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Two New Species of *Amblyseius* (ACARI: Phytoseiidae) from Kerala, India

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ABSTRACT: This study was conducted to find out the acarine natural enemies of phytophagous mites on vegetable crops in various localities of North Kerala. A total of 29 species of plant samples were examined during the period of study, 66 species of predatory mites were collected. Two new species of *Amblyseius viz.*, *Amblyseius amithae* sp. nov. and *Amblyseius sachini* sp.nov. are described with illustrations.

Keywords: Acari, Predatory mite, Phytoseiidae, *Amblyseius*, New species, Kerala.

INTRODUCTION

During recent years mites are increasingly becoming serious pests of horticultural crops including ornamental and medicinal plants. Many of the mite species were assumed major pest status because of the elimination of natural enemies caused by the indiscriminate application of pesticides (Subhasree *et al*., 2015). Predatory mites are the promising bio control agents of phytophagous mites.

Predatory mites of the family Phytoseiidae has been generally considered to be the most promising group of predators of pest mites on different crops (Gerson *et al*., 2003) and other small arthropods. They feed upon injurious plant feeding mites of the families Tetranychidae, Tenuipalpidae and Eriophyidae (Tuttle and Muma, 2003). Several biological and ecological studies have shown that mites of this family are potentially important as biotic factors in the natural or biological control of injurious plant feeding mites. According to Beaulieu *et al*. (2011) about 2,300 species of phytoseiids belonging to over 90 genera were identified from different parts of the world.

Amblyseius is one of the largest genus belonging to the family Phytoseiidae. Many members of this genus feed on other pest mites and even thrips. Several species are popular as biological control against pest mites (Moreas, 2005). Genus *Amblyseius* was erected by Berlese in 1914, with *Zercon obtusus* Koch as its type species. It was earlier reported as a subgenus but Chant (1959) gave the genus status.

The reports on occurrence of new species of predatory mites are scanty from peninsular India. Hence a systematic survey was undertaken to unravel the occurrence of new species of predatory mites from various districts of Kerala.

MATERIALS AND METHODS

Vegetable crops cultivated in various localities of North Kerala were sampled for the collection of predatory mites over two years (April 2015- May 2017). The pest affected plant parts were taken to the laboratory in separate polythene covers and screened under a stereozoom microscope (MS13/ MS24, Magnus). The recovered predatory mites were cleared in lactic acid solution and mounted in Hoyer's medium permanently and slide mounted specimens were examined under a phase-contrast microscope (CX31, Olympus) for detailed systematic studies. Measurements were taken with micrometers and illustrations were made using a camera lucida attached with CX31 olympus microscope.

Identification was carried out according to Chant and McMurtry (2007). The terminology used in this study follows that of Rowell *et al*. (1978) and Chant and Yoshida-Shaul (1991) for dorsal and ventral chaetotaxy respectively. All measurements are given in micrometers (µm). All the type specimens were kept in the acarological collections maintained at the P. G. & Research Department of Zoology, Malabar Christian College, Calicut, which will be later transferred to Zoological survey of India, Calicut, Kerala.

RESULTS AND DISCUSSION

The genus *Amblyseius* is diagnosed by having a slightly sclerotized dorsal shield, ventrianal shield of female with variety of shapes, chelicerae with many teeth, leg I, II, III with macrosetae, spermatheca highly variable in form, seta s_4, Z_4 and Z_5 usually greatly elongated with a few exceptions and caudoventral setae ZV_3 unstable and absent on a number of species.

1. *Amblyseius amithae* sp. nov (Fig. 1.)

Female: Dorsal shield smooth, 350 long, 310 wide with 17 pairs of setae. Measurements of setae: j_1 - 35, j_3 - 50, s_4 - 100, Z_4 - 130, Z_5 – 300, all other setae minute or small. Sternal shield length and width is equal- 70 long with 3 pairs of sternal setae ST_1-25, ST_2-30 and ST_3-21. Metasternal shield with setae ST_4 - 21 long. Genital shield 90 wide with a pair of setae ST_5 - 20 long. Ventrianal shield 110 long, 90 wide, with 3 pairs of preanal setae and a pair of elliptical preanal pores little below the level of third pair of preanal setae. Four pairs of setae present around the ventrianal shield. ZV_1, ZV_2, ZV_3 -10 each, JV_1-11, JV_2-12, JV_4-11 and JV_5 - 85 long, smooth. Two pairs of metapodal plates present, primary one 20 and accessory one 10 long. Fixed digit of chelicera with 5 teeth anterior to *pilus dentilis* and 4 teeth posterior to it; movable digit with 4 teeth. Peritreme extends anteriorly up to j_1 and curves down. Cervix of spermatheca is short 13 long, tubular-fundibular with differentiated atrium. Macrosetae on leg IV: genu - 107, tibia – 65 and basitarsus - 62.

Leg chaetotaxy:

genu II	1	1	1,
	1	2	
genu III	2	1	1,
	1	1	
tibia II	2	2	1;
	1	1	
tibia III	1	2	1
	1	1	

Male: Unknown

Habitat: *Amaranthus dubius* Mart.ex Thell.

