

Distribution and tritrophic associations of aphid parasitoids of tribes Ephedrini and Praini (Aphidiinae: Braconidae: Hymenoptera) in India

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Abstract

The members of tribes Ephedrini and Praini (Aphidiinae: Braconidae: Hymenoptera) are exclusively koinobiont aphid parasitoids. Both tribes are widely distributed and some species have been successfully used in biological control of the aphids worldwide. The Ephedrini comprises of 29 species and Praini consists of 16 species of parasitoids in India; parasitising 94 and 79 species in 11 and 13 states/union territories of India, respectively. Among the Ephedrini, *Toxares deltiger* and *Ephedrus plagiator* are highly polyphagous, parasitising 27 and 22 species of aphids infesting 28 and 52 host plants with 285 and 110 tritrophic associations, respectively. Among aphid species, *Myzus persicae* infests 38 species of food plants in 8 states/union territories of India. It serves as a host for Ephedrini parasitoids followed by *Aphis gossypii* and *Uroleucon sonchi*, parasitised by 8 species each of Ephedrini on 17 and 4 species of host plants in 6 and 3 states/union territories of India, respectively. The Indian fauna of Praini includes only one genus, *Praon*, of which 5 species are endemic. *Praon volucre* is highly polyphagous, parasitises 21 species of aphids infesting 27 species of host plants followed by *Praon abjectum* (10 species of aphids, 13 species of host plants), *Praon dorsale* (9 species of aphids, 10 species of host plants), *Praon orientale* (5 species of aphids, 5 species of host plants), and others with 1-4 aphid hosts feeding on 1-4 species of host plants. Jammu & Kashmir hosts a maximum of 11 species of *Praon* parasitising 34 species of aphids infesting 32 species of food plants followed by Meghalaya (7 species of parasitoids parasitising 20 species of aphids feeding on 18 species of food plants), Uttarakhand (6 species of parasitoids parasitising 8 species of aphids feeding on 6 species of food plants), West Bengal (5 species of parasitoids parasitising 11 species of aphids feeding on 11 species of food plants), Himachal Pradesh (5 species of parasitoids of 7 species of aphids feeding on 9 species of food plants) and other states 1-4 species of parasitoids, parasitising 1-6 species of aphids infesting 1-7 species of host plants. The parasitoids of both tribes are almost distributed in the northeast (Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and West Bengal) to the northwest (Himachal Pradesh, Jammu & Kashmir, Uttarakhand) India.

Almost two-thirds of Ephedrini and Praini species are recorded in Meghalaya and Jammu & Kashmir, respectively. A detailed tritrophic associations of different genera of Ephedrini and Praini are discussed.

Key words: Aphid, Aphidiinae, biological control, checklist, parasitoid, *Ephedrus*, *Praon*, *Toxares*.

1. Introduction

Aphids (Hemiptera: Aphididae) are soft-bodied, plant sap-sucking insects feeding almost all parts of the plants. More than 250 species of aphids are pestiferous on agricultural and horticultural crops, particularly some cereals, potatoes and mustards (Singh & Singh, 2021). Several unique features contribute to their success such as polyphagy, polymorphism and reproduction. They may reproduce by parthenogenesis, zygogenesis, or pedogenesis, depending on climatic conditions and food availability. They may be oviparous, viviparous, or both (Singh & Singh, 2022).

