



FIELD EVALUATION OF NEW INSECTICIDES AGAINST COTTON THRIPS (*THRIPS TABACI* LIND.) IN DISTRICT MULTAN

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ABSTRACT

The studies were conducted at farmer's field in Tehsil Shujabad of Multan district. The efficacy of following insecticides viz. Hicap 20 SL(imidacloprid) @ 500 ml/ha, Pirate 360 SC (chlorofenapyr) @ 250 ml/ha, Tracer 240 SC (spinosad) @ 125 ml/ha, Movento 50 WDG (spirotetramat) @ 500 gm/ha, Karate 2.5EC (lambda cyhalothrin) @ 825 ml/ha, Acephate 70 WP (acephate) @ 625 gm/ha, Imidacloprid 25 WP (imidacloprid) @ 185 gm/ha, Momentum 50 WDG (chlorofenapyr + nitenpyram) @ 375 gm/ha, Confidor 70 WG (imidacloprid) @ 58 gm/ha were evaluated on transgenic cotton (Bt-886) against adult thrips. Maximum mortality of thrips was recorded in Acephate 75SP *i.e.* 86.91% and 75.47% after 24 and 72 hours of spray while Pirate 360 SC @ 250 ml/ha exhibited maximum percentage of mortality *i.e.* 58.18% after 168 hours of insecticides application.

Keywords: Insecticides, Efficacy; Transgenic cotton Bt.886; Thrips; Pakistan

INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is regarded as mainstay of Pakistan's economy because it is a major source of foreign exchange and plays vital role in economic development of the country. Pakistan has very low per hectare yield of cotton as compared to other cotton producing countries (Bakhsh *et al.*, 2005). Numerous factors are narrated for the lower productivity of the crop but the most serious one is the intensity of insect pests attack (Anonymous, 2006; Aslam *et al.*, 2004). More than 1326 species of insects have been reported to attack cotton crop in the world (Atwal, 2002) and about 93 insect and mite pests have been reported to attack it in Pakistan (Yunis and Yousaf, 1979). The cotton growing areas of the country after the introduction of Bt.cotton has witnessed a significant change in cropping scheme (Ahsan and Altaf, 2009; Abdullah, 2010). The crop is now sown in the month of February instead of July and this long duration has exposed the crop to a number of insect pests. There is no doubt that the introduction of Bt. cotton in our agricultural landscape has proved beneficial to our farmers in the effective control of some specific lepidopterous species (Arshad *et al.*, 2009) but there is lack of resistance against sucking insect

pests (Hofs *et al.*, 2004; Sharma & Pampapathy, 2006; Jeyakumar *et al.*, 2008) so the sucking insect pests have warranted monitoring and intervention with insecticides in the early stage of the crop (Kilpatrick *et al.*, 2005). The sucking insect pests including whitefly (*Bemisia tabaci* Genn.), thrips (*Thrips tabaci* Lind.), and jassid (*Amrasca biguttula biguttula* Ishida) are more injurious to the cotton which cause 40-50 percent damage in the crop (Naqvi, 1976). Thrips (*Thrips tabaci* Lind.) have recently attained the status of a regular cotton insect pest in the Punjab province of Pakistan, probably due to over use of pesticides (Ali *et al.*, 1993). *Thrips tabaci* is the most important early-season sucking insect pest on cotton. It attacks cotton crop early in the season but high population densities can be seen during second fortnight in September (Ali *et al.*, 1993; Wilson & Bauer, 1993; Gupta *et al.*, 1997; Khan *et al.*, 2008). Both nymph and adult stages of thrips damage the tissue and destroy leaves by sucking the cell sap. Due to attack of this pest leaves curl up and plants remain stunted at initial stage. Thrips has been reported to develop resistance against conventional insecticides, intensive research have been carried out for evaluating new insecticides with novel mode of action against thrips with minimum hazards for mammals and

natural enemies (Lobna T. M. Zidan, 2012). Ghabn, 1948 and Bournier, 1969 have reported that *T.tabaci* was responsible for the loss of 50% of young cotton plants and can also act as vector of plant diseases (Sakimura, 1963). Our farmers irrationally use more and more insecticide/pesticide for its control which is detrimental not only to natural enemies but also to our environment hence attempts were made to study the field efficacy of various insecticides against thrips on Bt.cotton.

