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COMPARATIVE EFFICACY OF DIFFERENT INSECTICIDES AGAINST SUCKING PESTS OF COTTON

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Abstract: Seven insecticides, viz. Mospilan 20SP, Confidor 200SL, Talstar 10EC, Advantage 20EC, Actara 25WG, Polo 500EC and Tamaron 60SL were evaluated for their efficacy against jassid (*Amarasca devastans* Dist.), whitefly (*Bemisia tabaci* (Genn.)) and thrips (*Thrips tabaci* Lind.) on cotton, at the University College of Agriculture, Bahauddin Zakariya University, Multan. The most effective insecticides for jassid, up to seven days were Confidor and Mospilan, while Advantage was ineffective to control jassid population. Against whitefly the most effective insecticides were Mospilan and Actara, while Mospilan, Confidor and Tamaron were highly effective against thrips.

Keywords: *Amarasca devastans*, *Bemisia tabaci*, Chemical control, *Gossypium hirsutum* L., *Thrips tabaci*.

INTRODUCTION

Cotton (*Gossypium hirsutum* L.) is the most important cash crop in Pakistan, which is cultivated on 3.12 million hectares and is the source of large amount of foreign exchange, contributing about 11.7 percent of value added in agriculture and about 2.9 percent of GDP [Anonymous 2003]. It also contributes about 69.5 % share in national oil production [Awan 1994]. Cotton seed cake is important animal feed and organic manure [Chidda 1997].

In spite of large acreage, yield of seed cotton is very low because of severe pest complex. According to an estimate bollworms and sucking pest complex cause about 20-40% yield losses in Pakistan [Ahmad 1999]. Important sucking insect pests are jassid *Amarasca devastans* Dist. (Hemiptera: Cicadellidae), whitefly, *Bemisia tabaci* (Genn.) (Hemiptera: Aleyrodidae), cotton thrips, *Thrips tabaci* Lind. (Thysanoptera: Thripidae) and cotton aphid, *Aphis gossypii* Glover (Hompotera: Aphididae). No single pest control method is sufficient for good production. With effective control of cotton pests, yield of cotton can be increased by 200-300 kg ha^{-1} [Khan *et al.* 1987].

Crop protection with chemicals is desirable and unavoidable part of integrated pest management [Mohyuddin *et al*. 1997]. Even in the technologically advanced countries, about three percent of market value of agriculture crops is spent on toxic chemicals and their application. In Pakistan, pesticides worth more than 10 billion rupees are imported, out of which about 70-80% are sprayed against cotton pests. To find out the specific chemicals as a part of Integrated Pest Management, efficacy of different insecticides was investigated and reported in this paper.

MATERIALS AND METHODS

The experiment was laid out in a Randomized Complete Block Design in the farm area of the University College of Agriculture, Bahauddin Zakariya University, Multan. Cotton variety NIAB-98 was sown in June 2001. The net plot size for each treatment was 6.45 x 4.94 m and was replicated four times. There were six lines in each plot, 75 cm apart, while plant-to-plant distance was 23 cm. Fertilizers were applied at recommended doses. There were eight treatments including a control. Seven insecticides namely Mospilan 20SP (Acetamaprid), Confidor 200SL (Imidacloprid), Talstar 10EC (Bifenthrin), Advantage 20EC (Carbosulfan), Actara 25WG (Thiomethoxam), Polo 500EC (Diafenthiuron) and Tamaron 60SL (Methamidophos) were sprayed at recommended doses at Economic Threshold Level (ETL).

The population of sucking pests was counted from six plants, selected randomly in each treatment. The number of insects were recorded from upper, middle and lower leaf of alternate plants, a day before, one, three and seven days after spray. Percent population change (increase or decrease) was calculated by using modified Abbot's formula [Flemings and Ratnakaran 1985] as below:

$$\% \text{ Population change} = \left\{ 1 - \frac{\text{Post treatment population in treatment}}{\text{Pre treatment population in treatment}} \times \frac{\text{Pre treatment population in control}}{\text{Post treatment population in control}} \right\} \times 100$$

Data analysis was performed by analysis of variance and means were separated using LSD test at 5% level of significance, by using MSTAT-C [MSU 1982].

RESULTS AND DISCUSSION

A*MARASCA DEVASTANS* DIST.

