

STUDY OF THE EFFICACY OF INSECTICIDES AGAINST DAMAGE OF WHITEFLY ON OKRA

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ABSTRACT

Field experiment was conducted during Kharif 2011 to evaluate the efficacy of six insecticides against sucking insect pest whitefly on okra (Abelmoschus esculentus L.). Thiamethoxam 25 WG @25 g a.i./ha spraying recorded the lowest whitefly population and was more effective followed by Difenthiuron 50 WP @300 a.i./ha in controlling whitefly population.

KEYWORDS: *Abelmoschus esculentus, Efficacy, Insecticides, Okra, Whitefly*

INTRODUCTION

Vegetables are rich and comparatively cheaper source of vitamins. Consumption of these items provides taste, palatability, increases appetite and provides fibre for digestion to prevent constipation. They also play key role in neutralizing the acids produced during digestion of foods and provide valuable roughages which help in movement of food in intestine. Some of the vegetables are good sources of carbohydrates, proteins, vitamin A, vitamin B, vitamin C and minerals. As per dietician, daily requirement of vegetables is 75 - 125 g of green leafy vegetables, 85 g of other vegetables and 85 g of roots and tubers with other food.

Okra is also play most important role in human life. Okra (*Abelmoschus esculentus* L.), which is also known as bhindi and lady's finger is an important malvaceous vegetable crop of sub-tropics

and tropic regions. There are many insect pest attack on okra of which whitefly is most important pest of Okra. Its damage varies from year to year and depends on weather conditions and intensity of incidence. Different measures are adopted to control insect pests in okra such as for whitefly control, seed treatment before planting could be effective or some cultural practices are to prevent the damage of insect pests, but still no method has been devised to control these devastating insects. Although chemical control yet has been the most effective tool to control these insect pests (Jech and Husman, 1998). The whitefly is most notorious among top hundred insect pests having a pandemic distribution and damaging many important crops including vegetables, tubers, fiber crops and ornamentals (Touhidul and Shunxiang, 2007; Abdel- Baky and Al-Deghairi, 2008). Apart from their direct damage by sucking

plant sap, it is also known as the vector for deadly yellow vein mosaic virus. Due to its rapid movement from one plant to another, high reproductive potential and its living habitat, management of the pest is very difficult (Fouly *et al.*, 2011). Farmers rely on conventional insecticides such as organophosphate; carbamate and synthetic pyrethroid to manage these sucking pests (Patel *et al.*, 1997). The repeated use of systemic insecticides has resulted in the development of resistance in the insect pest, and disturbance to the agroecosystem by affecting the non targets (Dittrich *et al.*, 1990). So the present work was carried out to study the efficacy of different insecticides against whitefly on okra.

MATERIALS AND METHODS

The present study was carry out to investigate the efficacy of different insecticides against damage of whitefly in the experimental field of Department of Entomology, Live Stock Farm, Adhartal, JNKVV, Jabalpur (M.P.) during *kharif* 2011-2012. Jabalpur is situated on Kymore plateau agro-climatic region of Madhya Pradesh between 22° 49" and 24° 8" North latitude and 78° 21" and 80° 58" East longitude and at an altitude of 411.78 m above the mean sea level. The climate of the region is typically semi-humid and sub-tropical. Jabalpur comes under Satpura Hills and lies in the rice-wheat crop zone of the Madhya Pradesh state. The mean annual rainfall is nearly 1423 mm, which is received mostly between mid - June to mid-September. The mean maximum temperature during the hottest months of May and June varies from 45.5 to 46.4°C. January is the coldest month with mean maximum and minimum temperature of 24.4°C and 7.3°C, respectively. Regular observations starting immediately after sowing was carried out once in a standard week to record occurrence of whitefly damage to okra. The insects appearing on

the crop right from sowing up to harvest were recorded. The crop was kept unprotected for this purpose. The sequence in which the insects appeared was also noted. The status of different insect pests recorded was determined on the basis of the damage caused by them. For observations 25 plants were randomly selected and population of different insect pests and mites were recorded. The significance among different treatment means was judged by critical difference (C.D) at 5% level of significance for comparison among the treatments, the marginal means of each treatment was considered. Observation of sucking pest viz, whitefly were recorded from 6 leaves (2 lower, 2 middle and 2 upper) from 5 randomly selected plants in each plot during early morning hours (6 to 8 am). A total of 30 leaves per plot were thoroughly screened for recording these data. The regular observation after first, second and third spray recorded on 1, 3, 5, 7 and 10 days after each spray.

