RESEARCH ARTICLE

EVALUATION OF THIAMETHOXAM 25% WG AGAINST JASSID, APHID AND WHITEFLY ON OKRA

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Abstract: Okra, *Abelmoschus esculentus* (L) Moench is an important vegetable crop, grown in tropical and sub tropical parts of the world. India is the world's second largest producer of vegetables next to China. The experiment was conducted at Entomological Experimental Field, JNKVV, Jabalpur, using RBD, during the summer season of 2016. The Plot size was 3x5 m., crop was sown in the second week of April. It can be concluded that comparing the Thiamethoxam 25% WG @ 200 gm/ ha can be recommended for reducing the infestation due to jassids, aphids and whiteflies on okra. Perusal of the healthy fruit yield data revealed that significantly highest among all the treatments was registered by Thiamethoxam 25% WG @ 200 gm/ ha. (42.71 q/ ha). All the insecticidal treatments were significantly superior then untreated control, which registered the lowest healthy fruit yield of 23. 45 q/ ha.

Keywords: Aphids, Jassids, Okra, Thiamethoxam, Whiteflies

INTRODUCTION

Okra, *Abelmoschus esculentus* (L) Moench is an important vegetable crop, grown in tropical and sub tropical parts of the world. India is the world's second largest producer of vegetables next to China. Okra belongs to family Malvaceae and it has multipurpose uses. Its fruit are consumed as green vegetable and mucilaginous extracts of green stem and roots are used for clarifying sugar cane juice in "Gur" manufacturing in India. Okra is widely cultivated in plans of the India with acreage of 524.0 mha. and production 6203.0 MT and productivity 11.83 MT/ha. In Madhya Pradesh, okra is grown in 26.51 mha. area with production of 305.90 MT and 11.5 MT/ ha productivity . Okra crop is usually heavily infested by various insects pests, which affect the crop both, quantitatively and qualitatively. In early stage of its growth considerable damage is caused by jassid, *Amrasca biguttula biguttula* resulting in discolouration, curling and deformation of leaves and deterioration of yield quantity and quality. The estimated 22.6 per cent losses on account of jassids. In later stage Shoot and fruit borer (*Earias vittella* and *E.insulana*) causes considerable damage to okra shoots in early stage and later on to fruits. There is a long list of insect pests on okra crop . Reported *Amrasca biguttulla biguttula*, *E. vittella*, *Melanagromyza hibisci*, *Aphis gossypii*, *Bemisia tabaci*, *Nezara viridula*, *Tetranychus telarius* Auct. *Dysderus koenigii*, *Mylabris pusiaulata*, *Anomis flava, Myllocerus undecimpustulalus*, Var Maculosus and *Sylepta derogata*, on okra crop, in Gwalior (M.P.) Among these insect pests, shoot and fruit borer, far as *E. vittella* (Fab.) is the most destructive pest causing considerable damage to okra crop in all stage of its growth. More severe damage has been reported by the workers who stated 12.09 and 40.37 per cent damage in okra by *E.vitlella* during mansoon and summer seasons respectively. The observed 58.90 per cent avoidable fruit losses by shoot and fruit borer, *Earias vitlella* (Fab.) on okra crop. *Earias villella* is not only a serious pest of cotton and okra but it also causes considerable damage to other malvaceous plants.

MATERIALS AND METHODS

The experiment was conducted at Entomological Experimental Field, JNKVV, Jabalpur, using randomized block design, during the summer season of 2016. The Plot size was 3x5 m. The okra crop was sown in the second week of April, variety hybrid no.319 with treatment seven. All agronomical practices were adopted. The treatment consisted of spraying the crop three with Four Doses of Thiamethoxam 25%WG (80, 100,120 and 200 gm/ ha) along with two doses of a commonly recommended insecticide viz. Azadiractin 0.15% (400ml /ha) and Imidacloprid 17.8% SL (120ml/ha) were sprayed to work out their Bio-efficacy against jassid, aphid and whitefly of okra. Observations were made regularly on incidence of Jassid, Aphid and Whitefly after the germination of okra crop. First spray was given after the appearance of jassid and aphid in sufficient numbers. Pre-treatment observations on jassid aphid and whitefly were recorded 24 hours before treatment and post treatment observations were recorded on six leaves per plant 2 upper, 2 middle and 2 lower from ten randomly selected plants per plot. These observations were taken on 1st, 5th, 7th and 10th days after each spray of insecticides. The data of actual population of jassid, aphid and whitefly were transformed into square root transformation and statistically analyzed in randomized block design as per the method.

