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An updated checklist of tri-trophic associations of aphidophagous species of the genera *Illeis* Mulstant and *Megalocaria* Crotch (Coccinellidae: Coleoptera) in India

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Abstract
This study provides a comprehensive account of the tri-trophic associations involving three species of the aphidophagous species of the genus *Illeis* Mulstant (*Illeis cincta* (Fabricius), *Illeis confusa* Timberlake, and *Illeis indica* Timberlake); and a single species of the genus *Megalocaria* Crotch (*Megalocaria dilatata* (Fabricius) in India. Among them, *Illeis cincta* is relatively more polyphagous, preying on 12 aphid species across 23 host plants, with 33 tri-trophic associations recorded in eight Indian states. *Illeis confusa* and *Illeis indica* show limited and region-specific aphidophagy, with 13 and 7 aphid-host plant associations respectively. *Megalocaria dilatata* was recorded to feed 26 species of aphids infesting 21 plant species with 37 tri-trophic associations across 11 states and union territories, mostly in Manipur state. A comprehensive survey approach is necessary to catalogue these aphidophagous ladybird predators in those unexplored states and union territories because, in fact, no attempts have been made to document their tritrophic interactions in those parts of India.

Keywords: Aphid, biological control, checklist, ladybirds, distribution, predator, tri-trophic associations

Introduction

Aphidophagous ladybird beetles, belonging to the family Coccinellidae (Coleoptera: Insecta), play a vital role in the ecological regulation of aphid populations across a wide range of agroecosystems and natural habitats [12]. Their significance lies in their function as effective biological control agents, contributing to sustainable pest management in agricultural and horticultural systems. These beetles are voracious predators, capable of consuming large numbers of aphids throughout their larval and adult stages, thereby helping to suppress aphid outbreaks that can otherwise lead to significant crop damage and yield loss [18]. In addition to their direct role in pest suppression, aphidophagous ladybirds reduce the reliance on chemical pesticides, which helps prevent environmental contamination, preserve non-target organisms, including pollinators, and minimises the risk of pesticide resistance in pest populations. Their presence in crop fields often indicates a healthy, balanced ecosystem, and their conservation and augmentation are considered integral to integrated pest management (IPM) strategies. Coccinellidae is a globally present family of small ladybird beetles that comprises approximately 6,000 species, with India contributing around 550 species across 90 genera and 16 tribes [29].

The study of tri-trophic interactions with aphids as prey and host plants as the base provides critical insights into food web dynamics and ecosystem functioning. By maintaining aphid populations at sub-economic levels, aphidophagous ladybird beetles contribute significantly to the economic and ecological sustainability of farming practices. A checklist of aphidophagous predators is a valuable resource in the biological control of aphid pests impacting agricultural and horticultural crops. By carefully cataloguing the predator species, their prey (aphids), and related host plants, such lists offer essential insights into naturally occurring biocontrol agents within various agroecosystems [42]. This data is crucial for identifying the most effective and regionally suited predator species for specific biological control measures. Additionally, it supports the selection of suitable predator-prey-plant interactions for conservation or enhancement in integrated pest management (IPM) strategies. Ultimately, the use of these checklists promotes sustainable crop protection by minimising reliance on chemical pesticides while fostering ecological balance in agricultural fields and orchards [40].

The genera *Illeis* Mulsant, 1850 and *Megalocaria* (Fabricius , 1775) belong to the tribe Coccinellini under subfamily Coccinellinae [4]. Some members of these genera are aphidophagous, making them important biocontrol agents that significantly contribute to the protection of agricultural and horticultural crops [10, 42]. Consequently, a thorough approach is required to document and conserve these aphid-eating ladybirds in agroecosystems, which could assist in managing aphid populations [12]. Previous checklists of aphidophagous Coccinellini in India indicate their distribution across various states and union territories [1. 20. 29], yet they do not cover their tri-trophic interactions. Aphids (Hemiptera: Aphididae) are soft-bodied, sap-sucking insect pests that grow quickly and pose considerable threats to agricultural and horticultural crops [43, 44], not only by extracting nutrients but also by transmitting various viral diseases [41, 45].

