Zoological and Entomological Letters

E-ISSN: 2788-8428
P-ISSN: 2788-8436
Impact Factor (RJIF): 5.39
ZEL 2025; 5(2): 279-282
www.zoologicaljournal.com
Received: 13-10-2025
Accepted: 19-11-2025

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A first record of the mite genus *Neoseiulus* hughes, 1948 (*Acari*: *Mesostigmata*: *Phytoseiidae*) from Maharashtra state, India, with redescription of *N. barkeri* Hughes

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DOI: https://www.doi.org/10.22271/letters.2025.v5.i2d.163

Abstract
The present study reports the first documented record of the genus *Neoseiulus* belonging to the family *Phytoseiidae* from the state of Maharashtra, marking the significant faunal inventory of plant-associated mites. Predatory mites are economically important and well-studied for their biocontrol activity against phytophagous mites, thrips, and other arthropods. The mites were collected on the hibiscus plant and from the soil. The study reveals the presence of *Neoseiulus barkeri* (Hughes 1948). This is the first record of *Neoseiulus* mite from Maharashtra; the newly recorded species is redescribed and compared with previous studies.

Keywords: First record, predatory mite, *Neoseiulus*, biocontrol, Maharashtra

Introduction
Mites of the family *Phytoseiidae* (*Acari*: *Mesostigmata*) are economically important and are well studied because of their proven biological activity against several phytophagous mites and other agricultural insect pests (McMurtry *et al.*, 2013) [20]. They have gained significant attention in the last few decades in terms of taxonomic literature, redescriptions, integrated pest management studies at the greenhouse, open fields, and laboratory experiments. The number of species under the family *Phytoseiidae* reaches beyond 2700, belonging to 94 genera, and new species are being described over the year, as their distribution is worldwide except Antarctica (De Moraes *et al.*, 2025; Jose *et al.*, 2024) [9, 16]. The major contribution to Indian *Phytoseiidae* was made by Dr. S. K. Gupta (Former Scientist, ZSI) and Dr. Krishna Karmakar (BCKV, West Bengal), who have described several new species from various states of India (Biswas & Karmakar, 2024; Biswas & Karmakar, 2025; Gupta & Karmakar, 2015) [2, 14].
The *Neoseiulus* Hughes, 1948, is the third largest genus of the family *Phytoseiidae*, comprising approximately 382 valid species (De Moraes *et al.*, 2025) [9]. Apart from being a speciose genus, only 16 species are reported from India (Biswas & Karmakar, 2025; Jose *et al.*, 2023) [3, 15]. *N. barkeri* is one of the commercially available and cosmopolitan species (De Moraes *et al.*, 2004; Demite *et al.*, 2014) [10, 11]. Earlier studies have shown that *N. barkeri* is effective against agricultural pests such as *Frankliniella occidentalis* Pergande, *Raoiella indica* Hirst, *Thrips tabaci* Lindeman, *Tetranychus urticae* Koch, and *Megalurothrips usitatus* Bagnall (Br⊘dsgaard & Hansen, 1992; Chi *et al.*, 2024; Fan & Petitt, 1994; Filgueiras *et al.*, 2020; Rodriguez-Reina *et al.*, 1992) [5, 8, 12, 13, 21].
The Maharashtra state, located in western India and possesses a rich biodiversity of flora and fauna. The state is mainly divided into the narrow Konkan belt (coastal area along the Arabian Sea), the Sahyadri (Western Ghats), which is among the world's 36 biodiversity hotspots, and the large Deccan plateau, covering Vidarbha, Marathwada, and the remaining part of Maharashtra. Because of the different topography, the climate and temperature changes in all three seasons, there is a chance to explore phytoseiid fauna, which is overlooked. Despite considering an important role in the food chain of agricultural habitats, not a single species of *Neoseiulus* mite was reported from Maharashtra (Demite *et al.*, 2014) [11] and hence, the present work was carried out to collect plant-associated mites from the study area.

Materials and Methods

Plant-associated mites were inspected at the underside of the leaves of the Hibuscus plant by using a 10x magnifier hand lens in the field, as well as leaf litter was also collected, and mites were separated in the laboratory by using a Berlese-Tullgren funnel. Initially, the mites were kept in 95% alcohol in an Eppendorf tube. Later, the mites were cleared in cavity blocks containing 70% lactic acid on the hot plate at 50 °C for four days. The mites were slide-mounted using Hoyer's medium (Krantz & Walter, 2009) [18] and dried in a heat incubator at 50 °C for one week. The coverslips are sealed by using nail polish, and the slides are stored in a slide cabinet. The slides were observed under a Labomed LX 500 trinocular microscope, and photographs were taken using an Amscope 5 MP camera attached to the microscope. Photographs were further edited in Photoshop software, while Drawings were made by camera lucida. Scale bars were added using ImageJ software. For dorsal and ventral setal notations, we followed (Chant & Yoshida-Shaul, 1989, 1991) [6, 7]. The mites were identified and confirmed from relevant literature, such as the original holotype description, subsequent redescriptions, and the Indian key on *Neoseiulus* provided by (Jose *et al.*, 2023) [15].