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Observations on yield were taken at each picking after the spray. The data on healthy marketable fruit yield per plot (total of all 12 pickings) was converted in to per hectare yield (q/ha.) and statistically analyzed. Observation were also recorded on population of natural enemies of jassids aphids and white fly immediately before the first spray and 1st, 5th,7th and 10th days after each spray of insecticides. The actual population of natural enemies was transformed into square root transformation and statistically analyzed. Number and weight of healthy and damaged fruits were recorded 1,5,7,10 days after the first second and third sprays. The data were subjected to analysis of variance after angular transformation, at 5% level of significance.

Table 2. Details of Treatments

Treatment code	Treatments	a.i. (gm/ ml) /ha.	Dose gm/ ml/ ha.
T1	Thiamethoxam 25% WG	20	80
T2	Thiamethoxam 25 %WG	25	100
T3	Thiamethoxam 25 %WG	30	120
T4	Thiamethoxam 25 %WG	50	200
T5	Azadiractin0.15%	-	400
T6	Imidacloprid 17.8 % SL	21.36	120
T7	Control	-	-

RESULTS

Four Doses of Thiamethoxam 25%WG (80, 100,120 and 200 gm/ ha) along with two doses of a commonly recommended insecticide viz. Azadiractin 0.15% (400ml /ha) and Imidacloprid 17.8% SL (120ml/ha) were sprayed to work out their Bio-efficacy against jassid, aphid and whitefly of okra.

Jassid

The data on jassid population presented in Table 4 indicated that significantly lower population of jassids (29.32 jassids/ 60 leaves) among all the treatments was observed in Thiamethoxam 25% WG @ 200 gm/ha. All the other insecticidal treatments were also registered significantly lower population then untreated control (148.51 jassids/ 60 leaves). Among the other insecticidal treatments viz. Thiamethoxam 25% WG @100 gm/ ha., Thiamethoxam 25% WG @ 120 gm/ ha., Imidacloprid 17.8% SL @ 120ml/ ha, and Azadiractin 0.15%@400ml/ha, populations of jassids were at par to each other and ranged between 50.30 to 57.24 jassids/ 60 leaves. All these treatments were significantly superior then Thiamethoxam 25% WG @ 80 gm/ ha., which registered the population of 87.09 jassids/ 60 leaves, However it was also having significantly lower population as compared to untreated control. Similar finding the basis of overall mean of three sprays, all the insecticidal treatments significantly reduced the jassid population as compared to control (127.50 jassids/30 leaves). Among the treatments, imidacloprid 17.8% SL @ 35.6 g a.i./ha. was found to be significantly effective among all the treatments as it recorded lowest jassid population (31.72 jassids/30 leaves). The next effective treatment was difenthiuron 50 WP @ 300 g a.i./ha (40.77 jassids/30 leaves) followed by imidacloprid 17.8% SL @ 17.8 g a.i./ha (50.66 jassids/30 leaves) and thiamethoxam 25% WG @ 25 g a.i./ha (51.83 jassids/30 leaves) but found at par to each other. Emamectin benzoate 5% SG @ 12 g a.i./ha (68.80 jassids/30 leaves) and emamectin benzoate 5% SG @ 10 g a.i./ha (79.88 jassids/30 leaves) were the next group of better treatments. Treatment NSKE 5% @ 750 g a.i./ha (93.36 jassid/30 leaves) although found least effective, but it was significantly superior to control . In conformity to the present findings, also reported that imidacloprid 17.8% at 40 g a.i. was found most effective.

Aphid

The data on aphid population presented in Table 5 indicated that significantly lower population of aphids (14.81 aphids/ 60 leaves) among all the treatments was registered by Thiamethoxam 25% @ WG 200 gm/ ha. All the other insecticidal treatments were also registered significantly lower population then untreated control (83.12 aphids/ 60 leaves). Among the other insecticidal treatments viz. Thiamethoxam 25% WG @100 gm/ ha., Thiamethoxam 25% WG @ 120 gm/ ha., Azadiractin 0.15%@400ml/ha and Imidacloprid 17.8% SL @ 120ml/ ha, populations of aphids were at par to each other and ranged between 27.28 to 29.41 aphids/ 60 leaves. All these treatments were superior then Thiamethoxam 25% WG @ 80 gm/ ha., which registered the population of 45.08 aphids/ 60 leaves however it was also having significantly lower population as compared to untreated control. The finding is in agreement with the findings the aphid population started to decline and reached to 22.45 aphids per leaf at September end in both the years of study. The performance of imidacloprid to reduce the population of aphid is good because of its systemic property and other hand investigation on neonicotinoid molecules against okra aphid is in line with the finding of. The aphid appeared in the second week of September with an average population of 1.42 mean aphid/leaf. The aphid population peaked is

in the second week of October (25.87 mean aphid/leaf).

