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Bio-efficacy of new combi-product against sucking pests of cotton

A.N.SURPAM*, P.S. NEHARKAR[1], SHUBHANGI P. BHASME[1], S.R. KAMDI[1] AND B.S. KADAM[1]

AUTHORS' INFO
Associated Co-author :
[1]Department of Agricultural Botany, College of Agriculture, GADCHIROLI (M.S.) INDIA

Author for correspondence:
A.N. SURPAM
Department of Agricultural Botany, College of Agriculture, GADCHIROLI (M.S.) INDIA

ABSTRACT : The present investigation was undertaken with a view to find out bioefficacy of new combi-product against sucking pests of cotton in comparison with individual insecticide. The results revealed that (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha was the superior treatment in reducing the sucking pest complex *viz*., aphids, thrips during all observational period after first and second spray. It was, however, at par with (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha. Among the sole insecticides, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha was found to be most superior insecticide for minimizing aphids and thrips population.

KEY WORDS : Bio-efficacy, Sucking pest, Cypermethrin, Indoxacarb

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Cotton is most extensively cultivated commercial cash crop and important of all fibre crops of the world. Cotton plays a dominant role in Indian economy as it contributes about 80 per cent of raw material of textile industry in the country, providing livelihood for more than 100 million people through production, processing and marketing (Rakesh and Kathane, 1989) and hence, it is popularly known as "white gold". It is prime source of natural fibre. The cotton seed which accounts for nearly 65 per cent of the weight is utilized for oil extraction or as a valuable concentrate for the cattle.

India ranks third in cotton seed production being next to USA and China. The production of cotton increased from 3.04 to 12.80 (4 fold) million tonnes since independence to 1998-99 (Barua, 1999). The main products of cotton seed are oil, cake or meal, linters and hull. All these products have high industrial value (Patel *et al*., 1999). The oil is used as edible oil having low cholesterol and also used in soap industries (Manikar *et al*., 1988 and Shaikh *et al*., 1996).

RESEARCH PROCEDURE

A field experiment was carried-out at the Experimental Field of Department of Entomology, College of Agriculture, VNMAU, Parbhani. All the recommended cultural and agronomical practices were carried out to raise a good crop.Two combi products cypermethrin 10 per cent indoxacarb 10 per cent SC at various doses and untreated check were evaluated against sucking pest. The experiment were laid out in Randamized Block Design (R.B.D.) replicated thrice with plot size 5.4 m x 4.8 m. The cotton variety PH-348 was sown at a spacing 90

cm x 60 cm. For recording observations, five plants were randomly selected in each net plot and properly labeled with plastic tags before observation. Observations on sucking pest complex *i.e.* aphids, thrips were recorded from top, middle and bottom leaves of each selected plant. Observations were recorded one day before spray and 1, 3, 7 and 14 days after application.

Yield of cotton :

Seed cotton from each net plot was picked at each picking and weighed separately. Three pickings were carried out and at the end of last picking, total yield from each net plot was calculated and computed on hectare basis.

Statistical analysis :

The data on sucking pest complex were compiled and averages per three leaves were worked out. The data were then subjected to poissons $\sqrt{x+0.5}$ formula *i.e.* transformation before analysis. The data obtained in percentages were subjected to arcsine transformation. The yield data were converted into kilogram per hectare and subjected to statistical analysis and results were compared at critical level for deciding the superiority of the treatments.

RESEARCH ANALYSIS AND REASONING

The findings of the present study as well as relevant discussion have been presented under following heads :

Bio-efficacy of combi-product against sucking pests of cotton :

The combi-product was evaluated on the basis of observations recorded on mean number of sucking pests per three leaves at 1, 3, 7 and 14 days after each insecticidal treatment. The data are presented in Tables 1 to 2 and Fig. 1 to 4.

Aphids- first spray :

The effect of various treatment schedules on the population of aphid is presented in Table 1 and Fig 1.

The data on aphid population recorded a day before first spray in different plots was found statistically non-significant indicating uniform distribution of the pest in the experimental plots. The pest population in different treatment plots ranged from 31.10 to 39.10 aphids per three leaves.