MATERIALS AND METHODS:

Following insecticides viz. Hicap 20SL (imidacloprid) @500ml/ha, Pirate 360SC (chlorofenapyr) @250ml/ha, Tracer 240SC (spinosad) @125ml/ha, Movento 50WDG (spirotetramat) @500gm/ha, Karate 2.5EC (lambda cyhalothrin) @825ml/ha, Acephate 70WP (acephate) @625gm/ha, Imidacloprid 25WP (imidacloprid) @185gm/ha, Momentum 50WDG (chlorofenapyr+nitenpyram) @375gm/ha, Confidor 70WG (imidacloprid) @58gm/ha were sprayed on cotton crop having maximum population of thrips at the farmer's field in Tehsil Shujabad of

Multan district. The Cotton variety Bt. 886 was selected for this study. There were ten treatments including control. The plot size for each treatment was 6.45m x 4.94 m. There were six lines in each plot, 75 cm apart; while plant-to plant distance was 23 cm. All the inputs applied were same in all the treatments. The data of thrips was recorded from 15 leaves selected at random from 15 plants per plot by taking upper, middle and lower portion of the plant before spray and then after 24, 72 and 168 hours of spray. The data was consolidated and percent mortality was calculated by using the formula.

$$\% \text{ Mortality} = \frac{(\text{Population before spray} - \text{Population after spray})}{\text{Population before spray}} \times 100$$

STATISTICAL ANALYSIS:

The data were subjected to analysis of variance (ANOVA) by using Statistix Version-9 (www.statistix.com/freetrail.html) (Lawes Agricultural Trust Rothamsted Experimental Station, Rothamsted, UK). The means were separated by LSD (Least Significant Difference).

Table 1.

Percent mortality of thrips 24, 72 and 168 hours after spray 2013.

Insecticides			Percentage Mortality of Thrips on Cotton After		
TRADE NAME	COMMON NAME	Dose/ha	24 hours MEAN±SE	72hours MEAN±SE	168 hours MEAN±SE
Hicap 20SL	imidacloprid	500ml	79.97±4.37ab	75.77±2.07b	41.37±3.48de
Pirate 360 SC	chlorofenapyr	250ml	74.91±3.80bc	76.14±2.37b	61.92±6.55a
Tracer 240SC	spinosad	125ml	80.70±1.70ab	79.43±3.23ab	52.54±2.52b
Movento 50WDG	spirotetramat	500gm	62.67±7.24d	66.21±7.92c	43.19±3.67cd
Karate 2.5EC	lambdacyhalothrin	825ml	68.28±2.82cd	66.22 ±5.19c	37.25±1.84e
Acephate 75SP	acephate	625gm	86.91±3.94a	85.41±2.01a	40.54 ±2.56de
Imidacloprid 25 WP	imidacloprid	185gm	70.31±4.96bc	65.63±4.69c	42.76±2.26cde
Momentum 50WDG	chlorofenapyr+ nitenpyram	375gm	72.96±2.56c	67.75±2.24c	47.29±1.78bc
Confidor 70 WG	imidacloprid	58gm	68.35±2.91cd	67.53±2.31c	39.45±1.34de
Control			5.33±0.67e	4.09±0.25d	5.59±0.65f
LSD Value			6.97	6.89	5.82

Means followed by common letters in the representative category are not significantly different from each other by LSD at $\alpha = 0.05$.

