I J T A
© Serials Publications
National Academy of Agricultural Science (NAAS)
Rating : 3.03

Relative Toxicity of Different Insecticides against *Thrips tabaci* Lindeman on Coton

V. Ravi Kumar[1], N.V.V.S.D. Prasad[2] and T. Madhumathi[3]

Abstract: *Eight insecticides were evaluated to find out their relative toxicity against thrips on cotton. Among the insecticides evaluated, flonicamid 10 WG (15 g a.i./ha) had shown greater control against thrips throughout the crop period. Diafenthiuron 50 WP (300 g a.i./ha) was found to be effective after flonicamid 10 WG where as fipronil 5 SC (50 g a.i./ha) and acephate 75 SP (562.5 g a.i./ha) had shown satisfactory results in controlling thrips. Imidacloprid 17.8 SL (35.6 g a.i./ha) and bifenthrin 10 EC (75 g a.i./ha) were less effective against thrips at all stages of the crop. Highest number of bolls and seed cotton yield was observed in flonicamid 10 WG treated plot which had shown significantly better performance over all other treatments.*

Key words: *Cotton, thrips, insecticide toxicity, flonicamid, diafenthiuron*

INTRODUCTION

Cotton has been infested by 162 insect pests in India, only few of them are key production constraints which cause losses to the tune of 30-80% (Patil, 1998)[5]. Leafhoppers, thrips, aphids and whiteflies are the important sucking pests which inflict the crop at seedling and cause phenomenal losses. Early stages of the crop is highly vulnerable to the attack of sucking pests. Among sucking insect pests, thrips, create a big problem on cotton crop from the early stages up to its maturity, severe attack of thrips cause silvery appearance to leaves of crop. It is an important pest at seedling stage of cotton and initial sign of damage occurs on cotyledonary leaves and subsequently cotton leaves turns to have a silvery appearance and in case of sever attack leaves of cotton crop become crinkled and ragged. This pest cause the major leaf area destruction, late maturity and slow down plant growth in early grown cotton crop (Hawkins *et al*. 1966[3]; Sadras and Wilson 1998[8]). Protection of cotton crop from the sucking pests at its early growing stage is very important because it is a proven fact that a good plant stands at initial stage results in good produce (Rajeshwaran *et al*., 2005[6]). Hence Crop protection with chemicals is desirable and unavoidable part of integrated pest management. Present study was conducted to compare efficacy of different insecticides against thrips on cotton.

MATERIALS AND METHODS

Evaluation of insecticides: The experiment to find out the relative toxicity of different insecticides against *Thrips tabaci* on cotton crop was conducted at Regional Agricultural Research Station, Lam farm, Guntur, Andhra Pradesh during *kharif* season in the year 2013-14. The experiment was laid out in Randomized Block Design with eight insecticides monocrotophos 36 SL (360 g a.i./ha), acephate 75 SP (562.5 g a.i./ha), imidacloprid 17.8 SL (35.6 g a.i./ha), diafenthiuron 50 WP (300 g a.i./ha), fipronil 5 SC (50 g a.i./ha), dinotefuran 20 SG (40 g a.i./ha),

[1] Ph.D Scholar, Department of Entomology, Agricultural College, Bapatla, ANGRAU
[2] Senior scientist, RARS Lam, Guntur, ANGRAU
[3] Professor, Department of Entomology, Agricultural College, Bapatla, ANGRAU
E-mail: vanamaravikumar76@gmail.com

flonicamid 10 WG (15 g a.i./ha), bifenthrin 10 EC (75 g a.i./ha) for foliar application and a control treatment which were replicated thrice. RCH 2 cotton hybrid was selected for this purpose with the spacing of 105 × 60 cm with plot size of 5.25×4.8 m^2. Standard agronomic practices were adopted to raise a good cotton crop.

Preparation of spray fluid for foliar application: A measured quantity of insecticidal solution /powder was mixed with a little quantity of water and stirred well, after which the remaining quantity of water was added to obtain the required concentration of spray fluid.

Foliar application of treatments: Sprayings were given by using a hand compression knapsack high volume sprayer, during morning hours. The plot in each treatment was sprayed with respective insecticides ensuring uniform coverage of insecticide. The first spraying was given at 50 days after sowing when the incidence of thrips population was sufficiently built up in the experimental plots. A total of four sprays were given during the course of season at 10 days interval.