The data on surviving population of aphids recorded one day after first spraying revealed that all the insecticidal treatments were significantly superior over untreated control. The average number of aphids ranged from 4.60 to 11.90 in different insecticidal treatments as against 33.40 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (4.60) was the most effective treatment against aphids and it was however, statistically at par with treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (5.15) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (6.81). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (7.13) was found to be better treatment than others.

The data on surviving population of aphids recorded 3 days after first spraying revealed that all the insecticidal treatments were significantly superior over untreated control. The average number of aphids ranged from 5.90 to 16.56 in different insecticidal treatments as against 35.82 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200+200 g a.i./ha (5.90) was most effective treatment against aphids and was statistically at par with treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (6.30) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (7.10). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (9.77) was

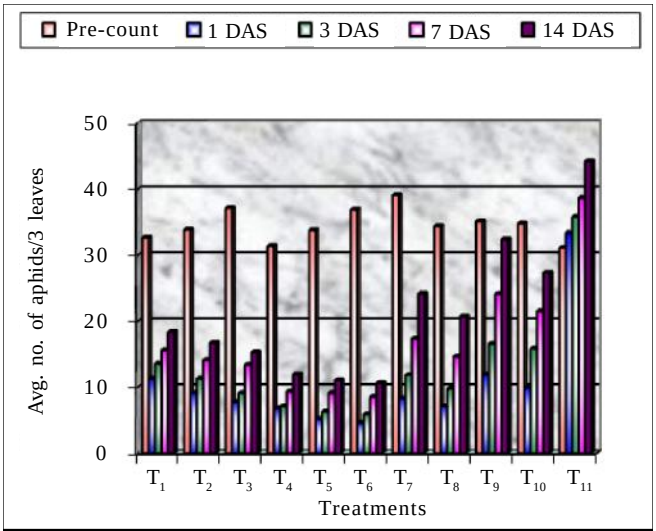

Fig. 1 : Population of aphids after first spray

found to be the best treatment and significantly superior over others.

The data on survival population of aphids recorded 7 days after first spraying revealed that all the insecticidal treatments were significantly superior over untreated control. The average number of aphids ranged from 8.54 to 24.11 in different insecticidal treatments as against 38.67 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (8.54) was the most effective treatment against aphids and was statistically at par with treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (9.12) and (T_4) cypermethrin 10 per cent + indoxarcarb 10 per cent SC @ 75 + 75 g a.i./ha (9.33). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (14.64) was found to be the best treatment and significantly superior over others.

The data on survival population of aphids recorded 14 days after first spraying revealed that all the insecticidal treatments were significantly superior over untreated control. The average number of aphids ranged from 10.63 to 32.42 in different insecticidal treatments as against 44.24 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (10.63) was significantly superior over all other treatments and it was followed by the treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (11.03) and (T_4) cypermethrin 10 per cent + indocarcarb 10 per cent SC @ 75 + 75 g a.i./ha (11.93).

Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (20.71) was found to be best and significantly superior over others.

Aphids- second spray :

The data on aphid population after second spray are presented in Table 1 and Fig. 2.

The observations recorded one day after second spraying revealed that all the insecticidal treatments were significantly superior over untreated control. The average number of aphids ranged from 1.61 to 7.34 in different insecticidal treatments as against 35.36 in untreated control. The treatment (T_6) cypermethrin 10 per cent +

