Efficacy of different insecticides against mealybug, *phenacoccus solenopsis* tensley on cotton crop

By

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Abstract

A field experiment was concluded to evaluate the efficacy of different insecticides viz., Dimegro (Dimethoate), Edmital-D (Fenvelrate + Dimethoate), Edcura (Perofenofos) and Agridan (Carbofuran), against mealybug Phenacoccus solenopsis Tensley, on cotton during kharif season-2008. The crop was treated when pest appeared. The data obtained were analyzed statistically and highly significant differences were observed amongst insecticides, which showed a different degree of control in respect of diminishing pest population. All the insecticides proved effective against mealybug and gave more than 81 % pest mortality after 24 hours of spray but their efficacy decreased gradually after 48 and 72 hours of treatment. Plot treated with Dimegro (spray) and Agridan (soil application) found most effective in reducing the pest population (90.0 %) followed by Edmital-D (73.8 %), Edcura (69 %), Agridan (61.7 %) and Dimegro (52.6 %) in treated plots.

Key words: Cotton, Mealybug, insecticides, damage

Introduction

Mealybug, Phenacoccus solenopsis Tensley., (Hemiptera: Pseudococcidae), is a serious sucking insect and attacks different host plants including cotton. It is a serious new threat to agriculture and attacks more than 200 kind of plants, including cotton and presently established in central and northern Africa, India, Pakistan, northern Australia, and southeastern Asia (Anonymous, 2003). Kairo *et al.,* (2000) reported that Mealybug, is native to southern Asia, and has spread to other parts of the world viz. Africa, and more recently North America and Caribbean, where it is still extending its range. Moses *et al.,* (2004), reported that the hibiscus mealybug, was first reported in the Caribbean in 1994 on Grenada and this was the first record of the insect as a major pest in the New World. The pest has also extended its distribution to Central America (Belize) and North America (California, USA). Since it arrived in Grenada in 1994, spread to Guyana (South America) and at least 14 other Caribbean islands (Anonymous, 2003). Dhawan *et al.,* (1980), and Muralidharan & Badaya, (2000) reported from India that mealybug, (*M. hirsutus*) caused economic losses to cotton crop.

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Recently, mealybug has been observed as a serious economic threat to agriculture in Pakistan and grower's community suffered huge losses in yield and quality of cotton crop has also been spoiled, due to attack of this pest. Mealybug has recently emerged as a serious pest of cotton in Pakistan (Abbro, *et al*, 2005).

It was found to attack 154 plant species including crops, vegetables, ornamental plants and weeds (Arif *et al*, 2009). Hakro and Buriro, (2005) reported that the attack of mealybug had been recorded in Sindh on cotton crop since last so many years, but with very low density as a pest of minor economical importance, this is the first time, this pest has been recorded on larger area and in extensive cotton field and has caused huge loss to the cotton crop. Khushk and Mal, (2006) has also reported that the pink mealybug, emerged as a cotton pest, gradually increased in Sindh and Punjab during 2005, its sudden appearance damaged crop in Multan, Sanghar, Mirpurkhas and Tando Allahyar. Mealybug had never attacked on cotton crop in Sindh before 2005 but since last year in August it appeared on cotton when the crop was already matured, but this year its attack has been observed in May on low intensity and if the pest was not controlled it would cause severe damage to the cotton crop (Anonymous, 2006). Shafqat, *at el*., (2007) reported that mealybug played havoc with the cotton crop in Pakistan during 2005.

Considering the economic losses due to this insect pest, endeavors have been taken to protect cotton crop by adopting different control techniques. Williams, (1996) reported that Plant protection products are of limited effectiveness against mealybug because of its habit of hiding in crevices, and the waxy covering of its body. Mani, (1989) reported from India, that most granular insecticides are ineffective against mealybug, whereas systemic insecticides are only used to control heavy infestations. He also reported that IPM using both, coccinellid beetle predators and insecticides (dichlorvos and chlorpyrifos) has achieved good control against mealybug on grapevine. Anonymous, (2003) has also reported that Pesticides cannot easily penetrate the thick wax layers on the Pink *Hibiscus* mealybug's body; therefore applying pesticides is an ineffective control technique against this mealybug species, whereas Shafqat, *at el.*, (2007) reported from Punjab Pakistan that pesticides provided satisfactory control of cotton mealybug in both the laboratory and in the field conditions, but it depends on wise and justified use of these chemicals, and necessitates development of an integrated pest management strategy.

Keeping in view the importance of the subject, the present study was carried out to assess the response of different insecticides against the mealybug on cotton crop.

Materials and Methods

A field trial was conducted to evaluate the efficacy of different insecticides (Table-1) against mealybug on cotton crop during 2008, at Mirpurkhas, Sindh. There were six treatments

including control replicated three times with randomized complete block design (RCBD) with 7 X 5 meters. The crop (variety CRIS-134) was sown on 4th May-2008, at row to row distance of 75 cm and plant to plant 22.5 cm. The first spray of insecticides was applied with solo power sprayer on 13th July in each treatment and thereafter two more sprays were done at 6 days intervals.