Material examined: Holotype ♀ marked on the slide, INDIA: KERALA: Kavumvattam (Kozhikode district), 24.x.2015, ex. *A. dubius*, coll. Rahul (No.A 136). Paratype 4♀♀ from the habitat mentioned above (No. A 136/1, 136/2, 136/3, 136/4).

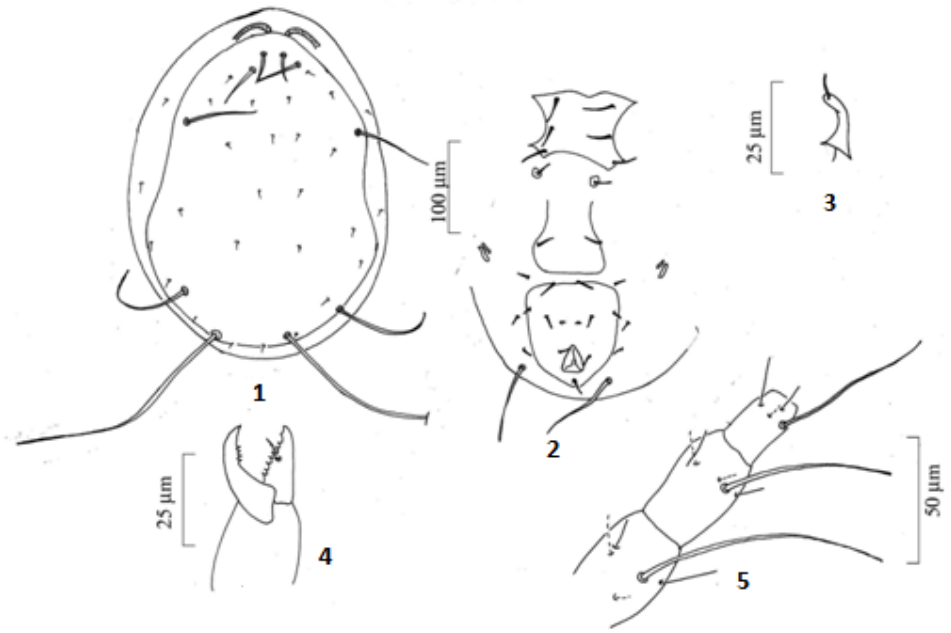

Fig. 1. Adult female of *Amblyseius amithae* sp. Nov. (1. Dorsal view of female, 2. Ventral view of female, 3. Spermatheca, 4. Chelicera of female, 5. Leg IV showing setation).

Remarks: This new species resembles *Amblyseius channabasavannai* Gupta and Daniel, 1978 in the dorsal chaetotaxy, shape of ventrianal shield, position of peritreme etc., but differs from it by the following characters.

1. Dorsal shield is wider (310) in the new species than *A. channabasavannai* Gupta and Daniel (210-230).
2. Setae j_1 (35), s_4 (100) and Z_5 (300) are longer in the new species but it is 28, 82 and 250 respectively in *A. channabasavannai*.
3. Fixed digit of chelicerae with 5 teeth anterior to *pilus dentilis* in the new species instead of 4 in *A. channabasavannai*.
4. Cervix of spermatheca is short (13) with differentiated atrium in the new species while it is long (32) with undifferentiated atrium in *A. channabasavannai*. 4. Longest nature of setae JV_5 (85 long) in the new species when compared to *A. channabasavannai* (67-72).
5. Length of macrosetae present on leg IV basitarsus 62 long in the new species while it is only 45 in *A. channabasavannai*.

This new species also resembles *Amblyseius chilcotti* Chant, 1971 having similar structure of spermatheca, shape of ventrianal shield etc., but differs from it by the following characters.

1. Dorsal shield is smaller in the new species (350 long) when compared with *A. chilcotti* Chant (384).
2. The length of setae Z_5 300 in the new species but it is only 165 in *A. chilcotti*.
3. Fixed digit of chelicera with a strong *pilus dentilis* in the new species whereas it is absent in *A. chilcotti*.
4. Number of teeth on the movable digit of chelicera is 4 in the new species instead of 2-3 in *A. chilcotti*.
5. Differences exists in the relative length of macrosetae present on leg IV, genu - 107, tibia – 65 and basitarsus – 62 in the new species but it is 97,85 and 78 respectively in *A. chilcotti* Chant.

Etymology: This species is named in honour of Prof. Amitha, teacher of the first author.

2. *Amblyseius sachini* sp.nov (Fig. 2.)

