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A new parasitic plant mite (Acari: Eriophyoidea) found on *Trewia nudiflora* L. (*Euphorbiaceae*) from India.

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ABSTRACT

During the periodical surveys for plant mite in the area of the Gangetic Plain of India, a new species eriophyoid mite, Ditilomiopus trewiacolous sp. nov. of the family Ditilomiopidae is found on the lower surface of the leaves of Trewia nudiflora. Trewia nudiflora L. belonging to family Euphorbiaceae, is an important medicinal plant, grows in moist tropical and semi-evergreen forests as well as non-forest areas of India and its neighbouring countries, Bangladesh, China, and Malaysia. The plant is attacked by a tiny sap sucking parasitic mite belonging to the superfamily Eriophyoidea of subclass Acari of class Arachnida and produces severe damage to the host. This new parasitic mite species is collected and processed for microscopic study and finally described with sufficient illustrations following standard taxonomic procedure. The relationship to the host plant is also described here. A comparative study of this mite with other previously known species has been conducted. After proper taxonomic diagnosis, it is found that this parasitic mite appears as new to Science from India. New name with its etymology has been given to this mite species following the Rules of International Code of Zoological Nomenclature and also registered in Zoo-Bank account to create unique ID: LSID urn: lsid: zoobank.org:pub:3BC0363B-160B-46CE-B9DA-20864762AD10. This study may be helpful to the plant protection departments and may provide the basis of further research including DNA barcoding and systematic evolution. This research finding may also be helpful to the students of Pharmacology and Medicinal Botany.

Keywords:
Eriophyoid mite; ditilomiopidae; India; medicinal plant; new species, taxonomy.

1. Introduction

Eriophyoid mites are an important group of plant-feeding parasitic mites encountered on agricultural, ornamental, horticultural, and medicinal plants, including forest and fruit trees, in India. Among the Acari, these mites constitute the second largest group with respect to their phytophagous mode of life worldwide (Lindquist et al., 1996). These tiny creatures have drawn the attention of biologists worldwide because of their

morphological and biological specializations. All mites are microscopic and show a significant reduction in body structure. They are exclusively plant parasites at all stages of their development (Jeppson et al.,1975, Shukla, 2021, Vervaet, 2021). Owing to their obligatory plant-feeding habits, they exhibit marked host specificity (Abdel-Khalek & Momen, 2022; Brown et al., 2021). The taxonomic richness of eriophyoid mites is fundamentally linked to their highly specialized association with specific host plant (Stephan et al., 2008). As obligate phytophagy habit, these micro herbivores select precise microhabitats that facilitate all stages of their life cycle. A significant proportion of Eriophyoidea occupy cryptic niches – such as leaf axils, buds, and petiole bases – which offer both nutritional resources and protection from desiccation. Reflecting their negatively phototropic nature, many species preferentially inhabit enclosed structure, including galls and leaf sheaths. Conversely, vagrant species frequent exposed surfaces, particularly the abaxial leaf lamina and vein junction. Through their specialised feeding mechanisms, eriophyoids frequently induce mechanical damage and physiological stress, establishing them as significant agricultural pest across various crop anf vegetable systems.

During the feeding process certain phytophagous mite species secrete saliva into host plant tissues, including a spectrum of physiological and morphological changes (Druciarek et al., 2019; Scrocka et al., 2010). The resulting plant responses manifest as various damage symptoms, including the formation of galls, blisters, eriniums, big buds, leaf and fruit browning, distortion of flower buds, development of witches' broom, rust, and the growth of felt -like hairs or closely packed papillae on infested surfaces (Scrocka et al., 2010; Childers et al., 2001).