Results

- Systematic Account
- Phylum: Arthropoda
- Class: Arachnida
- Subclass-*Acari*
- Order: *Mesostigmata*
- Family: *Phytoseiidae*
- Genus: *Neoseiulus*
- Species: *barkeri* (A. M. Hughes 1948)

Female (n- 5)

Dorsum: (Fig. 1a). Dorsal setal pattern 10A:9B (Setae *r3* and *R1* off the shield). Dorsal shield is smooth and oval in shape (343 µm) long and (178 µm) wide, bearing sigillary marks at slightly away from the center and possesses 17 pairs of setae: *j1 15, j3 17, j4 15, j5 15, j6 15, J2 15, J5 10, z2 20, z4 19, z5 15, Z1 20, Z4 37, Z5 52, s4 25, S2 25, S4 21, S5 20, r3 15, and R1 17*. Except that Z4 and Z5 are lightly serrated, and the remaining setae are smooth. There are five pairs of solenostomes present (*gd1, gd4, gd6, gd8, and gd9*).

Peritreme (Fig. 1a). Reaches beyond the bases of *j1*.

Venter: (Fig. 1b). Sternal shield smooth (70 µm) long, (85 µm) wide at setae *st2*, with three pairs of simple setae *st1*, *st2*, and *st3*, and two pairs of poroids are present. The distance between *st1-st3* (65 µm) and *st2-st2* (65 µm), while seta *st4* and one pair of pores are present on a separate metasternal shield. The genital shield is smooth and bears one pair of simple setae *st5*. Two pairs of metapodal shields are present, of which the primary shield (33 µm) is larger as compared to secondary shield (13 µm). Ventrianal shield is longer than wide (120 µm long and 98 µm wide) and reticulated with transverse lines at the posterior region. It bears three pairs of preanal setae (*JV1, JV2, and ZV2*), one pair of adanal setae, an unpaired post-anal seta, and one pair of prominent solenostomes.

Chelicera: (Fig. 1c). Fixed digit (29 µm) long with five teeth, and pilus dentilis. The movable digit (33 µm) is long and bears one tooth.

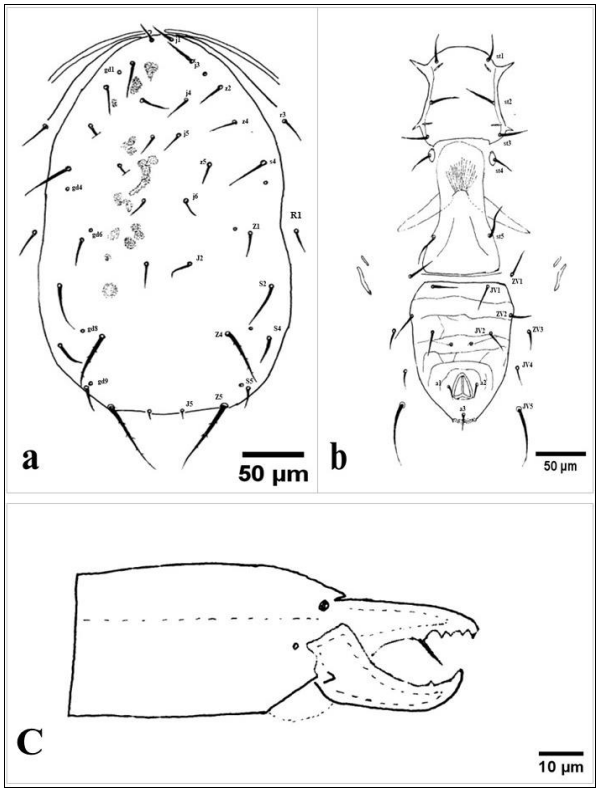

Fig 1: Female a. showing dorsal idiosoma b. Ventral idiosoma C. Chelicera showing pilus dentilis

