Wondered to know the threat for wonder tree

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Neem (*Azadirachta indica* A. Juss.), popularly called as "Indian wonder tree", is known for its medicinal values as anti-malarial, anti-fungal, anti-viral and anti-carcinogenic effects. This is one of the most popular plant products being utilized in crop protection for the control of crop-pests. Apart from its various commercial formulations available in the market (Azadirachtin 300 ppm, 1500 ppm, 10000, 15000 ppm), its extract, NSKE @ 5 % is commonly used against crop-pests. The neem tree is being attacked by insects is a rare situation particularly the stem borers. However, it's surprising to know that in the present situation thousands of neem trees across Karnataka state are attacked by a mirid bug known as "Tea Mosquito Bug" (TMB), *Helopeltis antonii* (Fig. 1). A plant having pesticidal property is being attacked by a pest is really a wonder. TMB normally attacks fruit crops and few plantation crops; however, neem was reported as an alternative host for TMB (Saroj *et al*., 2016). It normally does not pose any threat to neem, but its pestiferous nature in the recent past can be attributed to climate change induced favourable weather conditions (Kalyanasundaram, 2016). Hence, the information pertaining to TMB in terms of host range, biology, nature of damage and management is needed to bring awareness among the scientific and, farming community and common people.

Host Range: Three species of *Helopeltis*, *viz.*, *H. antonii*, *H. bradyi* and *H. theivora* were recorded in India, where *H. antonii* is the dominant species (Sundararaju and Bakthavatsalam, 1994). *Helopeltis antonii* with a life cycle of 25-32 days is also found in plants like cinchona (*Cinchona* spp.), persian neem and annatto (Fletcher, 1914); mahogany (Fletcher, 1914; Rao 1915); cashew and guava (Ayyar, 1940; Puttarudriah 1952); avocado (Puttarudriah, 1952), apple and grapevine (Puttarudriah and Appanna, 1955); cotton (Puttarudriah, 1958); cocoa *(Theobroma cocoa L.)* (Abraham and Remamony, 1979); camphire (*Lawsonia alba* Lam.) (Sundararaju, 1984); drumstick (*Moringa oleifera* Lam.) (Pillai *et al*., 1979); rose apple, mango, all spice and black pepper (Piper nigrum L.) (Devasahayam and Nair,1986); poria tree (*Thespesia populnea* L.) (Sundararaju and Baktavatsalam, 1994); *Ailanthus excels* Roxb. (Satapathy, 1993; Sundararaju, 1996); ber (*Zizyphus mauritiana* Lam.), Indian gooseberry (*Emblica officinalis* L.), cotton (*Gossypium barbadense* L. and *G. hirsutum* L.), cowpea and Compositae weed plant (*Lactuca runcinata* DC.) (Sundararaju, 1996); neem (Onkarappa and Kumar 1997; Sundararaju and Sundarababu,1999); Singapore cherry (*Muntingia calabura* L.) (Srikumar and Bhat, 2013); *Annona* spp. (Venkata Rami, 2009).

Biology: The eggs of TMB are white, ovo-elongate, laterally compressed measuring

about 1.0 to 1.31 mm long (Ambika and Abraham, 1979). Two unequal extra-chorionic processes arise from the anterior end of the eggs measuring nearly 0.29-0.67 mm in length. The eggs are embedded in plant tissue singly or in small groups usually with the operculum and extra chorionic processes exposed. The fecundity of *H. antonii* on cashew varies from 10 to 41 eggs (Pillai *et al.,* 1984) and 28 to 35 eggs (Ambika and Abraham, 1979). *Helopeltis antonii* lays its eggs primarily on the young shoots, inflorescence stalks and tender nuts of cashew, but sometimes accepts the petioles and ventral midribs of leaves (Ambika and Abrahamm, 1979). On guava, *H. antonii* lays eggs primarily on ventral midribs of leaves, flower buds, and pea-sized guava fruit singly or in groups (Sundararaju and Sundarababu, 1999). Incubation period of *H. antonii* varies among hosts *viz*., neem (8-9 days), guava (9-10 days) and cashew (7-8 days) as reported by Sundararaju (1996). It has five nymphal instars that vary in size, duration, colour and development of body parts. Nymphal developmental periods of 15.3 ± 0.82 days were recorded for *H. antonii* on neem; 20.24 ± 1.79 days on guava and 12.60 ± 0.50 days on the cashew (Sundararaju, 1996). The longevity of *H. antonii* adults varied from 7 to 46 days (Stonedahl, 1991; Sundararaju, 199; Srikumar and Bhat, 2011).

Damage symptoms: It sucks the plant sap from tender shoots of neem causing degeneration and injects poly-phenol oxidase from their salivary glands (Mandal, 2000) thereby, complete drying of affected branches is noticed (Fig. 2). Typical feeding damage by *H. antonii* appears as a discoloured necrotic area or a lesion around the point of entry of the labial stylets inside the plant tissue leading to the destruction of plant cells. The infestation of inflorescence results in “blossom blight” (Devasahayam and Nair, 1986). When they puncture the tissues, a gum oozes out of the holes as depicted in Fig 3.

Fig. 1: Tea mosquito bug adult, *Helopeltis antonii*

Severity of TMB: Thousands of neem trees were found infested by mirid bug during September to December, 2021 in several districts of Karnataka *viz.,* Raichur, Koppal, Yadgir and Ballari. Even the invasion of this bug was also been reported from Rayalaseema region of Andhra Pradesh (Kurnool, Anantapur, and parts of Kadapa district) and Telangana (Mahaboobnagar and Hyderabad) during November, 2021. The pest’s infestation on cashew started from October/November pronounced more during December to March with the population reaching peak in January during which the trees were in full bloom with flowering and fruiting. Later the population subsided during the monsoon period (Sundararaju, 2005). Kalloor *et al*. (2020) reported after the northeast monsoon shower ceased at Mettupalayam, Coimbatore, population of TMB started infesting neem during October-November, 2019. The bugs were active in neem until April, 2020 at varied levels of

intensity and the pest population reached its peak during January, 2020. The highest

Fig. 2: Drying of infested branches due to tea mosquito bug

Fig. 3: Oozing of gum from feeding punctures by tea mosquito bug

number of TMB was recorded (9.60 per three terminal shoots per tree) during the third standard week of 2020 and the lowest numbers were recorded during 15th standard week 2020 (2.00 per three terminal shoots per tree). Wind velocity, maximum temperature, rainfall, relative humidity, sunshine hours and evaporation rates were found negatively correlated with the population of TMB. While, minimum temperature was positively correlated with the population abundance of TMB (Kalloor *et al*., 2020).

Management: Collect and destroy the damaged plant parts followed by spraying the trunks, branches, foliage, and inflorescence early in the morning or late in the evening hours is recommended for efficient control with flonicamid 50% WP @ 0.50 g or dinotefuron 20 % SG @ 0.30 g or acephate 75% SP @ 1.0 g or thiamethoxam 25% WG @ 0.30 g or profenofos 50 % EC @ 2ml or acetamiprid 20% SP @ 0.6 gm per litre (Radhika, 2020; Padmaiah, 2021). Bio-control agents particularly *Telenomus* spp, an efficient egg parasitoid on tea mosquito eggs (Kalyanasundaram, 2016). Research is needed to figure out how the bugs managed to evade the insect-repellent azadirachtin, a chemical molecule found in practically every part of the neem tree.

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