

Predatory Mites of the Genus *Amblyseius* (Acari: Phytoseiidae) Associated with Insect Pests in South Gujarat

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Abstract— An intensive field investigation was conducted during the year 2024-25 and 2025-26 to study the diversity of predatory mites associated with major agricultural and horticultural insect pests across South Gujarat. The predatory mite family Phytoseiidae emerged as the most dominant and ecologically significant group, represented by a high diversity of species belonging to the genus *Amblyseius*. During the study period, eight species from genus *Amblyseius* were identified: *Amblyseius channabasavannai*, *A. largoensis*, *A. vasiformis*, *A. multidentatus*, *A. sacchari*, *A. gossypii*, *A. herbicolus* and *A. longispinosus*. These predatory mites were predominantly associated with soft-bodied sucking pests, particularly the whiteflies *Bemisia tabaci* and *Aleurolobus barodensis*. The study establishes a critical taxonomic and ecological baseline for deploying these native phytoseiid predators within Integrated Pest Management (IPM) frameworks.

Keywords— Diversity, Mites, South Gujarat, Predatory mite, *Amblyseius*, *Phytoseiidae*, Biological control, Whitefly, *Bemisia tabaci*, Taxonomy.

I. INTRODUCTION

The genus *Amblyseius* Berlese (Family: Phytoseiidae, Subfamily: Amblyseiinae) represents one of the most species-rich, economically vital and globally distributed groups of predatory mites used in biological pest control. Formally established by Italian entomologist Antonio Berlese in 1914, the genus comprises well over 400 recognized species. Morphologically, these microscopic arachnids are characterized by smooth, lightly sclerotized (hardened) dorsal shields, a characteristically vase-shaped or divided ventrianal shield in females and significantly elongated dorsal setae (specifically the s4, Z4 and Z5 pairs), which facilitate spatial sensing during rapid, agile movement. They possess highly adapted chelicerae with multiple specialized teeth designed to pierce the outer cuticle of soft-bodied agricultural pests, including whitefly nymphs, thrips and phytophagous spider mites (Tetranychidae). Ecologically, the vast majority of species within *Amblyseius* are classified as Type III generalist predators under the globally recognized phytoseiid lifestyle classification system developed by McMurtry et al. (2013). Unlike strict specialist predators that starve when their primary prey is depleted, Type III generalists are highly adaptable opportunists. They can effectively subsist, develop and reproduce on a broad spectrum of alternative foods, including plant pollen, honeydew, fungal spores and small non-pest micro-arthropods. This generalist feeding strategy allows *Amblyseius* populations to successfully persist within agri-horticultural ecosystems even during periods of very low target pest densities, making them exceptionally effective at suppressing pest complexes before they can reach economic injury levels. Because of their high reproductive potential, rapid developmental rates and versatile searching behaviour, several key species—such as *Amblyseius swirskii* Athias-Henriot and *Amblyseius largoensis* (Muma)—have been extensively mass-reared and integrated into global Integrated Pest Management programs as frontline, sustainable alternatives to synthetic chemical acaricides in both open-field crops and protected greenhouse environments.

II. MATERIALS AND METHODS

The field sampling and laboratory investigations were carried out at the Department of Entomology, N. M. College of Agriculture, Navsari Agricultural University, Navsari, Gujarat, India, during the research period spanning 2024-2025 and 2025-2026. Random field surveys were executed across 42 localized collection sites distributed over seven distinct districts of South Gujarat: Navsari, Surat, Bharuch, Tapi, Narmada, Valsad and The Dangs. Ecosystems surveyed included key seasonal field crops (rice, sugarcane, cotton, pulses), vegetable fields (chilli, okra, tomato) and perennial fruit orchards (mango, sapota, guava). Live insect pest specimens and their respective infested plant structures were collected directly via active handpicking, specialized insect nets and light/pheromone traps to minimize host dislodgement. Samples were secured in ventilated plastic bottles labelled accordingly and then transferred to the laboratory. To facilitate precise isolation without loss of delicate morphological features, host insects were temporarily inactivated in a refrigerator for 15 minutes. The specimens were individually scrutinized under a high-resolution stereomicroscope. Located mites were carefully segregated utilizing a fine, moistened camel hair brush and preserved in a 70 percent ethanol medium. Weakly sclerotized specimens were mounted directly onto glass slides in Hoyer's medium. The mounted slides were cured in a constant-temperature oven at 30°C for 1 to 2 weeks to ensure tissue clearing and optimal leg extension. Cured slide rings were permanently sealed with commercial nail polish to prevent atmospheric moisture infiltration. The diagnostics and generic categorizations were performed using a Phase-Contrast Research Microscope, following the specialized keys provided by Krantz and Walter (2009) and Chant and McMurtry (2007). All morphometric evaluations are detailed in micrometres.

