



## First report of six predatory mites (Acari: Phytoseiidae) from the central Indian state of Chhattisgarh

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**ABSTRACT:** Occurrence of phytoseiid mites, viz, *Euseius delhiensis*, *Neoseiulus fallacis*, *Phytoseius kapuri*, *Typhlodromips syzygii* and two new species of *Amblyseiulella* and *Neoseiulella* is reported for the first time from the central Indian state of Chhattisgarh.

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**KEY WORDS:** First report, phytoseiid mites, Chhattisgarh, India, vegetables

### INTRODUCTION

Predatory mites have already gained acceptance among farmers worldwide as natural enemies that provide effective pest control in greenhouses and open fields. They are now commercially viable because of the range of crops on which they are used as a biocontrol option for phytophagous mites and small sucking insects like thrips and whiteflies. Predatory mites of Phytoseiidae are more valuable as they in general inhabit plants and offer sustainable control of pest mites. Till date 2,735 species of phytoseiids have been described from around the world, out of which, more than 210 species are found in India (Demite *et al.*, 2014, 2016; Gupta and Karmakar, 2015). Phytoseiid fauna of most of the Indian states have already been explored (Gupta, 1986, 2003), except some regions like the central Indian state of Chhattisgarh, which is the tenth-largest state with predominant agricultural background. The present paper reports on the phytoseiid mites collected from the plains of Chhattisgarh.

### MATERIALS AND METHODS

A roving survey was conducted for predatory mites in Purena of Raipur district (21°13'52"N; 81°42'44"E) and Abhanpur of Dhamtari district (21°03'57"N; 81°45'11"E) in Chhattisgarh. The samples collected from various vegetable crops, cotton and tapioca were examined under a stereozoom microscope (Nikon SMZ800) and mites were picked up with a fine camelhair brush moistened with 70–80% ethyl alcohol. In some cases, mites were washed from plant parts or shaken directly into jars filled with alcohol or water to which a surfactant had been added (Zacharda *et al.*, 1998).

Mites were killed and fixed with freshly prepared 70–80% ethyl alcohol and mounted individually in Hoyer's medium on standard microscope slides. Slides were then kept on a hot plate at 40–45°C for 72 hours for clearing of specimens and drying of medium. Occasionally, slides were kept under a table lamp or in an oven for drying of medium for 2

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days. Dried slides were ringed with transparent nail polish. Cleared specimens were identified with the help of published keys and relevant literature (Gupta, 1986, & 2003) following the classification of Chant and McMurtry (2007). Measurements (in  $\mu\text{m}$ ) were taken under a compound microscope (Leica DM1000) at 400 $\times$  for comparisons with original descriptions. All the slides are available in the Mite Repository of ICAR–National Bureau of Agricultural Insect Resources, Bengaluru, India.

## RESULTS AND DISCUSSION

### *Euseius delhiensis* (Narayanan & Kaur)

*Typhlodromus* (*Amblyseius*) *delhiensis* Narayanan & Kaur, 1960, *Proc. Indian Acad. Sci.*, 51: 5–7.

*Euseius delhiensis*, Chant & Baker, 2007: 120.

*Euseius delhiensis*, Gupta & Karmakar, 2015: 59.

Measurements: Dorsal shield smooth, 328 long, 213 wide, with 17 pairs of setae;  $j_1$ –30–33,  $j_3$ –35–40,  $j_4$ –13–15,  $j_5$ –15–18,  $j_6$ –23–25,  $J_2$ –23–25,  $J_5$ –4–5,  $z_2$ –27–30,  $z_4$ –40–43,  $z_5$ –13–15,  $Z_4$ –25–28,  $Z_5$ –60–63,  $s_4$ –55–58,  $S_2$ –25–28,  $S_4$ –23–25,  $S_5$ –28–33,  $r_3$ –18–20,  $R_1$ –13–15; sternal shield 73, longer than broad, with three pairs of setae; genital shield 88 wide with a pair of setae; ventrianal shield 95 long, 70 wide, with a pair of crescent-shaped preanal pores and three pairs of preanal setae arranged in two transverse curved rows; a pair of metapodal plates present, primary one 25, secondary one smaller; fixed digit of chelicera with three apical teeth, movable digit with one tooth; macrosetae on leg IV: genu–53–55, tibia–40–45, basitarsus–73–75.

Leg chaetotactic formulae: Genu II 2, 2/0, 2/0, 1; genu III 1, 2/1, 2/0, 1; tibia II 1, 1/1, 2/1, 1; tibia III 1, 1/1, 2/1, 1.

Remarks: This was earlier unknown from Chhattisgarh.

Distribution in India: Delhi, Kerala, Odisha, Punjab, Tamil Nadu, Uttar Pradesh, West Bengal and Chhattisgarh (new report).

### *Neoseiulus fallacis* (Garman)

*Iphidulus fallacis* Garman, 1948, *Bull. Conn. Agr. Expt. Sta.*, 520: 13.

*Neoseiulus fallacis*, Chant & McMurtry, 2007: 24.

