Madras Agric. J., 99 (7-9): 615-619, September 2012
https://doi.org/10.29321/MAJ.10.100154

Short Note

Host Plants of Invasive Papaya Mealybug, *Paracoccus marginatus* (Williams and Granara de Willink) in Tamil Nadu

P. Sakthivel*, P. Karuppuchamy, M. Kalyanasundaram and T. Srinivasan
Department of Agricultural Entomology,
Tamil Nadu Agricultural University, Coimbatore – 641 003.

Invasive papaya mealybug, *Paracoccus marginatus* (Williams Granara de Willink) invaded Tamil Nadu, India in 2008 has attained the status of a serious pest on a wide range of host plants. An extensive survey conducted during 2009 - 2011 revealed the presence of this mealybug on 133 plant species belonging to 48 families including pulses, oilseeds, fibre crops, narcotics, green manures, vegetables, fruit trees, tuber crops, flower plants, ornamentals, plantation crops, medicinal and aromatic plants, biofuel crops, tree species and weeds. Plants from Malvaceae, Solanaceae, Asteraceae and Euphorbiaceae were generally found as preferred hosts of this mealybug species. High host preference was noticed on 33 hosts followed by medium damage in 31 hosts. Pest intensity and damage was found to be low in 56 host plants while there was incidental damage for shorter durations in 13 hosts.

Key words: Papaya mealybug, *Paracoccus marginatus,* survey, host range

*Corresponding author email: sakthiento@yahoo.com

About 5000 species of mealybugs (Pseudococcidae: Hemiptera) have been recorded from 246 families of plants throughout the world (Ben-Dov, 1994). *Paracoccus marginatus* (Williams and Granara de Willink) is a polyphagous pest that can damage a large number of economically important field crops, tropical and sub-tropical fruits, vegetables and ornamental plants (Ben-Dov, 2008). The papaya mealybug is believed to a native of Mexico or Central America and was first described in 1992 by Williams and Granara de Willink and re-described in 2002 by Miller and Miller. *P. marginatus* has established in the Caribbean since 1994 (Miller *et al.,* 1999). *P. marginatus* was recorded in papaya for the first time in Tamil Nadu Agricultural University, Coimbatore, during July, 2008 (Muniappan, 2009).

It became a serious pest of papaya in Tamil Nadu and nearly 820 ha in Erode and 576 ha in Coimbatore districts had been affected (Revathy, 2010). The entire papain industry at Coimbatore district faced a dire threat due to the severity of this pest on papaya, apart from inflicting severe damage to tapioca and mulberry in the neighbouring districts of Tamil Nadu (Suresh *et al.,* 2010). threatened the economical production of many crops. Keeping in view the prevailing situation, a field survey was conducted during 2009 -2011 to record the host range of *P. marginatus* in Tamil Nadu.

Materials and Methods

An extensive survey for papaya mealybug was conducted for consecutive years in Tamil Nadu during 2009-2011. Infestation of mealybug was categorized on the following parameters based on

visual observation. During survey, whole plants of the species were examined for occurrence and infestation levels as described by Arif *et al.* (2009).

Parameter	Infestation levels
Incidental	· Only a few individuals of the mealybug casually found.No breeding individuals observed.
Low	· All stages of mealybug found in low numbers. No adverse symptoms like deformation of leaf observed on the plant.
Medium	· All stages of mealybug found in large numbers. Wilting and yellowing of plant leaves observed. Infested plants normally survived.
High	· All stages of mealybug found in very large numbers. Almost all plant parts (stem, leaves, flowers and fruits) covered with mealybug showing white appearance. Leaves, fruits and inflorescences covered with honey dew excretion and sooty mould.Excessive leaf and fruit shedding. Most of the plants died in the infested area.

Results and Discussion

Paracoccus marginatus was recorded from 133 plant species belonging to 48 families including pulses, oilseeds, fibre crops, narcotics, green manures, vegetables, fruit trees, tuber crops, flower plants, ornamentals, plantation crops, medicinal

and aromatic plants, biofuel crops, tree species and weeds (Table 1). Plants from Malvaceae, Solanaceae, Asteraceae and Euphorbiaceae were generally found as preferred hosts of this mealybug species. Among these, *Parthenium hysterophorus* (Asteraceae), *Hibiscus rosa sinensis, Abutilon hirtum* (Malvaceae), *Jatropha curcas*, *Manihot esculenta* (Euphorbiaceae) and *Plumeria alba* (Apocynaceae) harboured this pest round the year and acted as a persistent source for the spread of papaya mealybug. High host preference was noticed on 33 hosts followed by 31 hosts with medium damage while 56 hosts recorded low levels of damage and 13 with incidental damage.

