

# Present Status of Mealy Bug *Phenacoccus solenopsis* (Tinsley) on Cotton and Other Plants in Sindh (Pakistan)

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**Abstract** – In Pakistan mealy bug *Phenacoccus solenopsis* Tinsley (Hemiptera: Pseudococcidae) was recorded first time in 2005 on cotton and other plants. The survey was carried out in different districts of Sindh to know the status of the mealy bug on cotton and other plants. The pest was widely sprayed in the surveyed areas attacking a number of plants including cotton. Mean maximum population (mealy bug 2<sup>nd</sup> & 3<sup>rd</sup> instars and adults/shoot) was recorded in the districts Shaheed Benazirabad 46.93 followed by Ghotki district (38.88), Sukkur, (32.17), Naushahro Feroze (32.07), Khairpur (29.67), and Dadu district (14.69). Mealy bug was recorded on 22 plants in Shaheed Benazirabad district. On unsprayed cotton (95%) mealy bugs were found parasitized by *Aenasius bambawalei* Hayat, followed by (92%), on *Abutilon indicum* (91%), okra (87%), *datura*, (86%), china rose (80%) on egg plant, and on tomato (77%) during 2010. However, mealy bugs parasitized by *Aenasius bambawalei* very low in 2011 due to indiscriminate use of pesticides and appearance of hyper parasitoid. Different insecticides were also tested for controlling mealy bug on cotton. Maximum mortality of the mealy bug recorded in plots treated with Movento 20 SC (95.2%), followed by Movento energy 480 SC (94.8%), Confidor 50 SC+ Ultra (93.3%), Profenofos 50 EC (92.69%), Confidor 70 WG (92.40%), Fyfanon 57 EC (91.1%), Bono 20 SC (89.60), and Malatox 57 EC (84.65%) up to one week of spray. The meteorological data revealed that mealy bug was more common in the field at temperatures in the range of 30.5-39.5°C.

**Keywords:** *Phenacoccus solenopsis*, *Aenasius bambawalei*, Parasitism and population

## INTRODUCTION

Cotton, *Gossypium hirsutum* L., is the most important fiber crop of Pakistan. It is used in textile as well as oil industries and earns foreign exchange through export in shape of raw cotton, cotton yarn, cloth, garments and other products. It makes about 80% of national edible oil production (Agha, 1994). It engages millions of employees in the farms and factories. It provides edible oil, animal feed, fiber, and fuel to a large proportion of the urban and rural populations. It supplies raw material for about 1200 ginning units, 180 spinning units, about 470 textile mills, and 50 vegetable oil mills operating in the country. It is also a major export item from the crop sector because it directly or indirectly contributes about 66 percent to Pakistan's export earnings (Government of Pakistan, 1995). Unfortunately, the crop was severely attacked by many sucking and chewing insect pests including cotton mealy bug. Mealy bugs have recently become abundant on cotton in Pakistan. These soft bodied insects belong to family Pseudococcidae of order Hemiptera. About 5000 species of mealy bugs have been reported from 246 families of plants throughout the world. Among these, 56 species have been reported from 15 genera of family Malvaceae, including cotton and many other plants of economic importance (Ben-Dov, 1994).

Mealy bugs were never been reported from cotton in Pakistan until 2005 when for the first time *Phenacoccus solenopsis* Tinsley was recorded from Vehari-Punjab. This insect alone was held responsible for the loss of 0.2 million bales (bale weighs 375 lbs or 170 kg) in 2007 in Pakistan (Muhammad, 2007). Mahmood *et al* (2011) reviewed its world distribution. According to them it is a new world species and has recently entered a number of countries in Asia and Australia. They reported that this insect is widespread on the plains of Pakistan. Results of present studies carried out in different districts of Sindh on its distribution and abundance are reported in this paper.

## MATERIALS AND METHODS

### Mealy Bug Population on Cotton and other Hosts

Regular survey of mealy bug was under taken to record the phenology and host range in different areas/districts of upper Sindh including Shaheed Benazirabad, Naushahro Feroze, Dadu, Khairpur, Sukkur and Ghotki from May to December 2010. Five terminal shoots each measuring 15cm long were taken at random one each from the four corners and in the center of the of the cotton field. Samples of mealy bugs collected from fields were kept in jars (laboratory (at  $26 \pm 2^{\circ}\text{C}$  temperature and 75.5% R.H). Samples were kept in Petri-dishes for a week for parasitoids emergence, in the lab  $20^{\circ}\text{C}$  temperature and 75.5% R.H. Counts were made of healthy and mummified 2<sup>nd</sup>, 3<sup>rd</sup> instars and adult mealy bug individuals from the samples. The observations on cotton were made from May to December 2010. Samples of same size were also taken from other plants where the mealy bug was found. Similar experiments were improved upon in 2011.

