

A Survey on Species Complex of Mealybug and their Natural Enemies on Cotton in Guntur District of Andhra Pradesh

Key words: Cotton, Mealybug species complex, Natural enemies.

Cotton, “white gold” is an important fiber as well as cash crop of India. Among all the cotton producing countries in the world, India ranks first in area (122.38 lakh ha⁻¹) with a cotton production of 361 lakh bales and productivity of 501 kg ha⁻¹. In Andhra Pradesh, it is being cultivated in 5.51 lakh ha⁻¹ with a production of 20 lakh bales and productivity of 688 kg ha⁻¹ (AICCIP, Annual Report, 2018-19). Sucking pests of cotton viz., leafhopper (*Amrasca devastans* Distant), whitefly (*Bemisia tabaci* Genn), aphids (*Aphis gossypii* Glover), thrips (*Thrips tabaci* Lindeman) and mealybug (*Phenacoccus solenopsis* Tinsley) damage the crop with regular infestation at different growth stages and reduce the yield up to 21.20 per cent (Dhawan *et al.*, 1998). Introduction of transgenic *Bt* cotton hybrids for commercial cultivation has resulted in an immense increase in the seed cotton yield and reduction in the average number of insecticidal sprays from 3.10 to 1.17 (Barwale *et al.*, 2004). However, adoption of transgenic *Bt* cotton hybrids resulted in severe incidence of sucking pests. Rapid development and more fertility of the sucking pests is due to the use of heavy doses of nitrogenous fertilizers which lead to increase in the quantum of some amino nitrogen concentrations in the plant system (Jain and Bhargava, 2007). Cotton mealybug was an invasive pest in India since 1991 (Fuchus *et al.*, 1991). Initially, it was a minor sucking pest and after 2007 it has emerged as a serious pest (Nagare *et al.*, 2009). It attacks plants by sucking cell sap from the phloem tissue (Aijun *et al.*, 2004). It secretes honeydew which makes sooty mould on the surface of the leaves, that decreases leaf area for photosynthesis, resulting in the death of plant tissues (Mark *et al.*, 2005). In cotton, *P. Solenopsis* attacked plant parts show bunched top appearance and stunted growth, chlorosis, and produce fewer bolls of smaller size with bad opening which ultimately affects the seed cotton yield up to 44.21% (Dhawan *et al.*, 2007).

MATERIAL AND METHODS:

Collection of mealybug samples and natural enemies

A roving survey was conducted during *khariif* 2018-19, in cotton growing areas in Guntur district,

to identify the species complex of mealybug and their natural enemies. In Guntur district, two mandals were selected and in each mandal three villages were selected for the survey.

The mealybug specimens were collected along with leaves, twigs and petiole intact and they were brought to the laboratory. The gravid females of mealybug were collected from each colony (Female is large and wingless with pale yellow body having lateral wax filaments). Altogether, twelve mealybug samples were collected from each mandal.

The collected mealybug colonies were kept in petriplates for the emergence of parasitoids in the laboratory. The colonies were observed daily for the emergence of parasitoids. Similarly, predator species associated with mealybug colonies observed in field condition as were collected. The collected mealybug, parasitoid and predator specimen were preserved in 70 per cent ethanol and sent to the taxonomist, National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru for species level identification.

RESULTS AND DISCUSSION

Identification of various species of mealybugs observed on cotton crop collected from Guntur district.

The samples of mealybugs were collected from Guntur district of Andhra Pradesh during *khariif* 2018-19 under the survey program. The samples consisted mostly of adult females of mealybugs along with various species of natural enemies *i.e.* parasitoids and predators. In the collected samples, three species of mealybugs viz., *Phenacoccus solenopsis* Tinsley (Plate 1), *Ferrisia virgata* Cockerell (Plate 2), *Paracoccus marginatus* Williams and Granara de Willink (Plate 3) (Table 1) were identified by the taxonomist, NBAIR, Bengaluru.

Some important characteristics of mealybugs observed during the present studies were as follows:

Phenacoccus solenopsis Tinsley

- It is known as cotton mealybug.
- Large size of the body as compared to other mealybugs.

