



Persian J. Acarol., 2022, Vol. 11, No. 3, pp. 447–455.
<https://doi.org/10.22073/pja.v11i3.74600>
Journal homepage: <http://www.biotaxa.org/pja>



<http://zoobank.org/urn:lsid:zoobank.org:pub:DE4361C0-016D-41D1-BAB2-9B5D55561C24>

Article

A new species of eriophyoid mites (Acari: Eriophyoidea) infesting *Terminalia crenulata* (Heyne) from sub-Himalayan region of India

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ABSTRACT

Among the Acari, eriophyoid mites are considered important pests as they produce various damage symptoms while feeding on plants. During the general surveys for eriophyoid mites of Mongalbari, Malda, West Bengal, India, one new species, *Colomerus terminaliae* sp. nov. of the family Eriophyidae was found along the rolling of leaf margin of *Terminalia crenulata* (Heyne) (Combretaceae). This new phytophagous mite species is described and illustrated from the specimens collected at present study area. The new species is compared with other closely related species and a differential diagnosis is also provided here. The new species belongs to the genus *Colomerus* Newkirk & Keifer, 1971. This new species is morphologically distinguished from other existing species of *Colomerus* and it produces leaf rolling at the edges of leaves and causes damage to this economically important tree by its phytophagous mode of nutrition. For proper control of this mite pest, studying its taxonomy and relation to the host plant is essential.

KEY WORDS: *Colomerus*; Combretaceae; Eriophyidae; taxonomy; West Bengal.

PAPER INFO.: Received: 23 March 2022, Accepted: 21 April 2022, Published: 15 July 2022

INTRODUCTION

Eriophyoids are a highly specialized group of phytophagous mites and are considered as serious pests throughout the world. They cause various damages to plant parts except roots and are also known to transmit viruses to plant bodies while feeding on them. During the general survey on eriophyoid mites in two districts namely Malda and Dakshindinajpur of West Bengal, India (25° 0' 39.0276" N and 88° 8' 27.9528" E.), a new species was collected from *Terminalia crenulata* (Heyne) and is described here. *Terminalia crenulata* commonly known as crocodile-bark tree or Black murdah is native to India, Bangladesh, Sri Lanka and Myanmar growing in tropical and semi-tropical regions. This tree is useful because its wood in mixture with other hardwood species has been found suitable for manufacture of chemical pulps for writing, printing and wrapping papers. The tree yields a copious gum. Their kernels yield non-edible oil used in manufacture of soaps after blending with other oils and the leaves are highly valued as fodder for milk cattle and are also fed to Tasar silkworm. The new phytophagous mite species causes damage to plants by producing leaf rolling symptoms. The period of infestation and damage caused to the plant is discussed here.

So far 27 species are known within the genus *Colomerus* (Keifer 1978; Ghosh and Chakrabarti 1989; Amrine and Stasny 1994; Chakrabarti and Pandit 1997; Amrine *et al.* 2003; Amrine and de Lillo 2006; Chandrapatya *et al.* 2014); three of which are described in West Bengal, India, including

How to cite: Sarkar, S. (2022) A new species of eriophyoid mites (Acari: Eriophyoidea) infesting *Terminalia crenulata* (Heyne) from sub-Himalayan region of India. *Persian Journal of Acarology*, 11(3): 447–455.

C. alangii Keifer, 1978, *C. woodfordis* Ghosh & Chakrabarti, 1989 and *C. trichodesmae* Chakrabarti & Pandit, 1997. The present study has added one new species to this list from India. Species of *Colomerus* are distributed in all continents except Antarctica infesting plant families namely Alangiaceae, Euphorbiaceae, Lyrthaceae, Palmaceae, Piperaceae, Rosaceae, Rubiaceae and Vitaceae. This new mite species is collected for the first time from the plant family Combretaceae. Earlier there was no record of species of *Colomerus* from the present study area. This region of sub-Himalayan West Bengal exhibits a very interesting ecological niche where a unique floristic pattern prevails. Floristic patterns have direct influences on the composition of eriophyoid fauna. Thus, a thorough exploration of this group in this area may result in many new species.