Beyond these feeding injuries, a more significant concern in agriculture is that a subset of these mite species acts as vectors for viral pathogens in numerous crop plants (Sarwar, 2020; Stephan et al., 2008; Jones, 1999). Mites in general, and specially eriophyoid mites, possess minute body sizes and very short oral stylets, which restrict their feeding to the epidermal cells of their hosts (Scrocka et al., 2010; Keifer et al., 1982; Jones, 1999).). This localized feeding behaviour facilitates the acquisition and transmission of disease agents directly into the adjascent plant cells (Scrocka et al., 2010). Globally, 13 species of phytophagous mites have been implicated in the transmission of 21 pathogens to at least 34 plant species (Scrocka et al., 2010; Chagas et al., 2001)

Trewia nudiflora is a tropical plant popular in traditional herbal medicine. It is a medium- to large-sized tree having 20- 30 m height with a straight trunk. The tree produces cluster of small white and fragrant flowers. The fruit is a yellowish-brown drupe containing many seeds. The foliage is characterized by simple, ovate, which exhibit a lustrous, dark green appearance on the adaxial surface. The average leaf blade measures up to 15 cm in length.The roots, leaves, and bark of this plant are used to treat rheumatism, gout, edema, flatulence, manage sputum, promote wound healing, and relieve stomach-related issues and excessive bile (Ram et al., 2004, Hamilton, 2004, Sultana et al. 2022). Phytochemical screening of *T. nudiflora* has established the presence of a diverse range of bioactive compounds within the plant, including tannins, phenols, flavonoids, and saponins, with potential biological effects (Ripa et al., 2022). Phytochemicals identified in this plant have been documented to possess antioxidant, anticancer, and cerebroprotective properties (Balakrishnan et al., 2013; Esan et al., 2022; Kumer et al., 2012). During entomological surveys conducted in the northern districts of West Bengal,

India (25 °10′ 20″ N, 88 °14′ 50″ E), a new species of eriophyoid mite was recovered from the foliage of *Trewia nudiflora* (Euphorbiaceae)

According to the working Catalogue of the Eriophyoidea of The World – Version 1.0- The Catalogue of the Eriophyidae (Joel Hallan; biocat@ccms.net), as of February 2025, altogether 104 valid species of *Diptilomiopus* are known from all over the world (Craemer et al., 2017; Sur et al., 2018; Amrine, personal communication,Amrine and Stasny 1994 et al., 2003; Yan-mei yuan and Xiao-Feng Xue 2019, Chakrabarti et al., 2019). To date, five species of *Diptilomiopus* have been described on plants of the family Anacardiaceae and nine species on the family Moraceae from India. (Chakrabarti et al, 2019).

Study reveals that only one species of *Diptilomiopus* has been described on *T. nudiflora*, *Diptilomiopus indicus*, by Chakrabarti and Mondal from India in 1983. Currently, there are no published scientific studies or data documenting the relationship between this mite and the plant. A detailed taxonomic observation of the collection made on *T. nudiflora* yielded a new species of the genus *Diptilomiopus* Nalepa, 1916 (see Nalepa 1916) from this area. The new species damages the tender leaves of the plant. After proper taxonomic diagnosis, one new species was added to the list of The Catalogue of World Eriophyoid Fauna from this locality. Detailed morphological description of the new eriophyoid mite species, period of attack, and the damage caused to the plant are discussed.

2. Materials and Methods

2.1 Collection and temporary preservation

The mite- infested leaves were collected, placed in a polythene bag, and then brought to the laboratory. The material was shield from heat to maintain dryness and stop the buildup of internal moisture.

2.2 Handling of mite

To collect mites from the plant samples, a stereo dissecting microscope is typically used to locate them, even on misshapen plant parts. They can be retrieved using tools such as pins; moistening the tip of the tool with water or other suitable liquid media often make it easier to pick the mites up.