### Efficacy of Insecticides for Controlling Mealy Bug on Cotton Crop

Eight insecticides were tested for the efficacy against cotton mealy bug. The crop was sown on 27-05-2010 and crop was sprayed on 03-08-2010. The trial was conducted at CCRI-Sakrand Farm in Randomized Complete Block Design (RCBD) with four replications. Plot size was kept at 30' x 40'. Spray were initiated when the mealy bug population increased. The control plot was kept unsprayed for comparison of the pest population.

## RESULTS AND DISCUSSION

### Phenology

During observations the mealy bug was found breeding profusely on cotton and other plants in May-December. It seems to breed almost throughout the year.

### Population Trends of the Mealy Bug on Cotton

The results showed that the mealy bug infestation started initially after germination of cotton plants. The minimum infestation was in June, 2010 and maximum in September was recorded at all areas surveyed (Table-1). The mealy bug infestations were comparatively higher at Shaheed Benazirabad and Ghotki, compared with Khairpur, Naushahro Feroze, Sukkur and Dadu districts of Sind province (Table-1).

TABLE 1. POPULATION OF MEALY BUG IN DIFFERENT DISTRICTS OF SINDH-IN 2010

	Mealy bug Numbers Per Terminal Shoot in Following Districts					
	Shaheed Benazirabad	Naushahro Feroze	Dadu	Khairpur	Sukkur	Ghotki
Jun.	10.14	5.11	0.78	0.14	4.45	0.22
Jul.	16.33	14.11	2.36	3.43	13.78	13.50
Aug.	23.70	17.10	7.10	19.30	16.8	10.90
Sept.	84.30	8.54	18.0	60.80	24.10	133.33
Oct.	113.00	98.30	22.45	67.30	65.80	72.20
Nov.	50.00	76.00	39.75	53.67	86.50	39.00
Dec.	31.00	5.29	12.33	3.00	13.75	3.00
Mean	46.93	32.07	14.69	29.67	32.17	38.88

Mealy bug on plants other than cotton

The mealy bug was recorded from more than 22 plants however it was consistently found on egg plant, tomato, *Abutilon indicum*, okra, hollyhock and china rose. At the peak period of its population in September, it was found most abundant on cotton, followed by china rose, *Abutilon indicum*, okra, eggplant, tomato and hollyhock (Table-2). Commonality of the mealy bug on different plants has been reported by Arif, *et al.* (2009) who reported the incidence of mealy bug *Phenacoccus solenopsis* on about 154 plants but was most abundant on cotton.

TABLE 2: MEALY BUG POPULATIONS ON DIFFERENT PLANTS HOSTS IN SINDH IN SEPTEMBER, 2010

	English/ Local Name	Technical Names	Mean Mealy Bug Infestation/ Shoot
1.	Egg plant	<i>Solanum melongena</i>	45.12
2.	Tomato	<i>Lycopersicon esculentum</i>	23.41
3.	Abutilon	<i>Abutilon indicum</i>	65.74
4.	Cotton	<i>Gossypum hirsutum</i>	84.64
5.	Datura	<i>Datura alba</i>	24.46
6.	Okra	<i>Abelmoschus esculentus</i>	77.13
7.	Hollyhock	<i>Alcea setosa</i>	12.71
8.	China Rose	<i>Hibiscus rosa-sinensis</i>	69.23

### Natural Enemies of the Mealy Bug

Since mealy bug appearance was recorded during 2005 in Pakistan only insecticides have been tried to control the mealy bug on cotton. Natural enemies did not have much role in controlling the mealy bug. Mahmood *et al.* (2011) developed techniques of conserving predators and parasitoids in field conditions and successfully bred millions of parasitoids and predators using plant debris (mealy bug infested drying twigs and leaves). They reported a number of predators associated with the mealy bug in 2006-2007, however, parasitoid *Aenasius bambawalei* Hayat was first time reported during 2008 from Tando Jam Sindh-Pakistan (Solangi and Mahmood, 2011). This parasitoid spreads fast and keeps the mealy bug under control. In sprayed cotton fields though parasitoid was rare it was most common on unsprayed cotton fields and helped keep the pest under control (Table- 3). The parasitoid was not only common in cotton but also was common on other plants and most of the mealy bugs were found parasitized. In 2011 the parasitoid's population was less than 2010 (Table-4).