Table 1. Host range of *Paracoccus marginatus* with its infestation levels

Family/ Scientific Name	English Name/ Vernacular name	Status	Infestation
Acanthaceae			
Andrographis paniculata (Burm.) Wall.	*Kalmegh*	Weed	**
Crossandra infundibuliformis (L.) Nees	Fire cracker, *Kanagambaram*	Flower	**
Agaraceae			
Polianthes tuberosa L.	Tube rose, *Sambangi*	Flower	**
Aizoceae			
Trianthema portulacastrum L.	Carpet weed	Weed	**
Alternanthera sessilis (L.)R. Br.	Sessile joy	Weed	**
Amaranthaceae			
Celosia spp.	Cocks comb	Weed	**
Achyranthes aspera L.	Prickly chaff flower	Weed	**
Aerva lanata (L.) Juss.	Mountain knot grass	Weed	**
Aerva tomentosa Forsk.	Javanese woolplant	Weed	**
Amaranthus viridis L.	Green amaranth	Weed	***
Celosia argentea L.	Wild cocks comb	Weed	**
Digera muricata (L.) Mart.	False amaranth	Weed	*
Anacardiaceae			
Mangifera indica L.	Mango	Fruit	**
Annonaceae			
Annona squamosa L.	Custard apple	Fruit	****
Apocynaceae			
Allamanda violacea L.	*Allamanda*	Ornamental	**
Catharanthus roseus (L)	Periwinkle	Weed	**
Nerium oleander L.	Oleander	Weed	****
Plumeria alba L.	White frangipani	Ornamental	****
Rauvolfia serpentina (L.) Benth	Snakeroot, *Sarpagandha*	Weed	**
Asclepiadaceae			
Gymnema sylvestre R. Br	Miracle fruit	Medicinal	****
Calotropis gigantea L. (Ait.)	Milkweed	Weed	***
Asteraceae			
Eupatorium cannabinum L.	Hemp-agrimony	Weed	****
Helianthus annus (L.)	Sunflower	Oilseed	****
Tagetes erecta L.	Marigold	Ornamental	****
Wedelia calandulacea Less.	Yellow karisalai	Medicinal	**
Wedelia chinensis Merril	Chinese wedelia	Medicinal	**
Zinnia elegans Jacq.	*Zinnia*	Ornamental	**
Ageratum conyzoides L.	Chick weed	Weed	***
Parthenium hysterophorus L.	Congress grass	Weed	****
Tridax procumbens L.	Coat buttons	Weed	****
Vernonia cinerea (L.)	Purple fleabane	Weed	**
Bignoniaceae			
Tecoma stans L. (Juss.)	Yellow trumpetbush	Ornamental	***
Bombacaceae			
Ceiba pentandra (L.) Gaertn.	Silk cotton, *kapok*	Fibre	****
Burseraceae			
Commiphora caudata (Wight & Arn.)	Hill mango	Medicinal	*
Caesalpinaceae			
Bauhinia purpurea L.	Purple camel's foot	Medicinal	*
Tamarindus indica L.	Tamarind	Tree	**
Cassia angustifolia Vahl.	Indian senna	Medicinal	**
Cassia fistula L.	Golden shower tree	Ornamental	**
Cassia auriculata L.	Avaram senna	Ornamental	**
Capparidaceae			
Cleome viscosa L.	Wild mustard	Weed	*