2.3 Media Making

For a long time, the modified Berlese fluid, commonly known as 'Hoyer's Medium,' has been used for this purpose. It is a very good clearing agent, but during solidification, several cracks appear within it, which hampers the examination of eriophyids under higher magnification. The ingredients of this medium were as follows: Distilled water (50 ml), Gum Arabic (30 g), Chloral hydrate (200g) and Glycerin (20 ml). Hoyer's Medium, has traditionally been used in one step, that is, the mites were needled into a drop of suspension on a slide, a cover slide was placed upon it, and the preparation was warmed at low heat on a hot plate or oven. However, heat treatment decreased the longevity of the prepared slides by causing the media to crack. Further modifications by adding sorbitol to this medium have been recommended, but successful results have not been obtained so far. Keifer (1969) elaborately discussed the efficiency of different mounting media and categorically discussed the chemical composition of each ingredient therein. He opined that except Knono's medium (mentioned below), no other

medium is satisfactory for eriophyid studies. Keifer (1969) suggested the use of a preparatory media devised by Tokuo Kono, here referred to as Kono's mixture, in which mites could be heated before being transferred to the final Hoyer's media. A slight acidity was introduced into Kono's mixture by adding hydrochloric acid to increase the dissolving action of the fluid. The compositions of Kono's mixture are as follows Chloral hydrate – 100g; Glycerin – 10 g; water 50 ml; Concentrated HCL 1 ml.

2.4 Slide preparation

The mites were extracted from the leaves with a needle under a stereomicroscope and subsequently mounted on a grooved slide holding Kono's medium (Jeppsion et al., 1975) To clear the mites, the slides were heated on a 35ºC hot plate before being mounted in Hoyer's medium (Lillo et al., 2010).

2.5 Specimens examination, Measurements and illustrations

A total of 56 specimens (one holotype and 55 paratypes) were examined using a Leitz Dialux 20 microscope equipped with phase illumination. Following standard procedures (Amrine et al., 2003; Lillo et al., 2010), detailed line drawings were produced via an integrated draw tube-type prism camera lucida.

Generic classification was based on Amrine et al., (2003), while morphological terms and abbreviations were adopted from Lindquist (1996). All specimen were measured in micrometers (µm) using an ocular micrometer under phase- contrast illumination at 1000x magnification (10 x 100X). These procedures followed the standardized protocols of Amrine and Manson (1996) and de Lillo et al. (2010).

The important taxonomic characters of the specimen that were taken into consideration were width and length of the body, length and width of the prodorsal shield, length of the gnathosoma, length of legs, and length of the epigynum length of different setae. In the descriptive data, measurements are presented with the holotype value first, followed by the range for paratypes enclosed in parentheses

2.6 Storage of Slide

The type specimens are currently hosed in the Entomology research Unit, Department of Zoology, Serampore college, Calcutta University, India. Following publication, the holotypes and paratypes will be transferred to the National Zoological Collection at the Zoological Survey of India in Kolkata.

2.7. Zoo-Bank Registration for new species

The ZooBank account registration of the new species was performed following the ICZN Rules. The account ID is LSIDurn:lsid:zoobank.org:pub:3BC0363B-160B-46CE-B9DA-20864762AD10.

2.8. Time and Location of Study

Type locality: In dia: West Bengal: Dakshin Dinajpur, Latitude: 24°50′ 40″ N, Longitude: 87 °55′ 50″ E. Period of study July 2023 to December 2024

3. Results and discussion

Taxonomic studies and differential diagnosis with other pre-existing species of the genus *Diptilomiopus*. It may be claimed that this parasitic mite is new to science. The etymology

of the new species name strictly follows the Rules of the International Code of Zoological Nomenclature.

3.1. Description of the Genus Diptilomiopus Nalepa, 1916

The body is spindle-shaped and robust. Gnathosoma and chelicerae are large and set at a perpendicular angle or strongly recurved between leg I (Fig. 1A). Prodorsal shield is wider than its longitudinal axis and is without frontal lobe, scapular tubercles, and setae are usually absent. Legs are with prominent genu but without genual seta; only tarsal setae present on legs; tarsal empodium divided. Coxae I may or may not be separated, with a less prominent sternal line; *1b* tubercles are usually absent; opisthosoma is sub-circular in cross-section with two to three ridges just behind the prodorsal shield; seta *c2* is absent, often tubercles are present; epigynium may be smooth or provided with longitudinal scorings and granules or tubercles; internal apodeme is of normal length. Type species: *Diptilomiopus javanicus* Nalepa, 1916.