The main reason of low population of parasitoid is the adverse effect of large scale use of pesticides in cotton and vegetables. Moreover a hyper parasitoid *Promuscidea unfauciiventris* Girault has appeared thereby impacting parasitoid population. As a result of decline in population of the parasitoid the mealy bug population has increased severely.

TABLE 3: PARASITISM OF *AENASIUS BAMBAWALEI* ON DIFFERENT HOST PLANTS AT SHAHEED BENAZIRABAD DISTRICT IN AUGUST 2010

	English/Local Name	Technical Names	Parasitism Percent
1.	Eggplant	<i>Solanum melongena</i>	80
2.	Tomato	<i>Lycopersicon esculentum</i>	77
3.	Abutilon	<i>Abutilon indicum</i>	92
4.	Cotton	<i>Gossypum hirsutum</i>	95
5.	Datura	<i>Datura alba</i>	87
6.	Okra	<i>Abelmoschus esculentus</i>	91
7.	China Rose	<i>Hibiscus rosa-sinensis</i>	86

### Efficacy of Insecticides for Controlling Mealy bug on Cotton Crop

TABLE 5: EFFICACY OF INSECTICIDES FOR CONTROLLING MEALY BUG AT CCRI-SAKRAND DURING AUGUST 2010

Treatment	Dose/ acre (ml/g)	Post-Treatment Average Population/Shoot			Mortality (%)		
		48 hours	72 hours	1 week	48 hours	72 hours	1 week
Bono 20 SL	125 ml	26.07	17.41	13.17	76.89	85.70	89.60
Malatox 57 EC	750 ml	31.12	22.01	19.45	72.41	81.90	84.65
Profenofos 50 EC	500 ml	18.31	11.21	9.26	83.76	90.78	92.69
Confidor 20 SC	250 ml	17.0	8.0	5.0	83.5	93.5	95.2
Fyfanon 57 EC	500 ml	33.0	21.0	10.0	66.6	82.9	91.1
Confidor 20 SL+ ultra	250 ml	34.0	13.0	7.0	65.8	89.8	93.3
Confidor 70 WG	140 gm	25.0	12.0	7.0	74.6	88.1	92.4
Movento energy 480 SC	150 + 250 ml	30.0	10.0	5.0	70.2	91.6	94.8
Control	-	112.81	121.62	126.74	-	-	-

Results given in Table-5 indicate that, Movento 20 SC gave maximum (95.2%) mortality followed by Movento Energy 480 SC, Confidor 50 SC+Ultras, Profenofos 50 EC, Confidor 70 WG, Fyfanon 57 EC, Bono 20 SC and Malatox 57 EC up to one week of spray. Similes results were reported by (Aheer, *et al.* 2009) who also mentioned that all tested insecticides proved significantly effective against mealy bug up to 7 days after treatment.

## METEOROLOGY DATA

The meteorology data was recorded during the survey of cotton mealy bug at CCRI-Sakrand Farm. The results showed that the mealy bug built up its population when the temperature 29°C and was maximum in the temperature range of 30.5-39.5°C and decreased at temperatures below 29°C. (Table 2,3&6).

TABLE 6: METEOROLOGICAL DATA OF 2010 SEASON RECORDED AT CENTRAL COTTON RESEARCH INSTITUTE, SAKRAND, SINDH-PAKISTAN

Month	Mean Mealy Bug Population/ Shoot at Shaheed Benazirabad	Average Maximum Temp. and Range °C	Average Minimum Temp. and Range (°C)	Mean relative Humidity and Range (%)	Rainfall (mm)
Jun.	10.14	40.6(29.0-45.0)	27.4 (25.0-31.0)	57.8(47.0-91.5)	45.2
Jul.	16.33	38.6(35.0-43.0)	28.1(24.5-29.0)	65.7(56.0-90.5)	136.2
Aug.	23.70	35.7 (30.0-38.0)	27.2 (24.5-29.0)	73.8(63.5-90.5)	72.0
Sep.	84.30	34.3 (33.5-38.0)	25.1(21.5-30.0)	75.6(56.0-93.5)	50.0
Oct.	113.00	35.7 (30.5-39.5)	21.9(18.0-25.0)	55.9(41.7-66.0)	-
Nov.	50.00	29.1(24.0-33.0)	14.9 (8.5-20.5)	52.7(41.3-69.0)	-
Dec.	31.00	23.2(20.0-25.0)	7.5(4.0-10.0)	55.3(42.0-72.7)	-

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