Recording observations: Incidence of thrips per three leaves top, middle and bottom were recorded with the help of 4X magnifying lens on 5 randomly selected plants per each treatment at 3rd and 7th day after treatment (DAT). The plants height of each treatment was recorded at 10 days after each foliar application. Number of bolls per each plant and the kapas yield from each plot were recorded separately in kg/plot for two pickings and converted into q/ha.

RESULTS AND DISCUSSIONS

Efficacy of insecticides against thrips on cotton after first application: The data of thrips population after three days of first application (Table 1) showed that flonicamid 10 WG and diafenthiuron 50 WP recorded less population of thrips of 6.40 and 7.07/ 3 leaves/plant respectively followed by fipronil 5 SC (8.73/3 leaves/plant). Bifenthrin 10 EC (13.00/3 leaves/plant), dinotefuran 20 SG (12.40/3 leaves/ plant) were less effective but the pest population was less than that of control plot (18.20 /3 leaves/ plant). The data after seven days of first application (Table 1) showed that flonicamid 10 WG recorded less population of thrips (7.47/3 leaves/plant) followed by diafenthiuron 50 WP (8.07/3 leaves/ plant) and fipronil 5 SC (9.60/3 leaves/plant). Acephate 75 SP and monocrotophos 36 SL had shown satisfactory results where as dinotefuran 20 SG and bifenthrin 10 EC were less effective in reducing the thrips population.

Efficacy of insecticides against thrips on cotton after second application: Thrips population reached to highest number during this period in control plot (Table 1). Control of the pest by these chemicals followed the same trend as observed in the data of first application. Flonicamid 10 WG (7.07/3 leaves/plant), diafenthiuron 50 WP (7.40/3 leaves/plant) and fipronil 5 SC (9.27/3 leaves/ plant) recorded less population of thrips while bifenthrin 10 EC (13.73/3 leaves/plant) and dinotefuran 20 SG (13.00/3 leaves/plant) recorded less population but the pest population was less than control plot (24.27 /3 leaves/plant).

Efficacy of insecticides against thrips on cotton after third and fourth application: The population of the thrips in control plot was found to be decreased as the age of the cotton crop increased. The data regarding the toxicity of different insecticides against thrips after third and fourth application followed the same pattern of control as in the case of earlier sprays (Table 1).

Cumulative efficacy of four sprays at 7 DAT against thrips on cotton: Cumulative data of four sprays at 7 DAT showed that flonicamid 10 WG (6.45/3 leaves/plant) and diafenthiuron 50 WP (7.10/3 leaves/plant) were effective in reducing the thrips population and they were on par with each other (Table 1). The present findings are in conformity with the results of Gaurkhede *et al*. (2015)[2] who reported that flonicamid 50 WG @ 0.02 per cent was effective in reducing the thrips population. Bharpoda *et al* (2014)[1] who reported that Diafenthiuron 50 WP @ 0.05 was effective against thrips in cotton. Fipronil 5 SC (8.18/3 leaves/plant) was effective in reducing the thrips population. The present findings are in conformity with the results of Gaurkhede *et al*. (2015)[2] who reported that the application of fipronil 5 SC @ 0.015

per cent was highly effective against thrips. Acephate 75 SP (8.73/3 leaves/plant) was also effective against thrips in recording the lowest population which was at par with fipronil. The present findings are in agreement with Bharpoda *et al* (2014)[1] who reported that acephate 75 WP @ 0.075% treated plot had shown less thrips population. Dinotefuran 20 SG (11.72/3 leaves/ plant) and Bifenthrin 10 EC (12.37/3 leaves/plant) were found to be least effective against thrips. Khan (2011)[4] reported that Bifenthrin 10 EC was less effective against thrips.