RESULTS AND DISCUSSION

To study the efficacy of insecticides against damage of whitefly on okra observations made a day before spraying on the population of whiteflies revealed non-significant differences among the treatments.

Efficacy of different insecticides against whitefly infesting okra after first spray

Data presented in Table 1 revealed that one day after spray, among the treatments, T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha), T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) and T₁ (Pyriproxyfen 10 EC @ 50 g a.i./ha) were found significantly effective in which minimum whitefly population per 30 leaves were observed 6.33, 8.00 and 8.67, respectively. In the next group of treatments, T₅, T₃ and T₆ were also significantly effective and superior over control. At 3 days after first spray, treatment T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) and

T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) were found significantly effective in which low whitefly population recorded 20.00 and 22.00 average per 30 leaves. In second group, treatment T₃ (Imidacloprid 17.8 SL @ 25 g a.i./ha), T₁ (Pyriproxyfen 10 EC @ 50 g a.i./ha) and T₅ (Emamectin benzoate 5 SG @ 25 g a.i./ha) were also found significantly effective and showed whitefly population 32.33, 33.67 and 35.67, respectively per 30 leaves. All the treatments were found significantly superior over control. Among all the treatments, five days after first spray T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) and T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) were found significantly more effective and showed minimum whitefly population 25.00 and 32.00 per 30 leaves. In second group, treatment T₃ (Imidacloprid 17.8 SL @ 25 g a.i./ha), T₁ (Pyriproxyfen 10 EC @ 50 g a.i./ha) and T₅ (Emamectin benzoate 5 SG @ 25 g a.i./ha) were found significantly where whitefly population recorded 35.67, 35.67 and 43.00, respectively per 30 leaves. All the treatments were found significantly superior over control. At seven days, among all the treatments, T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) was found significantly and highly effective showed lower population of whitefly i.e. 26.33 per 30 leaves. In next groups, treatment T₂ (Difenthiuron 50 WP @ 300 g a.i./ha), T₃ (Imidacloprid 17.8 SL @ 25 g a.i./ha) and T₁ (Pyriproxyfen 10 EC @ 50 g a.i./ha) were also found significantly effective, where whitefly population was moderately higher, recorded 39.00, 43.00 and 42.00, respectively. All the treatments were found significantly superior over control. In T₇ (Control) population was 76.67 whitefly per 30 leaves. At 10 days after first spray, treatment T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha), T₂ (Difenthiuron 50 WP @ 300 g a.i./ha), T₃ (Imidacloprid 17.8 SL @ 25 g a.i./ha), T₁ (Pyriproxyfen 10 EC @ 50 g

a.i./ha) and T₅ (Emamectin benzoate 5 SG @ 25 g a.i./ha) were found significantly effective and at par showed minimum population, whereas treatment T₆ (Quinalphos 25 EC @ 250 g a.i./ha) showing non-significant difference among the treatments. In T₇ (Control), population was 113.33 per 30 leaves.

Efficacy of different insecticides against whitefly infesting okra after second spray

One day after second spray (Table 2) among all the treatments, insecticidal treatments T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha), T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) and T₁ (Pyriproxyfen 10 EC 50 g a.i./ha) were found effective. In next group, treatment T₃ (Imidacloprid 17.8 SL @ 25 g a.i./ha) and T₅ (Emamectin benzoate 5 SG @ 25 g a.i./ha) were found effective. All the treatments found significantly superior over control. From three days after second spray, It was clearly evident from the data that, treatment T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) followed T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) showed the lowest population of whitefly/30 leaves i.e. 18.66 and 20.33, respectively. Remaining all the treatments, T₁ (Pyriproxyfen 10 EC @ 50 g a.i./ha), T₃ (Imidacloprid 17.8 SL 25 g a.i./ha), T₅ (Emamectin benzoate 5 SG @ 25 g a.i./ha) and T₆ (Quinalphos 25 EC @ 250 g a.i./ha) were found at par and significantly effective. T₇ (Control) recorded the highest whitefly (71.67/30 leaves). All the treatments were found significantly effective and at par over control. Minimum population was recorded in treatment T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) (28.67 per 30 leaves), while T₇ (Control) recorded the maximum population 99.66/30 leaves five days after second spray. Seven days after second spray, data revealed that treatments T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) and T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) showed significantly low population i.e. 31.00 and 39.00 per 30 leaves

respectively. However, in control it was 128.67 per 30 leaves. Remaining treatments were also found significantly superior over control. At 10 days after spray, treatment T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) maintained its effectiveness up to 10 days and found significantly superior among all the treatments. In another group, treatment T₂ and T₃ also found significantly at par with each other which showed lower population per 30 leaves, respectively.

