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Occurrence of Invasive Papaya Mealybug, *Paracoccus marginatus* Williams & Granarade Willink (Hemiptera: Pseudococcidae) on *Ipomoea carnea* in Gujarat

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ABSTRACT: This paper reports the occurrence of invasive papaya mealybug, *Paracoccus marginatus* Williams & Granara de Willink (Hemiptera: Pseudococcidae) on a medicinal herb, *Ipomoea carnea* in Gujarat. Eggs are greenish yellow and are laid in an egg sac and entirely covered with white wax. The ovisac is developed ventrally on the adult female. Nymphs and adults generally congregated along the terminal shoots and all areas of the tender leaves. The adult female is yellow and is covered with a white waxy coating. It was found to damage various parts including the leaves, stems, and tender shoots. Sucking the sap by insect resulted in curling, crinkling, rosetting, twisting, general leaf distortion and finally sooty mould was developed. This is the first report from Gujarat and perhaps from India. By considering the importance of *I. carnea* in many fields particularly pesticidal property against many pests, there is need of further study, a strict monitoring of this pest.

Keywords: Papaya mealybug, *Paracoccus marginatus*, *Ipomoea carnea*, First report, sporadic infestation, Gujarat.

INTRODUCTION

Ipomoea carnea (Family: Convulvulaceae) which is generally known as Bush Morning Gloryin English. The Hindi/Marathi names are Besharam/Naffatia, meaning shameless, refers to its rampant spreading. This plant is spread all over the world including Asia, Africa and North America (Shinners, 1970). Morning glory, the name itself introduces the shimmering flower which blooms with the sunlight, dries up in the afternoon and fades into the darkness of the night giving way to new flowers day after day. This evergreen, flowering shrub grows to a height of 5-6 m. The stem is thick and develops into a solid trunk over several years with many branches from base (Bhalerao, 1985). The stem is erect, woody, hairy, and more or less cylindrical in shape and greenish in colour. It has alternate leaves. Normally it attains 1.25 - 2.75 m long and 0.5 - 0.8 cm diameter. The leaves are light green, heart shaped or somewhat lanceolate and 10-25cm long. The upper surface of leaf is dull green and the lower surface is paler. The leaves which receive lesser sunlight may grow larger than the leaves which receive full sunlight (Afifi *et al.*, 1988; Chaudhuri *et al.*, 1994; Sharma and Bachheti 2013).

The plant has many chemical constituents and shows various mechanical, insecticidal & pharmacological properties. It has been described to possess medicinal properties and is used in traditional medicine in several countries. It is used in different traditional medical systems including Ayurveda, Siddha and Unani. Moreover, the stem is used as fire wood by the poor peoples and also for making paper. It contains a component identical to marsilin, a sedative and anticonvulsant. A glycosidicsaponin has also been purified from *I. carnea* with anti-carcinogenic and oxy-toxic properties. Flowers attract the butterflies and humming birds. This plant used as a raw material for activated carbon. Sahayaraj and Ravi (2008) reported that in *I. carnea* benzene and chloroform extracts yielded the compounds such as neophyadiene, 1-decanol, tetradecanoic acid, pentadecane, 1-iodo-2-methylundecane, transcaryophyllene, cicosane, 2-butenoic acid and cholestan-3-one. Cholestan-3-one is a steroidal compound and it has a high pesticide property. *Ipomoea carnea* extracts were evaluated against the cotton leaf worms, *Spodoptera littoralis* by Nassar *et al.* (2018) and reported deformation abnormalities of *S. littoralis*. Active compounds of essential oils from stems of *I. carnea* could be explored as natural repellents for the control of banana stem weevil, *Odoiporus longicollis* (Sahayaraj *et al.*, 2015). *I. carnea* extracts were studied for their antifeedant efficacy against rice pest namely the leaf folder (*Cnaphalocrosis medinalis*). Spray of naffatia (*1. fictulosa*) leaves extracts 10% suspension effectively managed the population of leaf miner, *Phyllocnistis citrella* St.psylla, *Diaphorinacitri* on Kagzilime (Borad *et al*., 2001).

MATERIAL AND METHODS

The present finding was noted during the survey of insect pests on mango at farmers field in Valsad district

of South Gujarat. During field visit, different life stages of mealybug was observed on *I. carnea* along the non-cultivated area. Regular fortnightly monitoring was also carried out for the confirmation of the *I. carnea* as host plants of this insect. Moreover, different life stages observed were collected and brought to the laboratory for further study and photographed using a Knowa Getner Stereo trinocular microscope. Observations on colour, size, shape and measurements of different life stages were also taken. Based on the photographs and literature available on internet and keys developed by Williams (2004) for identifying mealybugs of southern Asia led to identification of mealybug as *Paracoccus marginatus* (Williams and Granarade Willink) (Hemiptera: Pseudococcidae) commonly known as Papaya mealy bug which is an exotic pest and caused serious damages to papaya and several other horticultural crops in the southern states of India. Further, the identification was confirmed by Dr. Sunil Joshi, Principal Scientist, ICAR, NBAIR, Bangalore, Karnataka.