The members of two superfamilies of the order Hymenoptera are known to parasitise aphids: Ichneumonoidea (family: Braconidae, subfamily: Aphidiinae) and Chalcidoidea (families Aphelinidae, Encyrtidae). The subfamily Aphidiinae is a small monophyletic group within Braconidae and its members are exclusively koinobiont endoparasitoids (parasitising growing hosts) of aphids (Singh & Singh, 2016). It includes over 500 species worldwide (Yu et al., 2012). They are widely distributed throughout biogeographical regions (Belshaw et al., 2000). Several species of this subfamily are important agents for the biological control of aphid pests, being mass-produced commercially (Hågvar & Hofsvang, 1991; Waterhouse, 1998; Singh, 2001; Singh & Singh, 2016; Das & Chakrabarti, 2023a). The Aphidiinae consists of five tribes, Aclitini, Aphidiini, Ephedrini, Praini, and Trioxini (Sanchis et al., 2000). Most authors agree that the Ephedrini and Praini are the most ancient groups of the Aphidiinae as they demonstrate several primitive braconid features in both the larval and the adult morphology (Mackauer, 1968; Starý, 1988; Finlayson, 1990; Sanchis et al., 2000). The tribe Ephedrini includes following genera: *Ephedrus* Haliday, 1833; *Indoephedrus* Samanta, Pramanik & Raychaudhuri, 1983; *Ncoephedrus* Samanta, Tamili, Saha & Raychaudhuri, 1983 and *Toxares* Haliday, 1840; and the tribe Praini includes *Areopraon* Mackauer, 1959; *Dyscritulus* Hincks, 1943; *Praon* Haliday, 1833 and *Pseudopraon* Starý, 1975. The present article deals with the tritrophic associations of the members of these two tribes in different states/union territories of India. The Indian fauna of Ephedrini includes species of all four known genera, of which two genera are endemic; and Praini includes only one genus *Praon* which parasitises many species of aphids feeding on both agricultural and horticultural crops (Akhtar et al., 2011a; Das & Chakrabarti, 2023b).

The conservation of natural enemies is important for ecosystems and sustainable pest management because they help to control pest populations and stabilise ecosystems. Therefore, in any particular area, for conservation biological control of the aphid population, the resident population of their natural enemies (parasitoids/predators) must be conserved by applying cultural practices which need information on the resident aphid-parasitoid species status of that area that make the backbone of such a strategy (Hajek & Eilenberg, 2018). On this background, aphid hosts and the host plants of the aphid parasitoids belonging to the tribes Ephedrini and Praini in different states/union territories of India are catalogued and presented here.

2. Materials and methods

The present checklist is based on the primary data of published literature on parasitoids, e.g. books, book chapters, journals, proceedings of conferences, review articles and a few authentic theses (available on Shodhganga, <https://shodhganga.inflibnet.ac.in>) up to December 30, 2024. In most of the recent literature, there are several errors in the scientific names of both parasitoids as well as their aphid hosts and food plants because of their modified status and other nomenclatural decisions and clarifications. The names of aphids, as well as plants that were misspelt in the original records have been corrected where we logically ascertain the intended species. The species identified only up to the generic level are considered as species. In the present checklist, attempts have been made to provide the valid scientific names of the parasitoids following GBIF (2025), aphids following Favret (2025), and the plants, following (WFO, 2025). Synonymy of only aphid parasitoids are given and for the synonymy of aphids and host plants, cited sources may be consulted.

3. Results and Discussion

Data displayed in Tables 1 to 8 shows that 29 species of Ephedrini parasitoids and 16 species of Praini parasitoids are recorded in India, parasitising 94 and 79 species of aphids in 11 and 13 states/union territories of India, respectively. Among the Ephedrini, *Toxares deltiger* and *Ephedrus plagiator* are highly polyphagous parasitising 27 and 22 species of aphids infesting 28 and 52 host plants, respectively. The parasitoids of both tribes are almost distributed in the northeast (Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and West Bengal) to the northwest (Himachal Pradesh, Jammu & Kashmir, Uttarakhand) India. Almost two-thirds of species of Ephedrini and Praini are recorded in Meghalaya and Jammu & Kashmir, respectively. Detailed tritrophic associations of different genera of Ephedrini and Praini are discussed below.

Table 1. List of species of Ephedrini parasitoids associated with different species of aphid host and host plants, tritrophic associations (triplets) in different numbers of states and union territories of India.