III. RESULTS AND DISCUSSION

Members of the family Phytoseiidae under the order Mesostigmata constituted the dominant group. Several predatory mite species, namely *Amblyseius multidentatus*, *A. sacchari*, *A. gossypii*, *A. herbicolus*, *A. largoensis*, *A. longispinosus*, *A. channabasavannai*, *A. vasiformis*, *Euseius finlandicus* and *E. ovalis* were frequently associated with whiteflies and other soft-bodied insects occurring on crops. Similar observations were reported by El-Badry (1967), who demonstrated the predatory role of phytoseiid mites against whiteflies. Krantz and Walter (2009) reported that members of Mesostigmata frequently establish phoretic, predatory and parasitic associations with insects and often dominate insect-associated acarofauna due to their ecological versatility. The predominance of phytoseiid mites may be attributed to their ecological adaptability and their tendency to utilize insects either as prey or as temporary carriers for dispersal. Similar associations of phytoseiid mites with whiteflies have been reported by El-Badry (1967), Nomikou et al. (2001) and McMurtry et al. (2013), suggesting that phytoseiid mites are important natural enemies of whiteflies in different agroecosystems.

3.1 Detailed Systematic Account of Genus *Amblyseius* Species

3.1.1 *Amblyseius channabasavannai* Gupta & Daniel, 1978

Superorder: Parasitiformes

Order: Mesostigmata

Suborder: Monogynaspida

Superfamily: Phytoseioidea

Family: Phytoseiidae

Subfamily: Amblyseiinae

Genus: *Amblyseius*

Colour: Transparent white

Measurements: Length: 325-335 µm; Width: 210-215 µm

Description

Adult Female:

Dorsum: Dorsal shield smooth with 18 pairs of setae. Dorsal setae smooth and pointed; j1, j3, s4, Z4 and Z5 longer than all other equally sized setae, Z5 the longest and whip-like. Setae r3 and R1 are placed on the lateral integument.

Venter: Sternal shield with three pairs of sternal setae, st1, st2 and st3. Genital shield with one pair of setae, st5. Ventrianal shield longer than wide, widest at the level of the seta, Zv2. Ventrianal shield with three pairs of preanal setae, Jv1, Zv2 and Jv2. Peritreme extending to j1 anteriorly, stigmata placed at the level of coxa IV. Spermatheca with a tubular cervix and parallel walls.

Gnathosoma: Fixed digit of chelicerae, multidentate and movable digit with four teeth.

Legs: Macrosetae on leg IV are placed on the genu, tibia and basitarsus. Leg chaetotaxy: genu II 2, 2/0, 2/0, 1; tibia II 1, 1/1, 2/1, 1; genu III 1, 2/1, 2/0, 1; tibia III 1, 1/1, 2/1, 1.

Male: Not recovered during sampling.

Materials examined: Adult specimens of *B. tabaci* collected from Borakhadi (21°08'40" N 73°20'15" E) in Dist. Tapi.

Remarks: The specimens examined closely agree with the original description of *A. channabasavannai* given by Chant and McMurtry (2007), who recognized species of the genus *Amblyseius* by their characteristic dorsal chaetotaxy, spermathecal morphology, and leg macrosetae. The species has all the important diagnostic characters. The species was recorded in association with *B. tabaci* infesting chilli during the present study.