3.2. Description of the new species

Ditilomiopus trewiacolous ***sp.*** **nov** (Fig.1A) [*Diptilomiopus daulatpurensis* 2011 is an invalid name as it is in the dissertation thesis name]. ZooBank Account ID: LSID urn: lsid: zoobank.org:pub:3BC0363B-160B-46CE-B9DA-20864762AD10.

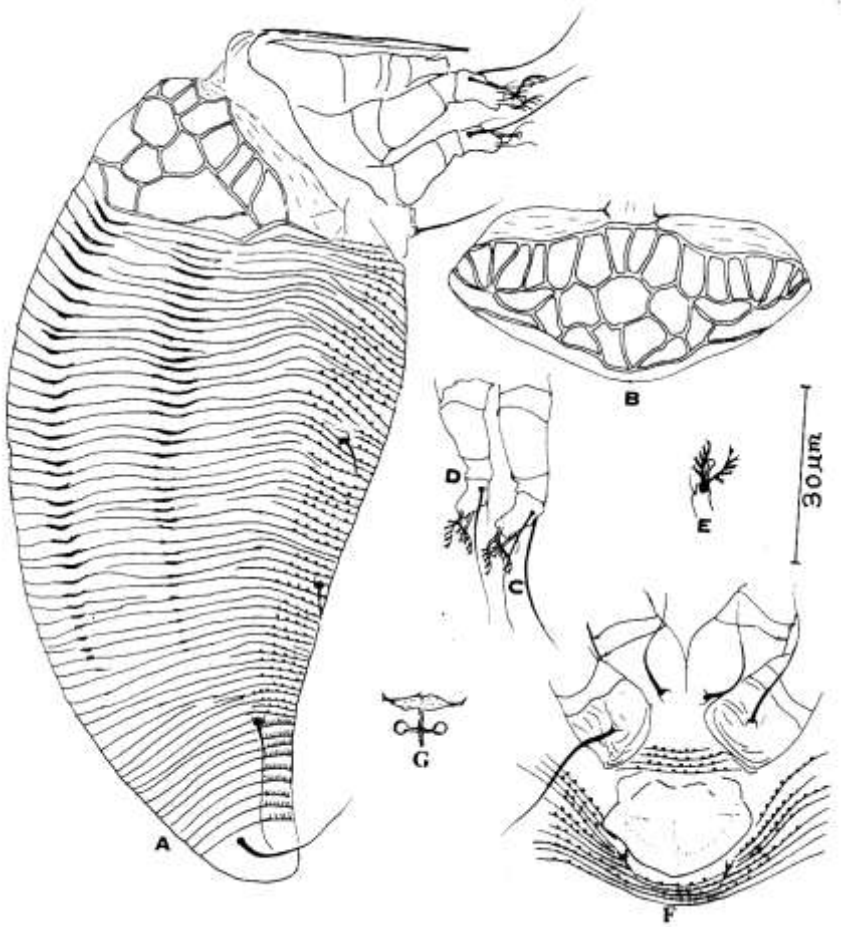

Figure 1. *Diptilomiopus trewiacolous* ***sp. nov.***, holotype, no. no.1410/75/2024: A-Antero-dorsal mite (AD); B- Antero – Dorsal mite (AD); C – Leg I (L1); D- Leg II (L2); E- tarsal empodium of L1 (em); F – Coxal – genital region (CG); G- Internal genitalia of female.

Female (1 holotype and 55 paratype specimens) (Fig. 1 A): Body 163.3 (163.3-170.8) long, 69.0 (69.0-85.8) wide, robust, fusiform with three ridges and four grooves running up to two-thirds of the body length, pinkish-brown in color. Gnathosoma 35.4 (34.5-35.4) long, curved down, dorsal pedipalp genual seta d 3.7 (3.4-3.7) long,

Prodorsal shield (Fig. 1B) 28.9 (28.9-29.9) long, 65.3 (65.3-65.8) wide with a prodorsal shield lobe; prodorsal shield design present complete network of cells with a central large polygonal cell, number and size of cells show bilateral symmetry, median line present but lacking on the central cell region, admedian and submedian lines forming complete cells in three tires; on each half of the prodorsal shield anterior tire with eight cells, second tire with two cells and third tire with four cells; scapular tubercle and seta *sc* absent.