Species of parasitoids	Number of			
	Species of aphid hosts	Species of host plants	Triples	States/union territories
1. <i>Ephedrus brevis</i>	1	1	1	1
2. <i>Ephedrus cavariellae</i>	5	5	5	3
3. <i>Ephedrus cerasicola</i>	2	3	3	1
4. <i>Ephedrus dioscoreae</i>	5	4	5	4
5. <i>Ephedrus helleni</i>	4	3	4	2
6. <i>Ephedrus lacertosus</i>	17	11	24	9
7. <i>Ephedrus laevicollis</i>	4	8	10	5
8. <i>Ephedrus longiarticulatus</i>	1	2	2	1
9. <i>Ephedrus minor</i>	2	4	4	1
10. <i>Ephedrus nacheri</i>	9	10	10	6
11. <i>Ephedrus niger</i>	7	9	11	5
12. <i>Ephedrus orientalis</i>	5	5	5	3
13. <i>Ephedrus perillae</i>	1	1	1	1
14. <i>Ephedrus persicae</i>	10	16	16	7
15. <i>Ephedrus plagiator</i>	22	52	71	10
16. <i>Ephedrus rannagarensis</i>	1	1	1	1
17. <i>Ephedrus srinagarensis</i>	7	8	12	6
18. <i>Ephedrus trichosiphoniellae</i>	4	4	4	1
19. <i>Ephedrus urticae</i>	3	3	3	4
20. <i>Ephedrus</i> sp.	16	20	21	6
21. <i>Indoephedrus neoficicola</i>	1	1	1	1
22. <i>Indoephedrus reticulatus</i>	1	1	1	1

Species of parasitoids	Number of			
	Species of aphid hosts	Species of host plants	Triples	States/union territories
23. <i>Neophedrus helichrysi</i>	1	1	1	1
24. <i>Neophedrus kalimpongensis</i>	1	1	1	1
25. <i>Toxares deltiger</i>	27	28	32	3
26. <i>Toxares macrosiphophagum</i>	18	20	22	6
27. <i>Toxares shigai</i>	6	5	6	3
28. <i>Toxares zakai</i>	5	5	6	4
29. <i>Toxares</i> sp.	1	1	1	1
Total	94	122	285	11

A. Tritrophic associations and distribution of Ephedrini parasitoids

Table 2 demonstrates Ephedrini parasitoids parasitising 94 species of aphids infesting 122 species of host plants distributed in 11 states/union territories of India. The aphid *Myzus persicae* infests 38 species of food plants in 8 states/union territories of India serves as host for Ephedrini parasitoids followed by *Aphis gossypii* and *Uroleucon sonchi* which parasitised by 8 species each of Ephedrini on 17 and 4 species of host plants in 6 and 3 states/union territories of India, respectively. Table 3 shows that out of 122 species of host plants of aphids, *Sonchus oleraceus* (an annual weed herb) is used as a host plant for aphids utilised as hosts for 6 species of Ephedrini parasitoids; other food plants are infested by 1-4 species of aphids and are parasitised also by 1-4 species of parasitoids. Regarding the distribution of Ephedrini parasitoids, all species were recorded in northern India. Almost two-thirds of parasitoids (18 species) were recorded in Meghalaya followed by Jammu & Kashmir (15 species), Manipur and West Bengal (each 9 species) and less than 10 species in other states.

Table 2. List of aphid species associated with different species of Ephedrini parasitoids, aphid hosts, host plants and tritrophic associations (number of triples) in different number of states and union territories of India.

Species of aphids	Number of			
	Species of parasitoids	Species of host plants	Triples	States/union territories
1. <i>Acyrtosiphon pisum</i>	2	2	3	3
2. <i>Amphorophora ampullata bengalensis</i>	2	2	2	2
3. <i>Aphisaurantii</i>	1	1	1	1
4. <i>Aphis craccivora</i>	4	11	13	4
5. <i>Aphis fabae</i>	2	5	5	3
6. <i>Aphis farinosa</i>	1	1	1	1
7. <i>Aphis gossypii</i>	8	17	20	6
8. <i>Aphis longisetosa</i>	2	2	2	1
9. <i>Aphis nerii</i>	1	1	1	1
10. <i>Aphis odinae</i>	1	1	1	1
11. <i>Aphis pomi</i>	2	1	2	1
12. <i>Aphis solanella</i>	4	4	4	1
13. <i>Aphis</i> sp.	3	3	3	2
14. <i>Aphis spiraeicola</i>	5	7	9	2
15. <i>Aphis verbasci</i>	1	1	1	1
16. <i>Aulacorthum perillae</i>	1	1	1	1
17. <i>Aulacorthum</i> sp.	1	3	3	2
18. <i>Betacallis sikkimensis</i>	1	1	1	1
19. <i>Betacallis</i> sp.	1	1	1	1
20. <i>Brachycaudus helichrysi</i>	6	9	10	5
21. <i>Brachycaudus</i> sp.	2	2	2	1
22. <i>Brachysiphoniella montana</i>	2	1	2	1
23. <i>Brevicoryne brassicae</i>	2	3	3	3
24. <i>Capitophorus formosartemisiae</i>	1	1	1	1

