International Journal of Science, Environment and Technology, Vol. 5, No 3, 2016, 1217 – 1225

ISSN 2278-3687 (O)
2277-663X (P)

BIO-EFFICACY OF THIAMETHOXAM 25%WG AGAINST SUCKING PESTS OF OKRA UNDER TERAI REGION OF WEST BENGAL

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Abstract: A field trial was conducted to assess the bio-efficacy of different doses of Thiamethoxam 25%WG and check, Wiloxam against sucking pests like Jassids, Aphids and White flies of okra. The crop protected by higher doses of Thiamethoxam 25%WG 25, 50 and 75gm a.i./ha) proved its superiority over the lower dose (15gm a.i/ha) and standard check, Willoxam. The results indicate a reduction of 83.35% and 96.67% population of Jassids, 92.95% and 99.47% population of Aphids and 83.80% and 96.67% population of White flies respectively in first and second spray with Thiamethoxam 25%WG @ 75g a.i./ha though it is at par with Thiamethoxam 25% WG @ 25g and 50g a.i,/ha. However, considering the cost of inputs, it would be better to suggest Thiamethoxam 25%WG @25g a.i./ha for the better management of these target pests of okra.
Keywords: Thiamethoxan 25% WG, Jassids, White fly, aphid, okra.

Introduction

Okra, [*Alellmoschus esculentus* (L.) Moench], is one of the important vegetable crops amongst the cultivated fruit vegetables grown in our country. The crop is grown throughout India with a production of 57.38 lakh tones and Andhra Pradesh is leading producer with 19.20% share in total production of India, followed by West Bengal (13.80%) (NHB, 2012). The pest problem is the main limiting factor in the production of okra. Among, 72 species of insects attacking okra, the most serious pests are jassid [*Amrasca biguttula bigutulla* (Ishida)], aphid, (*Aphis gossypii* Glover), whitefly [Bemisia tabaci (Gen.)] shoot and fruit borer [*Earias insulana* (Boisduval) and *E. vitella* (Fab.)] and American bollworm [Helicoverpa armigera (Hub.)] (Rawat and Saha, 1973). These pests are most serious causing 45-57.1% damage to fruits (Shrinivasan and Krishna Kumar, 1983 and Nderitu *et al.*, 2008). On the other hand, the sucking pest complex of okra consisting of aphid, leaf hopper, white flies, thrips and mites causes 17.46% yield loss and if failure to control them in initial stages, damage was reported to cause 54.04% yield loss (Chaudhary and Daderch, 1989 and Anitha

*Received April 28, 2016 * Published June 2, 2016 * www.ijset.net*

and Nandihalli, 2008). For the management of sucking insect pest, farmers use several insecticides indiscriminately, which has lead to development of resistance, resurgence of pest and problem of residual toxicity. To overcome these problems, identification of safe molecules with better insecticidal properties, lower mammalian toxicity, safety to natural enemies etc., which fit well in the IPM concept, is need of the hour.

A number of pesticides have been advocated for the control of okra pest complex. However, they are partially effective or become ineffective in due course of time due to several reasons. The present investigation was undertaken to evaluate the efficacy of new molecule, Thiamethoxam 25% WG against the sucking pests of okra as it is a broad spectrum systemic and is very effective in controlling aphids, jassids, thrips and white flies in cotton and okra.

Methods and Materials

The experiment was conducted to evaluate the efficacy of Thiamethoxam 25%WG in suppressing the sucking pests *i.e.* white fly, aphid and jassid population in okra during kharif season of 2014 and 2015 at Farmers field, Jateswar, Jalpaiguri, West Bengal. The experiment was laid out in randomized block design with 6 treatments and 3 replications in 5m x 6m plot with a spacing of 45cm x 45cm. The okra variety US AGRI (hybrid variety) was taken for the experiment. The crop was raised under standard agricultural practices with a fertilizer dose of 120:60:60 kg NPK/ha. The insecticides of different concentrations were sprayed two times at an interval of 15 days as soon as the pests appeared in the field.

Observations on the target pests population (aphids, leafhopper, whitefly) were made one day before spraying and after three, seven and fourteen days of spray. During observation five plants were selected randomly from each plot and three leaves (top, middle and bottom) from each plant were selected. Finally, mean population of aphids, leafhopper and whitefly/leaf was worked out at three, seven and fourteen days after spray. Observations on whitefly adults were recorded without disturbing the plants in early morning to minimize the observational errors. Okra green fruits were collected at each picking and weighed separately from each net plot area. At the end of last picking, total yield from each net plot was calculated and computed on hectare basis (t/ha). The percentage (%) reduction of the target insect population over control was calculated with the help of Henderson and Tilton formula (1955):

Corrected % of Insect Population reduction=

$$\left(1-\frac{\text{n in Co before treatment x n in T after treatment}}{\text{n in Co after treatment x n in T before treatment}}\right)\times 100$$

Where,

n= insect population; T= Treated plot; Co=Control plot

The data thus collected in two years of study were pooled and analyzed statistically after necessary transformation wherever required.