Female: Dorsal shield smooth, 275 long, 190 wide with 17 pairs of setae, mostly small except j_1, j_3, s_4, Z_4 and Z_5 being long measuring 25, 65, 75, 100 and 200 respectively. Sternal shield smooth, 63 long, 66 wide with 3 pairs of sternal setae ST_1, ST_2 and ST_3 – 20 each. Metasternal shield conspicuous with setae ST_4 - 21 long. Genital shield 63 wide with a pair of setae ST_5 - 18 long. Genital and ventrianal shield is separated by an integumental fold present in between them. Ventrianal shield 90 long, 75 wide with 3 pairs of preanal setae and a pair of elliptical pores; four pairs of setae present around ventrianal shield. ZV_1 - 10, ZV_2 - 8, ZV_3 – 10, JV_1 - 8, JV_2, JV_4 – 10 each and JV_5– 62 long, smooth. Two pairs of metapodal plates present, primary one 20 and accessory one 11 long.

Fixed digit of chelicera with 5 teeth anterior to *pilus dentilis and* 4 teeth posterior to it; movable digit with 3 teeth. Peritreme extends anteriorly up to j_1 and curves slightly inward. Cervix of spermatheca is 10 long, tubular-fundibular shaped which is gently looped with a nodular atrium. Macrosetae on leg IV: genu - 100, tibia - 62 and basitarsus - 48.

Leg chaetotaxy:

$$\text{genu II } \begin{matrix} 2 & 1 \\ 1 & 1 \\ 0 & 2 \end{matrix}, \quad \text{genu III } \begin{matrix} 1 & 2 \\ 1 & 1 \\ 0 & 1 \end{matrix}, \quad \text{tibia II } \begin{matrix} 2 & 1 \\ 1 & 1 \\ 1 & 1 \\ 0 & 2 \end{matrix}; \quad \text{tibia III } \begin{matrix} 1 & 1 \\ 1 & 1 \end{matrix}.$$

Male: Unknown.

Habitat: *Capsicum annum* Linnaeus.

Material examined: Holotype ♀ marked on the slide, INDIA: KERALA: Kadalundi (Kozhikode district), 2.xi.2015, ex. *C. annum*, coll. Rahul (No.A 163/1). Two paratype slides with two ♀♀, collection details as that of the holotype (No. A 163/2, 163/3).

Remarks: This species resembles *Amblyseius paraaerialis* Muma, 1967 but it is differentiated by the possession of the following characters.

1. Dorsal shield is shorter (275 long, 190 wide) than *A. paraaerialis* Muma, (350 long, 255 wide).
2. Differences exists in the relative length of setae like j_3, s_4, Z_4 and Z_5 which are longer in the new species but it is shorter in *A. paraaerialis*.
3. Fixed digit of chelicerae with 4 teeth posterior to *pilus dentilis* instead of 1-2 teeth in *A. paraaerialis*.
4. In the new species cervix of spermatheca is tubular – fundibular, gently looped with nodular atrium whereas in *A. paraaerialis* Muma it is short, well looped, thick walled and saccular with undifferentiated atrium.
5. Differences in the length of macrosetae on leg IV genu, tibia and basitarsus for the new species (100, 62 and 48 respectively) instead of (73, 46 and 56).
6. Presence of a clear band between genital and ventrianal shield.

Etymology: Name in honour of Dr. Sachin P James, who is the teacher of first author.

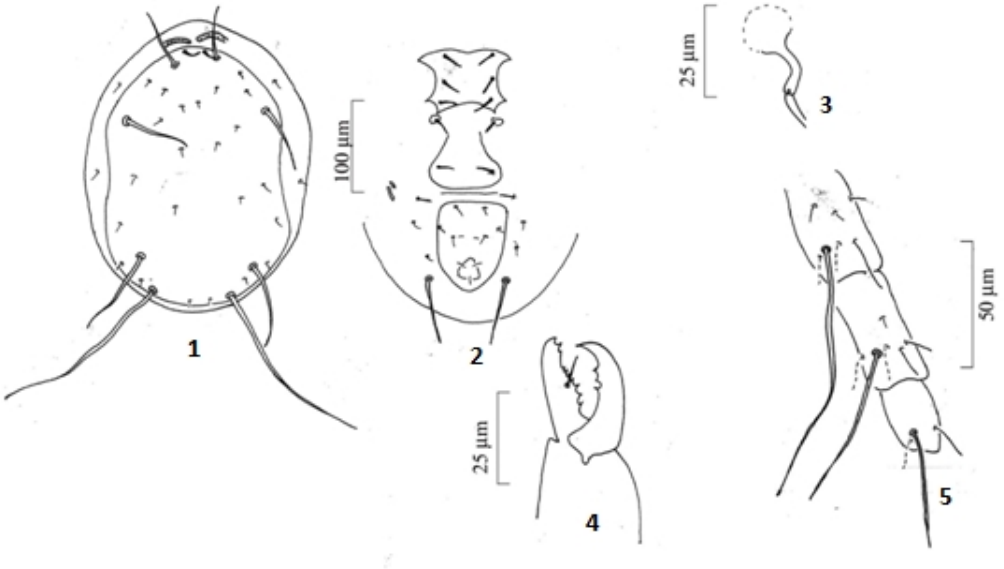

Fig. 2. Adult female of *Amblyseius sachini* sp. nov. (1. Dorsal view of female, 2. Ventral view of female, 3. Spermatheca, 4. Chelicera of female, 5. Leg IV showing setation).

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