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Mealy bug complex on transgenic cotton in Perambalur district of Tamil Nadu

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Abstract

Different species of insects and mites are reported to devour cotton at various stage of growth and above dozen are very serious pest causes 52-60 per cent losses in seed cotton. After introduction of *Bt* cotton sucking insect pests are the most important in cotton cultivation. Among the sucking pests, mealy bugs are most serious in *Bt c*otton.Survey conducted during three consecutive years of 2011-12 from September (*Kharif* season) to February (*Rabi* season), 2012-13 and 2013-14 in the same season. Revealed that *Phenacoccus solenopsis* Tinsley and *Paracoccus marginatus* Williams and Granara de Willink was the predominant mealy bug species noticed in different blocks of Perambalur district, Tamil Nadu. The mealy bug infestation was observed in grade I (1 to 10 mealy bugs scattered on plant) in all farmer fields surveyed with few exceptions. Scattered infestation of mealy bug was also recorded in other host plants namely, tapioca, bhendi, mesta, mulberry, brinjal, tomato, parthinium, papaya, mango, blackgram, sesamum, redgram, neeriam, sunflower, marigold, tuberose, crotons, jatropha sp, pomegranate, hibiscus, abutilon, guava and curry leaf. The maximum (32.50%) percentage of infested plants was recorded in the block of Veppanthattai and lowest (6.50%) in Alathur block of Perambalur district during 2011 to 2014, respectively. The maximum intensity (1.15) of mealy bug infestation was recorded in the block of Veppanthattai of Perambalur district during 2011-12. The maximum number of plants in grade. IV (whole plant infested) was 61, 42 and 39 respectively. So mealy bug complex is the major issues on transgenic cotton in Perambalur district of Tamil Nadu.

Keywords: Emerging pest, infested plants, intensity, mealy bug, *Phenacoccus solenopsis* and *Paracoccus marginatus*

Introduction

Cotton (*Gossypium spp.*) is popularly known as '**White Gold'**, belongs to family malvaceae and it is premier cash crop of India. Perambalur district is the central part of Tamil Nadu State and well known for its cotton cultivation since 1990 and it is hot spot of Tamil Nadu for cotton cultivation. Cotton crop is "**White gold in black soil"** of Perambalur district. After introduction of boll guard technology (*Bt*) in 2002, the productivity of cotton is increased from 308kg /ha in 2001 to 496.16 kg/ ha in 2013 (Anonymous, 2013). But, the Cotton production is stagnant over the years due to many biotic and abiotic constraints. Among the biotic problems, insect pests are major in India.

However Commercialization of *Bt* cotton led to a change in pest scenario, which resulted in the emergence of minor pests into a major pest occurred on cotton at Perambalur district of Tamil Nadu. It has attained serious pest status in cotton growing areas of Perambalur since 2009. In India first incidence of *Phenacoccus solenopsis* in cotton has been reported from the fields of Baroda district during 2003-2004 (Jhala *et al.,* 2008).The cotton belt of Maharashtra was seriously threatened by the exotic species of mealy bug, *Phenacoccus solenopsis* Tinsley (Homoptera: pseudococcidae) covering larger areas and causing huge losses during 2006-2007 (Bhosle *et al*., 2009). Whereas, Papaya mealy bug, *Paracoccus marginatus* Williams and Granara de Willink was first reported from Coimbatore, Tamil Nadu during 2007 infesting papaya and also infests cotton was found to be sporadic cum potential pest in South Zone (Karanthi, 2011). Five species of mealy bugs *viz*., *Phenacoccus solenopsis, Maconellicoccus hirsutus, Pseudococcus longispinus, Phenacoccus solani* and *Ferrisia malvastra* have been reported from different parts of the country (Jhala *et al.,* 2008). Presently, *P.solenopsis* is the only major species in almost all cotton growing areas of the country. The infestation of mealy bug has been reported on more than 350 plant species including ornamental and fruit trees.

Materials and Methods

The studies were conducted in 20 villages of Perambalur district, Tamil Nadu State during 2011 to 2014 by Department of Entomology, Faculty of Agriculture, Annamalai University, Chidambaram with Collaboration of Krishi Vigyan Kendra, Valikandapuram (Indian Council

of Agriculture Research), Perambalur, Tamil Nadu. During the field survey, observation on occurrence of mealy bugs and infestation were recorded at 15 days interval from September to February month in cotton and alternate hosts at selected 20 villages from 5 cotton field at randomly selected plants in 4 blocks of Perambalur district during main season of the crop in 2011 to 2014 by using GPS system to record the presence and mealy bug infestation (Nagrare, *et al.,* 2008).