Species of aphids	Number of			
	Species of parasitoids	Species of host plants	Triplets	States/union territories
25. <i>Capitophorus hippophaes</i>	3	3	3	1
26. <i>Capitophorus mitegoni</i>	2	2	2	3
27. <i>Capitophorus</i> sp.	1	1	1	1
28. <i>Cavariella aegopodii</i>	4	4	6	5
29. <i>Cavariella</i> sp.	3	4	4	3
30. <i>Ceratovacuna silvestrii</i>	1	1	1	1
31. <i>Ceruraphis eastopi</i>	1	1	1	1
32. <i>Chaitophorus indicus</i>	1	1	1	1
33. <i>Chaitophorus leucomelas</i>	1	1	1	1
34. <i>Chaitophorus populeti</i>	1	1	1	1
35. <i>Ericolophium euryae</i>	2	2	2	2
36. <i>Eriosoma lanigerum</i>	1	1	1	1
37. <i>Eumyzus</i> sp.	1	1	1	1
38. <i>Eutrichosiphum flavum</i>	1	1	1	1
39. <i>Greenidea ficicola</i>	2	1	2	1
40. <i>Hayhurstia atplicis</i>	2	2	2	3
41. <i>Hyalopterus pruni</i>	1	1	1	1
42. <i>Hyperomyzus carduellinus</i>	2	5	5	4
43. <i>Hyperomyzus lactucae</i>	1	1	1	1
44. <i>Hyperomyzus</i> sp.	2	3	3	1
45. <i>Impatientinum asiaticum dalhousiensis</i>	1	1	1	1
46. <i>Lachnus tropicalis</i>	2	2	2	1
47. <i>Losomaphis himalayensis</i>	1	1	1	1
48. <i>Lipaphis erysimi</i>	4	5	7	2
49. <i>Macromyzus maculatus</i>	1	1	1	1
50. <i>Macrosiphoniella pseudoartemisiae</i>	2	3	3	3
51. <i>Macrosiphoniella sanbornii</i>	5	4	6	4
52. <i>Macrosiphoniella</i> sp.	2	2	2	1
53. <i>Macrosiphumminatii</i>	1	1	1	1
54. <i>Macrosiphum pachysiphon</i>	1	1	1	1
55. <i>Macrosiphum rosae</i>	4	4	4	5
56. <i>Melanaphis donacis</i>	1	1	1	1
57. <i>Melanaphis</i> nr. <i>arundinariae</i>	1	1	1	2
58. <i>Melanaphis vandergooti</i>	1	1	1	1
59. <i>Metopolophium montanum</i>	1	1	1	1
60. <i>Microlophium carnosum</i>	2	1	2	1
61. <i>Microlophium</i> sp.	1	1	1	1
62. <i>Micromyzus kalimpongensis</i>	1	1	1	2
63. <i>Myzus dycei</i>	1	1	1	1
64. <i>Myzus mumecola</i>	1	1	1	1
65. <i>Myzus obtusirostris</i>	2	1	2	1
66. <i>Myzus ornatus</i>	4	6	6	3
67. <i>Myzus persicae</i>	13	38	41	8
68. <i>Myzus sorbi</i>	1	1	1	1
69. <i>Myzus boehmeriae</i>	2	2	2	1
70. <i>Neomyzus circumflexus</i>	2	5	5	4
71. <i>Nippolachnus piri</i>	1	1	1	2
72. <i>Ovatus</i> nr. <i>crataegarius</i>	1	1	1	1
73. <i>Panaphis juglandis</i>	1	1	1	1
74. <i>Persicaria chinensis</i>	1	1	1	1
75. <i>Prociphilus himalayaensis</i>	1	2	2	2
76. <i>Prociphilus micheliae</i>	1	1	1	1
77. <i>Prociphilus</i> sp.	3	2	4	2
78. <i>Rhopalosiphum nymphaeae</i>	3	3	3	2
79. <i>Rhopalosiphum padi</i>	2	3	3	3
80. <i>Schizaphis rotundiventris</i>	2	3	3	2
81. <i>Shinjia orientalis</i>	1	1	1	1

