Biological Forum – An International Journal **14(2): 1303-1307(2022)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Diversity and Abundance of Spider Mites and Associated Predatory Mites of Shivamogga Region

Safeena Majeed A.A.[1*], Rajashekharappa K.[1], Srinivasa N.[2], Jayalaxmi Narayan Hegde[1] and Chinnamadegowda C.C.[2]

Department of Agricultural Entomology,
[1]Keladi Shivappa Nayaka University of Agricultural and Horticultural Sciences, Shivamogga (Karnataka), India.
[2]University of Agricultural Sciences, GKVK, Bengaluru (Karnataka), India.

(Corresponding author: Safeena Majeed A.A.)*
(Received 07 April 2022, Accepted 08 June, 2022)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: Diversity of spider mites collected from October 2019 to October 2021 from Shivamogga district across 42 host plants comprising of cultivated crops, forest trees, grasses and weeds was investigated. A total of 16 species of tetranychid mites were recorded and *Tetranychus macfarlanei* Baker & Pritchard was the most abundant species followed by *Tetranychus truncatus* Ehara and *Tetranychus neocaledonicus* Andre. *Oligonychus grypus* Baker & Pritchard is recorded for the first time from Karnataka and *Penisetum glaucum* (L.), while *Apluda mutica* L. are the new hosts globally. *T. macfarlanei* and *T. truncatus* are reported for the first time from *Tinospora cardifolia* (Thunb.). Among the 16 species, one *Tetranychus* species could be identified only up to the genus level due to unavailability of males and unsuccessful multiplication of mites in the laboratory. All these spider mites are found associated with Phytoseiid predatory mites *viz*., *Amblyseius paraaerialis* Muma, *Amblyseius largoensis* (Muma), *Amblyseius shoreae* Gupta, *Transeius tetranychivorus* (Gupta), *Neoseilus longispinosus* (Evans), *Paraphytoseius* sp., *Phytoseius* sp., *Euseius* sp. and mite predators of the family Stigmaeidae, Tydeidae and Bdellidae. The study has documented diversity of both of pestiferous phytophagous mites across different ecosystems though alarms the potential of mite pests, the documentation oflocally available predatory mites, highlights the possibility of their usage in biological control.

Keywords: Tetranychid mites, diversity, abundance, Shivamogga district, phytoseiids.

INTRODUCTION

Mites are ubiquitous found in both terrestrial and aquatic habitats. The guild "Plant mites" consists of many mite species belonging to different taxa. In view of global importance as pest, tetranychids ranks first, damage all types of crops including field, vegetable, fruit, ornamental, medicinal and aromatic plants (Vacante, 2015). In spite of this huge diversity, so far reported spider mites from India are only 122 species (Migeon & Dorkeld 2022). Because their precise identification problem due to their small size, cryptic nature, limited number of available morphological characters and similarity between species. In addition, both sexes are often needed in order to arrive to precise determinations in many species. Hence, unfortunately much less well known than other groups in the phylum Arthropoda, except few extensive collections by Gupta.

Gupta (1976) reported 32 species under 11 genera and reviewed the spider mites of India and reported 83 species under 18 genera (Gupta, 1983 & 1985). Further he reported occurrence of 100 species under 20 genera from India (Gupta, 1991) and in 1994 reported 101 species (Gupta & Gupta 1994). From Karnataka, Zeity (2011) recorded the diversity of mites in Lalbagh Botanical Garden, Bengaluru and enlisted 71 species of mites belonging to 38 genera and 17 families. Again, similar study was conducted in 17 districts of Karnataka and reported 46 tetranychid mite species, among which 13 species were first records from India (Zeity, 2015). Shivamogga district, being the entrance door of western ghats and known for its huge biodiversity across plants and animals, but information on diversity of tetranychid mite from the area is lacking. Hence the resent study was framed to explore the faunal diversity of tetranychid mites in Shivamogga district and associated predatory mites were also documented, which can be further exploited in biological control of mites and other sucking pests.