MATERIAL AND METHODS

The shoots of plants were collected and placed in individual polythene bags. Care was taken to avoid accumulation of moisture within the bags. These were finally stored in a refrigerator. The plant samples were examined under stereomicroscope within a short time to confirm whether there was infestation of mites or not. With the aid of a stereomicroscope, the mites were picked up from the infested plant material using a needle and placed onto a concaved slide containing Kono's medium. The slide was then placed on a hot plate having a temperature of 5–10 °C and cooked enough to clear the mites. The mites upon being cleared enough were mounted in modified Hoyer's medium after a bath in the same medium. The ingredients of Kono's mixture are chloral hydrate 100 g, Glycerin 10 g, water 50 ml, concentrated HCl 1 ml. The mites were studied under a Leitz Dialux 20 microscope with provision for phase illumination. Camera lucida drawings were prepared using a built-in drawing tube type prism camera lucida attached to the microscope. The morphological terminologies and abbreviations used here follow Lindquist (1996) and the generic classification system followed is that of Amrine *et al.* (2003).

Measurements were taken at 10×, and 100× magnification and strictly under phase contrast using an ocular micrometer. Ten specimens including the holotype were measured. The following measurements were taken during this study: i) length of body: distance from the anterior tip of the prodorsal shield to the posterior end of the body, ii) width of body: maximum width just behind rear prodorsal shield margin, iii) length of shield: distance from the tip of anterior lobe to rear prodorsal shield margin, iv) width of prodorsal shield: maximum width along rear shield margin, v) length of palps: length from base of proximal segment to end point of terminal segment, vi) length of legs: distance from base of trochanter to the tip of tarsus, vii) length of epigynum: maximum width across mid transverse line, viii) length of seta: distance from the socket to its tip. All measurements were taken as recommended by de Lillo *et al.* (2010) and are given in micrometers (µm) referring to the length unless specified otherwise. In the text, measurements of holotype are followed by the range of measurements of the paratypes in the parentheses. Slides after being properly labeled with all relevant data were stored suitably. All slides bearing the type specimens were deposited in the Entomology Research Unit, Department of Zoology, Serampore College, Serampore, 9, William Carey Road, West Bengal, India. Registration of this new species in Zoobank account is done.

RESULTS

Colomerus terminaliae sp. nov. (Fig. 1)

<http://zoobank.org/urn:lsid:zoobank.org:act:56DF0FAB-5ACC-465B-8D41-B28833A6E977>

Female (*n* = 30)

Body 159 (159–163) long, 47 (467–55) wide, worm like, white in color.