RESULTS AND DISCUSSION

I. carnea is generally pest-free, due perhaps to the presence of insecticidal compounds. But, papaya mealybug infestation was typically observed as clusters of cotton-like masses on the above-ground portion of *I. carnea*. It was found to damage various parts including the leaves, stems, and tender shoots. Sucking the sap by insect resulted in curling, crinkling, rosetting, twisting, general leaf distortion and finally sooty mould was developed (Plates A and B). *P. marginatus* 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 redescribed 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). Presently, in Indian peninsula, the post has invaded Tamil Nadu (Muniappan *et al*., 2008), Kerala (Krishnakumar and Rajan 2009), Karnataka (Mahalingam *et al*., 2010; Shekhar *et al*., 2011), Andhra Pradesh, Kerala, Tripura, Odisha and Maharashtra (Shylesha *et al*., 2011), Jammu and Kashmir (Sharma *et al*., 2013). The exotic pest was reported from Gujarat on Bt cotton (Dhobi *et al*., 2014). The pest got its entry into West Bengal infesting papaya and subsequently on mulbery (Lalitha *et al*., 2015).

The adult female is yellow and is covered with a white waxy coating. A series of short waxy caudal filaments less than 1/4 the length of the body exist around the margin. Length and width of male adult ranged between 1.0 to 1.1 mm and 0.2 to 0.3 mm with average of 1.04 mm and 0.25 mm, respectively. Likewise, length and width of female adults ranged between 2.2 to 2.4 mm (1/16 inch) and 1.5 to 1.6 mm with average of 2.28 mm and 1.54 mm, respectively (Table 1). Eggs are greenish yellow and are laid in an egg sac that is three to four times the body length and entirely covered with white wax (Plate H, I). The ovisac is developed ventrally on the adult female (Plate D, J). Length and width of egg ranged between 0.3 to 0.4 mm and 0.1 to 0.2 mm with average of 0.33 mm and 0.15 mm, respectively.

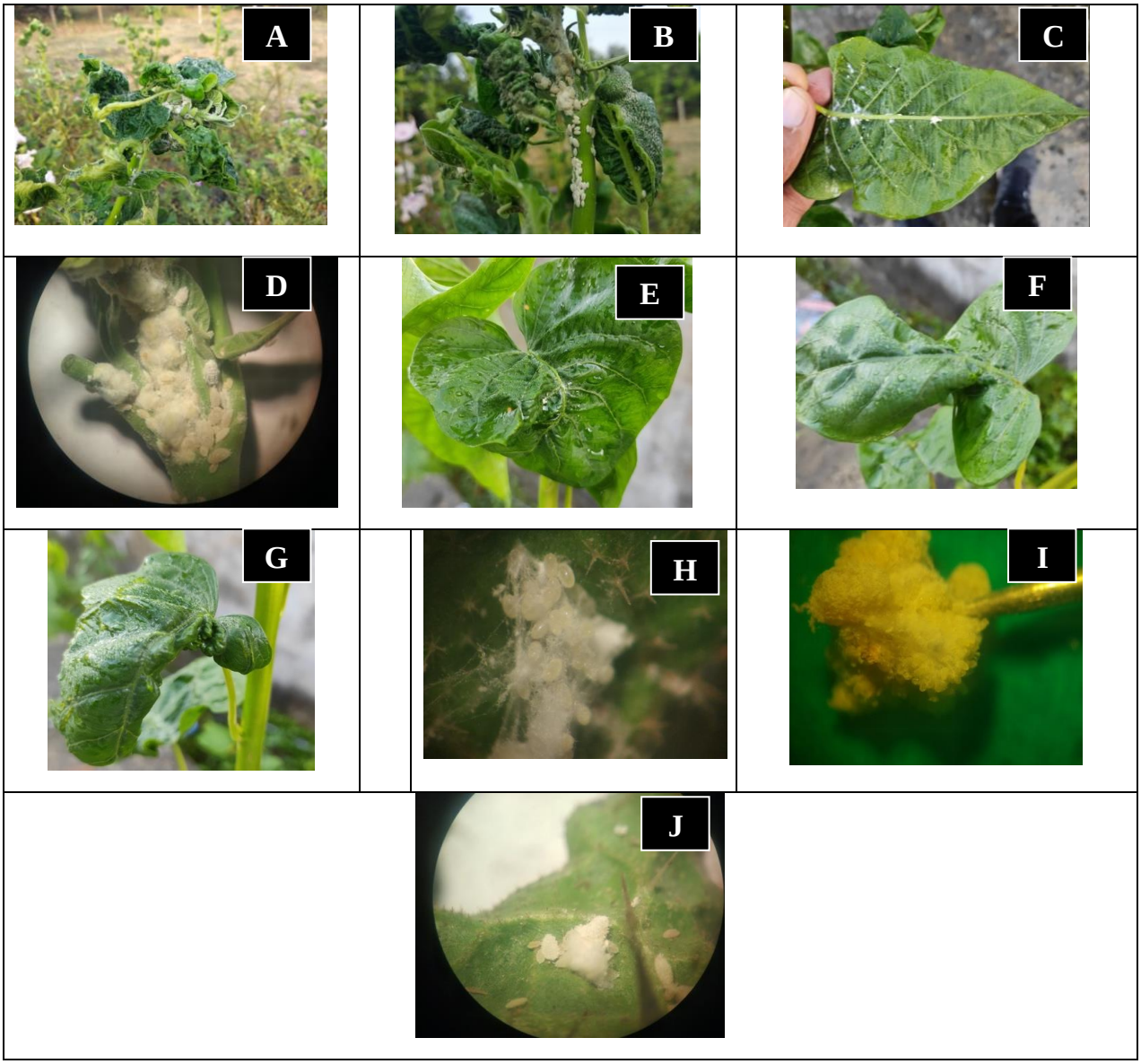
On *I. carnea*, the nymphs and adults generally congregated along the terminal shoots and all areas of the tender leaves (Plate A, B). Length and width of nymph (final instar) ranged between 1.2 to 1.4 mm and 0.5 to 0.6 mm with average of 1.32 mm and 0.54 mm, respectively. Terminal shoots become bunched and distorted (Plate A, B). On older leaves no any infestation was observed. On tender leaf the nymphs were seen near the veins and the midribs (Plate C). Severely infested tender leaves become crinkled (Plate F, G). Heavy mealy bug populations produce enormous honey dew, which deposited on upper surface of leaves (Plate E).

