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Efficacy of Different Insecticides against Cotton Thrips (*Thrips Tabaci* Lind.) (Thripidae :Thysonoptera) in Ecological Zone of Bahawalnagar

Laila Khalid[1], Dr.Muhammad Kashif Nadeem[2], Mueen-u-Din[3], Rizwan Amjad[4] Masood Qadir Waqar[5]

[1] *Research Officer*
[2] *Senior Subject Matter Specialists (Plant Protection)*
[3]*Senior Subject Matter Specialist (Agronomy)*
[4] *Agriculture Officer (Plant Protection) Bahawalnagar*
[5] *Director Adaptive Research Punjab*
[1, 4] *Adaptive Research Station Bahawalnagar*
[2,3]*Department of Adaptive Research Farm, Vehari Punjab- Pakistan*
[5]*Adaptive research Punjab, Lahore*

ABSTRACT

A field experiment was conducted during summer seasons 2014 and 2015 to determine the efficacy of different insecticides against cotton thrips (*Thrips tabaci*) at farmer's field of Adaptive Research station Bahawalnagar. Six different insecticides Spinosad 240SC @100ml/ha, Acephate 75SP @875g/ha, Dimethoate 40EC @1000ml/ha, Chlorpenpyre 360GL @250ml/ha, Spintoram 120SC @150ml/ha and Acetamaprid 20SP @375g/ha were evaluated in a three replicated RCBD method including an unchecked. Before application of insecticides, the pre treatment observations were taken on thrips, while post treatment observations were taken after 24, 72 and 168 hours of application of insecticides. However, Spinosad 240SC (87%) showed its effectiveness up to 7th day of the spray during both years. The mortality percentage of thrips on cotton was observed in case of Spintoram 120SC (83%) and Dimethoate 40EC (75%). This attained its effectiveness up to 7th day after application. Least controlled was observed when applied Acetamaprid 20SP (47%) during both years 2014-15.

INTRODUCTION

Cotton is the major crop and considering the white gold of Pakistan. It is the most important and economy dependent crop of Pakistan (Hakim et al. 2011). It contributes a huge share in the foreign exchange earnings and is important fiber crop (Ahmad et al. 2011). In textile manufacturing, it produces seeds with a potential multi product base such as hulls, oil and lint (Ozyigit et al. 2007). In Pakistan cotton is grown on an area of 2879 thousand hectares with a production of 13.0 million bales during the period 2013 against the target of 14.5 million bales a decline of 10.3% against the targets and decrease of 4.2% over the production of past year which was 13.6 million bales. Severe attack of insect pests like thrips, white fly, jassids and disease like cotton leaf curl virus are the major crop limiting factors (Annonymos, 2013). The insect pest infestation in cotton caused deterioration in lint quality and 10-40% losses in crop yield (Gahukar, 2006). The sucking insect pests are injurious to cotton crop. They cause damage by sucking the sap from the under surface of the leaves, transmit viral diseases (Butler & Henneberry, 1994). 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 appreance to leaves of crop. Besides cotton, thrips attack was observed on vegetables, greenhouse plants and roses (Boll et al. 2006; Zhang et al. 2007). The first sign of damage occurs on cotyledonary leaves which take on a silvery appearance. Damaged true leaves become ragged and crinkled with damaged areas becoming more apparent as leaves expand. In early season cotton, thrips cause significant leaf area destruction, delayed maturity and retarded plant growth (Sadras and Wilson 1998; Harp and Turner 1976; Hawkins et al. 1966). It is an important pest of cotton at seedling stage (Williams, 2006). Thrips is known to be a vector of the tomato spotted wilt virus (Boonham et al. 2002), which is an important plant disease. *Bt* cotton varieties were introduced in Pakistan during 2005 to control lepidopteran insect pests on cotton. However, widespread adoption of *Bt* cotton has resulted in an

increase in sap feeding insect pests like thrips, mites, mealy bugs and others (Malik and Hussain 2006). Use of chemicals is an essential part of integrated pest management in crop protection measures (Mohyuddin et al. 1997). Neonicotinoids are among the most effective insecticides for the control of sucking insect pests. Non selective use of pesticides leads to water pollution, soil degradation, pest resistance and resurgence and ozone depletion (Naeem et al. 2012).