Table 1. cont.,

Table 1. cont.,

Caricaceae			
Carica papaya L.	Papaya	Fruit	****
Combretaceae			
Terminalia cata ppa L.	Indian almond	Ornamental	**
Convolvulaceae			
Ipomoea pes-tigridis L.	Morning glory	Weed	**
Cucurbitaceae			
Luffa acutangula (L.) Roxb.	Ribbed gourd	Vegetable	***
Momordica charantia L.	Bitter gourd	Vegetable	***
Mukia maderaspatensis L.	Headache Vine	Medicinal	**
Euphorbiaceae			
Croton spp.	*Croton*	Ornamental	**
Emblica officinalis Gaertn	Amla	Fruit	***
Jatropha curcas L.	Physic nut	Biofuel	****
Jatropha glandulifera L.	Glandular jatropha	Biofuel	****
Jatropha gossypifolia L.	Cottonleaf physic nut	Biofuel	****
Jatropha integerrima L.	Spicy jatropha	Biofuel	****
Jatropha multifida L.	Coral plant	Biofuel	****
Jatropha podagrica L.	Gout stalk	Biofuel	****
Jatropha tanjorensis Ellis & Saroja	Jatropha spp.	Biofuel	****
Manihot esculenta Crantz	Tapioca	Tuber	****
Acalypha indica L.	Indian acalypha	Weed	****
Croton sparsiflorus Mor.	Rushfoil	Ornamental	*
Euphorbia hirta L.	Asthma weed	Weed	**
Phyllanthus maderaspatensis L	Madras leaf-flower	Medicinal	**
Fabaceae			
Arachis hypogaea L.	Groundnut	Oilseed	***
Cajanus cajan (L.) Millsp.	Red gram	Pulses	***
Crotalaria juncea L.	Sunhemp	Green manure	****
Erythrina indica L.	Indian coral tree	Ornamental	*
Glycine max (L.) Merrill	Soyabean	Legume	**
Lablab purpureus (L.)	Lab lab	Pulses	**
Sesbania grandiflora L.	Corkwood	Green manure	**
Vigna mungo (L.) Hepper	Black gram	Pulses	***
Vigna unguiculata (L.) Walp..	Cow pea	Pulses	***
Vigna radiata (L.) Wilczek	Green gram	Pulses	***
Clitoria ternatea L.	Butterfly pea	Ornamental	**
Rhynchosia minima DC.	Least snout-bean	Weed	**
Tephrosea purpurea (L.) Pers.	Wild indigo	Weed	***
Heliconiaceae			
Heliconia spp.	False bird-of-paradise	Ornamental	**
Labiatae/Lamiaceae			
Anisomeles malabarica (L.)	Malabar-catmint	Weed	**
Coleus forskohlii Briq.	Indian Coleus	Ornamental	**
Mentha arvensis L.	Mint	Spice	**
Origanum majorana L.	Marjoram	Aromatic	*
Scrophulariacce			
Lawsonia inermis L.	Henna	Cosmetic	**
Malpighiaceae			
Malpighia punicifolia L.	West Indian cherry	Fruit	**
Malvaceae			
Abelmoschus esculentus (L.) Moench	Bhendi	Vegetable	****
Abutilon hirtum (Lam.) Sweet	Country mallow	Weed	****
Gossypium spp.	Cotton	Fibre	****
Hibiscus sabdariffa L.	Mesta	Fibre	***
Sida acuta Burm.	Common wireweed	Weed	****
Abelmoschus moschatus L.	Musk mallow	Aromatic	***
Hibiscus rosa-sinensis L.	Shoe flower	Flower	****
Meliaceae			
Azadirachta indica L.	Neem	Tree	**
Melia dubia Cav.	White cedar	Tree	***
Mimosaceae			
Acacia ferruginea DC.	Rusty acacia	Timber	*
Acacia leucophloea L.	White bark acacia	Medicinal	*

Table 1. cont.,

Leucaena leucocephala (Lam.)	Subabul	Green leaf manure	***
Prosopis juliflora (Sw.) DC.	Velvet mesquite	Timber	***
Mimosa pudica L.	Touch-me-not	Weed	*
Moraceae			
Artocarpus heterophyllus Lam.	Jack	Fruit	**
Morus alba L.	Mulberry	Silkworm feed	****
Musaceae			
Musa spp.	Banana	Fruit	**
Myrtaceae			
Psidium guajava L.	Guava	Fruit	****
Nyctaginaceae			
Boerhavia diffusa L.	Tar vine	Medicinal	***
Boerhavia erecta L.	Erect spiderling	Medicinal	***
Palmae			
Cocos nucifera L.	Coconut	Plantation	**
Phoenix dactylifera L.	Date palm	Plantation	**
Pedaliaceae			
Sesamum indicum L.	Sesame	Oilseed	**
Piperaceae			
Piper betle L.	Betel vine	Spice	****
Piper longum L.	Long pepper	Spice	**
Punicaceae			
Punica granatum L.	Pomegranate	Fruit	**
Rhamnaceae			
Ziziphus mauritiana Lamk.	Ber	Fruit	**
Rosaceae			
Rosa spp.	Rose	Flower	**
Rubiaceae			
Anthocephalus chinensis (Lam.)	White Indian oak	Tree	*
Ixora coccinea L.	Jungle flame	Ornamental	**
Morinda citrifolia L.	Noni	Medicinal	***
Borreria articularis (L.f.) F. N.	Shaggy button plant	Medicinal	***
Rutaceae			
Murraya koenigii (L.) Sprengel	Curry leaf	Spice	***
Sapotaceae			
Achras sapota L.	Sapota	Fruit	***
Simaroubaceae			
Ailanthus excelsa Roxb.	Matchwood tree	Tree	**
Solanaceae			
Capsicum annum L.	Chilly	Vegetable	***
Lycopersicon esculentum Mill.	Tomato	Vegetable	***
Nicotiana tabacum L.	Tobacco	Narcotic	**
Solanum melongena L.	Brinjal	Vegetable	****
Solanum nigrum L.	Black nightshade	Medicinal	***
Solanum torvum Sw.	Turkey berry	Vegetable	**
Solanum trilobatum L.	Climbing brinjal	Medicinal	**
Solanum tuberosum L.	Potato	Tuber	****
Withania somnifera Dunal	Ashwagandha	Medicinal	****
Datura metel L.	Angels trumpet	Weed	*
Solanum xanthocarpum Schrad & Wendl.	Yellow berried nightshade	Medicinal	***
Sterculiaceae			
Theobroma cacao L.	Cocoa	Plantation	***
Tiliaceae			
Corchorus capsularis L.	Jute	Fibre	**
Verbenaceae			
Duranta erecta L.	Golden dewdrop	Ornamental	***
Lantana camara L.	Spanish flag	Weed	**
Tectona grandis	Teak	Timber	*****
Vitaceae			
Cissus quadrangularis L.	Devil's backbone	Medicinal	*
Zygophyllaceae			
Tribulus terrestris L.	Devils thorn	Weed	***

