

Description of A New Mite Pest *Caleptrimerus neemivorus* sp. nov. (Acari: Eriophyoidea) Infesting *Azadirachta indica* From India

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ABSTRACT

Among the Acari, eriophyid mites are considered important pests as they produce various damage symptoms while feeding on plants. During regular surveys for plant-feeding mites at English Bazar, Malda (25° 0' 39.0276" N and 88° 8' 27.9528" E.), West Bengal, India, a new species, *Caleptrimerus neemivorus* sp. nov. of the family Eriophyidae was found along the margin gall of the leaves of *Azadirachta indica* A. Juss. (Meliaceae). This new plant-feeding mite species was studied thoroughly from the taxonomic point of view and compared with other closely related species. A description and necessary illustrations of the specimens were provided. The nature of damage caused to the plant was studied carefully. After careful observation and literature study, it appears that this is the new mite species of the genus *Caleptrimerus*. It is now the fourth mite species described from *Azadirachta indica*. This new species is a "gall-forming" plant mite and causes damage to this economically significant medicinal plant. Such a taxonomic description of the mite pest and its nature of damage to the host plant is needed to control the potential mite pest.

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Keywords:

Eriophyidae; India; Neem; New mite-pest; taxonomy.

1. Introduction

Eriophyoids are a highly specialized group of phytophagous mites (Shukla, 2021; Vervaet, 2021) and are considered a serious pest throughout the world (Abdel-Khalek & Momen, 2022; Brown et al., 2021). They cause various damages to the plant parts, including gall formation (Desnitskiy et al., 2023; Hajizadeh & Hosseini, 2023; Hazra et al., 2023; Moskalets et al., 2022) and are also known to transmit viruses to the plant bodies while feeding on them (Druciarek et al., 2019; Sarwar, 2020; Stephan et al., 2008). During regular surveys for plant-feeding mites in the northern districts of West Bengal, India, a new mite pest was collected from a neem tree (*Azadirachta indica* A. Juss.) (Meliaceae) and was studied thoroughly. The neem tree, or Indian Lilac, is native to India, Bangladesh, and Pakistan and is now found growing in the tropical and semi-tropical regions of the world. It is a medium to large-sized tree with a rounded crown of bright green dense foliage. The neem tree is now gaining importance due to its wide scope of commercialization in agriculture, veterinary, cosmetics, medicine, toiletries, and various

other industries (Borkotoky et al., 2020; Kumar, 2022; Lee et al., 2017). Neem oil, neem cake, and neem-based pesticides are well-known products prepared from neem tree leaves (Moreno et al., 2020; Zhu et al., 2017).

So far, four mite species of this group have been recorded on neem plant namely *Calepitrimerus azadirachtae* (Channabasavanna, 1966); *Phyllocoptes azadirachtae* (Boczek & Chandrapatya, 1992a); *Diptilomiopus azadirachtae* (Boczek & Chandrapatya, 1992b) and *Phyllocopturta neemae* (Debnath & Karmakar 2015). This research article describes, illustrates, and describes the nature of damage produced by the new mite species on this economically important plant (Figure 1). The mite genus *Calepitrimerus* was established by Keifer in 1938 in *Bull. Calif. Dept. Agric.*, 27:310. The type species is *Calepitrimerus cariniferus* (Keifer, 1938). Channabasvana (1966) provided a key for the then-known three species of this genus in India. Mondal and Chakrabarti (1983), while describing three new species from eastern India, also provided a key to the Indian species of *Calepitrimerus*. A working Catalogue of the Eriophyoidea of the World. Version 1.0 -The catalog of the Eriophyidae (Joel Hallan; biocat@ccms.net) reflects that under the genus *Calepitrimerus* Keifer, 67 species, including 14 from India, are known (Amrine et al., 2003; Amrine & Stasny, 1994; Das and Chakrabarti 1985; Mondal & Chkarbarti, 1983; Mohanasundaram, 1982; Li N et al., 2023; Lotfollahi et al., 2023; Xue & Liu, 2022). One new species from the area of the present study has been added to this list. The period of infestation and damage caused to the plant is discussed here.