Influence of insecticides on plant height of cotton plants: The plant height of each treatment was recorded at 10 days after each foliar application (Table 2). The initial data of the plant height was taken before first foliar spray and the results showed non significant among the treatments.The data at 10 days after first application showed the significant difference among the plant heights of the treatments. Flonicamid 10 WG recorded 67.45 cm height which was on par with dinotefuran 20 SG (66.40 cm). Diafenthiuron 50 WP recorded 64.22 cm plant height. The least height of the plants was observed in treated plots of imidacloprid 17.8 SL (58.45) and bifenthrin 10 EC (56.33 cm). The data at 10 days after second application showed that Flonicamid 10 WG recorded more height of 89.78 cm which was on par with dinotefuran 20 SG (84.73 cm). Monocrotophos 36 SL recorded 83.22 cm plant height. Less height of the plants was observed in treatments imidacloprid 17.8 SL (73.78) and bifenthrin 10 EC (67.33 cm). Least height of the plants was observed in untreated control plot (64.35 cm). The data at 10 days after third application showed that Flonicamid 10 WG recorded 110.45 cm height which was on par with dinotefuran 20 SG (100.73 cm) and monocrotophos 36 SL (101.56 cm).

Table 1
Efficacy of insecticides against thrips on cotton

Treatments	*Thrips no. / 3 leaves / plant*									
	Before spray	*First spray*		*Second spray*		*Third spray*		*Fourth spray*		*Cumulative efficacy of four sprays at*
		3 DAT	*7 DAT*	*3 DAT*	*7 DAT*	*3 DAT*	*7 DAT*	*3 DAT*	*7 DAT*	*7 DAT*
T_1:Monocrotophos 36 SL	18.47 (4.30)	10.47 $(3.24)^{cde}$	11.67 $(3.42)^{bcd}$	10.93 $(3.31)^{cd}$	12.2 $(3.49)^{cd}$	10.87 $(3.30)^{cde}$	8.93 $(2.99)^{bcd}$	7.27 $(2.70)^{bc}$	6.27 $(2.50)^{bcd}$	9.77 $(3.13)^{cd}$
T_2:Acephate 75 SP	16.4 (4.05)	9.47 $(3.08)^{cd}$	10.53 $(3.25)^{bc}$	9.93 $(3.15)^{c}$	10.93 $(3.31)^{bc}$	9.80 $(3.13)^{bcd}$	8.07 $(2.84)^{abc}$	6.53 $(2.56)^{ab}$	5.40 $(2.32)^{abc}$	8.73 $(2.96)^{bc}$
T_3:Imidacloprid 17.8 SL	17.13 (4.14)	11.2 $(3.35)^{def}$	12.13 $(3.48)^{cde}$	11.47 $(3.39)^{cde}$	12.73 $(3.57)^{cde}$	11.73 $(3.43)^{def}$	9.47 $(3.08)^{cde}$	7.6 $(2.76)^{bc}$	6.6 $(2.57)^{cde}$	10.23 $(3.20)^{d}$
T_4:Diafenthiuron 50 WP	16.87 (4.11)	7.07 $(2.66)^{ab}$	8.07 $(2.84)^{a}$	7.4 $(2.72)^{ab}$	8.93 $(2.99)^{ab}$	7.87 $(2.80)^{ab}$	6.80 $(2.61)^{ab}$	5.40 $(2.32)^{a}$	4.60 $(2.14)^{ab}$	7.10 $(2.66)^{a}$
T_5:Fipronil 5 SC	17.67 (4.20)	8.73 $(2.96)^{bc}$	9.60 $(3.10)^{ab}$	9.27 $(3.04)^{bc}$	10.27 $(3.20)^{abc}$	8.93 $(2.99)^{abc}$	7.67 $(2.77)^{abc}$	6.2 $(2.49)^{ab}$	5.2 $(2.28)^{abc}$	8.18 $(2.86)^{b}$
T_6:Dinotefuran 20 SG	17.53 (4.19)	12.40 $(3.52)^{ef}$	14.13 $(3.76)^{de}$	13.00 $(3.61)^{de}$	15.00 $(3.87)^{de}$	13.13 $(3.62)^{ef}$	10.53 $(3.25)^{de}$	8.07 $(2.84)^{bc}$	7.20 $(2.68)^{de}$	11.72 $(3.42)^{e}$
T_7:Flonicamid 10 WG	17.6 (4.20)	6.4 $(2.53)^{a}$	7.47 $(2.73)^{a}$	7.07 $(2.66)^{a}$	8.33 $(2.89)^{a}$	7.07 $(2.66)^{a}$	6.13 $(2.48)^{a}$	4.8 $(2.19)^{a}$	3.87 $(1.97)^{a}$	6.45 $(2.54)^{a}$
T_8:Bifenthrin 10 EC	16.67 (4.08)	13.00 $(3.61)^{f}$	14.6 $(3.82)^{e}$	13.73 $(3.71)^{e}$	15.73 $(3.97)^{e}$	13.73 $(3.71)^{f}$	10.87 $(3.30)^{e}$	9.2 $(3.03)^{c}$	8.27 $(2.88)^{e}$	12.37 $(3.52)^{e}$
T_9:Control	17.47 (4.18)	18.2 $(4.27)^{g}$	21.07 $(4.59)^{f}$	24.27 $(4.93)^{f}$	26.2 $(5.12)^{f}$	23.6 $(4.86)^{g}$	19.47 $(4.41)^{f}$	16.53 $(4.07)^{d}$	13.6 $(3.69)^{f}$	20.08 $(4.48)^{f}$
F-test	NS	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig	Sig
SEm±	0.11	0.12	0.12	0.12	0.13	0.14	0.14	0.13	0.12	0.06
CD (P=0.05)	0.32	0.35	0.37	0.36	0.38	0.4	0.41	0.37	0.36	0.17
CV (%)	4.45	6.4	6.25	6.21	6.2	6.95	7.75	7.83	8.36	3.13