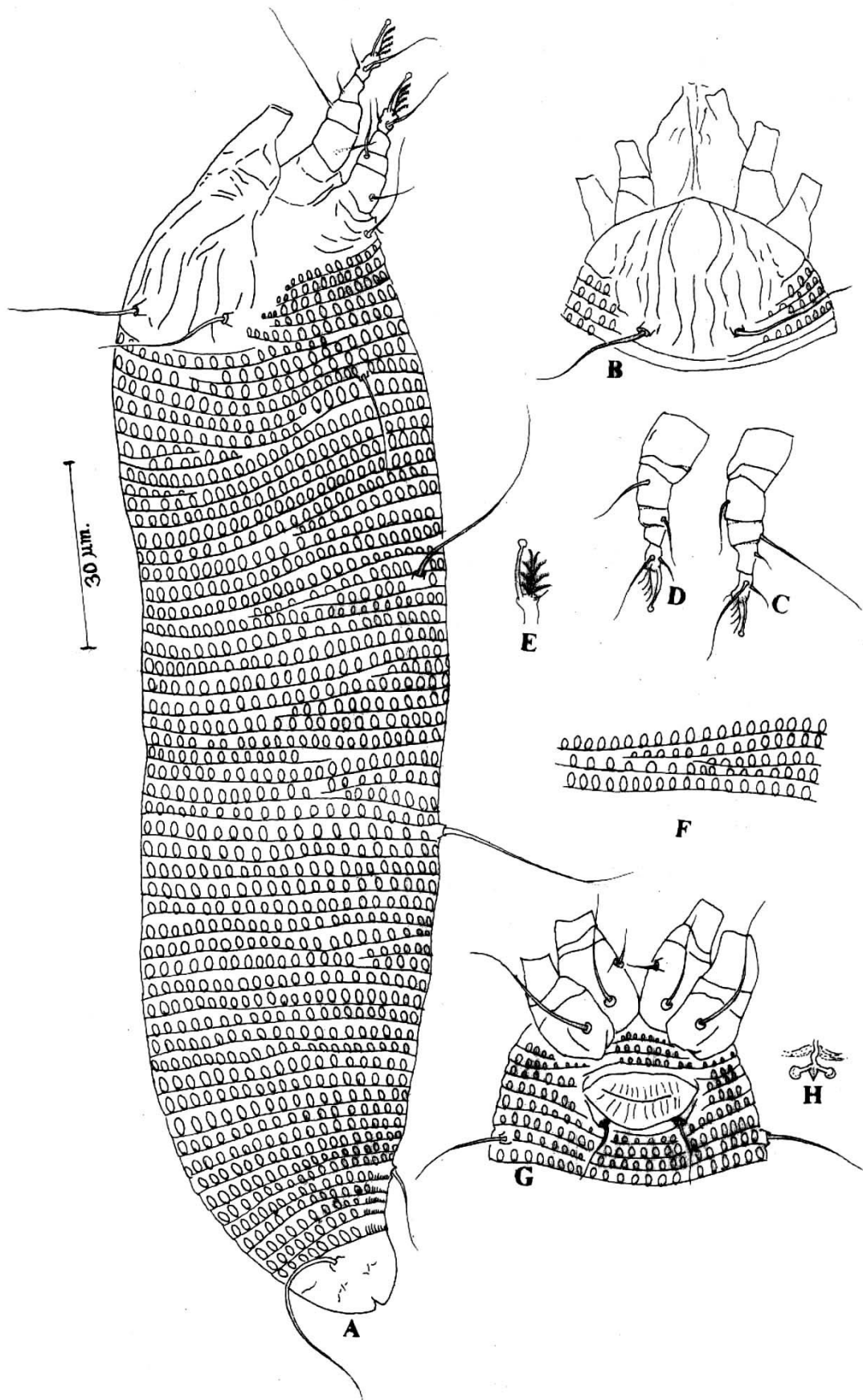


Figure 1. *Colomerus terminaliae* sp. nov. – A. Lateral view of body; B. Prodorsal shield; C. Leg I; D. Leg II; E. Tarsal empodium with solenidium; F. Lateral opisthosomal annuli; G. Coxal-genital region; H. Apodeme.

Gnathosoma – 16 (15–16) long, slightly curved down; dorsal pedipalp genual seta *d* absent; subepical pedipalp tarsal seta *v* 2 (1–2).

Prodorsal shield – 28 (28–29), 37 (37–38) wide; prodorsal shield subtriangular without shield lobe, prodorsal shield design shows two complete admedian lines broken at midpoint along its length, a short incomplete median line, two submedian lines, the right submedian line is broken whereas left summedian line is complete; dorsal tubercles near rear shield margin, 12 (12–13) apart, scapular seta *sc* 18 (18–19) and directed caudad.

Leg I – 34 (33–34); femur 8 (8–9), with basiventral femoral seta *bv* 7 (7–8); genu 4 (4–5) with antaxial genual seta *l'* 14 (14–15), tibia 4 (4–5), with paraxial tibial seta *l'* 4 (3–4); tarsus 6 (5–6); paraxial fastigial tarsal setae *ft'* 6 (5–6), antaxial fastigial tarsal seta *ft''* 14 (13–14); paraxial unguinal tarsal seta *u'* 2 (1–2), tarsal solenidion ω curved, knobbed and 5 (4–5), 4-rayed tarsal empodium *em* 5 (4–5).