*Neoseiulus fallacis*, Gupta & Karmakar, 2015: 53.

Measurements: Dorsal shield–378 long, 193 wide;  $j_1$ –30,  $j_3$ –50,  $j_4$ –28,  $j_5$ –38,  $j_6$ –43,  $J_2$ –53,  $J_5$ –13,  $z_2$ –45,  $z_4$ –50,  $z_5$ –28,  $Z_1$ –48,  $Z_4$ –66,  $Z_5$ –75,  $s_4$ –60,  $S_2$ –58,  $S_4$ –55,  $S_5$ –45,  $r_3$ –50,  $R_1$ –48; sternal shield 80 long, 82 wide; genital shield 72 long; ventrianal shield 128 long, 103 wide, with three pairs of preanal setae and a pair of crescent-shaped preanal pores; metasternal plate 15 long; two pairs of metapodal plates present, primary one 30 long; macrosetae on leg IV: genu–18, tibia–30, basitarsus–60; fixed digit of chelicera multidentate with *pilus dentilis* and movable digit with one tooth.

Leg chaetotactic formulae: Genu II 2, 2/0, 2/0, 1; genu III 1, 1/1, 2/1, 1; tibia II 1, 2/1, 1/1, 1; tibia III 1, 1/1, 2/1, 1.

Remarks: The measurements taken in the present study are similar to those given by Gupta (2003). This species was unknown from Chhattisgarh.

Distribution in India: Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Bihar, Haryana, Himachal Pradesh, Madhya Pradesh, Meghalaya, Punjab, Tamil Nadu, Tripura, West Bengal and Chhattisgarh (new report).

### *Phytoseius kapuri* Gupta

*Phytoseius* (*Phytoseius*) *kapuri* Gupta, 1969, *Israel J. agric. Res.*, 19(3): 115–117.

*Phytoseius kapuri*, Chant & McMurtry, 2007: 129.

*Phytoseius kapuri*, Gupta & Karmakar, 2015: 60.

Measurements: Dorsal shield 265 long, 135 wide;  $j_1$ –25–28,  $j_3$ –70–73,  $j_4$ –4–5,  $j_5$ –4–5,  $j_6$ –4–5,  $J_2$ –10–13,  $J_5$ –4–5,  $z_2$ –10–13,  $z_4$ –8–10,  $z_5$ –3–5,  $Z_4$ –75–78,  $Z_5$ –80–85,  $s_4$ –105–110,  $s_6$ –90–93,  $r_3$ –45–48,  $R_1$ –15–20; sternal shield wider (85) than long (80) with three pairs of sternal setae; genital shield 75 wide, 48 long; ventrianal shield 88 long, 56 wide, with three pairs of preanal setae and length of  $JV_4$ –53–

55; spermatheca bell-shaped; macrosetae on leg IV: genu-28, tibia-33, basitarsus-28.

Leg chaetotactic formulae: Genu II 2, 2/0, 2/0, 1; genu III 1, 2/0, 2/0, 1; tibia II 1, 1/1, 2/1, 1; tibia III 1, 1/1, 2/1, 1.

Remarks: Most measurements of the specimens collected are similar to those reported by Gupta (2003) from different states of India. This species was unknown from Chhattisgarh.

Distribution in India: Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Bihar, Gujarat, Jammu and Kashmir, Kerala, Madhya Pradesh, Meghalaya, Odisha, Puducherry, Punjab, Rajasthan, Tamil Nadu, Uttar Pradesh, West Bengal and Chhattisgarh (new report).

#### ***Typhlodromips syzygii* Gupta**

*Amblyseius syzygii* Gupta, *Int. J. Acarol.*, 1(2): 44-45.

*Typhlodromips syzygii*, Chant & Baker, 2007: 63.

*Typhlodromips syzygii*, Gupta & Karmakar, 2015: 55.

Measurements: Dorsal shield 338 long, 230 wide;  $j_1-15$ ,  $j_3-23$ ,  $j_4-10$ ,  $j_5-10$ ,  $j_6-13$ ,  $J_2-13$ ,  $J_5-8$ ,  $z_2-13$ ,  $z_4-13$ ,  $z_5-10$ ,  $Z_1-13$ ,  $Z_4-38$ ,  $Z_5-68$ ,  $s_4-25$ ,  $S_2-13$ ,  $S_4-8$ ,  $S_5-8$ ,  $r_3-15$ ,  $R_1-13$ ; sternal shield 68 long, 85 wide, with three pairs of setae; metasternal plate with setae conspicuous, 13 long, 8 wide; genital shield 83 wide; ventrianal shield vase-shaped, with lateral margins concave, 113 long, 73 wide, with three pairs of preanal setae and a pair of crescent-shaped preanal pores, four pairs of setae present around ventrianal shield,  $JV_5-30-35$  long; a pair of metapodal plates present, primary one 20 long, longer than secondary one; fixed digit of chelicera with three teeth anterior to *pilus dentilis*, three teeth posterior to it, movable digit also with three teeth; macrosetae on genu I-23, genu II-25, genu III-30, genu IV-38, tibia IV-33, basitarsus IV-40.