Efficacy of different insecticides against whitefly infesting okra after third spray

At one day after spray, treatment T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha), T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) and T₁ (Pyriproxyfen 10 EC @ 50 g a.i./ha) were found effective and significantly at par, hence recorded low whitefly population i.e. 12.67, 17.33 and 18.67 per 30 leaves, respectively. In the next group, treatment T₃ (Imidacloprid 17.8 SL @ 25 g a.i./ha), T₅ (Emamectin benzoate 5 SG @ 25 g a.i./ha) and T₆ (Quinalphos 25 EC @ 250 g a.i./ha) were found equally effective. All the insecticidal treatments were observed superior over T₇ (Control), which recorded 62.33 whitefly / 30 leaves (Table 3). At three days after third spray, treatment T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) was found most effective. However, in another group treatment T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) and T₃ (Imidacloprid 17.8 SL @ 25 g a.i./ha) were significantly at par among all the treatments. T₅ (Emamectin benzoate 5 SG @ 25 g a.i./ha) and T₆ (Quinalphos 25 EC @ 250 g a.i./ha), which were observed significantly less effective against whitefly on third day after third spray. Five days after third spray, the result revealed that treatment T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) and T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) were found significantly at par and effective. In these treatments, the minimum population / 30 leaves were recorded 13.33 and 15.67. In the

next group, treatment T₃ (Imidacloprid 17.8 SL @ 25 g a.i./ha), T₁ (Pyriproxyfen 10 EC @ 50 g a.i./ha) and T₅ (Emamectin benzoate 5 SG @ 25 g a.i./ha) were significantly at par, while treatment T₆ (Quinalphos 25 EC @ 250 g a.i./ha) was found significantly non-effective among the treatments. Seven days after third spray, the results on incidence of whitefly of bhendi revealed that treatment T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) was observed significantly the most effective showed least population (13.33/30 leaves). In another insecticidal applications, treatments T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) and T₃ (Imidacloprid 17.8 SL @ 25 g a.i./ha) both were significantly at par. Remaining treatments were significantly not effective, whereas all the treatments are comparatively superior over control. At 10 days after third spray, treatment T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) was found significantly more effective as compared to other treatments and also showed least population (31.66/30 leaves). In next group of treatments, T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) and T₃ (Imidacloprid 17.8 SL @ 25 g a.i./ha) also found significantly effective and at par with each other. Remaining treatments T₅ and T₆ were found significantly not effective against whitefly. Control treatment recorded the maximum population of whitefly (68.66 per 30 leave).

Overall effect of insecticidal treatments against Whitefly, Bemisia tabaci (Genn.) (Hemiptera: Aleyrodidae)

On the basis of result, data were recorded after every spray up to 3 sprays (1, 3, 5, 7 and 10 days after respective spray). Out of six treatments and one untreated control, T₄ (Thiamethoxam 25 WG @ 25 g a.i./ha) was found significantly more effective followed by T₂ (Difenthiuron 50 WP @ 300 g a.i./ha) in controlling whitefly population effectively (Figure 1). Maienfisch *et al.* (2000) reported that

thiamethoxam exhibits exceptional systematic characteristics and provides excellent control of a broad range of commercially important pests such as whiteflies.

CONCLUSION

It can be concluded that Thiamethoxam 25 WG @25 g a.i./ha spraying recorded the lowest whitefly population and was more effective followed by Difenthiuron 50 WP @300 a.i./ha in controlling whitefly population in okra.