MATERIAL AND METHODS

During this study, major agricultural and horticultural ecosystems including pasture lands of Shivamogga were sampled during different seasons for the occurrence of mites. Using a 10X hand lens, the presence/ absence of spider mites will be examined and plant material with mites were sampled in polyethylene bags with a proper label. The collected samples were

examined under a stereo microscope for spider mites. The mites collected were mounted on glass slides using Hoyer's medium. The collection data were recorded on the slides. The slides were examined under a Phase contrast microscope, Zeiss® ScopeA1. The mites were identified to the species level using keys provided by Krantz (1978). District map of location sampled was constructed using QGIS 3.20.2. Software and abundance of species were analysed using Shannon–Wiener diversity index.

RESULTS AND DISCUSSION

Representative samples were collected different talukas of Shivamogga for the presence of spider mites (Fig. 1).

A total of 16 species of tetranychid mites were recorded across 42 host plants (Table 1) comprising of cultivated, forest and pasture ecosystems. These mites belonged to four genus *viz*., *Tetranychus*, *Oligonychus*, *Schizotetranychus* and *Eutetranychus.* Of which, *Oligonychus grypus* Baker & Pritchard was recorded for the first time from Karnataka, while their host plants *Pennisetum glaucum* (L.) and *Apluda mutica* L. were new host records globally. This mite was earlier reported on *Oryza sativa* from Tamil Nadu (Kowsika, 2015) is the only other report available on the species from India.

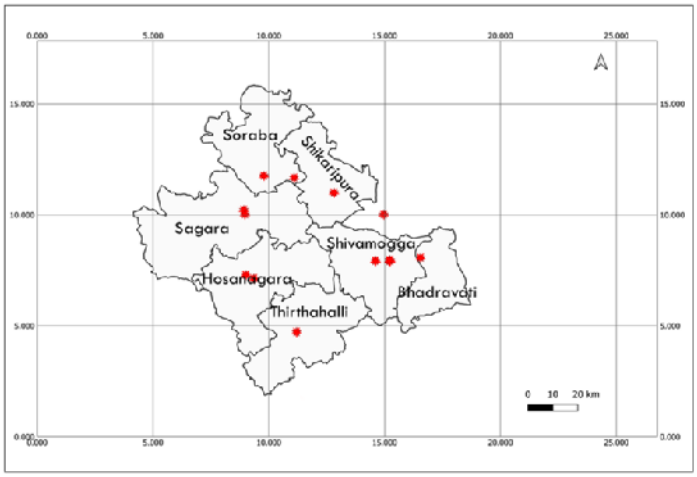

Fig. 1. Survey map of Shivamogga district.

Table 1: List of spider mites collected during the study and their host plants and distribution.

Sr. No.	Mite species	Hosts	Distribution
1.	*Tetranychus neocaledonicus* Andre	*Carica papaya, Codiaeum variegatum, Clitoria turnatea, Synedrella nodiflora*, Weed (undetermined)	Soraba, Thirthahalli
2.	*Tetranychus macfarlanei* Baker & Pritchard	*Abelmoschus esculentus, Boerhavia diffusa, Cocculus hirsutus, Crossosephalum crepediodis, Glycine max, Impatiens balsamina, Phaseolus* sp., *Phaseolus lunatus, Tinospora cardifolia, Vicia faba, Vigna unguiculata*	Soraba, Shivamogga, Navile
3.	*Tetranychus truncates* Ehara	*Carica papaya, Crossandra infundibuliformis, Solanum melongena, Solanum nigrum, Tinospora cardifolia, Vicia faba*	Bhadravati, Shikaripura, Surahonne
4.	*Tetranychus ludeni* Zacher	*Bidens Pilosa, Parthenium hysterophorus, Ricinus comunis, Vigna unguiculata* ssp. *sesquipedalis*	Soraba, Bhadravati, Navile
5.	*Tetranychus urticae* Koch	*Rosa chinensis, Solanum lycopersicum*	Surahonne, Shikaripura
6.	*Tetranychus fijiensis* Hirst	*Citrus* sp., *Areca catechu*	Shivamogga, Navile
7.	*Tetranychus lombardinii* Baker & Pritchard	*Jasminum* sp.	Shivamogga
8.	*Tetranychus bambusae* Wang & Ma	*Bambusa bamboos, Bambusa vulgaris*	Navile
9.	*Tetranychus udaipurensis*	*Coccinea grandis*	Navile
10.	*Tetranychus* sp.	*Solanum melongena, Tagetus erectus*, Ornamental plant	Navile
11.	*Oligonychus biharensis* Hirst	*Azadirachta indica, Rosa chinensis*	Navile, Thirthahalli
12.	*Oligonychus thelytokus* Gutierrez	*Ichnocarpus frutescens, Rosa chinensis Syzygium jambos*	Navile, Thirthahalli
13.	*Oligonychus tylus* Baker & Pritchard	*Areca catechu, Musa paradisiaca*	Soraba, Bhadravati, Shivamogga
14.	*Oligonychus grypus* Baker & Pritchard	*Apluda mutica, Pennisutum glaucum*	Navile
15.	*Schizotetranychus baltazari* Rimando	*Gliricidia sepium*	Bhadravati
16.	*Eutetranychus orientalis*(Klein)	*Gliricidia sepium, Phyllanthus reticulatus, Azadirachta indica*	Bhadravati, Navile