Table 1 : Effect of combi-product on aphids

Tr. No.	Treatments	Dosage g a.i./ha	Pre-count	Days after 1st spray				Days after 2nd spray			
				1	3	7	14	1	3	7	14
T_1	Cypermethrin 10% + indoxacarb 10% SC	40 + 40	32.66 (5.75)	11.30 (3.41)	13.56 (3.73)	15.61 (4.00)	18.35 (4.33)	4.20 (2.16)	5.09 (2.36)	6.32 (2.60)	9.24 (3.12)
T_2	Cypermethrin 10% + indoxacarb 10% SC	50 + 50	33.87 (5.86)	9.10 (3.09)	11.30 (3.43)	14.13 (3.82)	16.72 (4.14)	3.11 (1.89)	4.30 (2.19)	5.56 (2.46)	8.65 (3.02)
T_3	Cypermethrin 10% + indoxacarb 10% SC	60 + 60	37.15 (6.13)	7.78 (2.85)	9.11 (3.09)	13.39 (3.72)	15.29 (3.97)	2.87 (1.83)	3.63 (2.08)	5.32 (2.41)	8.13 (2.93)
T_4	Cypermethrin 10% + indoxacarb 10% SC	75 + 75	31.39 (5.64)	6.81 (2.70)	7.10 (2.75)	9.33 (3.13)	11.93 (3.52)	1.81 (1.51)	2.18 (1.63)	3.73 (2.05)	7.18 (2.77)
T_5	Cypermethrin 10% + indoxacarb 10% SC	100 + 100	33.80 (6.36)	5.15 (2.37)	6.30 (2.60)	9.12 (3.10)	11.03 (3.39)	1.74 (1.49)	2.09 (1.60)	3.27 (2.94)	6.64 (2.67)
T_6	Cypermethrin 10% + indoxacarb 10% SC	200 + 200	36.89 (6.11)	4.60 (2.31)	5.90 (2.52)	8.54 (3.00)	10.63 (3.35)	1.61 (1.45)	1.97 (1.56)	3.11 (1.89)	5.87 (2.52)
T_7	Cypermethrin 10% EC	50	39.10 (6.04)	8.30 (2.36)	11.84 (3.51)	17.36 (4.22)	24.19 (4.96)	3.91 (2.09)	4.80 (2.30)	6.89 (2.71)	10.12 (3.25)
T_8	Cypermethrin 10% EC	75	34.40 (5.90)	7.13 (2.83)	9.77 (3.20)	14.64 (3.89)	20.71 (4.60)	3.05 (1.88)	4.11 (2.14)	5.30 (2.40)	8.14 (2.93)
T_9	Indoxacarb 10% SC	50	35.10 (5.96)	11.90 (3.52)	16.56 (4.13)	24.11 (4.96)	32.42 (5.73)	7.34 (2.80)	8.41 (2.98)	10.01 (3.33)	13.15 (3.69)
T_{10}	Indoxacarb 10% SC	75	34.80 (5.94)	9.90 (3.22)	15.86 (4.04)	21.52 (4.69)	27.32 (5.27)	6.81 (2.70)	7.36 (2.80)	9.54 (3.16)	11.61 (3.47)
T_{11}	Untreated control		31.10 (5.62)	33.40 (5.82)	35.82 (6.02)	38.67 (6.25)	44.24 (6.68)	35.36 (5.98)	97.67 (6.17)	45.38 (6.81)	51.60 (7.19)
	S.E. ±		0.17	0.12	0.08	0.07	0.06	0.03	0.02	0.02	0.6
	C.D. (P=0.05)		NS	0.35	0.24	0.20	0.19	0.09	0.07	0.07	0.13

Figures in parentheses indicate $\sqrt{x+0.5}$ values. NS=Non-significant

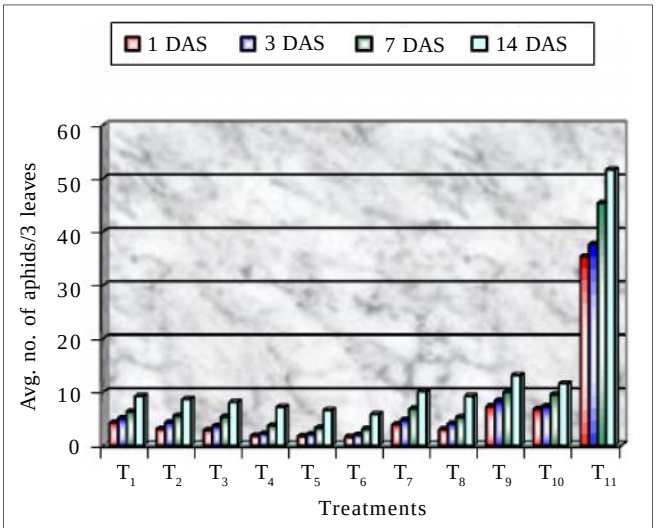

Fig. 2 : Population of aphids after second spray

indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (1.61) was most effective against aphids. However, it was statistically at par the with treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (1.74) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (1.81). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (3.05) was found to be best and significantly superior over others.

The observations recorded 3 days after second spraying revealed that all the insecticidal treatments were significantly superior over untreated control. The average number of aphids ranged from 1.97 to 8.41 in different insecticidal treatments as against 97.67 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (1.97) was most effective against aphids and was statistically at par with treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (2.09) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (2.18). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (4.11) was found to be best treatment and significantly superior over others.