This article focuses on the tri-trophic relationships involving species from two genera of aphidophagous ladybird beetles of tribe Coccinellini: *Illeis* Mulsant and *Megalocaria* (Fabricius) on various host plants. This checklist serves as an essential resource for taxonomists, researchers, academics, conservation managers, and policymakers, ensuring that these natural enemies can be effectively utilised in the natural or biological management of aphids.

Material and Methods

This checklist is based on the primary data from existing literature regarding aphidophagous predators of the above

tribes, including books, book chapters, journals, conference proceedings, review articles, and various reliable theses and websites up to July 31, 2025. The misspelt names of aphids, their predators and the plants in the original documents have been corrected where we accurately identify the intended species [38].

Results and Discussion

a. Genus *Illeis* Mulsant, 1850

Three species of the genus *Illeis*, *Illeis cincta* (Fabricius) (Figure 1A), *Illeis confusa* Timberlake (Figure 1B) and *Illeis indica* Timberlake (Figure 1C) are essentially mycophagous, and their entomophagy and arachnophagy are erroneously reported in the literature [30]. *Illeis cincta* is more polyphagous, feeding on 12 species of aphids than others. All these species feed on 13 species of aphids infesting 29 food plant species with 50 tri-trophic associations across 12 states/union territories of India (Table 1). A detailed account of tri-trophic associations of these predatory species is mentioned below.

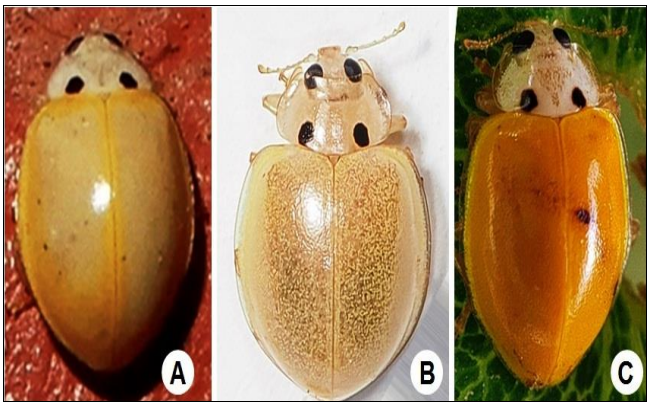

Fig 1: Photographs of *Illeis cincta* (A), *Illeis confusa* (B) and *Illeis indica* (C). Courtsey: https://www.inaturalist.org

Table 1: Number of aphid species recorded as prey of Illeis infesting different number of host plants in different states/union territories (ST/UT) of India.

Name of species	Aphid species	Plant species	Triplets	ST/UT
1. *Illeis cincta*	12	23	33	8
2. *Illeis confusa*	2	2	2	2
3. *Illeis indica*	7	10	13	4
4. *Illeis* sp.	2	2	2	1
Total	**13**	**29**	**50**	**12**

1. *Illeis cincta* (Fabricius, 1798) [syn. *Coccinella cincta* Fabricius, 1798; *Illeis darbarii* Sathe & Bhosale, 2002; *Psyllobora cincta* (Fabricius, 1798); *Thea cincta* (Fabricius, 1798)]

Illeis cincta is a moderately small beetle measuring 4.0-5.0 mm in length. The body is elongate oval with a moderately convex dorsum. The head is creamy yellow. Eyes are broadly separated. The pronotum has a pair of black median spots on its posterior margin. Elytra are bright lemon yellow with transparent lateral margins (Figure 1A) [30]. It is mainly distributed in peninsular and south Indian 8 states [30], however, its aphidophagy was recorded in 8 states and union territory (Andhra Pradesh, Jammu & Kashmir, Karnataka, Odisha, Punjab, Telangana, Uttar Pradesh and Uttarakhand) preying on 12 species of aphids infesting 23 species of plants such as beans, brassicas, brinjal, citrus, maize, okra, etc. with 33 tri-trophic associations as mentioned below.