Figure 1. Plate showing margin galls on neem leaves produced by this mite

2. Materials and Methods

The fresh neem leaves were collected. Both normal leaves and gall leaves were examined under a stereomicroscope. Gall tissue was cut, and mites were picked up from the gall leaf with the help of a needle and placed onto a grooved slide containing Kono's medium, a mixture of chloral hydrate 100 g, glycerin 10 g, water 50 ml, concentrated HCl 1 ml (Keifer, 1975) for clearing the mites. Then, the slide containing mites was heated at

50° C. Cleared mites were mounted in Hoyer's medium. The mites were observed under a Phase contrast microscope. Camera lucida line drawings of the mites were made. The taxonomically important morphological characters, as mentioned by Lindquist (1996) and Amrine et al. (2003), were measured at (10 × 100X) magnification appropriately described.

All measurements were taken as de Lillo et al. (2010) recommended and given in micrometers (µm). In the text, measurements of the holotype specimen were followed by the range of measurements of the paratype specimens in the brackets. Slides were labeled with all relevant data. All slides bearing the type specimens were deposited in the Entomology Research Unit, Serampore College, Serampore, 9, William Carey Road, West Bengal, India. Registration of this new species in the Zoobank account was done properly.

3. Results and Discussion

Based on morphometric studies, descriptions and illustrations of the new species are given here to erect the new species of the genus *Caleptrimerus*, and the nature of damage caused to the host plant is also narrated here. The etymology used for the nomenclature of the new mite pest species is given according to the *International Code of Zoological Nomenclature*.

3.1 Description of new species

Caleptrimerus neemivorus sp. nov. (Fig 2)

(Zoobank.org:pub:E5BE16C6-F508-4392-85AB-47C115078F06)

Caleptrimerus azadirachtis Sarkar, 2011: 81., is not a valid name as it has been used in the thesis.

FEMALE: Body is 137.2 (135.3-137.2) long, 66.2 (66.2-65.3) wide, fusiform, a little flattened dorsoventrally, pinkish white in colour. Gnathosoma is 20.5 (20.5-21.4) long, curved down, dorsal pedipalp genual seta *d* is 4.6 (3.7-4.6) long, prodorsal shield is 43.8 (42.9-43.8) long, 62.5 (62.5-63.4) broad with a shield lobe of 6.5 (5.6-6.5) long; prodorsal shield shows network of cells and lines, median line is not found at anterior side but faintly found at middle and rear margin, admedian lines are conspicuous, sinuate and diverging at the rear margin like a fork, submedian lines are extend from anterior to rear margin, sinuate and touching the admedian line at three point by giving out three transverse lines, on both lateral sides of the submedian line there is a symmetrically arranged network of cells of different shape and size, scapular tubercles are very close to rear shield margin and 24.2 (23.3-24.2) apart, scapular setae *sc* are 5.6 (4.6-5.6) long and directed upward. Leg I from base of trochanter is 29.8 (29.8-30.8) long; femur is 11.2 (11.2- 11.6) long, with basiventral femoral seta *bv* 11.2 (10.1-11.2); the length of genu is 4.6 (3.7-4.6) with an antaxial genual seta *l*¹ having 20.5 (19.6-20.5) length; tibia is 7.4 (7.1-7.4) long, with paraxial tibial seta *1*¹ 3.7 (3.7-4.1); tarsus is 5.6 (5.6-6.5) long; paraxial fastigial tarsal setae *ft*¹ are 21.4 (19.6-21.4) and antaxial fastigial tarsal seta *ft*¹ is 22.2 (22.2-21.4) long; paraxial unguinal tarsal seta *u*¹ is 1.8 (1.8-2.8) long, curved and knobbed tarsal solenidion ω , is 5.6 (5.1-5.6) long, tarsal empodium *em* is 3.7 (3.7-4.2) long with 4 rays. The length of the Leg II from base of trochanter is 28.9 (27.8- 28.9), femur is 10.2 (10.2-10.8), basiventral femoral seta *bv* is 11.2 (11.2- 12.1), the length of genu is 4.6 (3.7-4.6) with an antaxial genual seta *l*² 11.2 (10.2-11.2), tibia is 6.5 (6.5-7.4) with paraxial tibial seta *1*² 3.7 (3.7-4.1), tarsus is 5.6 (5.6-6.5) with paraxial fastigial tarsal setae *ft*² 6.5 (5.6-6.5), antaxial fastigial tarsal seta *ft*² is 19.6 (18.4-19.6), the length of paraxial unguinal tarsal seta *u*² is 1.8 (1.8-2.8), tarsal solenidion ω is curved and knobbed and 5.6 (5.2-5.6) long;