3.1.2 *Amblyseius largoensis* Muma, 1955

Colour: Transparent white

Measurements: Length: 370-375 µm; Width: 275-280 µm

Description

Adult Female:

Dorsum: Dorsal shield with 18 pairs of setae, of which j1, j3, s4, Z4, Z5 are longer than the other dorsal setae, j4, j5, j6, z2, z4, z5, r3, J2, Z1, R1, S4, S5, J5 are short and of the same length. Z5 is long and whip-like. The sublateral setae r3 and R1 are present on the lateral integument. Setal pattern 10A: 8B.

Venter: Sternal shield longer than wide and with three pairs of setae, st1, st2 and st3. Sternal seta st4 is located on the integument. Genital shield with one pair of setae, st5. Ventrianal shield with three pairs of preanal setae, Jv1, Jv2 and Zv2 and a pair of semilunar pores. Peritreme extending to the level of j1. Two pairs of metapodal plates are present. The cervix of the spermatheca is tubular with parallel walls.

Gnathosoma: Fixed digit of chelicerae with seven teeth, three posterior and four anterior to pilus dentilis. Movable digit of the chelicera with two teeth.

Legs: Macrosetae on genu, tibia and basitarsus of leg IV. Chaetotaxy of genu II: 2, 2/0, 2/0, 1, tibia II: 1, 1/1, 2/1, 1, genu III: 1, 2/1, 2/0, 1 and tibia III: 1, 1/1, 2/1, 1.

Male: The arrangement of setae on dorsum is very similar to that of the female. Ventrum with 5 pairs of sternal setae on the sternogenital shield.

Materials examined: The adults of *B. tabaci* collected from Vagaldhara (20°34'20"N 72°59'50" E) in Dist. Valsad.

Remarks: The specimen examined resembles *A. largoensis* reported from Florida in all features. This forms the first report of this species associated with *B. tabaci* from Gujarat. The present observations are in agreement with the descriptions provided by Chant and McMurtry (2007), who emphasized dorsal chaetotaxy, spermathecal structure, and leg macrosetae as key diagnostic characters for species of the genus *Amblyseius*. Similarly, Krantz and Walter (2009) reported that members of the family Phytoseiidae are characterized by well-developed predatory adaptations, including specialized chelicerae and distinct ventral shield structures, which were also observed in the present specimens.

3.1.3 *Amblyseius vasiformis* Moraes & Mesa, 1991

Colour: Transparent white

Measurements: Length: 410-420 µm; Width: 270-275 µm

Description

Adult Female:

Dorsum: Dorsal shield smooth with 17 pairs of setae; j1, j3, j4, j5, j6, z2, z4, z5, s4, J2, J5, Z1, Z4, Z5, S2, S4, S5 and lateral integument with two pairs of setae, r3 and R1. Setal pattern 10A:9B. All dorsal setae smooth and simple except Z4 and Z5, which appear slightly light serrated. All setae are short except j1, j3, s4, Z4 and Z5, which look longer and of variable length, Z5 being the longest. Two pairs of setae, r3 and R1, sublateral.

Venter: Sternal shield as long as wide, with three pairs of setae. One pair of sternal setae, st4 on the integument and st5 situated on the genital shield. Peritreme extends to the level of j1. Ventrianal shield vase-shaped, wider towards the anus. Ventrianal shield with three pairs of preanal setae, Jv1, Jv2, Zv2, anal setae and one pair of pores.

Gnathosoma: Chelicera with 14-15 teeth on the fixed digit and 4-5 teeth on the movable digit. The cervix of the spermatheca is funnel-shaped.

Legs: Macrosetae setaceous and seen on all the segments; SgeI, SgeII, SgeIII, SgeIV on the genu of legs I-IV; Sti III and Sti IV on tibia I & IV and StiIV on tarsus IV. Chaetotaxy of genu II: 2, 2/0, 2/0, 1 and genu III: 1, 2/1, 2/1, 1.

Male: Not recovered during sampling.