***Aphis aurantii* (Boyer de Fonsc., 1841)**
- *Citrus ×sinensis* (L.) Osbeck - Punjab [46]
- *Citrus reticulata* Blanco - Punjab [46]

***Aphis craccivora Koch*, 1854**
- *Citrus aurantiifolia* (Christm.) Swingle - Karnataka [8]
- *Vigna mungo* (L.) Hepper - Karnataka [16]; Odisha [5]
- *Vigna radiata* (L.) R. Wiczek - Karnataka [16]
- *Vigna unguiculata* (L.) Walp. - Uttar Pradesh [49]

***Aphis gossypii* Glover, 1877**
- *Acmella uliginosa* (Sw.) Cass. - Telangana [37]
- *Citrus ×sinensis* (L.) Osbeck - Punjab [46]
- *Citrus reticulata* Blanco - Punjab [46]
- *Cucumis sativus* L. – Karnataka [48]
- *Gossypium hirsutum* L. - Karnataka [16]
- *Solanum melongena* L. – Karnataka [48]; Uttar Pradesh [49]
- *Lagenaria siceraria* (Molino) Standl. - Uttarakhand [25]

***Aphis nerii* Boyer de Fonsc., 1841**
- *Calotropis procera* (Aiton) Dryand. - Uttar Pradesh [19]

***Aphis odinae* (van der Goot, 1917)**
- *Anacardium occidentale* L. - Karnataka [50]

***Brevicoryne brassicae* (Linnaeus, 1758)**
- *Brassica oleracea* L. var. *botrytis* - Uttar Pradesh [49]
- *Brassica oleracea* L. var. *gongylodes* - Jammu & Kashmir [17]
- *Brassica rapa* L. - Uttar Pradesh [49]

***Lipaphis erysimi* (Kaltenbach, 1843)**
- *Brassica oleracea* L. var. *botrytis* - Uttar Pradesh [49]
- *Brassica oleracea* L. var. *gongylodes* - Jammu & Kashmir [17]
- *Brassica* sp. - Uttarakhand [21]
- *Brassica rapa* L. - Uttar Pradesh [49]

***Melanaphis sacchari* (Zehntner, 1897)**
- *Sorghum bicolor* (L.) Moench - Odisha [24]
- *Zea mays* L. - Odisha [24]; Uttar Pradesh [49]

***Myzus persicae* (Sulzer, 1776)**
- *Abelmoschus esculentus* Moench - Karnataka [16]; Telangana [35]
- *Capsicum frutescens* L. - Karnataka [16]; Uttar Pradesh [49]
- *Citrus ×sinensis* (L.) Osbeck - Punjab [46]
- *Citrus reticulata* Blanco - Punjab [46]
- *Solanum melongena* L. - Uttar Pradesh [19, 49]

***Myzus persicae nicotianae* Blackman, 1987**
- *Nicotiana tabacum* L. - Andhra Pradesh [47]

***Rhopalosiphum maidis* (Fitch, 1856)**
- *Cenchrus americanus* (L.) Morrone - Uttar Pradesh [49]
- *Zea mays* L. - Telangana [35]

***Sitobion miscanthi* (Takahashi, 1921)**
- *Cenchrus americanus* (L.) Morrone - Uttar Pradesh [49]

2. *Illeis confusa* Timberlake, 1943 [syn. *Illeis chinensis* Yablokov-Khnzoryan, 1978]

Illeis confusa closely resembles *Illeis cincta* but is slightly larger (5.0-6.0 mm in length). Body coloration differs. The head and pronotum are creamy white, while the elytra range from lemon yellow to creamy yellow, with the pronotum consistently featuring a pair of black spots (Figure 1B) [30]. It is primarily found in the northeastern and northwestern regions of India. It is mycophagous as well, but likely mistakenly noted as aphidophagous in Assam and Uttarakhand, as stated below.

***Aphis aurantii* (Boyer de Fonsc., 1841)**
- *Citrus limon* (L.) Osbeck - Assam [32]

***Aphis gossypii* Glover, 1877**
- *Cucumis sativus* L. - Uttarakhand [25]

3. *Illeis indica* Timberlake, 1943

Illeis indica measures 4.1-5.4 mm long and resembles other *Illeis* species, but can be distinguished by its more elongated body with the elytra noticeably tapered toward the rear (Figure 1C). It is primarily documented in eastern and certain regions of northern and northeastern India [30]. Similar to other *Illeis* species, it is also mycophagous. Its aphidophagy was noted in four states/union territories of India, preying on seven aphid species that infest ten plant species, with thirteen tri-trophic connections listed below.