The observations recorded on aphid populations 7 days after second spray indicated that all the insecticidal treatments recorded significantly low aphid than untreated control. The average number of aphids ranged from 3.11 to 10.01 in different insecticidal treatments as against 45.38 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (3.11) recorded lowest aphid poulaiton and it was significantly superior over all other treatments except treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (3.27) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (3.73). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (5.30) was found to be the best and significantly superior over others.

The observations recorded on aphid populations 14 days after second spray indicated that all the insecticidal treatments were significantly superior over untreated control in reducing aphid population. The average number of aphids ranged from 5.87 to 13.15 in different insecticidal treatments as against 51.60 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (5.87) was the most effective treatment which was however, statistically at par with (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (6.64) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (7.18). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (8.14) was found to be the best treatment and significantly superior over others.

In nutshell, the treatment (T_8) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha was significantly superior over all other treatments except (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha. Among sole insecticide, cypermethrin 10 per cent EC @ 75 g a.i./ha was significantly superior over others.

Thrips- first spray :

The effect of various treatment schedules under the investigation on the population of thrips is presented in Table 2 and Fig.3.

The data on thrips population recorded a day before the spray in different plots was found statistically non-significant indicating the uniform distribution of the pest in the experimental plots. The population in the different treatments ranged from 63.57 to 73.18 thrips per three leaves.

The observations recorded on thrips populations one day after first spray indicated that all the insecticidal treatments were significantly superior over untreated control in reducing thrips population. The average number of thrips ranged from 13.73 to 25.67 in different

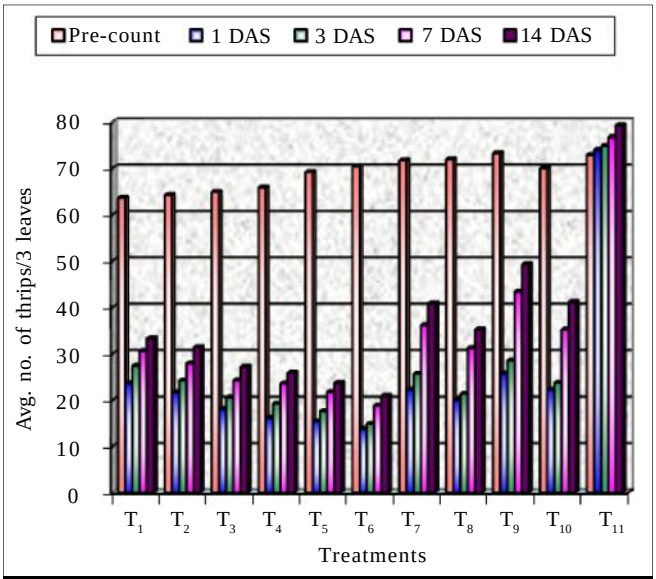

Fig. 3 : Population of thrips after first spray

insecticidal treatments as against 73.96 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (13.73) was significantly superior over all other treatments followed by (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (15.38), (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (16.08). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (19.94) was found to be the best treatment and significantly superior over others.

The observations recorded on thrips populations 3 days after first spray indicated significantly low thrips population than untreated control. The average number of thrips ranged from 14.8 to 28.48 in different insecticidal treatments as against 74.78 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (14.80) was significantly superior over all other treatments and was followed by (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (17.54) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (19.15). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (21.29) was found to be the best treatment and significantly superior over others.

