



***Tetranychus gloveri* (Acari: Tetranychidae): an emerging threat to tissue culture banana plantlets in nurseries**

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ABSTRACT: For many decades, mites are posing threat to agricultural and horticultural industries. Recently mite infestation in Horticultural nurseries has become serious problem in Kerala, India. Purposive sampling surveys were conducted in the Horticultural nurseries of Thrissur and Ernakulam districts to record the incidence of mite pests on nursery plants. Study of morphological characters like setae and aedeagus confirmed the mite species infesting TC banana plants is *Tetranychus gloveri* Banks.

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INTRODUCTION

Banana (*Musa* spp.), belonging to the family Musaceae is an important commercially grown fruit crop in tropical and sub tropical regions of the world. It is also commonly referred as “apple of the paradise”(Subba *et al.*, 2023).The Nendran (AAB group), also called a French plantation is one of the leading banana cultivars in Kerala due to its wide acceptance and special social economic importance in the state. In India, an average of 30.47 million tonnes of bananas are produced annually in an area of 8,60,000 acres (FAOSTAT, 2017). During 2018-19, total production of 4.24 lakh tonnes was reported from an area of 52,898.61 ha in Kerala (GoK, 2019). In recent times, micro propagation of the planting material using tissue culture is gaining importance to meet the high demand for banana suckers in planting season. But the cultivation of the plantlets for acclimatization in hardening unit is often threatened by the high incidence of pests and diseases (Agustin *et al.*, 2022). Mites (Acari) are a diverse group of arthropods that have been destroying and devastating the agricultural industry for many decades. They also occupy a wide range of habitats and a wide range of hosts including vegetable and ornamental crops (Al-Atawi, 2011)

MATERIALS AND METHODS

Purposive sampling surveys were conducted in the Horticultural nurseries of Thrissur and Ernakulam districts during January 2021 to march 2023 to record the incidence of mite pests on nursery plants. During the survey, symptoms of speckling, yellowing and drying of leaves were recorded in TC banana plants from four nurseries at Kannara (10° 32' 52"N 76° 19' 12"E), Vytilla (9°55'37"N 76°19'11"E), Vellanikkara (10°32'37"N 76°17'01"E) and Oddakkali (10°49'53"N 76°40'35"E). On examination using a hand lens (5 X), large number of different stages of spider mites, moulted skin and fine webbing were noticed on the lower surface of the leaves. The affected leaves were excised and collected in polythene bags, secured with rubber bands, labelled and brought to the laboratory for further examination.

In the laboratory, on observation of the leaf samples under a stereo zoom microscope (30X) large number of scarlet red adult female mites, creamy white nymphs, adult males, and translucent white spherical eggs were found. The male and female mites were picked then slide mounted on Hoyer's medium for morphological characterisation and species determination. Morphological characters namely chaetotaxy, structure of empodium on the leg of

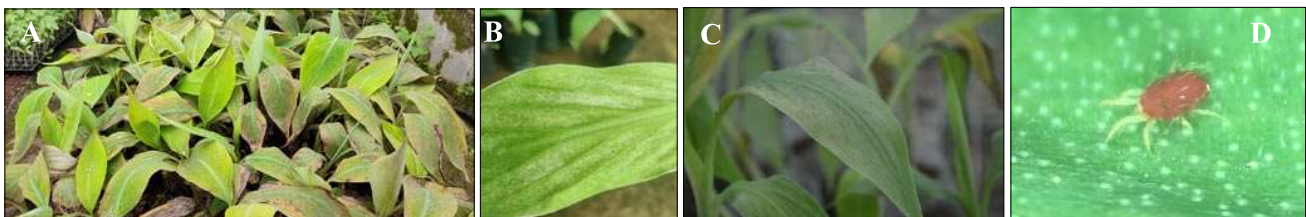


Fig. 1. Symptoms of mite infestation on banana plantlets A. TC plantlets in hardening unit B. Whitish speckles on leaf C. Yellowing of leaves D. Adult female mites

female mite were studied for identification at genus level and for species identification, shape of male genitalia were studied using Radical RXLr- 4 phase contrast microscope with image analyser.

RESULTS AND DISCUSSION

In the nursery, mite colonises the TC banana plants on the lower surface of the leaves, and feed the sap leading to development of white speckles on the upper surface (Fig.1). Later, the leaf turns yellow, followed by bronzing and drying (Fig.1). Severely infested plantlets succumbed to mite infestation.