Spinosad and acephate were effective at controlling thrips on greenhouse grown plants (Cloyd and Raymond, 2000). Din et al. (2015) reported that Spinosad and Spintoram proved to be effective in controlling cotton thrips in natural field conditions, while, Aslam et al. 2004, Tayyab et al. 2005 and Asi et al. 2008, in earlier studies were reported that Acetamaprid and Imidacloprid proved to be most effective against thrips. Neonicotinoids insecticides like diafenthiuron, acetamiprid, imidacloprid and thiamethoxam managed the development of resistance to *B. tabaci*, *A. devastans*, *T. tabaci* and other sucking insect pests against conventional insecticides in different parts of USA and Israel on different crops (Palumbo et al. 2001). Keeping in view the economic importance and pest status of thrips this study was conducted to obtain data on relative toxicities of insecticides labeled for the control of thrips.

MATERIALS AND METHODS

The experiment was conducted at farmer's field of Adaptive Research station Bahawalnagar during 2014 and 2015 against cotton thrips (*Thrips tabaci* Lind.: Thripidae) on cotton to test the efficacy of six insecticides viz. Spinosad 240SC @100ml/ha, Acephate 75SP @875g/ha, Dimethoate 40EC @1000ml/ha, Chlorpenpyre 360GL @250ml/ha, Spintoram 120SC @150ml/ha and Acetamaprid 20SP @375g/ha on cotton variety FH-142. The experiment was laid out in Randomized Complete Block Design (RCBD). The insecticides used in the present experiment were obtained from the local market and were sprayed at field recommended doses when the population of pest reached the Economic Threshold Level (ETL). The ETL for the thrips was considered as 8-10/leaf. There were 7 treatments including control, having 3 repeats. The plot size was kept as 30 ft x 60 ft. The plant inspection method was used for sampling the pest population. The field recommended doses of the insecticides as presented in Table 1 were sprayed with hand operated knapsack sprayer having 20 liters capacity fitted with hollow cone nozzle. The control plot remained unsprayed. The sprayer was calibrated using simple water by calculating the amount of water required for spraying on a unit area prior to experiment. All agronomic practices like irrigation, fertilizer applications etc. were kept uniform throughout the experiment on all plots. Pest data was recoded from 12 randomly selected plant leaves. To study the efficacy of different insecticides as mentioned in (Table 1), population of thrips was recorded by the same method a day before spray and after 24 hours, 72 hours and 168 hours after treatment. Crop was kept free from weeds. Population change increase or decrease was calculated by using modified Abbot's formula as below:

below:

% Population Change =

$$1 - \frac{Post\ treatment\ population\ in\ treatment}{Pre\ treatment\ population\ in\ treatment} \times \frac{Pre\ treatment\ population\ in\ control}{Post\ treatment\ population\ in\ control} \times 100$$

(Flemings and Ratnakaran 1985)

Data were analyzed statistically with M-stat package and means were compared by DMR test at 5 percent probability level (Duncan, 1955).

Table1. *Different insecticides used against cotton thrips, (Thrips tabaci) with respective doses per hectare.*

S. #	Insecticides with formulation	Dose (ml or gm/ha)
1	Spinosad 240SC	100
2	Acephate 75SP	875
3	Dimethoate 40EC	1000
4	Chlorpenpyre 360GL	250
5	Spintoram 120SC	150
6	Acetamaprid 20SP	375

RESULTS AND DISCUSSIONS

Insecticides (Table 1) were sprayed in recommended doses when the population of cotton thrips reached economic threshold level (ETL). Insecticides were dissolved in water to prepare insecticide solutions on vol. / vol. and Wt. / Vol. basis. The crop was sprayed in the morning before 10 a. m. The population of insect pests was recorded 2nd, 3rd and 7th days after application of insecticides. The data on pest population were analyzed by using the effectiveness of various insecticides was considered to be an indirect reflection of pest population in various treatments i.e. lower population of insect pests would represent higher toxicity and vice versa. The population of cotton thrips was significantly lower ($P<0.05$) in insecticides treated plots as showed in (Table 2). Thrips population fluctuated in terms of mortality (%) after 2nd, 3rd and 7th day spray application. All tested insecticides in (Table 2) caused significant mortality in population of cotton thrips even 7th days after spray. Spinosad 240SC was statistically highly effective with mortality in cotton thrips population as 69 and 84% even 3rd and 7th days of treatment during 2014 followed by Spintoram 120SC that caused mortality in population of cotton mites as 63 and 83. While in case of Chlorpenpyre 360GL and Dimethoate 40EC a similar effect on the mortality of cotton thrips was observed even after 3rd and 7th days after treatment i.e (67 & 75) and (60 & 74) as described in table 3. In case of Acephate 75SP the mortality in population as 52 and 66% after 3rd and 7th days of treatment. In case of Acetamaprid 20SP the mortality % of thrips was observed as 46 and 43 after 3rd and 7th day of spray application. Spinosad 240SC proved to be the best product even after 3rd and 7th days after application of insecticides. These results are similar as described by Din et al. (2015) and Cloyd and Raymond, (2000). Non selective use of pesticides leads to water pollution, soil degradation, pest resistance and resurgence and ozone depletion (Naeem et al. 2012).