Figures in parentheses are square root transformed values. NS: Non Significant, Sig: Significant

Table 2
Influence of insecticides on plant height, number of bolls / plant and yield of cotton plants

Treatments	Plant height					Number of bolls/plant	Seed cotton yield Q ha^{-1}
	Before 1st application	10 days after 1st application	10 days after 2nd application	10 days after 3rd application	10 days after 4th application		
T_1:Monocrotophos 36 SL	42.22 (6.50)	63.56 (7.97)^{cd}	83.22 (9.12)^{bc}	101.56 (10.08)^{ab}	118.56 (10.89)^{ab}	46.89 ^{c}	20.96 ^{bc}
T_2:Acephate 75 SP	43.67 (6.61)	61.33 (7.83)^{d}	77.67 (8.81)^{cd}	92.33 (9.61)^{bc}	105.67 (10.28)^{cd}	37.11 ^{d}	15.14 ^{e}
T_3:Imidacloprid 17.8 SL	42.78 (6.54)	58.45 (7.65)^{e}	73.78 (8.59)^{d}	88.11 (9.39)^{c}	98.78 (9.94)^{d}	29.00 ^{e}	14.51 ^{ef}
T_4:Diafenthiuron 50 WP	44.56 (6.68)	64.22 (8.01)^{bc}	81.89 (9.05)^{bc}	97.56 (9.88)^{bc}	112.89 (10.62)^{bc}	45.67 ^{c}	19.15 ^{cd}
T_5:Fipronil 5 SC	43.67 (6.61)	63.00 (7.94)^{cd}	80.33 (8.96)^{bc}	95.33 (9.76)^{bc}	110.67 (10.52)^{bc}	39.33 ^{d}	18.45 ^{d}
T_6:Dinotefuran 20 SG	45.07 (6.71)	66.40 (8.15)^{ab}	84.73 (9.21)^{ab}	100.73 (10.04)^{ab}	115.4 (10.74)^{bc}	54.00 ^{b}	21.97 ^{ab}
T_7:Flonicamid 10 WG	43.78 (6.62)	67.45 (8.21)^{a}	89.78 (9.48)^{a}	110.45 (10.51)^{a}	129.45 (11.38)^{a}	59.33 ^{a}	23.45 ^{a}
T_8:Bifenthrin 10 EC	43.67 (6.61)	56.33 (7.51)^{e}	67.33 (8.21)^{e}	76.33 (8.74)^{d}	84.33 (9.18)^{e}	26.89 ^{e}	12.63 ^{f}
T_9:Control	44.01 (6.63)	56.35 (7.51)^{e}	64.35 (8.02)^{e}	69.35 (8.33)^{d}	73.35 (8.56)^{f}	22.56 ^{f}	11.15 ^{f}
F-test	NS	Sig	Sig	Sig	Sig	Sig	Sig
SEm±	0.07	0.05	0.11	0.21	0.18	0.9	0.78
CD (P=0.05)	NS	0.15	0.33	0.62	0.53	2.67	2.32
CV (%)	5.25	6.54	7.42	6.85	7.65	4.76	9.49