Leg chaetotactic formulae: Genu II 2, 2/0, 2/0, 1; genu III 1, 2/1, 2/0, 1; tibia II 1, 1/1, 2/1, 1; tibia III 1, 1/1, 2/1, 1.

Remarks: Earlier this species was unknown from Chhattisgarh.

Distribution in India: Bihar, Odisha, Tripura, Uttar Pradesh, West Bengal and Chhattisgarh (new record).

#### ***Amblyseiulella* sp.**

Measurements: Dorsal shield 300 long and 158 wide;  $j_1-36-38$ ,  $j_3-85-90$ ,  $z_2-20-25$ ,  $z_4-30-38$ ,  $Z_4-68-72$ ,  $Z_5-90-95$ ,  $s_4-125-128$ ,  $r_3-45-50$ ,  $R_1-20-22$ ; sternal shield weakly sclerotized, 78-83 long, 70-73 wide with three pairs of sternal setae; metasternal plates 12-13; genital shield wider (98) than ventrianal shield, with a pair of setae; ventrianal shield smooth, 90 long, 62 wide, with three pairs of preanal setae,  $JV_5-62-65$ ; a pair of metapodal plates present, primary one 32-35 long; fixed digit multidentate, movable digit with 3 teeth; macrosetae on leg IV: genu-23-25, tibia-33-35, basitarsus-41-43, distitarsus-33-35; genu I and II also having one knobbed macroseta each.

Leg chaetotactic formulae: Genu II 2, 2/0, 2/0, 1; genu III 1, 2/1, 2/0, 1; tibia II 1, 1/1, 2/1, 1; tibia III 1, 1/1, 2/1, 1.

Remarks: Earlier no species of this genus was known from Chhattisgarh. This does not tally with any of the known species of *Amblyseiulella* and therefore is likely to be new to be described elsewhere.

Distribution in India: Arunachal Pradesh and Chhattisgarh (new report).

#### ***Neoseiulella* sp.**

Measurements: Dorsal shield lightly sclerotised and reticulated with 375 long, 245 wide;  $j_1-28$ ,  $j_3-40$ ,  $j_4-35$ ,  $j_5-33$ ,  $j_6-38$ ,  $J_2-50$ ,  $J_5-8$ ,  $z_2-25$ ,  $z_4-45$ ,  $z_5-33$ ,  $Z_1-55$ ,  $Z_4-53$ ,  $Z_5-65$ ,  $s_4-50$ ,  $S_2-60$ ,  $S_4-55$ ,  $S_5-10$ ,  $r_3-43$ ,  $R_1-45$ ; sternal shield longer 100 than wide 90, with three pairs of sternal setae; metasternal plate 13 long, 7 wide with a seta; genital shield 83 long, 90 wide; ventrianal shield bullet-shaped, 133 long, 88 wide, along with three pairs of preanal setae; two pairs of metapodal plates present, primary one 48 long, secondary one small;

macrosetae on leg IV: genu–20, tibia–27, basitarsus–45.

Leg chaetotactic formulae: Genu II 2, 2/1, 2/0, 1; genu III 1, 2/1, 2/0, 0.

Remarks: This species is close to *Neoseiulella transitans* (Gupta) but significantly differs in the dorsal chaetotaxy. This species is under further investigation and will be described as new only after its confirmation of novelty.

Distribution in India: New Delhi, Jammu and Kashmir, West Bengal and Chhattisgarh (new report).

Most predatory mites in India remain unreported and underexploited. The plant mites of Chhattisgarh in general and predatory phytoseiid mites in particular are almost totally unexplored though this state is one of the largest in India and is rich with biodiversity as well as with agricultural products. For example, there has only been one report from Chhattisgarh of a predatory mite (*Euseius* sp.) observed during insecticide trials (Sarathi, 2011) on *Jatropha curcas* L. in Raipur. In the present limited study, *Euseius delhiensis* and *Phytoseius kapuri* were abundantly found on cotton (*Gossypium hirsutum* L.) and eggplant (*Solanum melongena* L.), respectively. The occurrence of other mites on vegetables was casual in nature, the presence of *N. fallacis* on tapioca (*Manihot esculenta* Crantz) in Abhanpur and *T. syzygii* on cluster bean [*Cyamopsis tetragonobola* (L.) Taub.] in Purena was noteworthy. The undescribed *Amblyseiulella* and *Neoseiulella* species were found on pumpkin (*Cucurbita pepo* L.) and cluster bean, respectively. The present study highlights the abundance of mites on vegetable crops which need to be explored and documented to enrich the mite faunal wealth of Chhattisgarh. This study has given us only an indication of the large diversity of unidentified predatory mites in the central parts of India. It was a good indication of biological control, in which predatory mites found abundantly on vegetables, one of the most vulnerable crops for mite pests. Interestingly, *P. kapuri* and *N. fallacis* were earlier

reported (Gupta, 1986, 2003) from undivided Madhya Pradesh, the parent state of Chhattisgarh.

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