Table 1. Comparison of some important traits among *C. alangii*, *C. vitis*, *C. woodfordis*, *C. trichodesmae* and *C. terminaliae* sp. nov.

Morphological details	<i>C. alangii</i>	<i>C. vitis</i>	<i>C. woodfordis</i>	<i>C. trichodesmae</i>	<i>C. terminaliae</i> sp. nov.
Admedian lines on prodorsal shield	Generally not well defined (or broken)	Generally not well defined (or broken)	Generally not well defined (or broken)	Generally not well defined (or broken)	Admedian lines are complete
Region between admedian lines	With many short lines	With many short lines	With many short lines	With many short lines	With a short median line
Distance between tubercles of <i>sc</i> setae	16 (15–17)	9 (9–11)	16 (15–16)	19 (15–19)	12 (12–13)
Setae <i>sc</i> length	14 (13–14)	16–18	15 (14–16)	14 (14–18)	18 (18–19)
Setae <i>1b</i> length	7–8	5–6	6–7	6–7	8 (8–9)
Setae <i>1a</i> length	13–14	9–11	12–13	12–13	15 (14–15)
Setae <i>2a</i> length	24–27	28–29	23–26	24–26	28 (28–29)
Setae <i>c2</i> length	16–19	17–21	16–20	10 (9–10)	19 (18–19)
Setae <i>d</i> length	42–44	40–46	12–13	14 (13–14)	37 (37–38)
Setae <i>e</i> length	34–38	38–60	21–22	20 (20–22)	37 (37–38)
Setae <i>f</i> length	14–17	18–19	11–12	9 (9–11)	18 (17–18)
Setae <i>h2</i> length	41–44	38–44	44–45	47 (37–46)	43 (43–44)
Setae <i>3a</i> length	7–8	8–9	7–9	8–9	9 (8–9)
Shape of microtubercles	Rounded	Rounded	Elliptical or elongate	Rounded	Elliptical or elongate
Number of opisthosomal annuli	55–56	76–89	52 (52–55)	56 (52–58)	57–58
Surface of Coxae I	With dotted lines	With dotted lines	With dotted lines	smooth	Smooth
Scorings Epigynum	14 Longitudinal scorings 14–17) not arranged in two transverse	12 longitudinal scorings (12–13) arranged in two transverse rows	14 longitudinal scorings (14–15) of unequal length, not in two	14 longitudinal scorings (14–16) of unequal length, not in two	11 longitudinal scorings (10–11) arranged in two transverse rows
Number of empodial rays	5–6	5–6	6	4	4
Length and breadth of epigynum	12–13 long and 18–20 wide	8–9 long and 18–20 wide	13 (14–15) long and 19–20 wide	14 (10–18) long and 20 (18–20)	9 (9–10) long and 18 (18–19) wide
Host Plants Names	<i>Alangium salviifolium</i> Wangerin (family)	<i>Vitis vinifera</i> Linn. (family Vitaceae)	<i>Woodfordia floribunda</i> Salisb. (family Lythraceae)	<i>Trichodesma khasianum</i> Clarke (family Boraginaceae)	<i>Terminalia crenulata</i> (Heyne) (family Combretaceae)

Leg II – 30 (29–30) long; femur 8 (8–9) long, with basiventral femoral seta *bv* 7 (6–7); genu 4 (3–4) with antaxial genual seta *l''* 7 (6–7), tibia 4 (3–4), without paraxial tibial seta *l'*; tarsus 5 (4–5) long, paraxial fastigial tarsal setae *ft'* 4 (3–4), antaxial fastigial tarsal seta *ft''* 16 (15–16), paraxial unguinal tarsal seta *u'* 2 (1–2), tarsal solenidion ω curved slightly knobbed 6 (6–7); 4-rayed tarsal empodium *em* 5 (4–5).

Coxae I – 13 (13–14) and contiguous basally; coxal surface smooth; *Ib* tubercles with seta present at the anterior margin of the coxa and seta *Ib* 8 (8–9); *Ia* tubercles with seta present above the line across the *2a* tubercles; seta *Ia* 15 (14–15).