***Aphis craccivora* Koch, 1854**
- *Lablab purpureus* (L.) Sweet - West Bengal [9]
- *Pisum sativum* L. - Jammu & Kashmir [17]
- *Vicia faba* L. - Jammu & Kashmir [17]

***Aphis gossypii* Glover, 1877**
- *Capsicum frutescens* L. - West Bengal [9]
- *Solanum melongena* L. - West Bengal [9]

***Brevicoryne brassicae* (Linnaeus, 1758)**
- *Brassica oleracea* L. var. *gongylodes* - Jammu & Kashmir [17]

***Lipaphis erysimi* (Kaltenbach, 1843)**
- *Brassica juncea* (L.) Czern. - Jammu & Kashmir [17]

***Melanaphis sacchari* (Zehntner, 1897)**
- *Cenchrus americanus* (L.) Morrone - Andhra Pradesh [36]
- *Sorghum bicolor* (L.) Moench - Andhra Pradesh [36]

***Myzus persicae* (Sulzer, 1776)**
- *Capsicum frutescens* L. - West Bengal [9]
- *Solanum melongena* L. - West Bengal [9]

***Sitobion avenae* (Fabricius, 1775)**
- *Triticum aestivum* L. - West Bengal [13]

Unknown aphid
- Unknown plant - Arunachal Pradesh [10]

4. *Illeis* sp.

***Brevicoryne brassicae* (Linnaeus, 1758)**
- *Brassica oleracea* L. var. *botrytis* - Himachal Pradesh [39]

Unknown aphid
- *Cucumis sativus* L. - Himachal Pradesh [40]

b. Genus *Megalocaria* Crotch, 1871

The genus *Megalocaria* Crotch is prevalent in Australasia, Eurasia, Asia, and Palearctic areas, with a total of 7 species documented so far. In India, it is represented by two species, *Megalcaria dilatata* (Fabricius) and *Megalocaria reichei pearsoni* Crotch [30]. *Megalcaria dilatata* stands out because of its significant size and its dietary choice for woolly aphids that infest bamboo and sugar cane, being the sole known aphid-eating species in India.

1. *Megalocaria dilatata* (Fabricius, 1775) [syn. *Anisolemnia dilatata* (Fabricius, 1775); *Coccinella dilatata* Fabricius, 1775; *Caria dilatata* (Fabricius, 1775)]

Megalocaria dilatata, commonly known as giant ladybird, occurs in tropics of South, South East and Far East Asia [1]. The detail morphology of this species is provided by Patil & Gaikwad [23, 30].

Fig 2: Photographs of *Megalocaria dilatata* showing colour polymorphism. Courtesy: https://www.inaturalist.org

It measures 10.0-13.0 mm in length and 9.0-12.0 width. The body is bright reddish to orange yellow, round with strongly convex hemispherical dorsum. A pair of small oblique black maculae present below the posterior margin of eyes. Similarly, pronotum has two oval spots on posterior margin. Each elytron consists of five black spots arranged in a 1-2-2 pattern (Figure 2) [23]. In India, *Megalocaria dilatata* was recorded to feed 26 species of aphids infesting 21 plant species with 37 tri-trophic associations across 11 states and union territories, mostly in Manipur state as mentioned below.

***Aiceona* sp.**
- *Machilus gamblei* King ex Hook.f. - West Bengal [22, 27]

***Aiceona titabarensis* (Raychaudhuri & Ghosh, 1964)**
- *Litsea monopetala* Pers. - Manipur [7]

***Aphis aurantii* (Boyer de Fonsc., 1841)**
- *Camellia sinensis* (L.) Kuntze - India [20]

***Aphis craccivora* Koch, 1854**
- *Lablab purpureus* (L.) Sweet - Tripura [14]
- *Syzygium cumini* (L.) Skeels - Uttarakhand [11]