The study of morphological characters revealed that the mite species infesting TC banana plants is *Tetranychus gloveri* Banks. The key taxonomic characters of *T. gloveri* is furnished below.

Female: Tarsus I with two sets of duplex setae well separated, empodium of legs split distally (Fig.2 A and B).

Male: Aedeagus bent dorsad, knob much longer than the width of the neck, approximately half as long as dorsal margin of the shaft, knob axis sub parallel with dorsal margin of shaft, anterior projection of knob broadly rounded and posterior narrow and acute (Fig.2 C).

Tetranychus gloveri is a significant pest of several crops in different countries (Jeppson *et al.*, 1975; Bolland *et al.*, 1998). This species is wide spread in the Pacific and Americas, which may represent its natural range. Its highly polyphagous nature and high reproductive capacity enables the species to become a serious pest on agricultural crops, especially in green houses (Takafuji *et al.*, 1996). Recently, it has been reported as an invasive pest in Kerala infesting a wide host range of 35 host plants in 24 plant families viz., Malvaceae, Cucurbitaceae, Fabaceae, Amaranthaceae, Rutaceae, Solanaceae, Musaceae, Moraceae, Anacardiaceae, Caricaceae, Adoxaceae, Rosaceae, Compositae, Gentianaceae, Convolvulaceae, Balsaminaceae,

Orchidaceae, Asparagaceae, Goodeniaceae, Apocyanaceae, Euphorbiaceae, Oxalidaceae, Lamiaceae and Pontederiaceae (Bhaskar *et al.*, 2022).

Tetranychus gloveri was first described by Banks on *Gossypium* from United States of America. Later, Pritchard and Baker (1955) synonymised *T. gloveri* and *T. tumidus* Banks. But, Boudreaux (1958) separated the two species during which, the taxa originally called *T. gloveri* became *T. tumidus* and vice-versa. However, Boudreaux (1979) rectified this misidentification later. In India, it was first reported from Thrissur district from a commercial horticultural nursery as *Tetranychus okinawanus* (Zeity *et al.*, 2016). *Tetranychus okinawanus* was first reported on *Pueraria lobata* from Okinawa Islands of Japan by Ehara (1960). Recently, Sharkey *et al.*, (2022) synonymized *T. okinawanus* with *T. gloveri* based on morphological and molecular data.

The morphological identification of *T. gloveri* collected from Florida showed that only a single morphological character, the length of the solenidion on tarsus III, was used to separate *T. okinawanus* from *T. gloveri*. Using types of both species, Sharkey *et al.*, (2022). reassessed the character and found no basis for the treatment of *T. okinawanus* as a distinct species. Further, molecular characterisation of COI and ITS1/ITS2 sequences of *T. gloveri* were either highly similar or identical to GenBank sequences of *T. okinawanus* from Japan. Hence *T. okinawanus* was treated as a junior synonym of *T. gloveri*.

In this study, severe infestation of *T. gloveri* was recorded on TC banana plants from four horticultural nurseries in Thrissur and Ernakulam district. This species was earlier reported on banana in plantations from Kerala (Arunima *et al.*, 2018). As *T. gloveri* has high fecundity, developmental rate and polyphagous nature, the mite species can build up at a faster rate and may spread to other nursery plants. As many nurseries adopt chemical control as a strategy for mite management,

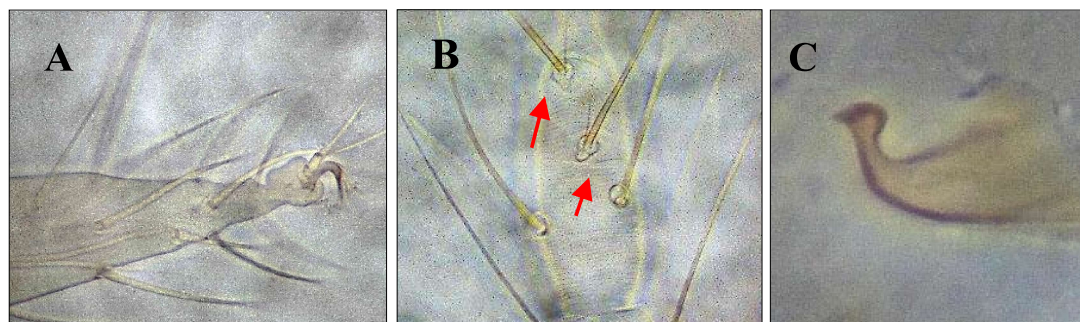


Fig. 2. *Tetranychus gloveri* Banks female A. empodium of legs B. Duplex setae on Tarsus I; Male C. Aedeagus