RESULTS AND DISCUSSION:**PERCENT MORTALITY OF THRIPS 24 HOURS AFTER SPRAY**

The data on the effectiveness of various insecticides for the control of thrips after 24 hours of spray revealed a highly significant difference among treatments in the 2013 trial ($F=94.66$; $df=29,18$; $P<0.01$; Table-I). The maximum percentage of mortality was observed in those treatments where Acephate 75SP (acephate) @ 625gm/ha was sprayed having 86.91% mortality followed by Tracer 240SC (spinosad) @ 125/ha (80.70%), Hicap 20SL (imidacloprid) @ 500ml/ha (79.97%), Pirate 360SC (chlorofenapyr) @250ml/ha (74.91%), Momentum 50WDG (chlorofenapyr+nitenpyram) @375gm/ha (72.99%), Imidacloprid 25WP(imidacloprid) @185gm/ha (70.31%), Confidor 70 WG (imidacloprid) @58gm/acre (68.35%) and Karate 2.5EC (lambdacyhalothrin) @825ml/ha (68.28%) respectively. The minimum mortality of the pest *i.e.* 62.67% after 24 hours of spray was observed in those treatments where Movento

50WDG (spirotetramat) @500gm/ha was sprayed.

PERCENT MORTALITY OF THRIPS 72 HOURS AFTER SPRAY

Highly significant difference were observed among treatments after 72 hours of spray in the 2013 trial ($F=94.76$; $df=29,18$; $P<0.01$; Table-I). Acephate 75SP (acephate) @625gm/ha proved to be most effective insecticide against thrips by showing 85.41% mortality followed by Tracer 240SC (spinosad) @125ml/ha (79.43%), Pirate 360SC (chlorofenapyr) @250ml/ha (76.14%), Hicap 20SL (imidacloprid) @500ml/ha (75.77%), Momentum 50WDG (chlorofenapyr+nitenpyram) @375gm/ha (67.75%). The minimum mortality of the pest *i.e.* 65.63% was observed in those treatments where Imidacloprid 25WP (imidacloprid) @185gm/ha was sprayed which is statistically similar to Confidor 70 WG (imidacloprid) @58gm/ha (67.53%), Karate 2.5EC (lambdacyhalothrin) @825ml/ha (66.22%) and Movento 50WDG (spirotetramat) @500gm/ha (66.21%) respectively.

Table 2

Percent mortality of thrips 24, 72 and 168 hours after spray 2014.

Insecticides			Percentage mortality of thrips oncotton after		
Trade name	Common name	Dose/ha	24 hours	72hours	168 hours
			Mean±se	Mean±se	Mean±se
Hicap 20SL	imidacloprid	500ml	71.74±2.79ab	68.16±6.39bc	43.61±3.84bc
Pirate 360 SC	chlorofenapyr	250ml	69.34±3.74bc	68.48±4.67bc	54.44±6.97a
Tracer 240SC	spinosad	125ml	76.55±5.01a	74.30±6.98ab	45.44±4.42b
Movento 50WDG	spirotetramat	500gm	60.90±5.88d	61.97±4.57cd	39.12±4.81cd
Karate 2.5EC	lambdacyhalothrin	825ml	65.46±4.92bcd	69.01±3.96abc	38.07±3.02d
Acephate 75SP	acephate	625gm	77.17±4.20a	76.08±5.49a	37.65±2.05d
Imidacloprid 25 WP	imidacloprid	185gm	64.12±3.54cd	56.09±3.65d	40.04±3.81cd
Momentum 50WDG	chlorofenapyr+nitenpyram	375gm	68.72±3.23bc	66.42±3.43c	47.62±3.70b
Confidor 70 WG	imidacloprid	58gm	65.59±4.14bcd	65.86±4.72c	35.24±3.74d
Control			7.44±0.11e	7.05±0.14e	6.75±0.08e
LSD Value			7.07	7.08	5.25

Means followed by common letters in the representative category are not significantly different from each other by LSD at $\alpha=0.05$.