The data was recorded from five randomly selected plants from each treatment, and observations were recorded one day before and one day, two, four and six days after each spray. Observation at six days was counted as pre observation of the subsequent spray. Numbers of nymph and adult were counted on each part of selected plant. The mortality of pest was calculated with the following formula:

$$\textbf{Percent mortality} = \frac{\textbf{A-B}}{\textbf{A}} \times \textbf{100}$$

Where A = pre-treatment population and B = post-treatment population of cotton mealybug per plant

Table-1: Insecticides and their doses applied in the experiment

S. No	Insecticides		Group	Dose ml/acre
	L. Name	C. Name		
1.	Dimegro 40 EC + Agridan 5G	Dimethoate + Carbofuran	Organophosphate + Carbamate	500 ml + 16 kg
2.	Edcura 50 EC	Profenofos	Carbamate	800 ml
3.	Edmital-D (2.5 EC + 40 EC)	Fenvelrate + Dimethoate	Prythroid + Organophosphate	600 ml
4.	Dimegro 40 EC	Dimethoate	Organophosphate	500 ml
5.	Agridan 5G	Carbofuran	Carbamate	16 kg
6.	Control	-	-	-

Data were analyzed statistically with M-Stat package and means were compared by DMR test at 5 percent probability level**.**

Results and Discussions

The data collected on the response of different insecticides against mealybug on cotton crop, was highly significant, the data in respect of pest reduction percentage after three sprays and at different intervals is presented in Table-2.

The consolidated composite average data of reduction percentage of pest population at different intervals of all three sprays are shown in Table-2. The results showed that two insecticides, i.e., Dimegro (sprayed) and Agridan (broadcasted) was found most

effective in controlling pest population and showed maximum reduction (90 %) among all insecticides tested at 24 hours, 48 hours and 72 hours interval followed by Edmital-D with 73.8 %, Edcura with 69.8 %, Agridan with 61.7 %, reduction whereas Dimegro spray resulted in the minimum reduction of 52.6 %

Results showed that two insecticides i.e., Dimegro (sprayed) and Agridan (broadcasted) were most effective with highest population reduction of 97.6 %, 24 hours after spray followed by Edcura (88.9 %), Edmital-D (87.9 %), Agridan (86.2 %) and Dimegro (81.2 %) in treated plots.

Similarly, 48 hours after spray the results revealed that the efficacy trend was same as 24 hours. Plot treated with Dimegro (sprayed) and Agridan (broadcasted) gave the maximum reduction of pest population (95.9 %a), followed by Edcura (75.4 %), Edmital-D (74.5 %), Agridan (62.9 %) and Dimegro resulted in lowest pest reduction (43.6 %).

Whereas 72 hours after spray the efficacy trend was almost same as 24 and 48 hours but all the insecticides lose their efficacy. Results showed that plot treated with both Dimegro and Agridan gave maximum reduction of pest population (76.4 %) followed by Edmital-D (58.9 %), Edcura (45.2 %), Agridan (35.9 %) and Dimegro (33.1 %).

Conclusions

It was concluded from present studies that combined effect of Dimegro (sprayed) and Agridan (broadcasted) remained most effective against the pest activity and resulted in the maximum reduction percentage of mealybug population in comparison to other insecticides tested on cotton crop.

The results are in agreement with Shafqat *at el.,* (2007) who reported from Punjab, Pakistan that pesticides provided satisfactory control of cotton mealybug in both the laboratory and in the field conditions, but it depends on wise and justified use of these chemicals and necessitates development of an integrated pest management strategy. Whereas Saeed *et al.,* (2007) have suggested that Insecticides belonging to different groups have been recommended against cotton mealybug.

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Table-2 Pest population and reduction percentage of Mealybug insect pest at different intervals of three sprays

S. No.	Name of Insecticide	Pre-Treatment population	Observations on different intervals after spray							
			24 hours		48 hours		76 hours		Total Average	
			Pest population	% Reduction	Pest population	% Reduction	Pest population	% Reduction	Pest population	% Reduction
1.	Dimegro + Agridan	12.3	0.3 a	97.6	0.5 a	95.9	2.9 a	76.4	1.2	90.0
2.	Edcura	12.6	1.4 a	88.9	3.1 ab	75.4	6.9 b	45.2	3.8	69.8
3.	Edmital-D	14.1	1.7 ab	87.9	3.6 ab	74.5	5.8 ab	58.9	3.7	73.8
4.	Dimegro	13.3	2.5 b	81.2	7.5 c	43.6	8.9 bc	33.1	6.3	52.6
5.	Agridan	16.7	2.3 ab	86.2	6.2 bc	62.9	10.7 c	35.9	6.4	61.7
LSD = 0.05		-	1.3	-	1.79	-	3.09	-	-	-
LSD = 0.01		-	1.96	-	2.61	-	4.50	-	-	-