Whitefly

The data on White fly population presented in Table 6 indicated that significantly lower population of white fly (15.53 whiteflies/ 60 leaves) among all the treatments was registered by Thiamethoxam 25% @ WG 200 gm/ ha. All the other insecticidal treatments were also registered significantly lower population then untreated control (46.15 whiteflies/ 60 leaves). Among the other insecticidal treatments viz. Thiamethoxam 25% WG @100 gm/ ha., Thiamethoxam 25% WG @ 120 gm/ ha., Azadiractin 0.15%@400ml/ha and Imidacloprid 17.8% SL @ 120ml/ ha, populations of whiteflies/ were at par to each other and ranged between 22.63 to 25.85 whiteflies/ 60 leaves. All these treatments were superior then Thiamethoxam 25% WG @ 80 gm/ ha., which registered the population of 33.28 whiteflies / 60 leaves however it was also having significantly lower population as compared to untreated control. Similarly On the basis of overall mean of third spray, imidacloprid 17.8% SL @ 35.6 g a.i./ha. was found to be significantly effective among all the treatments as it recorded lowest whitefly population (7.00 whiteflies/30 leaves). The next effective treatment was difenthiuron 50 WP @ 300 g a.i./ha (13.75 whiteflies/ 30 leaves) followed by imidacloprid 17.8% SL @ 17.8 g a.i./ha (20.08 whiteflies/30 leaves) and thiamethoxam 25% WG @ 25 g a.i./ha (20.92 whiteflies/30 leaves) but both were found at par to each other. Emamectin benzoate 5% SG @ 12 g a.i./ha (28.58 whiteflies/30 leaves) and emamectin benzoate 5% SG @ 10 g a.i./ha (36.50 whiteflies/30 leaves) were the next better treatments, while NSKE @ 750 g a.i./ha (43.92 whiteflies/30 leaves) was the least effective. All the insecticidal treatments have significantly reduced the whitefly population as compared to control (54.17 whiteflies/30 leaves). Similarly also reported that imidacloprid 17.8 SL at 25 g a. i./ha was found effective against jassid and whiteflies, while thiamethoxam also provided similarly level of protection as that of imidacloprd .

Healthy Fruit Yield

Perusal of the healthy fruit yield data (Table 7) revealed that significantly highest among all the treatments was registered by Thiamethoxam 25% WG @ 200 gm/ ha. (42.71 q/ ha). Next better treatments were Thiamethoxam 25% WG @ 120 gm/ ha., Azadiractin 0.15%@400ml/ha, Thiamethoxam 25% WG 100 gm/ ha. and Imidacloprid 17.8% SL @ 120ml/ ha having yield of 39.16 q/ha, 38.08 q/ha 37.90 q/ha and 36.38 q/ha respectively. These treatments were followed by Thiamethoxam 25% WG @ 80 gm/ ha. (31.17 q/ ha) which was significantly inferior as compared to above mentioned treatments. All the insecticidal treatments were significantly superior then untreated control, which registered the lowest healthy fruit yield of 23. 45 q/ ha. The maximum increased yield over control found in emamectin benzoate treated plots *i.e*. 72.27q ha. . Maximum marketable fruit yield of 71.35q /ha was recorded in acetamiprid, which was on par with imidacloprid (69.24q /ha), and thiamethoxam (65.42q/ha).

Effect of Treatments on Natural Enemies

In okra crop the only natural enemy recorded was the lady bird beetle. It is a major predator against soft bodied insects like jassids, aphids and whitefly etc. The data presented in Table 9 revealed that population of lady bird beetle was at par in all the treatments including the untreated control ranging from 0.33 to 0.47. Perusal the population data of lady bird beetle, it can be concluded that all the insecticidal treatments were have no adverse impact on the population of lady bird beetle. This finding is in agreement with the population of coccinellids ranged from 0.18 to 2.51 coccinellid/leaf. Altogether, 2 species of coccinellid predators which are *Coccinella transversalis* Fabr. and *C. septumpunctata* L were found associated with the aphid population. Observations regarding impact of neonicotinoids on population of natural enemies were furnished in the two rounds of spray of neonicotinoids on okra had no significant impact on the *Coccinellid*s (grubs and adults), *Chrysoperla* and spider population when compared with untreated control plot.