PERCENT MORTALITY OF THRIPS 168 HOURS AFTER SPRAY

Highly significant difference were observed among treatments after 168 hours of spray in the 2013 trial ($F=59.44$; $df=29,18$; $P<0.01$; Table-I). After 168 hours of spray Pirate 360SC (chlorofenapyr) @ 250ml/ha proved to be most effective against thrips by showing 61.92% mortality followed by Tracer 240SC (spinosad) @125ml/ha (52.54%), Momentum 50WDG (chlorofenapyr+ nitenpyram) @375gm/ha (47.29%), Movento 50WDG (spirotetramat) @ 500gm/ha (43.19%), Imidacloprid 25WP (imidacloprid) @185gm/ha (42.76%), Acephate 75SP (acephate) @625gm/ha (40.54%), Confidor 70WG (imidacloprid) @58gm/ha (39.45%) respectively. The minimum mortality *i.e.* 37.25% of the pest after 168 hours of spray was observed in those treatments where Karate 2.5EC (lambdacyhalothrin) @825ml/ha was sprayed.

PERCENT MORTALITY OF THRIPS 24 HOURS AFTER SPRAY

The data on the effectiveness of various insecticides for the control of thrips after 24 hours of spray revealed a highly significant difference among treatments in the 2014 trial

($F=71.23$; $df=29,18$; $P<0.01$; Table-II). The maximum percentage of mortality was observed in those treatments where Acephate 75SP (acephate) @625gm/ha was sprayed having 77.17% mortality followed by Tracer 240SC (spinosad) @125ml/ha (76.55%), Hicap 20SL (imidacloprid) @500ml/ha (71.74%), Pirate 360SC (chlorofenapyr) @250ml/ha (69.34%), Momentum 50WDG (chlorofenapyr+ nitenpyram) @375gm/ha (68.72%), Confidor 70WG (imidacloprid) @58gm/ha (65.59%), Karate 2.5EC (lambdacyhalothrin) @825ml/ha (65.46%) and Imidacloprid 25WP (imidacloprid) (64.12%) respectively. The minimum mortality of the pest *i.e.* 60.90% after 24 hours of spray was observed in those treatments where Movento 50WDG (spirotetramat) @500gm/ha (60.90%) was sprayed.

PERCENT MORTALITY OF THRIPS 72 HOURS AFTER SPRAY

Highly significant difference were observed among treatments after 72 hours of spray in the 2014 trial ($F=69.71$; $df=29,18$; $P<0.01$; Table-II). The maximum percentage of mortality was observed in those treatments where Acephate 75SP (acephate) @625gm/ha was sprayed having 76.08% mortality followed by Tracer 240SC (spinosad) @125ml/ha (74.30%), Karate 2.5EC

Table 3

Percent mortality of thrips 24, 72 and 168 hours after spray 2013-14.

Insecticides			Percentage mortality of thrips on cotton after		
Trade name	Common name	Dose/ha	24 hours Mean±se	72hours Mean±se	168 hours Mean±se
Hicap 20SL	imidacloprid	500ml	69.84±10.41abc	71.96±4.09cd	42.49±1.82c
Pirate 360 SC	chlorofenapyr	250ml	66.70±12.07bcd	72.31±1.19bc	58.18±6.69a
Tracer 240SC	spinosad	125ml	72.52±11.40ab	76.87±2.04ab	48.99±1.78b
Movento 50WDG	spirotetramat	500gm	56.32±8.55e	64.09±4.82ef	41.16±1.84cd
Karate 2.5EC	lambdacyhalothrin	825ml	61.02±9.48de	67.62±4.35de	37.66±1.02d
Acephate 75SP	acephate	625gm	75.47±9.22a	80.75±1.83a	39.09±1.93cd
Imidacloprid 25 WP	imidacloprid	185gm	62.19±12.56de	60.86±1.06f	41.40±2.75cd
Momentum 50WDG	chlorofenapyr+ nitenpyram	375gm	64.83±7.97cd	67.08±1.64e	47.46±1.42b
Confidor 70 WG	imidacloprid	58gm	61.12±7.04de	66.69±3.12e	37.34±1.20d
Control			5.78±1.17f	5.57±0.08g	6.17±0.35e
LSD Value			6.21	4.62	4.07

Means followed by common letters in the representative category are not significantly different from each other by LSD at $\alpha=0.05$.