The host plant, *Tinospora cardifolia* (Thunb.) was first time reported as host for spider mite species *Tetranychus macfarlanei* Baker & Pritchard and *Tetranychus truncatus* Ehara. Among all the 16 spider mite species, *T. macfarlanei* was the most abundant species followed by *T. truncatus* and *Tetranychus neocaledonicus* Andre (Fig. 2). Contrast to this earlier research states *Tetranychus urticae* Koch was the most predominant species in and around Coimbatore district of Tamil Nadu (Kowsika, 2015) and with wide host

range including vegetable and fruit crops (Nandagopal and Gedia 1995) and most common on eggplant and okra (Singh and Mukherjee 1991). Reason behind such changing pest status of spider mites unlike *T. urticae* in other parts contrary to *T. macfarlanei* in Shivamogga has to be addressed by future research.

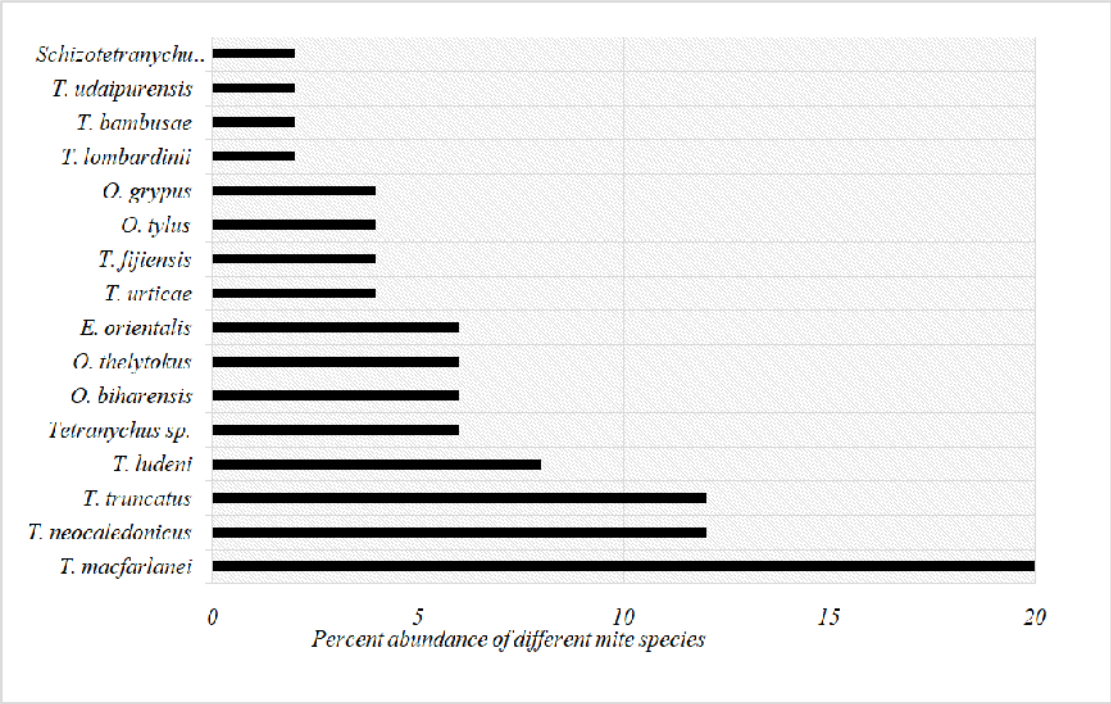

Fig. 2. Proportionate abundance of spider mites.

