1.		0.24NS	0.130.42	0.120.38	0.120.37	0.100.32	0.100.32	

* Figure is parenthesis in Square root transformed values

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