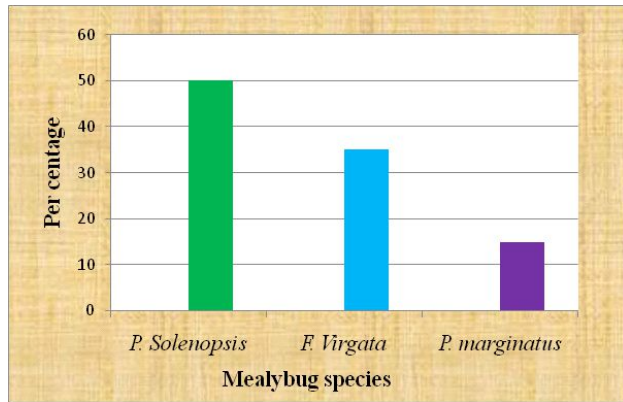


Fig 1. Distribution of mealybug species on cotton in Guntur district



Plate 1. *Phenacoccus solenopsis* Tinsley



Plate 2. *Ferrisia virgata* Cockerell



Plate 3. *Paracoccus marginatus* Williams and Granara de Willink



Plate 4. *Coccinella transversalis* Linnaeus



Plate 5: *Brumoides suturalis* Fabricius



Plate 6. *Cheilomenes sexmaculata* Fabricius

Coccinellid predators

- Three distinct dark spots present on dorsal surface of the body.
- A series of short waxy filaments exist on lateral side of the body.

Ferrisia virgata Cockerell

- It is commonly known as striped mealybug.
- Body bears lot of fine threads of wax.
- Two dark stripes on dorsal surface and two tail like structures or waxy tubes present at the posterior part of the body.

Paracoccus marginatus Williams and Granara de Willink

- It is commonly known as papaya mealybug.
- Small in size and a series of sharp waxy filaments exist around the body.

Table 1. Mealybugs species in cotton fields of Guntur district of Andhra Pradesh

District	Mandal	Villages	Per cent of species identified
Guntur	Chilakaluripet	Yadavalli	<i>P. solenopsis</i> (50%)
		Boppudi	<i>F. virgata</i> (20%)
		Veluru	<i>P. marginatus</i> (30%)
	Yadlapadu	Yadlapadu	<i>P. solenopsis</i> (50%)
		Jaggapuram	<i>F. virgata</i> (50%)
		Kondaveedu	

Table 2. Mealybug species diversity (average %) on cotton in two mandals in Guntur district

S.No	<i>P. solenopsis</i> %	<i>F. virgata</i> %	<i>P. marginatus</i> %
1	50	20	30
2	50	50	-
Average	50	35	15

Three mealybug species viz., *P. solenopsis*, *F. virgata*, *P. marginatus* were identified in cotton fields of Guntur district. In Chilakaluripet mandal of Guntur district, of the total mealybug species *P. solenopsis* accounted to 50 per cent, *F. virgata* to 20 per cent and *P. marginatus* to 30 per cent on cotton. In Yadlapadu mandal of Guntur district, *P. solenopsis* accounted to 50 per cent and *F. virgata* to 50 per cent on cotton. In Guntur district, out of these three mealybug species, *P. solenopsis* was noticed as the most dominant species (Table 2) (Fig.1).

The current results are corresponding to the earlier reports where *P. solenopsis* was reported on cotton in Andhra Pradesh, West Bengal and Karnataka regions of India (Durgaprasad *et al.*, 2008, Patel *et al.*, 2011, Hanchinal *et al.*, 2011). However, *F. virgata* was also reported on cotton in India by Dhawan 2007 and Nagrare *et al.* 2014.

P. marginatus was recorded on cotton in Gujarat and Coimbatore regions of India and it caused drying of the sympodial branches of both *Bt* and non-*Bt* cotton hybrids (Dhobi *et al.* 2014, Dharajothi *et al.*, 2010 and Dharajothi *et al.*, 2009)

Identification of various natural enemies on mealybugs in cotton

The samples of natural enemies collected from Guntur districts of Andhra Pradesh during *kharif* 2018-19. Overall a total of 3 species of coccinellid predators were identified. They were viz., *Cheilomenes sexmaculata* Fabricius (Plate 6), *Brumoides suturalis* Fabricius (Plate 5) and *Coccinella transversalis* Linnaeus (Plate 4).

The predators noticed in the present study are in similar with the findings of Gautam *et al.*, 2007, Tanwar *et al.*, 2007 and Patel *et al.*, 2009 who reported

predation of *P. solenopsis* by *B. suturalis*, *C. Sexmaculata* and *Scymnus sp.* *B. Suturalis* was voracious feeder of mealybugs (Khuhro *et al.*, 2012).

CONCLUSION

Mealybug management is one of the greatest challenges to the farmers due to diversity of species. Careful identification and documentation of the mealybug species are essential before control practices can be used. Among the mealybug species identified, *P. solenopsis* was the major species on cotton from the areas surveyed. More natural enemies were recorded during early stages of crop growth. This might be due to less number of insecticide sprays during early stage of the crop growth.

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