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Table 1: Efficacy of different insecticides against whitefly infesting okra (Days after first spray)

Treatment code	Treatments	Dose g a.i./ha	Pre- treatment	Mean Population of Whitefly / 30 Leaves					Overall Mean
				Days After First Spray					
				1	3	5	7	10	
T ₁	Pyriproxifen10 EC	50	91.00 (9.55)	8.67 (3.00)	33.67 (5.83)	35.67 (6.00)	42.00 (6.49)	45.00 (6.72)	33.00 (5.60)
T ₂	Defenthiuran 50 WP	300	84.66 (9.21)	8.00 (2.89)	22.00 (4.73)	32.00 (5.68)	39.00 (6.27)	38.67 (6.23)	27.93 (5.16)
T ₃	Imidacloprid17.8 SL	25	85.66 (9.27)	15.67 (4.02)	32.33 (5.72)	35.67 (5.99)	43.00 (6.58)	42.33 (6.53)	33.8 (5.76)
T ₄	Thiamethoxam25 WG	25	83.33 (9.15) L	6.33 (2.56) L	20.00 (4.51)L	25.00 (5.04) L	26.33 (5.15) L	31.00 (5.60) L	21.73 (4.57)
T ₅	Emamectin benzoate 5 SG	25	86.33 (9.31)	13.67 (3.75)	35.67 (6.00)	43.00 (6.55)	52.00 (7.22)	48.00 (6.95)	38.46 (6.09)
T ₆	Quinalphos 25 EC	250	84.66 (9.21)	19.33 (4.45)	41.33 (6.46)	44.67 (6.71)	56.33 (7.52)	51.00 (7.14)	42.53 (6.45)
T ₇	Control		91.33 (9.57) H	67.00 (8.20) H	57.33 (7.60) H	63.00 (7.95) H	76.67 (8.77) H	113.33(10.62) H	75.46 (8.62)
S.Em±			0.21	0.26	0.15	0.23	0.28	0.49	
CD at 5%			NS	0.81	0.47	0.71	0.85	1.53	

Figures in parentheses are $\sqrt{x} + 0.5$ square root transformed values NS=Non-significant, L=Lowest, H=Highest

Table 2: Efficacy of different insecticides against whitefly infesting okra (Days after second spray)

Treatment code	Treatments	Dose g a.i./ha	Mean Population of Whitefly / 30 Leaves					Overall Mmean
			Days After Second Spray					
			1	3	5	7	10	
T ₁	Pyriproxifen 10 EC	50	17.33 (4.21)	31.00 (5.60)	37.67 (6.16)	51.67 (7.18)	63.33(7.98)	40.20(6.22)
T ₂	Defenthiuran 50 WP	300	15.00 (3.90)	18.66 (4.34)	29.67 (5.46)	39.00 (6.27)	53.00(7.30)	31.06(5.45)
T ₃	Imidacloprid 17.8 SL	25	23.67 (4.90)	31.66 (5.66)	35.67 (6.00)	48.00 (6.93)	55.00(7.44)	38.80(6.18)
T ₄	Thiamethoxam 25 WG	25	12.00 (3.51) L	20.33 (4.55) L	28.67 (5.38) L	31.00 (5.58) L	46.66(6.86)L	27.73(5.17)
T ₅	Emamectin benzoate 5 SG	25	24.67 (5.00)	34.66 (5.90)	39.00 (6.28)	63.67 (7.95)	60.33(7.79)	44.46(6.58)
T ₆	Quinalphos 25 EC	250	37.67 (6.16)	40.33 (6.37)	45.00 (6.37)	76.00 (8.68)	80.33(8.98)	55.86(7.38)
T ₇	Control	---	59.00 (7.70) H	71.67 (8.48) H	99.66 (9.97) H	128.67 (11.34) H	131.66(11.49)H	98.13(9.79)
S.Em±			0.25	0.28	0.58	0.38	0.11	
CD at 5%			0.78	0.87	1.81	1.17	0.34	

Figures in parentheses are $\sqrt{x} + 0.5$ square root transformed values

NS=Non-significant,

L=Lowest,

H=Highest

Table 3: Efficacy of different insecticides against whitefly infesting okra (Days after third spray)

Treatment code	Treatments	Dose g a.i./ha	Mean Population of Whitefly / 30 Leaves					Overall Mean
			Days after Third Spray					
			1	3	5	7	10	
T ₁	Pyriproxifen 10 EC	50	18.67 (4.30)	20.67 (4.58)	23.00 (4.83)	25.00 (5.04)	46.33(6.83)	26.73(5.11)
T ₂	Defenthiuran 50 WP	300	17.33 (4.21)	18.00 (4.29)	13.33 (3.67)	22.33 (4.76)	38.66(6.25)	21.93(4.63)
T ₃	Imidacloprid 17.8 SL	25	20.33 (4.54)	21.67 (4.70)	21.00 (4.62)	23.00 (4.83)	41.33(6.46)	25.46(5.03)
T ₄	Thiamethoxam 25 WG	25	12.67 (3.59) L	13.67 (3.75) L	15.67 (4.01) L	13.33 (3.69) L	31.66(5.66)L	17.40(4.14)
T ₅	Emamectin benzoate 5 SG	25	25.00 (5.03)	24.33 (4.97)	26.67 (5.20)	28.33 (5.36)	46.00(6.81)	30.06(5.47)
T ₆	Quinalphos 25 EC	250	28.67 (5.39)	30.00 (5.51)	28.67 (5.38)	30.33 (5.54)	50.66(7.14)	33.66(5.79)
T ₇	Control	---	62.33 (7.92) H	63.00 (7.96) H	47.66 (6.92) H	51.67 (7.21) H	68.66(8.31)H	58.66(7.66)
SEm±			0.26	0.15	0.21	0.17	0.12	
CD at 5%			0.81	0.48	0.67	0.54	0.35	