Coxae II – Smooth except one curved line in each just below the *2a* tubercles and 10 (10–11), seta *2a* 28 (28–29) long.

Opisthosoma – With equal number of microtuberculated dorsal and ventral semiannuli 57 (57–58); large sized microtubercles elliptical in shape, located on annuli anterior margin; last 5 ventral annuli have micro striation, seta *c2* 19 (18–19) on annulus 7 (7–8), seta *d* 37 (37–38) on annulus 18 (17–18); seta *e* 37 (37–38) on annulus 31 (31–32); seta *f* 18 (17–18) on annulus 51 (50–51); seta *hl* absent, seta *h2* 43 (43–44).

Epigynum – 9 (9–10), 19 (18–19) wide and appressed to the coxae, 11 (10–11) longitudinal lines in 2 tiers; seta *3a* 9 (8–9).

Male – Not observed.

Type Material

Holotype – Female (marked with a red label) on slide (no.1442/86/2019), India: West Bengal: Malda, Mongalbari, Latitude: 24° 50' 47" N and Longitude: 87° 55' 48" E, 24. xii. 2019 from *Terminalia crenulata* (Heyne) (Combretaceae), Coll. S. Sarkar. Paratypes – 6 females on slide bearing holotype and 24 females on 4 slides (nos. 1443–1446/86/2019); collection data same as in holotype.

Differential diagnosis

So far 27 species are known under this genus including three from West Bengal, India (Amrine *et al.* 2003, Chandrapatya *et al.* 2014). The new species closely resembles *Colomerus alangii*, and *C. vitis*, *C. woodfordis*, and *C. trichodesmae* in some morphological traits but can be distinguished from them by its unique morphological features (Table 1).

The new species clearly differs from all other closely related species in having complete admedian lines in prodorsal shield and a short median line between two admedian lines. In other species of *Colomerus*, the region between admedian lines in prodorsal shield shows numerous broken lines. The distance between tubercles of *sc* setae is 12–13 apart in new species whereas it is 16–19 apart in other 3 species of *Colomerus* taken into consideration except *C. vitis*. In *C. vitis* tubercles of *sc* setae is 9–11 apart which is less than that of the new species. The new species also differs from *C. vitis*, *C. alangii* and *C. trichodesmae* in having elliptical or elongate microtuberles as all of the others have rounded microtubercles. Length of epigynum is 9 (9–10) in the new species but in other 3 species except *C. vitis* length of epigynum is greater and varies from 12–18. In *C. vitis* it is 8–9 long. On the basis of number of longitudinal scorings on epigynum, the new species differs from others as it has 11 scorings in two rows on its epigynum whereas other species have greater number of scorings (14–16) on their epigynum. The new species and *C. vitis* show resemblance in the arrangement of longitudinal scorings in two distinct rows on epigynum whereas in other species of *Colomerus* these longitudinal scorings are not arranged in two distinct rows. The surface pattern of coxae I is smooth in *C. trichodesmae* and in the new species but in other species, surface of coxae I is with fine dotted lines. Halawa *et al.* (2015) emphasized on the number of rays on tarsal empodium to classify the species of *Colomerus* on grape vine as he found this character was more or less fixed character (5–6 rays), but the new species has 4-rayed tarsal empodium. *Colomerus trichodesmae* also has 4-rayed tarsal empodium. In new species the length of seta *d* and seta *e* are of equal length whereas in other species they are unequal in length. The length of seta *sc* of new species is slightly longer than that of

other species. Seta *Ib* and *Ia* of the new species are longer than that of *C. vitis*, *C. trichodesmae* and *C. woodfordis*, and almost equal to that of *C. alangii*. But at the same time, it differs from *C. alangii* in having slightly longer seta *2a*. The host plant of the new species and its relation to the host is different from that of other closely related species. The damage symptoms produced to host plant by the new species is also different from that of other closely related species. The new species produces leaf rolling at leaf margin whereas *C. vitis* produces erineum on leaf, *C. alangii* produces yellowish green pouch gall on leaf, *C. trichodesmae* produces bead galls on both surfaces of the leaves and *C. woodfordis* produces 'crowded buds'. As the eriophyoid mites are highly host specific (Skoracka *et al.* 2010), the host plant specificity may be regarded as an important diagnostic tool for differential diagnosis of the species discussed here.