Leg I (Fig. 1 C) from base of the trochanter 27.0 (27.0-28.0) long; femur 14.0 (13.0-14.0) long, without basiventral femoral seta *bv*; genu fused with femur; tibia 4.6 (4.6-5.1) long, without paraxial tibial seta *1'*; tarsus 8,4 (7.4-8.4) long; two identical tarsal setae -paraxial fastigial tarsal seta *ft'* and antaxial fastigial tarsal seta *ft"* 32.6 (25.2-32.6) long; paraxial unguinal tarsal seta *u'* 4.6 (3.7-4.6) long, tarsal solenidion *ω* slightly curved, knobbed and 5.6 (4.6-5.6) long, 5 rayed divided tarsal empodium em 7.4 (6.5 -7.4) long.

Leg II (Fig. 1D) from the base of the trochanter 25.2 (25.2-26.1) long; genu fused with femur, femur 12.1 (12.1-13.0) long, without basiventral femoral seta *bv*; tibia 3.7 (3.7-4.6) long, without paraxial tibial seta *1'*; tarsus 8.4 (7.4-8.4) long, paeaxial fastigial tarsal setae *ft'* 28.0 (23.3-28.0). antaxial fastigial tarsal seta *ft"* absent. Paraxial unguinal tarsal seta *u'* 4.6 (3.7-4.6) tarsal solenidion *ω* 5.6 (4.6-5.6) long.

Tarsal empodium (Fig. 1E) 5 rayed divided tarsal empodium em 5.6 (5.1-5.6) long.

Coxal-Genital region (Fig.2F): Coxae I 18.6 (18.6-19.6) long and contiguous basally; coxal surface smooth; 1b tubercles and seta absent; 1a tubercles with seta present ahead of the line across the 2a tubercles with seta; seta 1a 21.4 (20.5-21.4) long. Coxae II ornamented with many curved lines and 15.8 (14.0-15.8) long, seta 2a 29.8 (28.9-29.8) long.

Opisthosoma (Fig. 1A) with 66 (57-66) smooth dorsal annuli and 74 (71-74) microtuberculeted ventral annuli; microtubercules rounded and located on anterior margin of ventral annuli; last 9 ventral annuli with microstriation, seta *c2* absent, seta *d* 11.2 (9.3-11.2) long on annulus 26 (25-26); seta *e* 6.5 (6.5-7.4) long on annulus 42 (42-43); seta *f* 29.8 (26.1-29.8) long on ventral annulus 61 (60-61); seta *h1* absent, seta *h2* 34.5 (34.5-37.3) long.

Epigynum (Fig. 1F, 1G) or Genitalia 14.0 (14.0-14.9) long, 28.0 (28.0-28.4) wide; epigynum smooth except a semicircular arc along the posterior margin and elliptical in shape; seta *3a* 3.7 (3.7-4.6) long. The internal genitalia (Fig.1G) show two conspicuous round spermathecae and a wavy oviduct.

Male: Males were not observed, as the taxonomic character variables of this mite are found only in female individuals.

Morphometric study of this mite under a microscope clearly produces many unique features of this new parasitic mite species, such as a reticulated cellular network on the

prodorsal shield and its number, closed cells, smooth surface of coxae I, and 5 rayed tarsal empodium. These taxonomically important features make the species unique to this genus.

3.2. Record of Type material

Holotype: Female (marked) on slide (no.1410/75/2024), India: West Bengal: Dakshin Dinajpur, Doulatpur, Latitude: 25°10′20″ N and Longitude: 88°14′50″ E, 14.9.2024 and 23. 9. 2024, from *Trewia nudiflora*. (Euphorbiaceae), Coll. S. Sarkar.