Table2. *Mean percent population change of cotton thrips after application of different insecticides on cotton during 2014.*

Treatments	Dose/ha (g,ml)	A.v pest population before spray	Post treatment average population/plant			(%) Population Change		
			2nd day	3rd day	7th day	2nd day	3rd day	7th day
Spinosad	100	11	06a	04a	02a	50a	69a	84a
Acephate	875	11	9.2d	6.2d	4.2d	23e	52e	66d
Dimethoate	1000	12	8.6c	5.6c	3.6c	34d	60d	74c
Chlorpenpyre	250	11	7.3bc	4.3bc	3.2bc	39b	67b	75bc
Spintoram	150	12	8.2b	5.2b	2.3b	37c	63c	83b
Acetamaprid	375	11	9.0e	7.0e	7.2e	25f	46f	43e
Control		11	12f	13f	12.6f	-	-	-
LSD (0.05)			9.8	7.7	6.5			

Each value is a mean of three replications. Means sharing similar letters in columns are not significantly different byDMR test (P=0.05)

It is evident from the (Table 3) that insecticides were found to be effective in controlling population of cotton mites during 2015 under field conditions. All tested insecticides (Table 1) caused significant mortality in population of cotton mites even 7 days after spray. Spinosad 240SC was statistically highly effective with mortality in cotton thrips population as 70 and 90% even 3rd and 7th days of treatment during 2014 followed by Spintoram 120SC that caused mortality in population of cotton mites as 56 and 83. While in case of Chlorpenpyre 360GL and Dimethoate 40EC a similar effect on the mortality of cotton thrips was observed even after 3rd and 7th days after treatment i.e (44 & 69) and (53 & 76) as described in table 3. In case of Acephate 75SP the mortality in population of thrips as 60 and 81% after 3rd and 7th days of treatment. In case of Acetamaprid 20SP the mortality % of thrips was observed as 47 and 51 after 3rd and 7th day of spray application. Spinosad 240SC proved to be the best product even after 3rd and 7th days after application of insecticides. Use of chemicals is an essential part of integrated pest management in crop protection measures (Mohyuddin et al. 1997).

Table3. *Mean percent population change of cotton thrips after application of different insecticides on cotton during 2015.*

Treatments	Dose/ha (g,ml)	A.v pest population before spray	Post treatment average population/plant			(%) Population Change		
			2nd day	3rd day	7th day	2nd day	3rd day	7th day
Spinosad	100	12	08a	06a	02a	55a	70a	90a
Acephate	875	12	10.3c	08b	04c	42b	60b	81b
Dimethoate	1000	11	10.3c	8.6c	4.7d	37d	53c	76c

Chlorpenpyre	250	11	11.3d	10.3d	5.9e	31e	44e	69c
Spintoram	150	11	9.66b	08b	3.33b	41c	56c	83b
Acetamaprid	375	12	12.0e	10.6d	10.2f	32e	47d	51d
Control		11	16.3f	18.3e	19.3g	-	-	-
LSD (0.05)			*11.6*	*8.2*	*9.4*			

Each value is a mean of three replications. Means sharing similar letters in columns are not significantly different by DMR test (P=0.05)

CONCLUSIONS

It is concluded from the research trial that all the insecticides proved to be effective for controlling cotton thrips but Spinosad 240SC @ 100 ml/ha proved to be more effective against cotton thrips followed by Spintoram 120SC @ 150 ml/ha.

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