Materials examined: The adults of *B. tabaci* collected from Borakhadi (21°08'40" N 73°20'15" E) in Dist. Tapi.

Remarks: The specimens examined closely resemble *A. vasiformis* in all diagnostic characters (Moraes and Mesa, 1991). This is the first record of the species in association with *B. tabaci* infesting chilli in Gujarat.

3.1.4 *Amblyseius multidentatus* Chant, 1959

Colour: Transparent white

Measurements: Length: 350-380 µm; Width: 220-250 µm

Description

Adult Female:

Dorsum: Dorsal shield smooth and lightly sclerotized, bearing 17 pairs of dorsal setae. All dorsal setae smooth and pointed. Setae j1, j3, s4, Z4 and Z5 are longer than the remaining dorsal setae, with Z5 the longest and slightly whip-like. Sublateral setae r3 and R1 are present on the lateral integument. Dorsal shield oval and well-developed.

Venter: Sternal shield smooth, with three pairs of sternal setae (st1-st3). Seta st4 is located on the integument and st5 on the genital shield. Ventrianal shield longer than wide and bearing three pairs of preanal setae (Jv1, Jv2 and Zv2). Peritreme extending anteriorly to the level of j1. Spermatheca with a tubular cervix and distinct atrium.

Gnathosoma: Fixed digit of chelicera multidentate, bearing several teeth. Movable digit with three to four teeth. Palps well developed and typical of the genus.

Legs: Leg IV with distinct macrosetae on genu, tibia and basitarsus. Leg chaetotaxy conforms to that typical of *Amblyseius* species. Legs slender and adapted for rapid movement.

Male: Similar to female in dorsal chaetotaxy. Ventral surface with sternogenital shield bearing five pairs of setae.

Materials examined: The adults of *A. barodensis* infesting sugarcane collected from Bedchit (21°04'55" N 73°22'10" E) in Dist. Tapi.

Remarks: The specimens examined closely resemble *A. multidentatus* in all important diagnostic characters, including dorsal chaetotaxy, spermathecal structure and cheliceral dentition. The species is recognized as an important predatory mite associated with various phytophagous mites and small insect pests.

3.1.5 *Amblyseius sacchari* Berlese, 1914

Colour: Transparent white

Measurements: Length: 330-360 µm; Width: 210-240 µm

Description

Adult Female:

Dorsum: Dorsal shield smooth, oval and moderately sclerotized. Shield bearing 17 pairs of dorsal setae. Dorsal setae smooth and pointed. Setae j1, j3, s4, Z4 and Z5 are distinctly longer than the remaining dorsal setae. Seta Z5 longest among all dorsal setae. Sublateral setae r3 and R1 are present on the lateral integument.

Venter: Sternal shield with three pairs of sternal setae (st1-st3). Seta st4 is situated on the integument and seta st5 is located on the genital shield. Ventrianal shield elongate, with three pairs of preanal setae (Jv1, Jv2 and Zv2). Peritreme extending anteriorly to the level of j1. Metapodal plates distinct. Spermatheca with a tubular cervix and clearly differentiated atrium.

Gnathosoma: Fixed digit of chelicera with several teeth, movable digit bearing two to three teeth. Palpal structures are well-developed and characteristic of the genus.

Legs: Macrosetae present on genu, tibia and basitarsus of leg IV. Leg chaetotaxy typical of the genus *Amblyseius*. Legs slender and well adapted for predatory activity.

Male: Similar to female but comparatively smaller. Ventral region with fused sternogenital shield bearing five pairs of setae.

Materials examined: The adults of *A. barodensis* infesting sugarcane collected from Bedchit (21°04'55" N 73°22'10" E) Dist.: Tapi.

Remarks: The specimens examined agree well with the original description of *A. sacchari*. Diagnostic features such as dorsal chaetotaxy, ventrianal shield structure, spermathecal morphology and cheliceral dentition correspond closely with descriptions. The species is commonly encountered as a predatory mite in agricultural ecosystems.