tarsal empodium *em* is 3.7 (3.7-4.2) long with 4 rays. Coxae I are 14.0 (14.0-15.1) long and contiguous; coxal surface is ornamented with longitudinal lines; 1b tubercles and seta are present at the anterior coxal approximation, seta 1b is 9.3 (8.4-9.3), 1a tubercles with seta are present in front of the line across the 2a tubercles; seta 1a is 23.3 (2.2-23.3) long; Coxa II is ornamented with few curve lines and 13.0 (13.0-13.9) long, seta 2a is 49.4 (48.2-49.4) long. Opisthosoma has 27 (27-29) smooth dorsal annuli and 55 (52-55) microtuberculated ventral annuli; rounded micro tubercles are located on anterior margin of ventral annuli; micro striations are found on last 9 ventral annuli, seta *c2* is 21.4 (21.4-23.3) on annulus 11 (10-11), seta *d* is 51.3 (50.2-51.3) long on annulus 24 (24-25), seta *e* is 8.4 (7.9-8.4) long on annulus 34 (34-37), seta *f* is 30.8 (29.8-30.8) long on annulus 50 (50-53), seta *h1* is 3.7 (3.7-4.1), seta *h2* is 70.0 (69.2-70.0) long. Genitalia is 12.1 (11.2-12.1) long and 21.2 (20.5-21.2) wide; genital cover flap epigynium has 11 longitudinal scoring, seta *3a* is 28.9 (27.3-28.9) long. MALE: Not observed.

3.2. Taxonomic deposition of specimens

Holotype: Female (marked) on slide (no.1306/22/2019), India: West Bengal: Malda, English Bazar (25° 0' 39.0276" N and 88° 8' 27.9528" E.), 23. vi. 2019 from *Azadirachta indica* A. Juss. (Meliaceae). Coll. S. Sarkar. Paratypes: 7 females on slide bearing holotype, 25 females on 6 slides (nos1307-1312/85/2019); collection data same as in holotype, 20 females on 3 slides (nos. 1313-1316/85/2020), India: West Bengal: Daksindinajpur, Daulatpur (25° 19' 33" N and 88° 19' 47" E) 20.xii.2020 from *Azadirachta indica* A. Juss. (Meliaceae). Coll. S. Sarkar.

3.3. Nature of damage produced to the host plant

Mites are seen along the margin gall of the leaf. Numerous populations were found inside the gall produced by the mite. The mites suck plant sap by their oral styles and proboscis. Damage symptoms are expressed as yellowish-pale leaves. The infected leaves fall off eventually. This mite species is found throughout the year, but the maximum population is from June to December.

3.4. Etymology

The new mite is named here following the International Code of Zoological Nomenclature Rules. The specific name '*neemivorous*' is taken from the common name of the host plant- 'Neem' and the term '*vorus*' means 'feeding on'. So, '*neemivorus*' means the Species that takes nutrients from Neem plants. The specific name has been selected here so that one can easily understand the feeding habits of the new species of this genus. This specific epithet of the Binomial Nomenclature reflects the host plant of the phytophagous mite. Since Eriophyoid mite shows host specificity, Taxonomists can identify the mite if they have the proper information about the host plant. Thus, this etymology is found to be highly justified.