Kondow *et al*. (2020) studied the population fluctuations of the papaya mealybug, *P. marginatus* in urban and peri-urban areas of Lomé (Togo) and reported that *Ipomoea triloba* is one of the relatively rich host plants of *P. marginatus*. The morphometric measurements of *P. marginatus* measured in the present study was also found in line with the earlier workers. The slight variation in linear measurements may be due to diversity of host plants and also due to climatic variations.

This is the first report of occurrence of invasive mealy bug, *P. marginatus* on *I. carnea* from Gujarat and perhaps from India. By considering the importance of *I. carnea* in many fields especially pesticidal property against many pests, there is need of further study and management of this pest.

Table 1: Linear measurements of different life stages of *P. marginatus* on *I. carnea*.

Stage	Length (mm)		Width (mm)	
	Mean ± SE	Range	Mean ± SE	Range
Egg	0.33±0.05	0.3 - 0.4	0.15±0.05	0.1-0.2
Nymph (Late instar)	1.32±0.06	1.2-1.4	0.54±0.05	0.5-0.6
Female adult	2.28±0.09	2.2-2.4	1.55±0.13	1.5-1.6
Male adult	1.04 ± 0.05	1.0-1.1	0.25±0.05	0.2-0.3
(Average of 10 specimens)				



A.Terminal shoots become bunched, rosetted and distorted, **B.** Nymphs and adults congregating on terminal shoots, **C.** Nymphs congregating along the veins and the midribs of tender leaves, **D.** Microscopic view of P. marginatus showing adult female with ovisac, **E.** Fresh honey dew deposition on upper surface of leaves,**F-G.** Curling, crinkling and twisting of tender leaves, **H.**Eggs of mealy bug (microscopic view), **I.** Ovisac loaded with eggs (microscopic view), **J.** Ovisac beneath the female adult (microscopic view)

Plate 1. Symptoms and infestation of Papaya mealy bug on Ipomoea carnea.

CONCLUSIONS

From the above study, it can be concluded that, the occurrence of invasive papaya mealybug, *Paracoccus marginatus* Williams & Granara de Willink (Hemiptera: Pseudococcidae) has been first time reported on a medicinal herb, *Ipomoea carnea* in Gujarat. Eggs are greenish yellow and are laid in an egg sac and entirely covered with white wax. The ovisac is developed ventrally on the adult female. Nymphs and adults generally congregated along the terminal shoots and all areas of the tender leaves. The adult female is yellow and is covered with a white waxy coating. It was found to damage various parts including the leaves, stems, and tender shoots. Sucking the sap by insect resulted in curling, crinkling, rosetting, twisting, general leaf distortion and finally sooty mould was developed.

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