Table 2 : Effect of combi-product on thrips

Tr. No.	Treatments	Dosage g a.i./ha	Pre-count	Days after 1st spray				Days after 2nd spray			
				1	3	7	14	1	3	7	14
T_1	Cypermethrin 10% + indoxacarb 10% SC	40 + 40	63.57 (8.00)	23.54 (4.90)	27.34 (5.27)	30.54 (5.57)	33.26 (5.80)	11.71 (3.49)	12.87 (3.64)	15.56 (4.00)	18.12 (4.31)
T_2	Cypermethrin 10% + indoxacarb 10% SC	50 + 50	64.18 (8.05)	21.63 (4.70)	24.15 (4.96)	27.85 (5.32)	31.35 (5.64)	10.07 (3.25)	11.23 (3.42)	13.66 (3.76)	17.56 (4.24)
T_3	Cypermethrin 10% + indoxacarb 10% SC	60 + 60	64.83 (8.08)	17.96 (4.29)	20.53 (4.58)	24.20 (4.96)	27.15 (5.25)	9.13 (3.10)	10.45 (3.30)	12.08 (3.54)	16.82 (4.16)
T_4	Cypermethrin 10% + indoxacarb 10% SC	75 + 75	65.78 (8.14)	16.08 (4.07)	19.15 (4.43)	23.51 (4.90)	25.81 (5.12)	8.36 (2.97)	9.61 (3.17)	10.98 (3.38)	13.07 (3.68)
T_5	Cypermethrin 10% + indoxacarb 10% SC	100 + 100	69.14 (8.34)	15.38 (3.98)	17.54 (4.24)	21.68 (4.70)	23.62 (4.91)	7.51 (2.83)	8.89 (3.06)	10.05 (3.24)	12.65 (3.62)
T_6	Cypermethrin 10% + indoxacarb 10% SC	200 + 200	70.34 (8.41)	13.73 (3.77)	14.80 (3.90)	18.73 (4.38)	20.84 (4.61)	6.39 (2.61)	6.72 (2.68)	7.21 (2.77)	10.76 (3.35)
T_7	Cypermethrin 10% EC	50	71.67 (8.49)	22.20 (4.76)	25.58 (5.10)	36.07 (6.04)	40.78 (6.41)	12.80 (3.64)	14.81 (3.90)	16.34 (4.10)	19.61 (4.24)
T_8	Cypermethrin 10% EC	75	7.187 (8.50)	19.94 (4.52)	21.29 (4.66)	31.18 (5.62)	35.16 (5.97)	10.63 (3.33)	11.76 (3.50)	14.26 (3.83)	17.34 (4.22)
T_9	Indoxacarb 10% SC	50	73.18 (8.58)	25.67 (5.11)	28.48 (5.35)	43.27 (6.61)	49.23 (7.04)	17.30 (4.21)	18.82 (4.39)	20.31 (4.56)	23.45 (4.89)
T_{10}	Indoxacarb 10% SC	75	69.91 (8.39)	22.23 (4.79)	23.66 (4.91)	35.19 (5.98)	41.10 (6.44)	13.80 (3.78)	15.26 (3.96)	18.11 (4.30)	21.15 (4.65)
T_{11}	Untreated control		72.80 (8.56)	73.96 (8.62)	74.78 (8.67)	76.67 (8.78)	79.18 (8.92)	70.13 (8.40)	72.87 (8.55)	75.40 (8.74)	81.08 (9.03)
	S.E. ±		0.07	0.06	0.08	0.09	0.12	0.05	0.17	0.08	0.07
	C.D. (P=0.05)		NS	0.17	0.24	0.28	0.33	0.17	0.34	0.26	0.21

Figures in parentheses indicate $\sqrt{x+0.5}$ values. NS=Non-significant

The observations recorded on thrips populations 7 days after first spray indicated that all the insecticidal treatments were significantly superior over untreated control in reducing thrips population. The average number of thrips ranged from 18.73 to 43.27 in different insecticidal treatments as against 76.67 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (18.73) was significantly superior over all other treatments and was followed by treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (21.68) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (23.51). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (31.18) was found to be the best treatment and significantly superior over others.

The observations recorded on thrips populations 14 days after first spray indicated that all the insecticidal treatments were significantly superior over untreated control in reducing thrips population. The average number of thrips ranged from 20.84 to 49.23 in different insecticidal treatments as against 79.18 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (20.84) recorded lowest thrips population and it was significantly superior over all other treatments. This treatment was followed by treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (23.62) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (25.81). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (35.16) was found to be the best treatment and significantly superior over others.

Thus, cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha was found significantly superior over all other treatments. In sole insecticides, cypermethrin 10 per cent EC @ 75 g a.i./ha was significantly superior over others.

Thrips -second spray :

Data on thrips population after second spray are presented in Table 2 and Fig.4.