(lambdacyhalothrin) @825ml/ha (69.01%), Pirate 360SC (chlorofenapyr) @250ml/ha (68.48%), Hicap 20SL (imidacloprid) @500ml/ha (68.16%), Momentum 50WDG (chlorofenapyr+nitenpyram) @375gm/ha (66.42%), Confidor 70WG (imidacloprid) @58gm/ha (65.86%) and Movento 50WDG (spirotetramat) @500gm/ha (61.97%). The minimum mortality of the pest *i.e.* 56.09% after 72 hours of spray was observed in those treatments where Imidacloprid 25WP (imidacloprid) @58gm/ha was sprayed.

PERCENT MORTALITY OF THRIPS 168 HOURS AFTER SPRAY

The data in the Table reveal that there is significant difference among treatments 168 hours after spray in the 2014 trials ($F=50.92$; $df=29, 18$; $P<0.01$; Table-II). The maximum mortality of the pest *i.e.* 54.44% after 168 hours of spray was shown in those treatments treated with Pirate 360SC (chlorofenapyr) @250ml/ha followed by Momentum 50WDG (chlorofenapyr+ nitenpyram) @375gm/ha (47.62%), Tracer 240SC @125ml/ha (45.44%) and Hicap 20SL (imidacloprid) @ 500ml/ha (43.61%), Imidacloprid 25WP (imidacloprid) @185gm/ha (40.04%) and Movento 50WDG (spirotetramat) @500ml/ha (39.12%). Confidor 70WG (imidacloprid) @58gm/ha exhibited the lowest percentage mortality *i.e.* 35.24% of the pest after 168 hours of spray which is statistically similar to Acephate 75SP (acephate) @625 gm/acre (37.65%) and Karate 2.5EC (lambdacyhalothrin) @825ml/ha (38.07%) respectively.

PERCENT MORTALITY OF THRIPS 24 HOURS AFTER SPRAY

The cumulative data on the effectiveness of various insecticides for the control of thrips after 24 hours of spray revealed a highly significant difference among treatments ($F=89.54$; $df=29, 18$; $P<0.01$; Table-III). The maximum percentage of mortality was observed in those treatments where Acephate 75SP (acephate) @625gm/ha was sprayed having 75.47% mortality followed by Tracer 240SC (spinosad) @125ml/ha (72.52%), Hicap 20SL (imidacloprid) @500ml/ha (69.84%), Pirate 360SC (chlorofenapyr) @250 ml/ha (66.70%), Momentum 50WDG (chlorofenapyr+nitenpyram) @375gm/ha (64.83%), Imidacloprid 25WP (imidacloprid) @185gm/ha (62.19%) and Karate 2.5EC (lambdacyhalothrin) @825ml/ha (61.02%). The minimum mortality of the pest *i.e.* 56.32% after 24 hours of spray was observed in those treatments where Movento 50WDG (spirotetramat) @500gm/ha was sprayed which is statistically similar to Confidor 70WG (imidacloprid) @58gm/ha (61.12%) respectively.