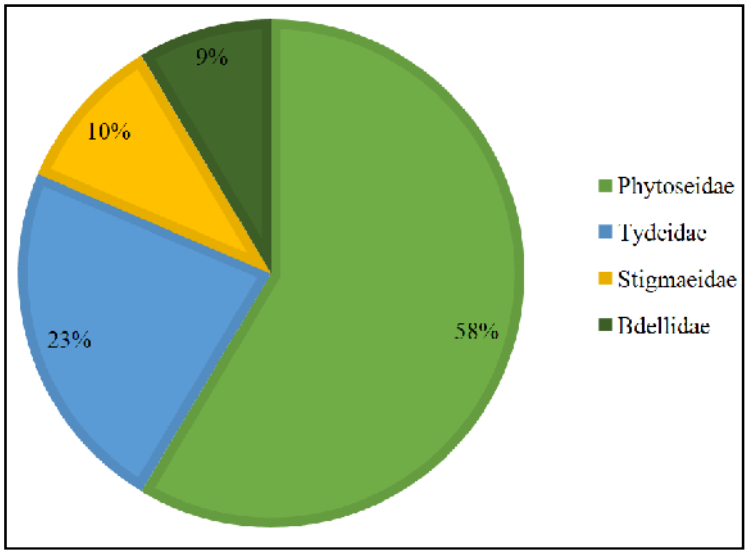

Fig. 3. Proportionate abundance of predatory mites.

In addition, predatory mites associated with spider mites were also collected and identified. Mites of the family Phytoseiidae, Stigmaeidae, Tydeidae and Bdellidae were identified, of which Phytoseid predators were more abundant (Fig. 3). The genus *Amblyseius* was more with respect to number of species (*Amblyseius paraaerialis* Muma, *Amblyseius largoensis* (Muma) and *Amblyseius shoreae* Gupta), while *Neoseilus longispinosus* (Evans) was more wide spread found feeding on nine species of prey mite species (Table 2).

Table 2: List of Phytoseiidae mites encountered and their prey mite species.

Sr. No.	Phytoseiid mites	Prey mite species
1.	*Amblyseius paraaerialis* Muma	*Tetranychus macfarlanei* Baker & Pritchard *Tetranychus truncatus* Ehara
2.	*Amblyseius largoensis* (Muma)	*Tetranychus macfarlanei* Baker & Pritchard *Tetranychus neocaledonicus* Andre
3.	*Amblyseius shoreae* Gupta	*Tetranychus macfarlanei* Baker and Pritchard
4.	*Transeius tetranychivorus* (Gupta)	*Tetranychus bambusae* Wang & Ma *Tetranychus ludeni* Zacher *Tetranychus macfarlanei* Baker & Pritchard *Tetranychus truncatus* Ehara
5.	*Neoseilus longispinosus* (Evans)	*Eutetranychus orientalis* (Klein) *Oligonychus tylus* Baker & Pritchard *Tetranychus lombardinii* Baker & Pritchard *Tetranychus ludeni* Zacher *Tetranychus macfarlanei* Baker & Pritchard *Tetranychus neocaledonicus* Andre *Tetranychus truncatus* Ehara *Tetranychus udaipurensis* Gupta & Gupta (1999) *Tetranychus urticae* Koch
6.	*Paraphytoseius* sp.	*Tetranychus macfarlanei* Baker and Pritchard
7.	*Phytoseius* sp.	*Tetranychus bambusae* Wang & Ma *Tetranychus neocaledonicus* Andre
8.	*Euseius* sp.	*Oligonychus tylus* Baker & Pritchard *Schizotetranychus baltazari* Rimando *Tetranychus macfarlanei* Baker & Pritchard *Tetranychus neocaledonicus* Andre *Tetranychus truncatus* Ehara

CONCLUSION

The present study has reported 16 spider mite species associated with variety of host plants and ecosystems from Shivamogga region, has apprehended the potentiality of spider mites as emerging pests and need of their control. Also, the study has enlisted eight species of the locally available predatory mites and possibility of their usage in biological control of spider mites and other sucking pests.