Relation to host

Mites are found along the leaf rolling at the edges. The mite produces deformities in the tender and matured leaves of the host plant. Leaves eventually become pale and fall off.

Etymology

The specific epithet is derived from '*Terminalia*' genus of the host plant.

Remarks

Colomerus terminaliae **sp. nov.** is new to Science and 28th species within the genus *Colomerus*. This new mite belongs to the Class Acari of the Family Eriophyidae and is a potential pest of the economically important plant *Terminalia crenulata* commonly known as crocodile bark tree. This tiny plant feeder sucks nutrients from this plant and leaves become dry and pale. The dry leaves fall off eventually.

A point of interest of these mites, potentially much more serious than direct losses to agriculture and forestry, is that a few species are known to be vectors of certain viral diseases of different crop plants (Slykhuis 1960). The transmission of 21 pathogens by 13 species of phytophagous mites to at least 34 plants has been reported in the literature (Stephan *et al.* 2008). Most mite species that are known to vector plant pathogens are in the Eriophyidae. As a result of their tiny size and very short stylets they feed only the epidermal cells of their plant hosts where they may acquire and transmit disease agents to these plant cells (Jones 1999). The basic necessity for the proper control or eradication of any harmful organism is to know its systematics as well as its degrees of damages inflicted on the host. In this regard, the eriophyoid mites are needed to understand in greater details particularly in India as the study of Indian eriophyoid is still at infant stage and most of the works are sparse and mainly on taxonomy. Therefore, it requires exploring the eriophyoid fauna through faunistic surveys all over the country on zonal basis and subsequently the relevant biology, ecology etc. of these economically important species.

ACKNOWLEDGEMENT

The author is thankful to professor Samiran Chakrabarti, retired Professor of Kalyani University, West Bengal, India for his academic guidance and help during this study.

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گونه جدیدی از کنه اریوفیوئید (Acari: Eriophyoidea) آلوده کننده *Terminalia crenulata* (Heyne) از منطقه نیمه هیمالیایی هند

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چکیده

در زیررده کنه‌ها، کنه‌های اریوفیوئید به عنوان آفات مهم در نظر گرفته می‌شوند، زیرا هنگام تغذیه از گیاهان علایم خسارت مختلفی را ایجاد می‌کنند. طی بررسی‌های کلی برای کنه‌های اریوفیوئید مونگالباری، مالدا، بنگال غربی، هند، یک گونه جدید *Colomerus terminaliae* از خانواده Eriophyidae در امتداد پیچش حاشیه برگ *Terminalia crenulata* (Heyne) (Combretaceae) یافت شد. این گونه کنه گیاهخوار جدید از نمونه‌های جمع‌آوری شده در منطقه مورد مطالعه حاضر توصیف و ترسیم شده است. گونه جدید با دیگر گونه‌های نزدیک مقایسه شد و تشخیص افتراقی نیز در اینجا ارائه شده است. پس از تشخیص درست، مشخص شد که گونه جدید به جنس *Colomerus* Newkirk & Keifer, 1971 تعلق دارد. این گونه جدید از نظر ریخت‌شناسی از دیگر گونه‌های موجود این جنس متمایز می‌شود و در لبه‌های برگ‌ها پیچش ایجاد می‌کند و باعث آسیب به این درخت مهم اقتصادی می‌شود. برای کنترل مناسب کنه آفت، مطالعه آرایه‌شناختی این کنه و ارتباط آن با گیاه میزبان ضروری است.

واژگان کلیدی: *Colomerus*; Combretaceae; Eriophyidae; گونه جدید؛ آرایه‌شناسی.

اطلاعات مقاله: تاریخ دریافت: ۱۴۰۱/۱/۳، تاریخ پذیرش: ۱۴۰۱/۲/۱، تاریخ چاپ: ۱۴۰۱/۴/۲۴