The data on incidence of mealy bugs were recorded from randomly selected 100 plants/field/village and per cent infestation was calculated. The intensity of infested plants was worked out for each observation on the basis of cumulative total of mealy bug grades divided by the number of infested plants observed. The seasonal abundance of economic important mealy bugs incidence were recorded in research fields of cotton belt area. The mealy bug population was counted from the five centimetre portion of infested shoot / branch of cotton plant. The grading system was followed in cotton field as given by Monga *et al*. (2009)

Grade 0(G0) –(0)- No mealy bug

Grade 1(G1) – (0-10) Scattered appearance of few mealy bugs in the plant

Grade 2(G2) – Severe incidence of mealy bug on any one branch of the plant

Grade 3(G3) – Severe incidence of mealy bug on more than one branch or half portion of the plant

Grade 4(G4) – Severe incidence of mealy bug on the whole plant.

Data on mean of per cent infested plants and intensity of infested plants were compiled and used for determining the results. Mealy bugs were collected from various *Bt* cotton fields as well as other host plants and preserved in ethanol containing vials. Collected mealy bugs were identified from Division of Entomology IARI, New Delhi and The Director ICAR-National Bureau of Agricultural Insect Resources (NBAIR) Bangalore.

Results and Discussion

The village wise data (Table 1) of incidence of mealy bug revealed that during 20011-2014 maximum per cent of mealy bug infested plants were observed in Vepanthattai block (32.50, 17.8 and 16.25) and lowest in Alathur block (6.50) respectively. However, the intensity of

infested plants was 1.15 and 09, in Veppanthattai block and 1.00 in Veppur block respectively. Whereas the minimum intensity of infested plants (1.00) was observed in the block of Vepanthattai in during 2013-2014.

The scattered infestation of mealy bugs (Grade 1) were 12, 07, 05 recorded in all the farmer fields. However, the total number of the plants that recorded severe incidence of mealy bugs on one branch of the plant (Grade 2) was 20, 16, and 15 respectively. Severe incidence of mealy bug on more than one branch or half Portion of the plant (Grade 3) were 29, 25 and 23 and on whole plant (Grade 4) 61, 42, and 39, respectively.

The scattered infestation of mealy bugs was observed on the host plants in different villages viz. Tapioca, bhendi, mesta, mulberry, brinjal, tomato, parthinium mango, papaya, blackgram, sesamum, redgram, neeriam, sunflower, marigold, tuberose, crotons and jatropha sp, pomegranate, hibiscus, abutilon, guava and curry leaf during survey by using GPS. The identification details of insect's specimen, alternate host and location of villages are given in Table 2 and Table 3.

Identification of mealy bugs occurring on cotton collected during survey in different locations showed that Cotton mealy bug *P. solenopsis* and Papaya mealy bug, *P.marginatus* was found most widely distributed in cotton and other alternate host of Perambalur district of Tamil Nadu and five different types of mealy bugs, Spherical mealy bug *Nipaecoccus viridis* (Newstead), Striped mealy bug *Ferrisia virgata* (Cockerell), Pink hibiscus mealy bug *Maconellicoccus hirsutus* (Green), Mango mealy bug *Rastrococcus iceryoides* (Green) (Pseudococcidae) and Ber mealy bug *Perissopneumon tamarindus* (Green) (Monophlebidae) is the most prevalent in the region of Tamil Nadu**.** Jhala *et al.,* (2008) have been reported five species of mealybugs *viz.*, *Phenacoccus solenopsis, Maconellicoccus hirsutus, Pseudococcus longispinus, Phenacoccus solani* and *Ferrisia malvastra* from different parts of the country. Laxman *et al*., (2009) observed the percentage infested plants due to *P.solenopsis* on *Bt* cotton ranged from 47 to 53 during September to December in 2007 and 2008.

Brar *et al.,* (2009) reported 8.06 per cent of infested plants and 1.07 per cent intensity of infested plants due to *P.solenopsis* on *Bt* cotton during intensive surveys in different villages of Faridkot district in Punjab. Bhosle *et al.,* (2009) conducted a roving survey of mealy bug on cotton in Marathwada region of Maharashtra State and reported that the percentage of infested plants was highest (52.08) in Parbhani and lowest (11.14) in Hingoli districts. Monga *et al*., (2009) recorded 5 to 44 per cent infestation of mealy bug (*P.Solenopsis*) on cotton at

various locations in Haryana. Suresh *et al., (*2010) recorded the level of incidence of mealybug *P.solenopsis* from 0.00 to 60 per cent on cotton, sunflower, vegetables (brinjal, tomato, bhendi,cucurbits), pulses and parthenium. The present study confirmed that the mealy bug complex were predominant and has emerged as a serious sucking pest of cotton.