The observations recorded on thrips populations one day after second spray indicated that all the insecticidal treatments were significantly superior over untreated control in reducing thrips population. The average number of thrips ranged from 6.39 to 17.30 in different insecticidal treatments as against 70.13 in untreated control. The

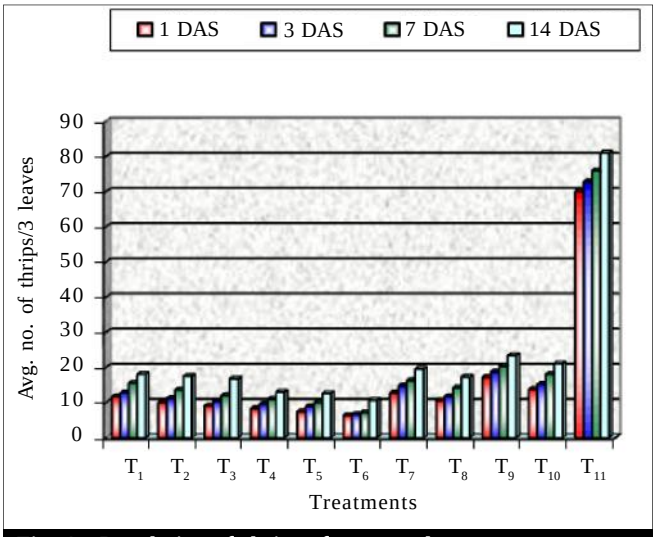

Fig. 4 : Population of thrips after second spray

treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (6.39) was significantly superior over all other treatments. It was followed by treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (7.51) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (8.36). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (10.63) was found to be the best treatment and significantly superior over others.

The observations recorded on thrips populations 3 days after second spray indicated that all the insecticidal treatments were significantly superior over untreated control in reducing thrips population. The average number of thrips ranged from 6.72 to 18.82 in different insecticidal treatments as against 72.87 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (6.72) recorded lowest thrips populations and it was significantly superior over all other treatments. It was followed by treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (8.89) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (9.61). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (11.76) was found to be the best treatment and significantly superior over others.

The observations recorded on thrips populations 7 days after second spray indicated that all the insecticidal treatments were significantly superior over untreated control in reducing thrips population. The average number

of thrips ranged from 7.21 to 20.31 in different insecticidal treatments as against 75.40 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (7.21) recorded lowest thrips population and it was significantly superior over all other treatments. This treatment was followed by treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (10.05) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (10.98). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (14.26) was found to be the best treatment and significantly superior over others.

The observations recorded on thrips populations 14 days after second spray indicated that all the insecticidal treatments were significantly superior over untreated control in reducing thrips population. The average number of thrips ranged from 10.76 to 23.45 in different insecticidal treatments as against 81.08 in untreated control. The treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha (10.76) was significantly superior over all other treatments. It was followed by treatment (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (12.65) and (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (13.07). Among the sole treatments, (T_8) cypermethrin 10 per cent EC @ 75 g a.i./ha (17.34) was found to be best treatment and significantly superior over others.

Thus, cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha was significantly superior over all other treatments. In sole insecticidal treatments, cypermethrin 10 per cent EC @ 75 g a.i./ha was significantly superior over others.

Effect of combi-product on seed cotton yield :

The highest yield of seed cotton (21.80 q/ha) was recorded in the treatment (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha, which was found significantly superior over all other treatments. Moreover, it was followed by the treatments (T_5) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 100 + 100 g a.i./ha (18.84 q/ha), (T_4) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 75 + 75 g a.i./ha (17.82 q/ha), (T_3) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 60 + 60 g a.i./ha (16.89 q/ha), (T_2) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 50 + 50 g a.i./ha (16.50 q/ha) and (T_1) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 40 + 40 g a.i./ha (14.69 q/ha). Among the sole treatments, (T_{10}) indoxacarb 10 per cent SC @ 75 g a.i./ha (17.15 q/ha) was significantly superior over all other sole treatments. The treatment (T_7) cypermethrin 10 per cent EC @ 50 g a.i./ha (11.16 q/ha) recorded lowest seed cotton yield after untreated control.

Thus, (T_6) cypermethrin 10 per cent + indoxacarb 10 per cent SC @ 200 + 200 g a.i./ha proved the best which recorded highest seed cotton yield and was significantly superior over all other treatments.

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