Results and Discussion

Jassids: The pooled data revealed that all the treatments, i.e., different doses of thiamethoxam 25%WG were significantly superior over untreated control in minimizing the jassid population in both spray schedule (Table-1, 2 and 3). In the first spray, thiamethoxam 25%WG@ 75g a.i./ha recorded lesser number of jassids (1.10/leaf) and significantly superior over all other treatments including check insecticide though they were at par with thiamethoxam 25%WG@ 25g and 50g a.i./ha. The same trend was followed in the second spray, where least population of jassid (0.30/leaf) was found with thiamethoxam 25%WG@ 25g a.i./ha. The reduction of jassid population with thiamethoxam 25%WG@ 75g a.i./ha was highest, 83.35% and 96.67% after first and second spray respectively, though they were statistically at par with thiamethoxam 25%WG@ 25g and 50g a.i./ha but differed from the plots treated with thiamethoxam 25%WG@ 15g a.i./ha and check. Sinha and Sharma (2007) reported that the foliar spray of Thiamethoxam 25 WG @ 20 g a.i./ha at 30 days of sowing was found effective in managing leafhopper (*Amrasca biguttula biguttula*) population on okra. Also the foliar spray of Thiamethoxam 25 WG @ 25 g a.i./ha was effective at 50 days after sowing followed by lambda-cyhalothrin 5 EC @ 50 g a.i./ha against leafhoppers. Similarly, Bharpoda *et al.* (2014) found that Thiamethoxam 25 WG @ 0.0125% was significantly superior insecticide in reducing the population of leafhopper in cotton.

Aphids: The pooled data on efficacy of Thiamethoxam 25%WG against aphids of okra are presented in Table-1, 2 and 3. Results indicated that all the doses of thiamethoxam 25% WG were significantly superior over the control as well as check. The minimum population of aphids (1.05 /leaf) was registered with Thiamethoxam 25%WG @ 75g a.i./ha which was significantly different from all other treatments in the first spray except thiamethoxam 25%WG@ 25g and 50g a.i./ha. In case of second spray, Thiamethoxam 25%WG@ 75g a.i./ha showed the least aphid population (0.09/ leaf) over all other treatments except

thiamethoxam 25%WG@ 15g a.i./ha and check. The highest reduction of aphid population was recorded with thiamethoxam 25%WG@ 75g a.i./ha, 92.65% and 99.47% after first and second spray respectively, and they were at par with all other treatments except theamethoxam @ 15g a.i./ha. The present findings of Thiamethoxam are in agreement with the studies of Misra (2002) who reported that thiamethoxam 25WG was superior over the conventional insecticides in controlling aphid. Our results are also supported by the findings of Ghoshal *et al.* (2013) who found that Thiamethoxam 0.006% 25 WG was effective against aphid in okra. Gavkare *et al.* (2013) found that, on the basis of LC50 value, Thiamethoxam was the most toxic insecticide against green peach aphid *Myzus persicae*. . Gaikwad *et al.,* (2014) also reported that the thiamethoxam 25%WG was very effective against aphids. They were exhibited that thiamethoxam 25%WG recorded 1.73 average survival aphid /3 leaves/plant and was found to be significantly superior over other treatment.

Whiteflies: The data given in Table 1, 2 and 3 shows that all treatments exerted significantly superiority over untreated control against whitefly. In the first spray, the treatment with Thiamethoxam 25% WG@ 75g a.i./ha recorded minimum number of whiteflies(1.93/leaf) but Thiamethoxam 25% WG@ 25g and 50g a.i./ha had no significant difference with it. In case of second spray, Thiamethoxam 25%WG@ 75g a.i./ha showed the least whitefly population (0.43/ leaf) and did not differed from all other treatments except thiamethoxam 25%WG@ 15g a.i./ha. The maximum mortality of whitefly population was recorded with thiamethoxam 25%WG@ 75g a.i./ha and it was 83.80% and 96.63% after first and second spray respectively and they were in line with all other treatments except Thiamethoxam 25% WG@ 15g a.i./ha. Our findings are in conformity with the findings of Rohini *et al.* (2012) who reported that Thiamethoxam 5 SG @ 0.2 g/l was effective on whiteflies compared to untreated control. Similar results were recorded by Mohansundaram and Sharma (2011) who reported the effectiveness of Thiamethoxam 25 WG against aphids.