Table 4. Efficacy of Thiamethoxam 25% WG against jassid infesting okra

Treatment Code	Treatments	Dose gm/ ml/ ha	Mean population jassid/ 60 leaves				Over all Mean
			Pre treatment	After First Spray	After Second Spray	After Third Spray	
T1	Thiamethoxam 25% WG	80	135.96 (11.65)	117.40 (10.83)	91.70 (9.57)	52.17 (7.22)	87.09 (9.21)
T2	Thiamethoxam 25 %WG	100	138.9 (11.78)	80.93 (8.99)	42.38 (6.51)	27.60 (5.25)	50.30 (6.92)
T3	Thiamethoxam 25 %WG	120	140.5 (11.85)	85.55 (9.24)	43.4 (6.58)	32.78 (5.72)	53.91 (7.18)
T4	Thiamethoxam 25% WG	200	141.96 (11.91)	46.95 (6.85)	26.34 (5.13)	14.68 (3.83)	29.32 (5.27)

T5	Azadiractin 0.15%	400	135.2 (11.62)	90.48 (9.51)	44.85 (6.69)	36.4 (6.03)	57.24 (7.41)
T6	Imidacloprid 17.8 % SL	120	140.56 (11.85)	80.15 (8.95)	48.18 (6.94)	43.03 (6.55)	57.12 (7.48)
T7	Untreated Control	---	142.16 (11.91)	154.71 (12.43)	142.20 (11.92)	148.63 (12.19)	148.51 (12.18)
	SEm ±		0.23		-	-	0.40
	CD at 5%		N.S.		-	-	1.24

Figures in parentheses are √x square root transformed values, N.S.= Non-significant

Table 5. Efficacy of Thiamethoxam 25% WG against aphid infesting Okra

Treatment Code	Treatments	Dose gm/ ml/ ha	Mean population aphids/ 60 leaves				Over all Mean
			Pre treatment	After First Spray	After Second Spray	After Third Spray	
T1	Thiamethoxam 25% WG	80	77.36 (8.79)	58.36 (7.63)	46.10 (6.79)	30.77 (5.54)	45.08 (6.66)
T2	Thiamethoxam 25 %WG	100	83.23 (9.12)	42.53 (6.52)	26.32 (5.13)	13.00 (3.60)	27.28 (5.09)
T3	Thiamethoxam 25 %WG	120	81.13 (9.01)	44.79 (6.69)	26.30 (5.12)	12.44 (3.52)	27.84 (5.12)
T4	Thiamethoxam 25% WG	200	80.63 (8.98)	24.45 (4.94)	13.63 (3.69)	6.35 (2.51)	14.81 (3.72)
T5	Azadiractin 0.15%	400	77.03 (8.78)	47.55 (6.89)	29.83 (5.46)	10.19 (3.19)	29.19 (5.18)
T6	Imidacloprid 17.8 % SL	120	82.16 (9.06)	38.45 (6.20)	31.64 (5.62)	18.15 (4.26)	29.41 (5.36)
T7	Untreated Control	---	76.86 (8.77)	82.06 (9.05)	77.34 (8.79)	89.96 (9.48)	83.12 (9.11)
	SEm ±		0.12	-	-	-	0.40
	CD at 5%		N.S.	-	-	-	1.23

Figures in parentheses are √x square root transformed values, N.S.= Non-significant