Figures in parentheses are square root transformed values. Sig : Significant

The data at 10 days after fourth application also depicted the same trend in which flonicamid 10 WG recorded more plant height of 129.45 cm which was on par with dinotefuran 20 SG (115.40 cm) and monocrotophos 36 SL (118.56 cm). The trend was same as observed in the previous data. From the above data it was clear that the treatments which were highly effective against thrips showed more plant height where as the insecticides which were less effective showed less plant height. The present findings were in supporting with Rohini (2010) who studied the efficacy of different insecticides and reported that highly toxic insecticides against sucking pests showed highest plant height.

Influence of insecticides on number of bolls / plant and cotton yield: Number of bolls per each plant and the kapas yield from each plot were recorded separately in kg/plot for two pickings and converted into q/ha (Table 2). The data showed that flonicamid 10 WG which was effective against thrips recorded highest number of bolls per plant (59.33) and yield (23.45 q/ha). Monocrotophos 36 SL and diafenthiuron 50 WP were on par with each other and recorded 46.89,45.67 bolls per plant and 20.96, 19.15 Q/ha respectively. Less number of bolls (26.89) and yield (12.63 q/ha) was observed in bifenthrin 10 EC. Untreated control plot recorded lowest bolls (22.56/plant) and yield (11.15q/ha).

CONCLUSIONS

All the insecticides tested were superior to untreated check by recording lower population of thrips. Among the insecticides tested, flonicamid 10 WG was found to be highly effective against thrips which was followed by Diafenthiuron 50 WP. Fipronil 5 SC, acephate 75 SP and monocrotophos 36 SL were also found to reduce thrips population. Imidacloprid 17.8 SL and bifenthrin 10 EC were very less effective against thrips when compared with flonicamid 10 WG. The efficacy of all the treatments decreased after 7 DAT leading to slight build up of population. Highest number of bolls (59.33/plant) and seed cotton yield (23.45 q/ha) was observed in flonicamid 10 WG treated plot which had shown

significantly better performance over all other treatments. The information developed by this study helps producers to choose effective insecticides for controlling thrips on cotton.

References

Bharpoda, T.M., Patel, N B., Thumar, R.K., Bhatt, N.A., Ghetiya, L.V., Patel, H.C and Borad, P. K. 2014. Evaluation of insecticides against sucking insect pests infesting Bt cotton BG- II.*The bioscan*. 9(3): 977-980.

Gaurkhede, A.S., Bhalkare, S.K., Sadawarte, A.K and Undirwade, D.B. 2015. Bioefficacy of new chemistry molecules against sucking pests of Bt transgenic cotton. *International journal of plant protection*. 8(1): 7-12.

Hawkins, B.S., Peacock, H.A and Steele, T.E. (1966), Thrips injury to upland cotton (*Gossypium hirsutum* L.) varieties. *Crop Science*. 6: 256-258.

Khan, S. M. (2011), Varietal performance and chemical control used as tactics against sucking insect pests of cotton. *Sarhad Journal of Agriculture.* 27(2): 255-261. 32.

Patil, B.V. (1998), Developing ipm schedule,in: Proceedings of seminar on IPM special issue, Indian cotton promotion association, Mumbai, pp 107-110.

Rajeshwaran, J., Santharam, G., Kuttalam, S and Chandrasekaran, S. (2005), Biological compatibility of carbofuran, with methyl demeton, carbendazim, magnesium sulphate and their effects on sucking pests of cotton. *Annals of Plant Protection Sciences.* 13: 22-33.

Rohini, A., Prasad, N.V.V.S.D and Chalam, M.S.V. (2011), Management of major sucking pests in cotton by insecticides. *Annals of Plant Protection Sciences*. 20(1) : 102-106.

Sadras, V.O and Wilson, L.J. (1998), Recovery of cotton crops after early season damage by thrips. *Crop Science*. 38: 399-409.