Yield: The data on fruit yield represented in table 3 shows that all treatments gave significantly higher green fruits yield of okra over untreated control (19.40 t/ha). However, highest yield of okra fruits (25.20t/ha) was obtained from plots treated with Thiamethoxam 25% WG @ 75gm a.i./ha and it was statistically at par with the plots treated with Thiamethoxam 25% WG @ 50gm a.i./ha (24.24t/ha) and Thiamethoxam 25% WG @ 25 gm a.i./ha (22.28t/ha). Similar results were observed by Anitha and Nandihalli (2009) who evaluated the efficacy of Thiamethoxam 25 WG (0.2 g/lit.) when applied as foliar sprays and

registered highest fruit yield. Similarly, Venkataravanappa *et al*. (2012) reported that Thiamethoxam 25 WG gave highest fruit yield of okra.

It is evident from the experiment that the plots treated with Thaimethoxam 25%WG @ 25, 50 and 75 a.i./ha showed excellent control of Jassids, Aphids and Whiteflies of okra along with significant increase in yield and had no significant difference among them. However, considering the cost of inputs, it would be better to suggest Thiamethoxam 25%WG@ 25g a.i./ha for the better management of the three pests of okra.

Acknowledgement

The authors are thankful to the M/S Willowood chemical Pvt. Ltd., New Delhi for providing the fund and facilities to conduct this research work.

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Table: 1. Effect of First Spray of different treatment schedules of Thiamethoxam 25% WG against insects of Okra

Treatments	Dose (g a.i./ha)	Jassid					Aphid					White Fly				
T_1	15	APTC /Plant	3 DAT	7 DAT	14 DAT	Mean	APTC /Plant	3 DAT	7 DAT	14 DAT	Mean	APTC /Plant	3 DAT	7 DAT	14 DAT	Mean
		4.92	1.27	1.47	1.73	**1.49**	16.4	4.46	4.75	5.3	**4.84**	10.2	2.97	3.27	3.65	**3.29**
		2.33	*1.33*	*1.40*	*1.49*	*1.41*	*4.11*	*2.23*	*2.29*	*2.41*	*2.31*	*3.27*	*1.86*	*1.94*	*2.04*	*1.95*
T_2	25	5.1	1.18	1.37	1.66	**1.4**	18.2	1.45	1.7	2.4	**1.85**	12	2.4	2.76	3.16	**2.77**
		2.37	*1.30*	*1.37*	*1.47*	*1.38*	*4.32*	*1.40*	*1.48*	*1.70*	*1.53*	*3.54*	*1.70*	*1.81*	*1.91*	*1.81*
T_3	50	5.34	1.06	1.25	1.6	**1.31**	17.3	0.94	1.32	1.95	**1.41**	11.7	1.98	2.23	2.71	**2.31**
		2.42	*1.25*	*1.32*	*1.45*	*1.35*	*4.22*	*1.20*	*1.35*	*1.57*	*1.38*	*3.49*	*1.57*	*1.65*	*1.79*	*1.68*
T_4	75	4.98	0.87	1.08	1.35	**1.1**	16.8	0.65	0.9	1.6	**1.05**	10.5	1.57	1.9	2.33	**1.93**
		2.34	*1.17*	*1.26*	*1.36*	*1.26*	*4.16*	*1.07*	*1.18*	*1.45*	*1.24*	*3.32*	*1.44*	*1.55*	*1.68*	*1.56*
T_5	25	5.16	1.25	1.46	1.8	**1.51**	17.4	1.67	2	2.61	**2.09**	12.24	2.57	2.81	3.23	**2.87**
		2.38	*1.32*	*1.40*	*1.52*	*1.42*	*4.23*	*1.47*	*1.58*	*1.76*	*1.61*	*3.57*	*1.75*	*1.82*	*1.93*	*1.84*
T_6	Water Spray	5.22	5.9	7.12	8.5	**7.17**	18	19.75	22.12	24.33	22.07	12.3	13.676	15.23	16.85	15.25
		2.39	*2.53*	*2.76*	*3.00*	*2.77*	*4.30*	*4.50*	*4.76*	*4.98*	*4.75*	*3.58*	*3.76*	*3.97*	*4.17*	*3.97*
S.Em±		**0.003**	**0.032**	**0.044**	**0.047**	**0.041**	**0.008**	**0.109**	**0.118**	**0.108**	**0.116**	**0.011**	**0.081**	**0.078**	**0.084**	**0.087**
CD at 5%		**NS**	**0.095**	**0.132**	**0.142**	**0.123**	**NS**	**0.326**	**0.355**	**0.325**	**0.348**	**NS**	**0.242**	**0.235**	**0.251**	**0.262**

APTC: Avg. Pre-treatment Count

Figure in Italic represents square root transform value

Table: 2. Effect of Second Spray of different treatment schedules of Thiamethoxam 25% WG against insects of Okra