***Aphis gossypii* Glover, 1877**
- *Cucumis sativus* L. - Manipur [7]

***Aphis nasturtii* Kaltenbach, 1843**
- Unknown plant - Manipur [3]

***Aphis spiraecola* Patch, 1914**
- *Bidens pilosa* L. - Manipur [7]
- *Cucumis sativus* L. - Manipur [3]

***Astegopteryx bambusae* (Buckton, 1893)**
- *Bambusa bambos* (L.) Voss - Sikkim [3]
- *Dendrocalamus strictus* (Roxb.) Nees - Karnataka [33]

***Astegopteryx minuta* van der Goot, 1917**
- *Bambusa* sp. - Sikkim [3]

***Brachycaudus helichrysi* (Kaltenbach, 1843)**
- *Prunus persica* (L.) Stokes - Himachal Pradesh [40]

***Brevicoryne brassicae* (Linnaeus, 1758)**
- *Brassica rapa* L. - Uttar Pradesh [49]

***Ceratovacuna lanigera* Zehntner, 1897**
- *Saccharum officinarum* L. – Maharashtra [23]; Manipur [3]; West Bengal [15]

***Ceratovacuna silvestrii* (Takahashi, 1927)**
- *Bambusa balcooa* Roxb. - Tripura [2]
- *Bambusa bambos* (L.) Voss - Karnataka [31]; Tripura [2]
- Unknown plant - Manipur [3]

***Cervaphis schouteniae* van der Goot, 1917**
- Unknown plant - Manipur [3]

***Greenideoida ceyloniae* van der Goot, 1917**
- Unknown plant - Manipur [3]

***Hysteroneura setariae* (Thomas, 1878)**
- *Pseudoxytenanthera stocksii* (Munro) T.Q.Nguyen - Karnataka [34]

***Lipaphis erysimi* (Kaltenbach, 1843)**
- *Brassica napus* L. - Manipur [7]
- *Brassica oleracea* L. var. *botrytis* - Uttar Pradesh [49]
- *Raphanus sativus* L. - Manipur [7]
- *Brassica rapa* L.- Uttar Pradesh [49]

***Melanaphis bambusae* (Fullaway, 1910)**
- *Bambusa bambos* (L.) Voss - Karnataka [34]

***Mollitrichosiphum montanum* (van der Goot, 1917)**
- *Alnus nepalensis* D. Don - Manipur [7]

***Myzus persicae* (Sulzer, 1776)**
- *Machilus gamblei* King ex Hook.f. - Assam [6]

***Pentalonia nigronervosa* Coquerel, 1859**
- Unknown plant - Manipur [3]

***Pseudoregma alexanderi* (Takahashi, 1924)**
- *Bambusa* sp. - Manipur [7]

***Pseudoregma bambucicola* (Takahashi, 1921)**
- *Bambusa* sp. - Karnataka [28]
- *Bambusa pallida* Munro - Karnataka [34]

***Pseudoregma bambusae* (Chakrabarti & Maity, 1982)**
- *Bambusa* sp. - Manipur [3]; Karnataka [31]

***Pyrolachnus pyri* (Buckton, 1899)**
- *Citrus* sp. - Manipur [3]
- *Pyrus communis* L. - India [30]

***Schizoneuraphis himalayensis* (Ghosh & Raychaudhuri, 1973)**
- *Machilus gamblei* King ex Hook.f. - West Bengal [9, 26]

Unknown aphid
- Unknown plant - Arunachal Pradesh [10]

2. *Megalocaria* sp.
***Eutrichosiphum khasyanum* (Ghosh & Raychaudhuri, 1962)**
- *Quercus serrata* Murray - Manipur [3]