Figures in parentheses are $\sqrt{x} + 0.5$ square root transformed values

NS= Non-significant,

L=Lowest,

H=Highest

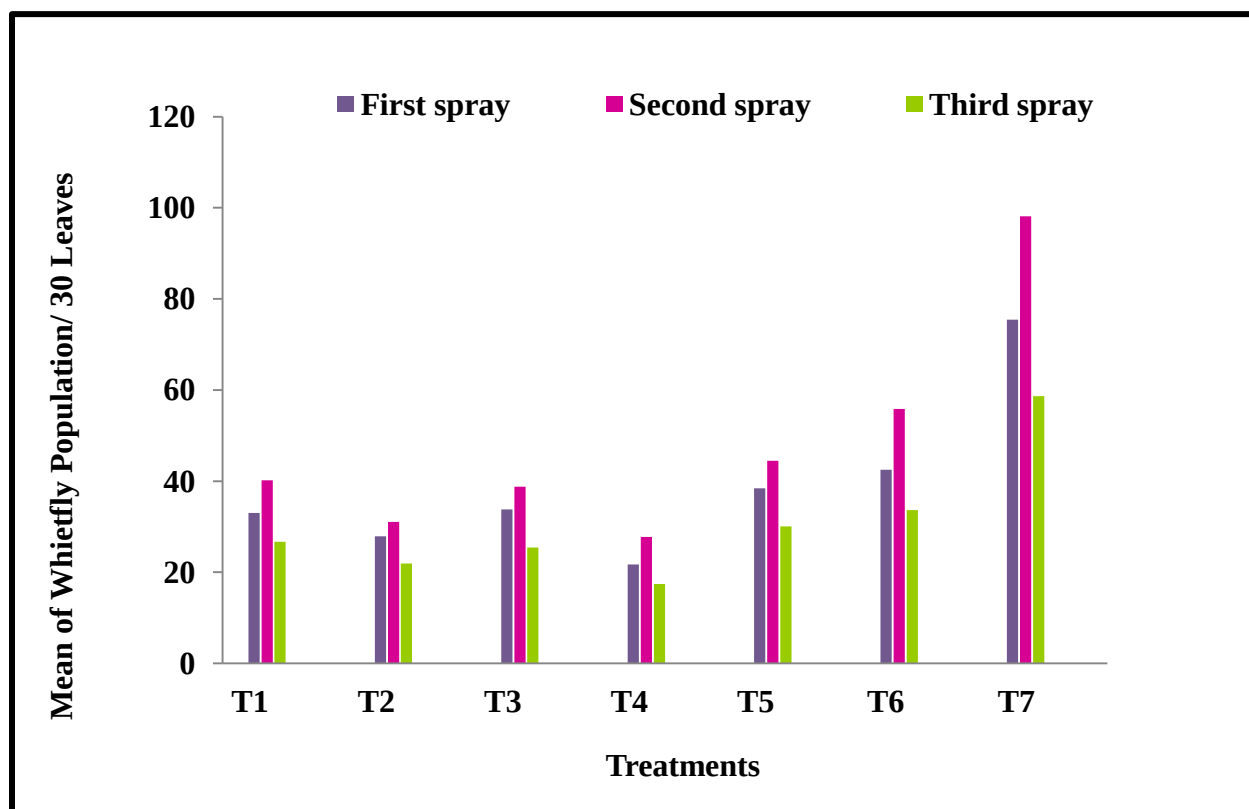


Figure 1: Efficacy of insecticides against whitefly infesting okra (Mean of three sprays)

[MS received : October 29, 2018]

[MS accepted : November 03, 2018]