Population level before spray and percent mortality 1, 3 and 7 days after spray is presented in Table 1. Maximum decrease in mean per leaf population of jassid, one day after spray was recorded in plots treated with Confidor, Tamaron, Actara, Talstar, Polo and Mospilan which was non-significantly different and higher than that in plot treated with Advantage.

Three days after spray maximum reduction in jassid population was recorded in plots treated with Confidor followed by Polo, Actara, Talstar and Mospilon, which were non-significantly different among each other. In plots treated with Advantage, increase in the population was observed. Maximum population decrease seven days after spray was recorded in plots treated with Confidor, followed by Mospilan. In plots treated with Actara and Tamaron, the decrease in jassid population was non-significantly different among each other and higher than that in all other

treatments. The decrease in population in plots treated with Talstar and Polo was also non-significantly different and higher than that in control, while application of Advantage resulted in increase in jassid population.

Table 1: Percent population change (increase or decrease) and mean per leaf population of jassid (in parenthesis) on different days before and after spray*.

Treatments		Dose per Acre	1 Day Before Spray NS	Population Change (- or +)		
Trade Names	Common Names			1 Day After Spray	3 Day After Spray	7 Day After Spray
Mospilan 20SP	Acetamaprid	150 g	(2.04)	78.65 (0.33)c	61.84 (0.37)bc	81.27 (0.37)de
Confidor 200SL	Imidacloprid	80-250 ml	(2.01)	94.75 (0.08)c	89.53 (0.10)c	94.86 (0.10)e
Talstar 10EC	Bifenthrin	250 ml	(2.10)	80.52 (0.31)c	43.90 (0.56)bc	28.22 (1.46)c
Advantage 20EC	Carbosulfan	500 ml	(3.02)	2.56 (2.23)a	-36.54 (1.96)a	-33.67 (3.91)a
Actara 25WG	Thiomethoxam	24 g	(2.37)	82.74 (0.31)c	65.38 (0.39)bc	69.07 (0.71)d
Polo 500EC	Diafenthiuron	200 ml	(2.35)	79.22 (0.37)c	53.45 (0.52)bc	39.81 (1.37)c
Tamaron 60SL	Methamedophos	500 ml	(2.54)	91.17 (0.17)c	84.26 (0.19)c	78.05 (0.54)d
Control		--	(2.23)	0.00 (1.69)b	0.00 (1.06)b	0.00 (2.16)b

* Means followed by same letters are non-significantly different from each other, (LSD; P=0.05). NS = non-significantly different.

All the insecticides proved effective against jassid, except Advantage, which resulted in increase in population. Confidor, Mospilan and Tamaron gave the most effective control of jassid up to seven days after spray.

BEMISIA TABACI (GENN.)

Population level before spray and percent mortality 1, 3 and 7 days after spray is presented in Table 2. One day after the spray, maximum decrease in population was observed in plots treated with Talstar, followed by Mospilan and Advantage. The decrease in whitefly population in plots treated with Actara, Polo and Confidor was also non-significantly different. Tamaron resulted in increased whitefly population. After three days of spray the population in all the treatments was lower than that in control except in plots treated with Tamaron and Advantage. Mospilan showed highest decrease in whitefly population followed by Talstar and Confidor. Plots treated with Polo resulted in lower decrease in whitefly population as compared to Confidor and Actara treated plots. Tamaron and Advantage resulted in increase in whitefly population. On seven days after spray Mospilan gave highest decrease in mean per leaf population of whitefly followed by Actara. Decrease in population in the plots treated with Talstar was lower than that in Actara but higher than that in Confidor. But population was statistically equal in Talsatar treated plots when compare to untreated plots. Polo, Advantage and Tamaron remained ineffective against whitefly and resulted in increase in whitefly population,

as population in plots receiving these insecticides was higher than that of untreated plots.

Table 2: Percent population change (increase or decrease) and mean per leaf population of whitefly (in parenthesis) on different days before and after spray*.