References

1. Agarwala BK, Ghosh AK. Prey records of aphidophagous Coccinellidae in India. A review and bibliography. Tropical Pest Management,1988:34:1-14. doi: 10.1080/09670878809371196
2. Agarwala BK, Saha S, Ghosh AK. Studies on *Ceratovacuna silvestrii* (Takahashi) (Homoptera: Aphididae) and its predator *Anisolemnia dilatata* (Fab.) on *Bambusa arundinacea*. Records of Zoological Survey oif India,1984:81:23-42.
3. Chakrabarti S, Sarkar S, Debnath M. Diversity, bioecology and biosystematics of aphidophagous predators of eastern Himalaya and northeast India. In: Biodiversitat und Naturausstattung im Himalaya, IV (eds. Hartmann, M. & Weipert, J.), Naturkundemuseum Erfurt, 2012, 129-147.
4. Che L, Zhang P, Deng S, Escalona HE, Wang X, Li Y. *et al*. New insights into the phylogeny and evolution of lady beetles (Coleoptera, Coccinellidae) by extensive sampling of genes and species, Molecular Phylogenetics and Evolution,2021:156:107045, doi: 10.1016/j.ympev.2020.107045.
5. Dash SS, Nayak Sikkim, Dhal A. Biodiversity and succession of insects of blackgram (*Vigna mungo* (L.) Hepper) during rabi in the western undulating zone of Odisha. Environment and Ecology,2023:41(4D):3033-3042. doi: 10.60151/envec/VVLG2803
6. Deori D, Thengal D, Bora DD. A study on pest complex of *Persea bombycina* (King Ex Hook. F.) Kosterm. with special reference to *Myzus persicae* sulzer. International Journal of Entomology Research,2021:6(1):46-50.
7. Devi SS. Studies on taxonomy and biology of aphidophagous coccinellids (Coleoptera: Coccinellidae) of Manipur and Nagaland. Ph.D. thesis, Manipur University, Canchipur, Imphal, India, 1989, 263. http://hdl.handle.net/10603/150284
8. Dileepkumar NT, Biradar AP, Mallapur CP, Kulkarni S, Venugopal CK. Survey on insect pests of acid lime, *Citrus aurantifolia* in northern Karnataka, India. Journal of Farm Science,2022:35(4):456-459.
9. Gurung B, Ponnusamy N, Pal S. Species diversity of predaceous coccinellids in different crop ecosystems under the hilly and terai region of West Bengal (India). Ecology Environment and Conservation,2019: 25(2):636-642.
10. Hemchandra O, Kalita J, Singh TK. Biodiversity of aphidophagous coccinellids and their role as