Treatments	Dose (g a.i./ha)	Jassid					Aphid					White Fly				
T_1	15	APTC /Plant	3 DAT	7 DAT	14 DAT	Mean	APTC /Plant	3 DAT	7 DAT	14 DAT	Mean	APTC /Plant	3 DAT	7 DAT	14 DAT	Mean
		1.73	0.5	0.67	0.88	**0.68**	5.3	1.43	1.55	1.7	**1.56**	3.65	1.02	1.13	1.4	**1.18**
		1.49	*1.00*	*1.08*	*1.17*	*1.09*	*2.41*	*1.39*	*1.43*	*1.48*	*1.44*	*2.04*	*1.23*	*1.28*	*1.38*	*1.30*
T_2	25	1.66	0.37	0.45	0.55	**0.46**	2.4	1.17	0.22	0.33	**0.24**	3.16	0.6	0.7	0.83	**0.71**
		1.47	*0.93*	*0.97*	*1.02*	*0.98*	*1.70*	*0.82*	*0.85*	*0.91*	*0.86*	*1.91*	*1.05*	*1.10*	*1.15*	*1.10*
T_3	50	1.6	0.3	0.37	0.47	**0.38**	1.95	0.09	0.15	0.21	**0.15**	2.71	0.43	0.5	0.67	**0.53**
		1.45	*0.89*	*0.93*	*0.98*	*0.94*	*1.57*	*0.77*	*0.81*	*0.84*	*0.81*	*1.79*	*0.96*	*1.00*	*1.08*	*1.01*
T_4	75	1.35	0.23	0.29	0.37	**0.3**	1.6	0.05	0.08	0.14	**0.09**	2.33	0.33	0.4	0.55	**0.43**
		1.36	*0.85*	*0.89*	*0.93*	*0.89*	*1.45*	*0.74*	*0.76*	*0.80*	*0.77*	*1.68*	*0.91*	*0.95*	*1.02*	*0.96*
T_5	25	1.8	0.43	0.5	0.6	**0.51**	2.61	0.23	0.29	0.37	**0.29**	3.23	0.67	0.75	0.87	**0.76**
		1.52	*0.96*	*1.00*	*1.05*	*1.00*	*1.76*	*0.85*	*0.89*	*0.93*	*0.89*	*1.93*	*1.08*	*1.12*	*1.17*	*1.12*
T_6	Water Spray	8.5	9.23	9.88	11.67	**10.26**	24.33	24.91	26.1	28.5	26.5	16.85	17.3	17.85	19.28	18.14
		3.00	*3.12*	*3.22*	*3.49*	*3.28*	*4.98*	*5.04*	*5.16*	*5.39*	*5.20*	*4.17*	*4.22*	*4.28*	*4.45*	*4.32*
S.Em±		**0.034**	**0.031**	**0.038**	**0.032**	**0.030**	**0.115**	**0.137**	**0.140**	**0.144**	**0.133**	**0.072**	**0.073**	**0.081**	**0.068**	**0.067**
CD at 5%		**0.102**	**0.090**	**0.092**	**0.094**	**0.092**	**0.345**	**0.41**	**0.421**	**0.432**	**0.398**	**0.215**	**0.220**	**0.245**	**0.205**	**0.205**

APTC: Avg. Pre-treatment Count

Figure in Italic represents square root transform value

Table: 3. Effect of different treatment schedules of Thiamethoxam 25% WG on different parameters in Okra crop

Treatment	Dose (gm a.i./ha)	Corrected Insect Population Reduction (%)						Yield (t/ha)
		Jassid		Aphid		White Fly		
		1st Spray	2nd Spray	1st Spray	2nd Spray	1st Spray	2nd Spray	
Thiamethoxam 25% WG (T_1)	15	78.40 *62.31**	91.20 *72.74*	76.09 *60.73*	93.45 *75.17*	73.88 *59.26*	91.24 *72.78*	20.84
Thiamethoxam 25% WG (T_2)	25	80.01 *63.44*	95.17 *77.30*	90.24 *71.80*	98.85 *83.84*	80.77 *63.99*	95.58 *77.59*	22.28
Thiamethoxam 25% WG (T_3)	50	81.60 *64.60*	96.06 *78.55*	91.66 *73.21*	99.23 *84.97*	83.09 *65.72*	96.35 *78.99*	24.25
Thiamethoxam 25% WG (T_4)	75	83.35 *65.92*	96.67 *79.49*	92.95 *74.60*	99.47 *85.83*	83.80 *66.27*	96.67 *79.49*	25.20
Thiamethoxam 25% WG (T_5)	25	78.58 *62.43*	94.80 *76.82*	98.66 *72.20*	98.66 *83.35*	80.73 *63.96*	95.46 *77.70*	21.36
Control	Water Spray	-	-	-	-	-	-	19.40
S.Em±		0.78	0.81	1.31	1.05	1.17	1.07	1.37
CD at 5%		2.31	2.41	3.92	3.12	3.48	3.22	4.05

*Angular transformed values