3.1.6 *Amblyseius gossypii* Berlese, 1914

Colour: Transparent white

Measurements: Length: 340-370 µm; Width: 220-245 µm

Description

Adult Female:

Dorsum: Dorsal shield smooth, oval and moderately sclerotized. Shield bearing 17 pairs of dorsal setae. All dorsal setae smooth and pointed. Setae j1, j3, s4, Z4 and Z5 are comparatively longer than the remaining dorsal setae, with Z5 the longest. Sublateral setae r3 and R1 are present on the lateral integument. Dorsal shield without conspicuous ornamentation.

Venter: Sternal shield smooth with three pairs of sternal setae (st1-st3). Seta st4 is situated on the integument, whereas st5 is located on the genital shield. Ventrianal shield longer than wide and bearing three pairs of preanal setae (Jv1, Jv2 and Zv2). Peritreme extending anteriorly to the level of j1. Metapodal plates distinct. Spermatheca with an elongate tubular cervix.

Gnathosoma: Fixed digit of chelicera with several teeth, movable digit with three teeth. Palps well developed and typical of the genus. Pilus dentilis distinct.

Legs: Leg IV with well-developed macrosetae on genu, tibia and basitarsus. Legs slender and adapted for predatory activity. Chaetotaxy conforms to the generic pattern of *Amblyseius*.

Male: Similar to female in dorsal chaetotaxy but comparatively smaller. Ventral surface with sternogenital shield bearing five pairs of setae.

Materials examined: The adults of *B. tabaci* collected from Borakhadi (21°08'40" N 73°20'15" E) in Dist. Tapi.

Remarks: The specimens examined agree closely with the original description of *A. gossypii*. Diagnostic characters, including dorsal chaetotaxy, ventrianal shield structure, spermathecal morphology and cheliceral dentition, correspond with published descriptions. The species is recognized as a predatory mite commonly associated with crops.

3.1.7 *Amblyseius herbicolus* Chant, 1959

Colour: Transparent white

Measurements: Length: 350-390 µm; Width: 225-260 µm

Description

Adult Female:

Dorsum: Dorsal shield smooth and lightly sclerotized, bearing 17 pairs of dorsal setae. Dorsal setae are smooth, slender and pointed. Setae j1, j3, s4, Z4 and Z5 are distinctly longer than other dorsal setae. Seta Z5 longest and slightly whip-like. Sublateral setae r3 and R1 are present on the lateral integument. Setal pattern 10A:9B.

Venter: Sternal shield slightly longer than broad and bearing three pairs of sternal setae. Seta st4 is present on the integument and st5 is situated on the genital shield. Ventrianal shield elongate with three pairs of preanal setae (Jv1, Jv2 and Zv2). Peritreme extending anteriorly to the level of j1. Spermatheca with an elongate tubular cervix and a distinct atrium.

Gnathosoma: Fixed digit of chelicera multidentate with several teeth. Movable digit bearing three teeth. Palps well developed. Pilus dentilis distinct.

Legs: Macrosetae present on genu, tibia and basitarsus of leg IV. Legs slender and well-adapted for rapid movement and predatory behaviour. Chaetotaxy typical of the genus.

Male: Similar to female but smaller. Ventral surface with fused sternogenital shield and five pairs of sternal setae.

Materials examined: The adults of *B. tabaci* collected from Borakhadi (21°08'40" N 73°20'15" E) in Dist. Tapi.

Remarks: The present specimens agree closely with the original description of *A. herbiculus* provided by Chant and McMurtry (2007). Diagnostic characters such as dorsal chaetotaxy, spermathecal morphology, ventrianal shield and cheliceral dentition were consistent with published descriptions. The species is recognized as an important predator of whiteflies, thrips and phytophagous mites and therefore may contribute to the natural biological control of *B. tabaci* in chilli ecosystems.