Paratypes: 6 females on slide bearing holotype and 49 females on 7 slides (nos. 1411 - 1417/75/2024); collection data same as holotype.

Type locality: India: West Ben gal: Dakshin Dinajpur, Doulatpur, Latitude: 24°50′ 40″ N, Longitude: 87 °55′ 50″ E.

Type material recording was performed following Standard Taxonomic procedures, and holotypes were deposited in the national repository as per ICZN Rules.

3.3. Relation to the host

Mites are vagrants on the abaxial surface of leaves, particularly near the leaf veins. During feeding, the mite inserts its oral stylets deep inside the veins of tender leaves and sucks the sap from them. Due to its sap-sucking habit from the leaf veins, the leaves turn yellowish-brown as visible damage symptoms (Fig. 2B). During heavy infestation, nutritional deficiency of the plant occurs, so the entire shoot becomes yellowish brown, and leaves fall prematurely. The leaves become unsuitable for medicinal use.
This host–parasite relationship study will be helpful for the management and proper treatment of plant diseases to agronomists and plant protection departments.

A B

Figure 2. Symptoms of Leaf Damage in *Trevia nudiflora* Caused by Mites (A: Fresh shoot of *Trewia nudiflora*; B: Damaged shoot of *Trewia nudiflora* due to mite infestation).

3.4. Etymology

The specific epithet of the name '*trewiacolus'* is derived from a combination of two words, '*Trewia*' genus of the host plant, and the latin word *'Colus'* meaning dwellin g in or inhabitant. For the naming of new species, the Rule of ICZN is strictly followed here. From this binomial nomenclature, the host of this parasitic mite can be easily understood.

3.5. Taxonomic Diagnosis

The new species falls under the group with a reticulated cellular network on the prodorsal shield. Among them, it shows close similarities with *D. trewir* Chakrabarti and Mondal (1983) shared a common host plant, having five rayed tarsal empodium and the absence of scapular tubercles and scapular setae. But it can be differentiated from it by having more number of cells on prodorsal shield and smooth surface of coxae I. The new species share common features in respect of network of cells on prodorsal shield with *D. davisi* Keifer (1969), *D. holmesi* Keifer (1962), *D. javeremovici* Keifer (1960) and *D. ficusis* Chakrabarti and Mondal (1983) but can be differentiated from them by 5 rayed tarsal empodium and from other Indian species of this group by its number of cells on prodorsal shield. This Taxonomic diagnosis will form the basis for further studies on molecular taxonomy. Morphometric study and comparative analysis of this mite with other known species establishes its unique morphological specialization. This mite species shows a high degree of host specificity and a unique feeding pattern.

4. **Conclusion**

The parasitic mite identified in this region represent a previously undescribed species and a potential pest of *Trewia nudiflora*, an important medicinal plant in India. As of 2025, 105 species of this genus have been identified on different plants worldwide. The 106th species is added to the list of eriophyoid fauna from this type locality in India. One significant outcome of this study is that a new species of the genus *Diptilomiopus* was observed for the first time in the plant family Euphorbiaceae from India. This mite pest damages plants through its sap-sucking feeding habit and parasitic mode of living. Host specificity and parasite-host relationships of this mite may provide a key to the species identification of this group of mites. These findings provide agronomists and plant protection specialists with the essential data needed for precise pest identification and disease diagnosis. Effective integrated Pest Management (IPM) relies fundamentally on a comprehensive understanding of species systematics and severity of host-plant damage. To develop effective management strategies, it is critical to determine both the taxonomic identity of a pest and the extent of the injury it inflicts on the host. This study offers valuable diagnostic support for agricultural and plant health departments. From this perspective, these findings may provide the basis for further taxonomic studies, including DNA Barcoding. Through this research outcome, agronomists, horticulturists, and entomologists of the plant protection department may identify the mite pest and its nature of damage. This study may help researchers in various other related fields, such as plant pathology, Pharmacology, Acarology, Taxonomy and Biodiversity.

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