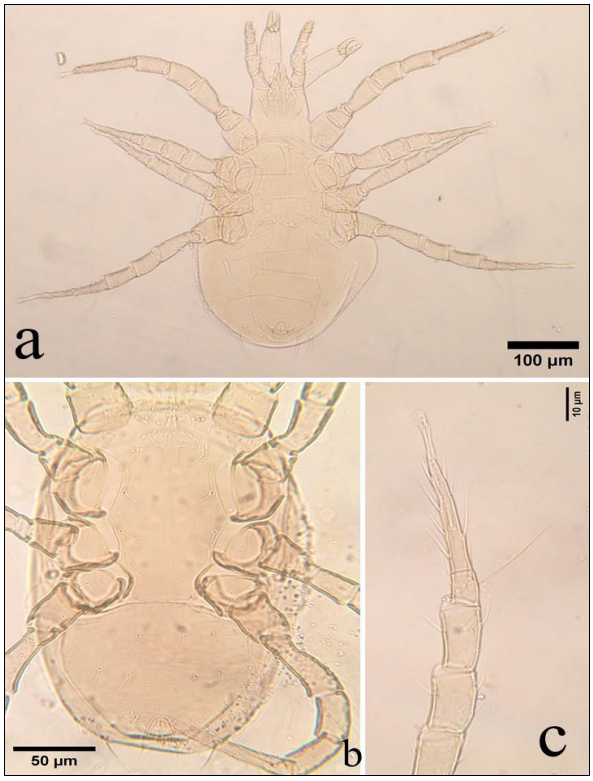

Fig 2: a. Female whole dorsum b. Male sternoventral shield c. Female macroseta on leg IV

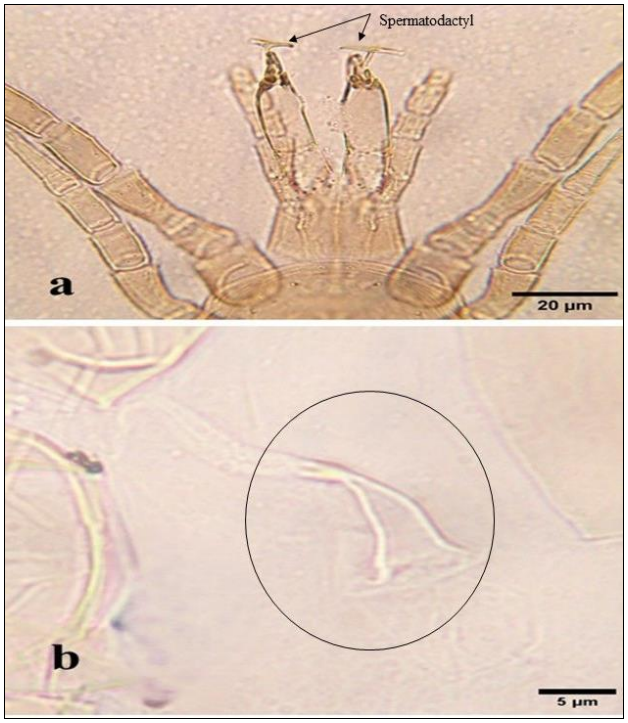

Fig 3: a. Showing male T-shaped Spermatodactyl b. female spermatheca

Spermatheca: (Fig. 3b). Calyx saccular 22 µm, atrium looks 'c' shaped and bifurcated with thick major ducts.

- **Leg:** Leg IV is the longest among all legs and bears one smooth, sharp-tipped macroseta on basitarsus. Fig. 2c (63 µm) is present. Leg I (325 µm), Leg II (246 µm), Leg III (244 µm), and Leg IV (330 µm).
- **Material examined:** 5 females; alt 429 meters asl. Mangrulpir, 20.310143º N, 77.346789º E, Tal-Mangrulpir, Dist- Washim,14 March 2025, collected by V.S. Bhand ex. *Hibiscus rosa-sinensis* plant and its leaf litter.
- **Distribution:** Cosmopolitan except Antarctica continent, in India, second record after West Bengal, in Maharashtra, in the present study.

Discussion

The current redescription of *N. barkeri* was compared with recent literature, such as (Bhowmik & Karmakar, 2021; Kreiter *et al.*, 2020; Zannou *et al.*, 2006) [1, 19, 22]. It matches with many morphometric details except in the cheliceral dentition of the female, movable digit possesses one tooth *vs* two teeth, also fixed digit bears five teeth *vs* three teeth, as shown in (Bhowmik & Karmakar, 2021) [1]. Our redescription is consistent with recent studies made by (Kreiter *et al.*, 2020) [19]. The accurate identification of species is needed not only for taxonomists but also for bio-controlling firms. Phytoseiid mites are generally distinguished based on the dorsal and ventral chaetotaxy and pattern of ornamentation. Sometimes, the presence or absence of solenostomes/glands is useful to discriminate between the species (Khaustov *et al.*, 2022) [17]. Interestingly, this species is the second record from India and the first record from the state of Maharashtra, especially from the Vidarbha region. In Maharashtra, taxonomists are mainly looking for the Western Ghats for the faunal documentation, so the present study highlights the Vidarbha region, which is understudied in terms of taxonomic studies, may have high potential for faunal diversity.

Acknowledgement

The authors would like to thanks Hon. Principal Dr. S. H. Kanherkar and Dr. M. D. Kulkarni, head of the Zoology department, Y. C. Mahavidyalaya, Mangrulpir, for providing all facilities to carry out this work. We are very thankful to Ms. Smita and Prof. Nikhil Bhagat for granting permission to collect specimens in their garden. A special thanks to Dr. Ismail Doker, Turkey, for confirming the species identity and valuable discussion throughout this study. The authors would like to thank the Maharashtra State Biodiversity Board, Nagpur, for permission to collect plant mites from the study area.

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