PERCENT MORTALITY OF THRIPS 72 HOURS AFTER SPRAY

Highly significant difference were observed among treatments after 72 hours of spray ($F=184.90$; $df=29, 18$; $P<0.01$; Table 3). Acephate 75SP (acephate) @625gm/ha proved to be most effective insecticide against thrips by showing 80.75% mortality of the pest followed by Tracer

240SC (spinosad) @125ml/ha (76.87%), Pirate360SC (chlorofenapyr) @250ml/ha (72.31%), Hicap 20SL (imidacloprid) @500ml/ha (71.96%), Karate 2.5EC (lambdacyhalothrin) @825ml/ha exhibited (67.62)%, Momentum 50WDG (chlorofenapyr+ nitenpyram) @375gm/ha (67.08%), Confidor 70WG (imidacloprid) @58gm/ha (66.69%), Movento 50WDG (spirotetramat) @500gm/ha (64.09%). The minimum mortality of the pest *i.e.* 60.86% after 72 hours of spray was observed in those treatments where Imidacloprid 25WP (imidacloprid) @58gm/ha was sprayed.

PERCENT MORTALITY OF THRIPS 168 HOURS AFTER SPRAY

The data in the Table reveal that there is significant difference among treatments after 168 hours of spray in ($F=97.00$; $df=29, 18$; $P<0.01$; Table-III). The maximum mortality of the pest *i.e.* 58.18% after 168 hours of spray was shown in those treatments treated with Pirate 360SC (chlorofenapyr) @250ml/ha followed by Tracer 240SC @125ml/ha (48.99%), Momentum 50WDG (chlorofenapyr+ nitenpyram) @375gm/ha (47.46%), Hicap 20SL (imidacloprid) @ 500ml/ha (42.49%), Imidacloprid 25WP (imidacloprid) @185gm/ha (41.41%) and Movento 50WDG (spirotetramat) @500ml/ha (41.16%). Confidor 70 WG (imidacloprid) @58gm/ha exhibited the lowest percentage mortality *i.e.* 37.34% of the pest after 168 hours of spray which is statistically similar to Acephate 75SP (acephate) @625 gm/acre (39.09%) and Karate 2.5EC (lambdacyhalothrin) @825ml/ha (37.66%) respectively.

DISCUSSION

Chemical control, being rapid method of pest control, is an important practice of Integrated Pest Management (IPM) programme to overcome losses caused by insect pests to crops (Mohyuddin *et al.*, 1997 and Sarfraz *et al.*, 2005). Chemical control is the most popular method for control of insect pests not only in Pakistan (Soomro *et al.*, 2008) but also in the whole world (Yang *et al.*, 2005) so majority of farmers prefer chemical control of insect pests either primary or secondary (Soomro *et al.*, 2000). Some sucking insect pests are cosmopolitan, polyphagous, widely distributed in tropical, subtropical and temperate regions and are also vector of number of viral diseases in large number of plants. Therefore chemical control is necessary to keep population of sucking insect pests below economic threshold level (Serdar *et al.*, 1999). In the present study Acephate 75SP after 24 and 72 hours of post treatment while Pirate 360SC after 168 hours of insecticides application exhibited the highest percentage of mortality. There is no published material to compare this study from Pakistan. The previous studies about efficacy of Confidor and Mospilon against thrips proved to be most effective by Mullins and Christie, 1995; Tufail *et al.*, 1995; Attique and Ghaffar, 1996; Hamed *et al.*, 1997; Wahla *et al.*, 1997; Aheer *et al.*, 2000; Afzal *et al.*, 2001; Saleem *et al.*, 2001; Saleem and Khan, 2001; Aslam *et al.*, 2004; Khattak *et al.*, 2004; Tayyib *et al.*, 2005; Solangi and Lohar, 2007; Shah *et al.*, 2007 is inconsistent to this study which may be

due to development of resistance of thrips against these insecticides. The findings of Din *et al.*, 2015 are consistent to our results to the extent that Acephate 75SP proved to be most effective after 24 hours of application.

COCLUSION:

From the present studies it is concluded that Acephate 75SP @625gm/ha and Pirate 360SC @250ml/ha proved to be most effective against cotton thrips.

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