Table 6. Efficacy of Thiamethoxam 25% WG against whitefly infesting Okra

Treatment Code	Treatments	Dose gm/ ml/ ha	Mean population whiteflies / 60 leaves				Over all Mean
			Pre treatment	After First Spray	After Second Spray	After Third Spray	
T1	Thiamethoxam 25% WG	80	42.66 (6.52)	38.78 (6.22)	32.51 (5.70)	28.55 (5.34)	33.28 (5.76)
T2	Thiamethoxam 25 %WG	100	43.66 (6.61)	32.05 (5.66)	21.01 (4.58)	14.83 (2.81)	22.63 (4.70)
T3	Thiamethoxam 25 %WG	120	47.00 (6.85)	32.47 (5.69)	21.9 (4.67)	15.65 (3.95)	23.44 (4.78)
T4	Thiamethoxam 25% WG	200	46.66 (6.81)	23.65 (4.93)	15.00 (3.87)	7.93 (2.81)	15.53 (3.88)
T5	Azadiractin 0.15%	400	48.00 (6.92)	32.76 (5.72)	22.41 (4.73)	15.85 (3.98)	23.67 (4.81)
T6	Imidacloprid 17.8 % SL	120	46.00 (6.76)	33.99 (5.83)	27.16 (5.21)	16.4 (4.04)	25.85 (5.03)
T7	Untreated Control	---	43.66 (6.56)	46.58 (6.82)	43.7 (6.61)	48.18 (6.94)	46.15 (6.79)
	SEm ±		0.35	-	-	-	0.23
	CD at 5%		N.S.	-	-	-	0.71

Figures in parentheses are √x square root transformed values, N.S.= Non-significant

Table 7. Efficacy of Thiamethoxam 25% WG on healthy fruit yield of okra

Treatment Code	Treatments	Dose gm/ ml/ ha	Total healthy fruit yield in all 12 picking (q/ha)			Over all Mean yield (q/ha)
			Replication one	Replication two	Replication three	
T1	Thiamethoxam 25% WG	80	32.96	30.37	30.18	31.17
T2	Thiamethoxam 25 %WG	100	35.37	38.88	39.44	37.90

T3	Thiamethoxam 25 %WG	120	36.29	40.0	41.20	39.16
T4	Thiamethoxam 25% WG	200	41.85	43.70	42.59	42.71
T5	Azadiractin 0.15%	400	37.03	37.40	39.81	38.08
T6	Imidacloprid 17.8 % SL	120	35	36.38	37.77	36.38
T7	Untreated Control	--	22.59	23.70	24.07	23.45
	SEm ±	--	--	--	--	0.83
	CD at 5%	--	--	--	--	2.54

Table 9. Effect of Thiamethoxam 25% WG on population of lady bird beetle.

Treatment Code	Treatments	Dose gm/ ml/ ha	Pre treatment	Mean population of lady bird beetles/ 60 leaves			Over all Mean
				After First Spray	After Second Spray	After Third Spray	
T1	Thiamethoxam 25% WG	80	0.00 (0.70)	0.33 (0.91)	0.41 (0.95)	0.33 (0.91)	0.36 (0.92)
T2	Thiamethoxam 25 %WG	100	0.00 (0.70)	0.41 (0.95)	0.33 (0.91)	0.66 (1.08)	0.47 (0.98)
T3	Thiamethoxam 25 %WG	120	0.00 (0.70)	0.33 (0.91)	0.33 (0.91)	0.41 (0.95)	0.36 (0.92)
T4	Thiamethoxam 25% WG	200	0.00 (0.70)	0.33 (0.91)	0.25 (0.86)	0.41 (0.95)	0.33 (0.91)
T5	Azadiractin 0.15%	400	0.00 (0.70)	0.25 (0.86)	0.41 (0.95)	0.41 (0.95)	0.36 (0.92)
T6	Imidacloprid 17.8 % SL	120	0.00 (0.70)	0.5 (1.0)	0.33 (0.91)	0.33 (0.91)	0.38 (0.94)
T7	Untreated Control	---	0.00 (0.70)	0.33 (0.91)	0.58 (1.04)	0.33 (0.91)	0.41 (0.95)
	SEm ±		0.00	-	-	-	0.03
	CD at 5%		N.S.	-	-	-	N.S.

Figures in parentheses are √x+ 0.5 square root transformed values, N.S.= Non-significant

CONCLUSION

From the above treatise it can be concluded that comparing the population of jassids, aphids, whiteflies and healthy fruit yield after application of all the treatments, Thiamethoxam 25% WG @ 200 gm/ ha was found significantly superior among all the doses and treatments applied. Next better treatments were Thiamethoxam 25% WG @120 gm/ ha., Azadiractin 0.15%@400ml/ha, Thiamethoxam 25% WG 100 gm/ ha. and Imidacloprid 17.8% SL @ 120ml/ ha. While Thiamethoxam 25% WG @ 80 ml/ ha was inferior to these treatments but it was found significantly superior to untreated control. It can be concluded that Thiamethoxam 25% WG @ 200 gm/ ha can be recommended for reducing the infestation due to jassids, aphids and whiteflies on okra.

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