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Table 1. Record of mealy bug complex on *Bt* cotton in different villages of Perambalur district of Tamil Nadu (2011 to 2014).

S.No	Name of the blocks	Infested plants (%)	Intensity of infested plants	Number of host plants in Mealy bug grade				
				G-0	G-II	G-III	G-IV	G-V
2011-12								
1.	Veppanthattai	32.50	1.15	05	02	05	08	21
2.	Alathur	23.60	1.12	02	08	03	05	15
3.	Perambalur	11.24	1.00	03	00	08	04	09
4.	Veppur	12.30	1.00	02	10	3	12	16
2012-13								
1.	Veppanthattai	17.80	1.09	02	05	03	13	05
2.	Alathur	06.50	1.00	00	00	03	02	12
3.	Perambalur	15.85	1.07	03	06	06	02	09
5.	Veppur	12.45	1.00	02	05	07	08	16
2013-14								
1.	Veppanthattai	16.25	1.00	02	07	05	08	12
2.	Alathur	06.10	1.00	01	00	03	05	08
3.	Perambalur	10.25	1.00	00	05	06	04	11
5.	Veppur	08.50	1.00	02	03	03	06	08

Table 2: Identification of meal bug complex on cotton and other host plants with Coordinates in Tamil Nadu

S.No	Villages of perambalur district (TN)	GPS-Coordinates		Alternate host recorded	Mealy bug complex
		Latitude	Longitude		
1	veppanthattai	11.33893	78.82246	Cotton, Tapioca, Bhendi, Mesta, Mulberry, Brinjal, Tomato,Parthinium, Papaya,Blackgram,Mango, Sesamum,Redgram, Gold Neeriam, Sunflower,Marigold,Tuberose,crotons and Jatropha sp, pomegranate, Hibiscus, Abutilon, Guava and curry leaf	Cotton mealy bug *P. solenopsis* and Papaya mealy bug, *P.marginatus* was found to most widely distributed in cotton and other alternate host of Perambalur district of Tamil Nadu. and five different types of mealy bugs, Spherical mealy bug *Nipaecoccus viridis* (Newstead), Striped mealybug *Ferrisia virgata* (Cockerell), Pink hibiscus mealy bug *Maconellicoccus hirsutus* (Green), Mango mealybug *Rastrococcus iceryoides* (Green) (Pseudococcidae) and Ber mealy bug *Perissopneumon tamarindus* (Green) (Monophlebidae). is the most Prevalent in the region of Tamil Nadu
2	Thondappadi	11.34354	78.84059		
3	sithali	11.24315	78.96973		
4	Vadakarai	11.39285	78.82876		
5	Kaikalathur	11.47833	78.86104		
6	Siruganpur	11.15895	78.92689		
7	Pasumbalur	11.42649	78.88065		
8	Sathanur	11.15698	78.96453		
9	Siruvayalur	11.15178	78.73791		
10	A.Kudikadu	11.32626	78.87634		
11	Naranamangalam	11.15129	78.86786		
12	Puthukurchy	11.13691	78.86648		
13	Kudalur	11.13429	79.00286		
14	Kulathur	11.10609	78.97975		
15	Koothur	11.15485	79.01626		
16	Pilimisai	11.15679	79.00404		
17	Puthu Vettakudi	11.25928	79.07985		
18	adhanur	11.18235	78.99888		
19	Perali	11.22542	78.94664		
20	Esanai	11.29427	78.83274		

Table 3: Species wise occurrence of mealy bug in crop

Sl. No	Name of mealybug	figure
1	**Cotton mealy bug, *Phenacoccus solenopsis (Tinsley)*** (Pseudococcidae: Hemiptera)	
2	**Papaya mealybug, *Paracoccus marginatus (Williams and Granara de Willink)*** (Pseudococcidae: Hemiptera)	
3	**Striped mealy bug ,*Ferrisia virgata* (Cockerell):** (Pseudococcidae: Hemiptera)	
4	**Pink mealy bug, *Maconellicoccus hirsutus (Green*)** (Pseudococcidae: Hemiptera)	
5	**Mango mealy bug, *Rastrococcus iceryoides (Green)*** Pseudococcidae: Hemiptera	
6	**Spherical mealy bug, *Nipaecoccus viridis (Newstead)* (**Pseudococcidae: Hemiptera)	
7.	**Ber mealy bug, *Perissopneumon tamarindus (Green)*** (Monophlebidae: Hemiptera)	

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