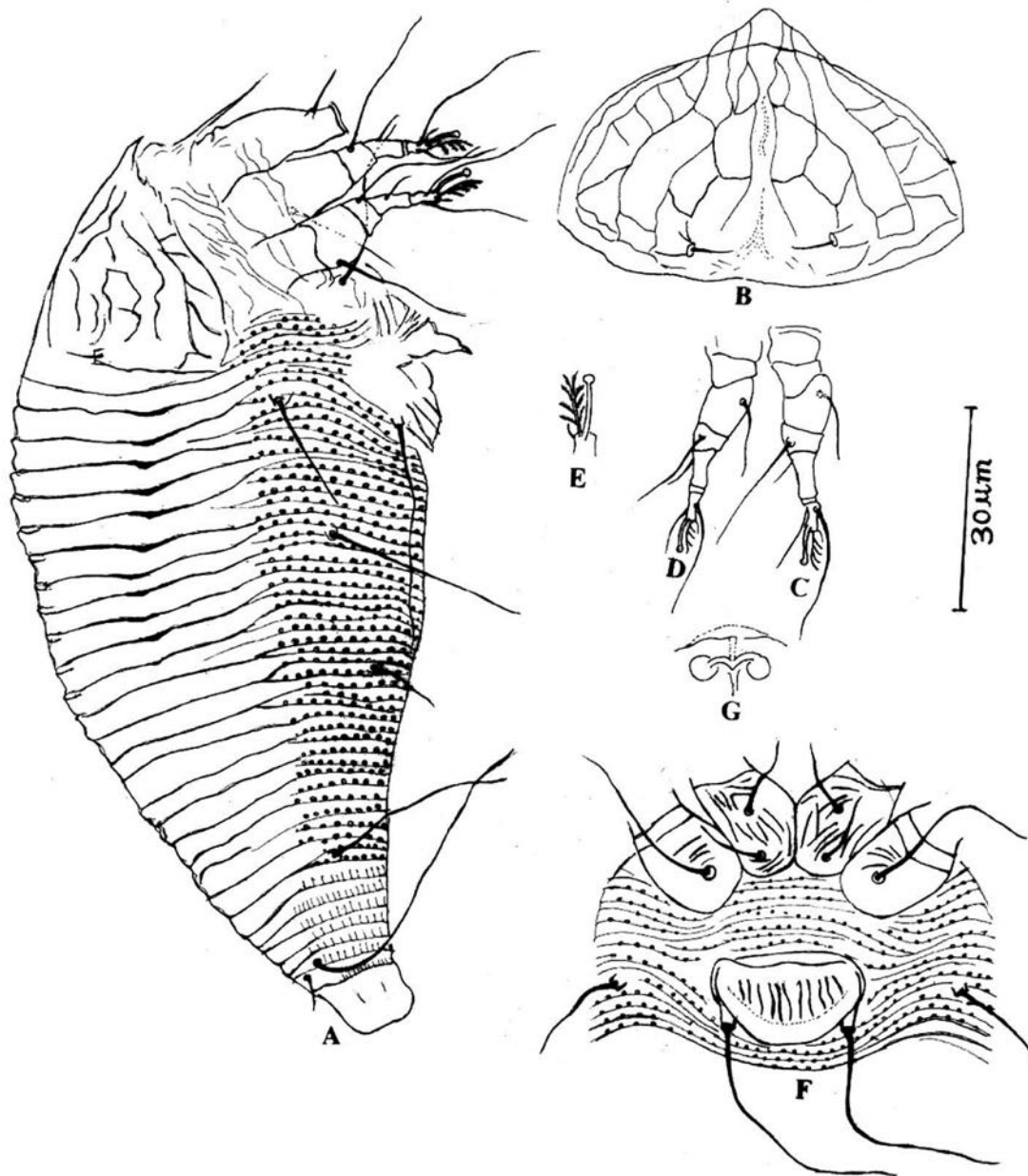


Figure 2. *Caleptrimerus neemivoorus*. sp. nov. A. Lateral view of the mite; B. Prodorsal shield; C. leg I; D. Leg II; E. Tarsal empodium with solenidion; F. Coxal-genital region; G. Apodeme.

4. Conclusion

It has been recorded so far that 64 species, including 14 species from India, are known to fall under the genus *Caleptrimerus*. The new species shows similarities with *C. hispidis*, *C. sagarensis*, and *C. azadirachtae* in having 4 rayed tarsal empodium, nonmicrotuberculus dorsal annuli and epigynium with longitudinal scoring, but differs from *C. hispidis* by having single row of longitudinal scorings on epigynium (double row in *C. hispidis*), moreover in *C. hispidis*, prodorsal shield design shows central disc which is absent in the new species. The new species differs from *C. sagarensis* by having ornamented coxae, an absence of a median line in the anterior half of the prodorsal shield, and a length of seta 3a. The other species with 4-rayed tarsal empodium are *C. achilleae* and *C. baileyi*, but

the new species differs by shield design. The new species comes very close to *C. azadirachtae* in common host sharing, in having ornamented coxae I, similar body shape and size, seta 3a longer than genitalia, similar stations on opisthosoma and legs. But differs from it by having various features such as very long dorsal pedipalp seta *d*, presence of few curved lines on coxae II, epigynium has 11 longitudinal scorings (*C. Azadirachtae* has 14-16 scorings). Prodorsal shield design is completely different from that of *C. azadirachtae* because the latter does not have a network of cells. Thus, it may be regarded as a new species.

This research finding may be helpful to the agronomists and the plant protection departments to implement control measures for the pest if they can identify the pest by seeing the damage symptoms produced by the species. Eriophyidae is an important group of phytophagous mites all over the countries. Thus, exploring this plant-feeding mite through extensive surveys in India is needed to control these mites properly.

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