3.1.8 *Amblyseius longispinosus* Evans, 1952

Colour: Transparent white

Measurements: Length: 360-420 µm; Width: 230-270 µm

Description

Adult Female:

Dorsum: Dorsal shield smooth, oval and lightly sclerotized. Shield bearing 17 pairs of dorsal setae. Dorsal setae smooth and pointed. Setae j1, j3, s4, Z4 and Z5 are conspicuously longer than the remaining dorsal setae. Setae Z4 and Z5 are especially elongated, giving the species its characteristic appearance. Sublateral setae r3 and R1 are present on the lateral integument. Setal pattern 10A:9B.

Venter: Sternal shield smooth with three pairs of sternal setae (st1-st3). Seta st4 is located on the integument, whereas st5 is situated on the genital shield. Ventrianal shield elongate and bearing three pairs of preanal setae (Jv1, Jv2 and Zv2). Peritreme extending anteriorly to the level of j1. Spermatheca with elongate tubular cervix and a differentiated atrium.

Gnathosoma: Fixed digit of chelicera multidentate with several teeth. Movable digit bearing three teeth. Palps well developed and typical of the genus. Pilus dentilis distinct.

Legs: Leg IV with conspicuous macrosetae on genu, tibia and basitarsus. Macrosetae long and slender. Legs adapted for active predation. Leg chaetotaxy conforms to the generic pattern of *Amblyseius*.

Male: Similar to female in general appearance but smaller. Ventral region with sternogenital shield bearing five pairs of setae.

Materials examined: The adults of *Aleurothrixus floccosus* collected from Kandolpada (21°09'15"N 73°28'30" E) in Dist. Tapi.

Remarks: The specimens examined closely resemble *A. longispinosus* in all important morphological characters. The species can be readily distinguished by the presence of long dorsal setae, particularly Z4 and Z5 and by the structure of the spermatheca and ventrianal shield. It is a widely distributed predatory mite and an important natural enemy of phytophagous mites and small insect pests.

TABLE 1
PHYTOSEIID PREDATORS ASSOCIATED WITH INSECTS OF AGRICULTURAL IMPORTANCE

S. No.	Predatory Mite Species	Host Insect Species	Primary Crop Ecosystem	Preferred Body Region	Nature of Interaction
1	<i>Amblyseius channabasavannai</i>	<i>Bemisia tabaci</i>	Chilli / Vegetables	Entire body surface	Active predatory
2	<i>Amblyseius largoensis</i>	<i>Bemisia tabaci</i>	Horticultural flora	Entire body surface	Active predatory
3	<i>Amblyseius vasiformis</i>	<i>Bemisia tabaci</i>	Chilli / Vegetables	Entire body surface	Active predatory
4	<i>Amblyseius multidentatus</i>	<i>Aleurolobus barodensis</i>	Sugarcane fields	Entire body surface	Active predatory
5	<i>Amblyseius sacchari</i>	<i>Aleurolobus barodensis</i>	Sugarcane fields	Entire body surface	Active predatory
6	<i>Amblyseius gossypii</i>	<i>Bemisia tabaci</i>	Chilli / Vegetables	Entire body surface	Active predatory
7	<i>Amblyseius herbicolus</i>	<i>Bemisia tabaci</i>	Chilli / Vegetables	Entire body surface	Active predatory
8	<i>Amblyseius longispinosus</i>	<i>Aleurothrix floccosus</i>	Citrus / Guava / Fruit trees	Entire body surface	Active predatory

IV. CONCLUSION

Eight distinct predatory species within the genus *Amblyseius* (*A. channabasavannai*, *A. largoensis*, *A. vasiformis*, *A. multidentatus*, *A. sacchari*, *A. gossypii*, *A. herbicolus*, and *A. longispinosus*) were identified and taxonomically characterized. These predatory mites demonstrate strong host preferences for economically damaging whitefly species, including *Bemisia tabaci*, *Aleurolobus barodensis* and *Aleurothrix floccosus*, across diverse cropping systems. The findings establish a critical taxonomic and ecological baseline for integrating these native phytoseiid predators into Integrated Pest Management (IPM) frameworks in South Gujarat. Future research should focus on evaluating the predatory efficiency, mass-rearing potential, and field efficacy of these species for biological control of whiteflies and other soft-bodied pests.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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