mite populations may develop resistance mechanisms which may lead to control failures. Thus, early detection, identification of mite species and employing integrated management tactics at initial stages is essential to reduce the risk of losing plantlets and their carry over to the main field.

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REFERENCES

- Agustin, I. S. D., Suryaminarsih, P., Sasikirono, P. and Wuryandari, Y. 2022. Pest and Disease Control in Cavendish Banana Seedlings Resulting from Tissue Culture. *Nusantara Science and Technology Proceedings*, 99-104.
- Al-Atawi, F. J. 2011. Phytophagous and predaceous mites associated with vegetable crops from Riyadh, Saudi Arabia. *Saudi Journal of Biological Sciences*, **18**(3):239-46.
- Arunima, V., Bhaskar, H., Abida, P. S., and Shylaja, M. R. 2018. *Tetranychus okinawanus* Ehara (Prostigmata: Tetranychidae) emerging as a potential invasive pest in Kerala, India. Abstract Book, *XV International Congress of Acarology*. Antalya, Turkey, 72p.
- Bhaskar, H., Mohan, S. M. and Sreesha, M. 2022. Establishment and spread of the invasive mite, *Tetranychus gloveri* Banks (Prostigmata: Tetranychidae) in Kerala, India. *Zoo symposia*, **22**: 164.
- Bolland, H. R., Gutierrez, J. and Flechtmann, C. H. W. 1998. A world catalogue of the spider mite family (Acari: Tetranychidae). Brill, Netherlands. pp.392.
- Boudreaux, B. 1979. Confusion of names for the spider mites *Tetranychus tumidus* and *T. gloveri*. In: Rodriguez, J.G. (Ed.) Recent Advances in Acarology. Proceedings of the Fifth *International Congress of Acarology* (East Lansing, 1978), **2**: 395–398.
- Boudreaux, B. 1958. *Tetranychus tumidus* Banks versus *Tetranychus gloveri* Banks (Acarina, Tetranychidae). *Annals of the Entomological Society of America*, **51**: 174-177.
- Ehara, S. 1960. On some Japanese tetranychid mites of economic importance. *Japanese Journal of Applied Entomology and Zoology*, **4**: 234–241.
- Food and Agricultural Organization of United Nations (FAO). 2017. Plant Health and Security. International Plant Protection Convention.
- GoK (Government of Kerala). 2019. Agricultural statistics 2018-19 [online].
- Jeppson, L. R., Keifer, H. H. and Baker, E. W. 1975. Mites Injurious to Economic Plants. University of California Press, Berkeley, pp.614
- Pritchard, A. E. and Baker, E. W. 1955. A Revision of the Spider Mite Family Tetranychidae. Pacific Coast Entomological Society, San Francisco, pp. 472.
- Sharkey, E. R., Beaulieu, F., Moore, M. R. and Bolton, S. J. 2022. Morphological and molecular data reveal the conspecificity of the spider mites *Tetranychus gloveri* and *T. okinawanus* (Acari: Trombidiformes: Tetranychidae). *Systematic and Applied Acarology*, **27**:250–268.
- Subba, S., Chowdhury, S., Chhetri, S., Meena, H. and Debnath, S. 2023. Floor management of banana orchard using banana biomat mulch and leguminous cover crop for sustainable production. *The Pharma Innovation*.
- Takafuji, A., Yokotsuka, T., Goka, K. and Kishimoto, H. 1996. Ecological performance of the spider mite, *Tetranychus okinawanus* Ehara (Acari, Tetranychidae), a species newly described from Okinawa islands. *Journal of the Acarological Society of Japan*, **5**:75–81.
- Zeity, M., Srinivasa, N. and Gowda, C. C. 2016. New species, new records and redescription of spider mites (Acari: Tetranychidae) from India. *Zootaxa*, **4085**:416–430.

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