bioindicators in agro-forest-ecosystem. The Bioscan, Special Issue,2010:1:115-122.
11. Khanduri PC, Sharma P. Species composition and host range of predatory coccinellids (Coleoptera) in Doon valley, Uttarakhand, India. Environment Conservation Journal,2025:26(2):495–500. doi: 10.36953/ECJ.32152025
12. Kumar B, Omkar. Ladybird beetles. In. Insect Predators in Pest Management (Ed. Omkar), CRC Press, Taylor & Francis Group, LLC, 2023, 187-228.
13. Kumar A, Pal SP. Feeding efficacy of predaceous giant lady beetle, *Anisolemnia dilatata* against sugarcane woolly aphid, *Ceratovacuna lanigera* Journal of Experimental Zoology, India,2019:22(2):1009-1012.
14. Maji A, Pal S, Gurung B, Banerjee MC, Sahoo SK. Diversity of aphids and their predatory coccinellids from West Bengal. Indian Journal of Entomology,2023:85(2):332-336. doi: 10.55446/IJE.2022.682
15. Majumder J. Giant ladybird predator, *Anisolemnia dilatata* (F.): ecological, biological and haematological evaluation of their developmental and reproductive fitness on aphid preys. Ph. D. thesis, Tripura University, Tripura, 2014, 153. http://hdl.handle.net/10603/172477
16. Megha RR, Vastrad AS, Kamanna BC, Kulkarni NS. Species complex of coccinellids in different crops at Dharwad region. Journal of Experimental Zoology, 2015:18(2):931-935.
17. Mir RA Composition biology and predation of ladybird beetles on aphids in agro-ecosystem of Kashmir. Ph.D. thesis, Aligarh Muslim University, Aligarh, Uttar Pradesh, 2013, 118. http://hdl.handle.net/10603/63173
18. Obrycki JJ, Harwood JD, Kring TJ, O'Neil RJ. Aphidophagy by Coccinellidae: Application of biological control in agroecosystems. Biological Control,2009:51(2):244-254. doi: 10.1016/j.biocontrol.2009.05.009.
19. Omkar, Bind RB. Records of aphid natural enemies complex of Uttar Pradesh. V. The coccinellids. Journal of Advanced Zoology,1996:17:44-48.
20. Omkar, Pervez A. Predaceous coccinellids in India: predator-prey catalogue. Oriental Insects,2004:38:27-61. doi: 10.1080/00305316.2004.10417373
21. Pal S, Bhatt J. Feeding efficiency of six beetle species against mustard aphid, *Lipaphis erysimi* (Kalt.) in Uttarakhand, India. International Journal of Current Microbiology and Applied Sciences,2018:7(4):1970-1976.
22. Pal S, Gurung B, Natarajan P, Medda PS. New prey record of giant ladybird beetle *Anisolemnia dilatata* (Fabricius) (Coccinellidae: Coleoptera) feeding on som plant aphid *Aiceona* sp. Journal of Threatened Taxa,2023:15(1):22551–22555. doi: 10.11609/jot.7450.15.1.22551-22555
23. Patil PB, Gaikwad SM. *Megalocaria dilatata* (Fabricius, 1755) (Coleoptera: Coccinellidae): first record from north western ghats of Maharashtra, India. European Journal of Biomedical and Pharmaceutical Sciences,2019:6(12):445-447.
24. Patnaik NC, Satpathy JM, Bhagat KC. Note on the occurrence of aphidophagous insect predators in Puri district (Orissa) and their predation on the sorghum aphid, *Longiunguis sacchari* (Zhnt.). Indian Journal of Agricultural Sciences,1977:47(11):585-586.
25. Pervez A, Nunes Maia AHN, Bozdoğan H. Reproduction and demography of an aphidophagous ladybird, *Hippodamia variegata* on six aphid species. International Journal of Tropical Insect Science, 2020:40:541-548. doi: 10.1007/s42690-020-00101-2
26. Ponnusamy N, Karthik S, Sai Reddy MS. Different coccinellid predators feeding on aphid (*Schizoneuraphis himalayensis* Ghosh & Raychaudhuri) of som plant (*Persea bombycina* Kost) in terai region of West Bengal. Agrobios Newsletter,2019:18(4):83-84.
27. Ponnusamy N, Gurung B, Pal S. Biology and feeding potential of giant ladybird beetle, *Anisolemnia dilatata* (Fab.) (Coleoptera: Coccinellidae) on som aphids (*Aiceona* sp.) (Hemiptera: Aphididae). Pest Management in Horticultural Ecosystems,2021: 27(1):61-64. doi: 10.5958/0974-4541.2021.00011.4
28. Poorani J. Two new species of Scymnini (Coleoptera: Coccinellidae) from Karnataka, India. Biodiversity Data Journal,2015:3:e5296. doi: 10.3897/BDJ.3.e5296
29. Poorani J. Coccinellidae of the Indian Subcontinent. In. Indian Insects, Diversity and Science (Eds. Ramani, S., Mohanraj, P. & Yeshwanth, H.M.), CRC Press, Boca Raton, 2019. doi.org/10.1201/9780429061400
30. Poorani J. An illustrated guide to lady beetles (Coleoptera: Coccinellidae) of the Indian Subcontinent. Part 1. Tribe Coccinellini. Zootaxa,2023:5332(1):1–307. doi: 10.11646/zootaxa.5332.1.1
31. Puttarudriah M, Channa Basavanna GP. Beneficial coccinellids of Mysore I. Indian Journal of Entomology,1953:15:87-96.
32. Ramya Haryana, Thangjam R. Predatory coccinellids of insect pests of Assam lemon (*Citrus limon* L. Burmf) in Jorhat district of Assam. Journal of Biological Control, 2016:30(2):121-123, doi: 10.18641/jbc/30/2/100585
33. Revathi TG, Remadevi OK. Review on beneficial insects and report on ants occurring on cultivated bamboos in India. Current Biotica,2011:5(1):107-120.
34. Revathi TG, Remadevi OK. Aphids as major pest of bamboos in nurseries of south India and association of potential biocontrol agents. Journal of American Bamboo Society,2011:24(1):29-34.
35. Roy DN, Raghavender B. Ladybird beetles (Coccinellidae: Coleoptera) in southern Telangana: diversity and habitat distribution. Indian Journal of Ecology,2024:51(6)(SI):1596-1601. doi: 10.55362/IJE/2024/4446
36. Seshu Reddy KV, Davies JC. Pests of sorghum and pearl millet, and their parasites and predators, recorded at ICRISAT center, India up to August, 1979. Departmental Progress Report 2, Cereal Entomology, September 1979. International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Andhra Pradesh, India, 1979, 23.
37. Shanker C, Chintagunta L, Muthusamy SK, Vailla S, Srinivasan S, Katti G. *et al*. Flora surrounding rice fi elds as a source of alternative prey for coccinellids feeding on the pests of rice. European Journal of Entomology,2018:115:364–371. doi: 10.14411/eje.2018.036
38. Sharma A, Acharya S, Singh R. Checklist of tri-trophic associations of aphidophagous predators of the tribe Chilocorini (Coccinellinae: Coccinellidae: Coleoptera) in India. International Journal of Zoological