Treatments				Population Change (- or +)		
Trade Names	Common Names	Dose per Acre	1 Day Before Spray NS	1 Day After Spray	3 Day After Spray	7 Day After Spray
Mospilan 20SP	Acetamaprid	150 g		49.96	49.35	27.24
			(8.06)	(7.58)cd	(8.44)e	(7.81)e
Confidor 200SL	Imidacloprid	80-250 ml		17.70	17.17	-40.64
			(5.91)	(9.14)c	(10.12)de	(11.07)cd
Talstar 10EC	Bifenthrin	250 ml		46.26	20.52	-21.89
			(6.08)	(6.14)d	(9.99)de	(9.87)cde
Advantage 20EC	Carbosulfan	500 ml		31.96	-29.16	-80.46
			(5.85)	(7.48)cd	(15.62)ab	(14.06)b
Actara 25WG	Thiomethoxam	24 g		34.77	16.17	9.34
			(7.04)	(8.63)c	(12.20)cd	(8.50)de
Polo 500EC	Diafenthiuron	200 ml		27.38	5.65	-33.46
			(6.47)	(8.83)c	(12.62)bcd	(11.50)bc
Tamaron 60SL	Methamedophos	500 ml		-12.31	-9.34	-128.30
			(8.14)	(17.18)a	(18.4)a	(24.75)a
Control		--		0.00	0.00	0.00
			(6.54)	(12.29)b	(13.52)bc	(8.71)cde

* Means followed by same letters are non-significantly different from each other, (LSD; P=0.05).
NS = non-significantly different.

All the insecticides resulted in decreased per leaf population of whitefly, one day after spray except Tamaron. The population of whitefly remained above ETL (5 adults or nymphs per leaf) in the whole experiment which revealed that none of the insecticide gave effective control against whitefly, that might be due to development of resistance in whitefly against these insecticides as Mohan and Katiyar [2000], reported that continuous use of Confidor may result in increase in whitefly population.
Mospilan and Actara remained effective up to seven days after spray while all other insecticides lost efficacy on seven day after spray, but population of whitefly in these plots was above ETL.

THRIPS TABACI LIND.

Population level before spray and percent mortality 1, 3 and 7 days after spray is presented in Table 3. Maximum decrease in the population on one day after application was recorded in plots treated with Mospilan and Tamaron having non-significantly different populations. The decrease in thrips population in plots treated with Advantage, Confidor and Actara was non-significantly different and higher than that in Talstar treated plots. Polo remained least effective, resulting in minimum decrease in thrips population. On three days after spray, Mospilan resulted in highest control, followed by Tamaron. Confidor and Advantage showed non-significantly different but higher decrease in thrips population than that in Actara. The minimum decrease in thrips population was recorded in plots

treated with Talstar. Seven days after spray Tamaron and Confidor caused highest reduction in thrips population, followed by Mospilan and Advantage. The population of thrips increased on seven days after spray in plots treated with Actara, Talstar and Polo due to loss of efficacy, as compared to untreated plots.

Table 3: Percent population change (increase or decrease) and mean per leaf population of Thrips (in parenthesis) on different days before and after spray*.

Treatments		Dose per Acre	1 Day Before Spray NS	Population Change (- or +)		
Trade Names	Common Names			1 Day After Spray	3 Day After Spray	7 Day After Spray
Mospilan 20SP	Acetamaprid	150 g		89.81	96.24	57.69
			(4.48)	(0.19)d	(0.23)e	(1.81)bc
Confidor 200SL	Imidacloprid	80-250 ml		65.94	67.49	63.44
			(3.81)	(0.54)cd	(1.69)cde	(1.33)c
Talstar 10EC	Bifenthrin	250 ml		48.37	13.30	3.60
			(3.77)	(0.81)bc	(4.46)a	(3.47)a
Advantage 20EC	Carbosulfan	500 ml		83.98	78.27	57.39
			(4.35)	(0.29)cd	(1.29)cde	(1.77)bc
Actara 25WG	Thiomethoxam	24 g		59.49	63.44	-6.66
			(4.33)	(0.73)cd	(2.16)cd	(4.41)a
Polo 500EC	Diafenthiuron	200 ml		5.45	45.74	-27.62
			(3.66)	(1.44)a	(2.71)bc	(4.46)a
Tamaron 60SL	Methamedophos	500 ml		86.08	84.68	66.50
			(3.97)	(0.23)d	(0.83)de	(1.27)c
Control		--		0.00	0.00	0.00
			(3.10)	(1.29)ab	(4.23)ab	(2.96)ab

* Means followed by same letters are non-significantly different from each other, (LSD; P=0.05). NS = non-significantly different.

These results are in conformity with those of Stefanov and Dimetrov [1986], who reported that Tamaron was effective against thrips. These results also favour the findings of Wahla *et al*. [1997], who reported that Tamaron and Confidor ware excellent against thrips. Actara gave satisfactory control up to three days after spray, while Polo remained least effective against cotton thrips.

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