Infestation: **** = High, *** = Medium, ** = Low, * = Incidental

Among the economically important crops, *Carica papaya* (papaya), *Morus alba* (mulberry), *Nicotiana tabacum* (tobacco), *Tectona grandis* (teak) and *Theobroma cacao* (cocoa) were high valued crops among which papaya and mulberry suffered heavy losses during the period of our studies.

Earlier, Miller *et al.* (1999) reported the incidence of papaya mealybug on 60 host plants of about 25 genera including economically important crops. Meyerdirk and Kauffman (2001) reported a wider host range of about over 60 species and Walker *et al.* (2003) listed 55 host plants in 25 genera. Ben-Dov reported the presence of mealybug species in 22 plant families (Ben-Dov, 2008). Regupathy and Ayyasamy (2010) also made an extensive survey and reported about 50 hosts including field and horticultural crops, herbaceous perennials, climbers, trees, ornamentals and several weed hosts.

However, the present study revealed about 133 plant species from 47 plant families indicating the sheer invasiveness of this species. Diversified hosts coupled with absence of a native natural enemy complex are responsible for the invasiveness of papaya mealybug. Weed species like *Parthenium*, *Abutilon*, *Sida* sp. *etc*., also provide a green bridge for the successful perpetuation of this species throughout the year as opined by Regupathy and Ayyasamy (2010).

The extreme host range is an alarm cum awakening call that *P. marginatus* may attack many more plants in future. Therefore effective weed control, field sanitation, following proper crop rotation and quarantine measures will be of high significance while adopting management strategy of this papaya mealybug.

References

Arif, M.I., Rafiq, M. and Ghaffar, A. 2009. Host plants of cotton mealybug *Phenacoccus solenopsis*): a new menace to cotton agroecosystem of Punjab. *Int. J. Agric. Biol.,* **11:** 163–167.

Ben-Dov, Y. 1994. A systematic catalogue of the mealybugs of the world with data on geographical distribution, host plants, biology and economic importance. Intercept Limited, Hants, UK. 686 p.

Ben-Dov, Y. 2008. Scale Net, *Paracoccus marginatus.* 17 September 2008. http://www.sel.barc.usda.gov/catalogs/pseudoco/Paracoccusmarginatus.htm

Meyerdirk, D. E. and Kauffman, W.C. 2001. Status on the development of a biological control program for *Paracoccus marginatus* Williams, papaya mealybug. USDA, APHIS, PPQ Report. 20p.

Miller, D.R., Williams, D.J. and Hamon, A.B. 1999. Notes on a new mealybug (Hemiptera: Pseudococcidae) pest in Florida and the Caribbean: the papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink. *Insecta Mundi,* **13:** 179-181.

Muniappan, R. 2009. Papaya meaybug, a new invader in Asia. IAPPS Newsletter January, 2009. http://www.plantprotection.org/news/NewsJan09.htm.

Regupathy, A. and Ayyasamy, R. 2010. Infestation of the invasive papaya mealybug *Paracoccus marginatus* (Williams and Granara de Willink) in small scale papaya farming system in Tamil Nadu. *Hexapoda,* **17:** 12-20.

Revathy, R. 2010. Chemical control of papaya mealybug, *Paracoccus marginatus* (Williams and Granara de Willink) on papaya. M.Sc (Ag) Thesis, Tamil Nadu Agric. Univ., Coimbatore, 119p.

Suresh, S., Jothimani, R., Sivasubrmanian, P., Karuppuchamy, P., Samiyappan, R. and Jonathan, E.I. 2010. Invasive mealybugs of Tamil Nadu and their management. *Karnataka J. Agric. Sci*., **23:** 26-34.

Walker, A., Hoy, M. and Meyerdirk, D. 2003. Papaya mealybug, *Paracoccus marginatus* Williams and Granara de Willink (Insecta: Hemiptera: Pseudococcidae). IFAS Extension Manual of University of Florida, EENY-302, 7p.

Received: May 25, 2012; Accepted: June 8, 2012