Investigations,2025:11(1):803-820. doi; 10.33745/ijzi.2025.v11i01.084
39. Sharma PK, Verma AK. Studies on the coccinellid predators of the cabbage aphid *Brevicoryne brassicae* in Himachal Pradesh. Journal of Biological Control,1993:7(2):15-19.
40. Sharma PL, Chauhan U, Sharma KC. Studies on the diversity of predatory coccinellid beetles (Coleoptera) in different agro-climatic zones of himachal pradesh. The Bioscan,2015:10(3):981-985.
41. Singh R. Biological control of the aphids by using their parasitoids. In: Biocontrol Potential and its Exploitation in Sustainable Agriculture, (Eds. Upadhyay RK, Mukerji KG, Chamola BP), Kulwer Academic/Plenum Publishers, USA,2001:2:57-73. doi: 10.1007/978-1-4615-1377-3_5
42. Singh R, Ahmad ME. Predators and parasitoids of aphids (Aphididae: Homoptera) infesting cereal crops in India, Munis Entomology & Zoology, 2025:20(2):3003-3041.
43. Singh R, Singh G. Aphids and their biocontrol. In: Ecofriendly Pest Management for Food Security (Ed. Omkar), Academic Press, 2016, 63–108. doi: 10.1016/B978-0-12-803265-7.00003-8
44. Singh R, Singh G. Reproductive Strategies in Aphids. In: Reproductive strategies in insects (Eds. Omkar & Mishra G.), Taylor. & Francis Group, LLC, 2022, 259-282. doi: 10.1201/9781003043195-13
45. Singh R, Singh G. Aphids. In: Polyphagous Pests of Crops (Ed. Omkar). Springer Nature Singapore, 2021, 105-182. doi: 10.1007/978-981-15-8075-8_3
46. Singh S, Sharma DR. Coccinellid predators beetles of insect pests of citrus in the Indian Punjab. Crop Improvement,2010:37(2):207.
47. Sitaramaiah S, Rao SG, Ramaprasad G, Sreedhar U. Role of biological control agents in tobacco insect pest management. In: Biocontrol Potential and its Exploitation in Sustainable Agriculture (Eds. Upadhyay RK, Mukerji KG, Chamola BP). Springer, Boston, *Mentha arvensis* subsp. *haplocalyx* var. *piperascens*, 2001, 215-234. doi: 10.1007/978-1-4615-1377-3_14
48. Subramaniam TV. A note on color variations in a common ladybird beetle, *Chilomenes sexmaculata* Fb. In Fletcher (ed.): Report of the Proceedings of the Fifth Entomological Meeting held at Pusa, 1923, 108-118.
49. Tiwari KM, Tripathi PN, Singh R. Biodiversity of aphidophagous predators in Ayodhya district, Uttar Pradesh, India. Arthropods,2024:13(3):120-156.
50. Vanitha K, Ravoprasad TN, Rajashekara H, Mog B. Occurrence of *Aphis odinae* van der Goot and its natural enemies in cashew. Pest Management in Horticultural Ecosystems,2022:28(2):53-57.