FUTURE SCOPE

Keeping the outcomes as base and reference it can be further used to develop the faunal diversity and distribution map of spider mites and associated predatory mites of Shivamogga region. Potentiality of predatory mites thus enlisted in biological control programme can be explored further. The outcomes can be used in addressing the studies on changing pest scenario of spider mites.

Acknowledgement. We extend heartfelt gratitude to the ICAR project Agricultural Acarology for the laboratory facilities, equipment and other logistics.
Conflict of Interest. None.

REFERENCES

Gupta, S. K. (1976). Contribution to our knowledge of tetranychid mites (Acarina) with descriptions of three new species from India. *Orient. Insects*., *10*: 327-351.

Gupta, S. K. (1983). Taxonomy and distribution of plant associated mites of India- a review. In: Abst. II All India Symposium of Acarology, Pune, p.1.

Gupta, S. K. (1985). Hand book of Plant mites of India. Zoological Survey of India, Calcutta, 520p.

Gupta, S. K. (1991). The mites of agricultural importance in India with remarks on their economic status. In: Modern Acarology: Proceedings of the VIII International Congress of Acarology, Dusbábek, F. and V. Bukva (Eds.) Ceske Budejovice, Czechoslovakia, 6-11 August, SPB Academic Publishing: The Hague *1*: 509-522.

Gupta, S. K. & Gupta, Y. N. (1994). A taxonomic review of Indian Tetranychidae (Acari: Prostgmata) with description of new species, redescriptions of known species and keys to genera and species. *Memoirs of the Zoological Survey of India, 18*: 1-196.

Gupta, S. K. & Gupta, A. (1999). Progress of taxonomic research on Indian mites up to the end of the twentieth century and the prospects of the research in the next millennium. *J. Acarol*., *15*(1&2): 80-83.

Kowsika, S. (2015). Species variation among populations of major *Tetranychus* spp. and *Oligonychus* spp. (Acari: Tetranychidae) inhabiting different Host plants in Tamil Nadu. *Ph.D. Thesis*. Tamil Nadu Agricultural University Coimbatore. 338 p.

Krantz, G. W. (1978). A Manual of Acarology. Oregon State University Press: Corvallis. 509 p.

Migeon, A. & Dorkeld. F. (2022). Spider Mites Web: a comprehensive database for the Tetranychidae. *https://www1.montpellier.inra.fr/CBGP/spmweb/*(verified 31 May, 2021).

Nandagopal, N & Gedia, M. V. (1995). Biology of the red spider mite *Tetranychus urticae* (Boisd.) a pest of groundnut. *Entomon., 20*: 41-43.

Singh, J. and I. N. Mukherjee (1991). Pest status of polyphagous mites in some Northern States of India. In: Proceedings of the First Asia Pacific Conference of Entomology, p.192-203.

Vacante V. (2015). The handbook of mites of economic plants identification, bioecology and control, CABI Wallingford, Oxford shire, UK, p.865.

Zeity, M. (2011). Fauna of mites associated with selected plants around Bangalore. *M.Sc. (Agri.) thesis*, University of Agricultural Sciences, Bangalore, Karnataka, India, p.139.

Zeity, M. (2015). Tetranychid mite fauna of major agro-ecosystem in Karnataka and some aspects of molecular characterization of selected genera of spider mite. *Ph. D. Thesis*, University of Agricultural Sciences, Bangalore, Karnataka, India, p. 240.

How to cite this article: Safeena Majeed A.A., Rajashekharappa K., Srinivasa N., Jayalaxmi Narayan Hegde and Chinnamadegowda C.C. (2022). Diversity and Abundance of Spider Mites and Associated Predatory Mites of Shivamogga Region. *Biological Forum – An International Journal*, *14*(2): 1303-1307.