Species of aphids	Number of			
	Species of parasitoids	Species of host plants	Triplets	States/union territories
82. <i>Sinomegoura photiniae</i>	2	1	2	2
83. <i>Sinomegoura rhododendri</i>	1	1	1	3
84. <i>Sitobion miscanthi</i>	1	2	2	2
85. <i>Sitobion rosaeiformis</i>	1	2	2	2
86. <i>Takecallis affinis affinis</i>	1	1	1	2
87. <i>Tetraneura</i> sp.	2	1	2	1
88. <i>Uroleucon cichorii cichorii</i>	1	1	1	1
89. <i>Uroleucon gobonis</i>	1	1	1	1
90. <i>Uroleucon simlaense</i>	1	1	1	1
91. <i>Uroleucon sonchi</i>	8	4	12	3
92. <i>Uroleucon</i> sp.	1	1	1	1
93. <i>Uroleucon tanacetii</i>	2	2	2	2
94. Unidentified aphids	4	5	5	3
Total	29	124	285	11

Table 3. The list of host plants associated with different species of Ephedrini parasitoids and number of their host aphids, host plants and tritrophic associations (triplets) in different number of states and union territories of India.

Host plant species	Number of			
	Species of parasitoids	Species of aphids	Triplets	States/union territories
1. <i>Ageratina riparia</i>	1	1	1	1
2. <i>Ageratum conyzoides</i>	3	2	3	3
3. <i>Ailanthus altissima</i>	2	1	2	1
4. <i>Antirrhinum majus</i>	1	1	1	1
5. <i>Artemisia vulgaris</i>	1	1	1	1
6. <i>Artemisia absinthium</i>	1	1	1	1
7. <i>Artemisia vestita</i>	1	1	1	1
8. <i>Artemisia vulgaris</i>	2	2	2	1
9. <i>Arundo donax</i>	1	1	1	1
10. <i>Asplenium</i> sp.	1	1	1	1
11. <i>Bambusa</i> sp.	1	2	2	2
12. <i>Beta vulgaris</i>	2	2	2	2
13. <i>Bidens pilosa</i>	4	4	6	3
14. <i>Blumea aromatica</i>	4	2	4	1
15. <i>Blumea hieraciifolia</i>	3	1	3	1
16. <i>Brassica juncea</i>	2	1	2	1
17. <i>Brassica napus</i>	1	1	1	1
18. <i>Brassica nigra</i>	2	1	2	1
19. <i>Brassica oleracea</i>	2	3	3	3
20. <i>Brassica oleracea capitata</i>	1	3	3	1
21. <i>Brassica oleracea gongylodes</i>	1	1	1	1
22. <i>Brassica rapa</i>	1	1	1	1
23. <i>Calotropis procera</i>	1	1	1	1
24. <i>Calotropis</i> sp.	1	1	1	1
25. <i>Calystegia sepiumsepium</i>	1	1	1	2
26. <i>Capsicum annuum</i>	3	3	3	2
27. <i>Capsicum frutescens</i>	1	1	1	1
28. <i>Capsicum</i> sp.	1	2	2	2
29. <i>Carduus edelbergii</i>	1	1	1	1
30. <i>Chenopodium album</i>	2	2	2	2
31. <i>Chrysanthemum leucanthum</i>	1	1	1	1
32. <i>Chrysanthemum</i> sp.	3	3	5	4
33. <i>Chrysanthemum morifolium</i>	1	2	2	1
34. <i>Cissampelos glaberrima</i>	1	1	1	1
35. <i>Citrus</i> sp.	1	1	1	1

Host plant species	Number of			
	Species of parasitoids	Species of aphids	Triplets	States/union territories
36. <i>Conium maculatum</i>	1	2	2	1
37. <i>Coriander</i> sp.	1	1	1	1
38. <i>Cotoneaster</i> sp.	1	2	2	2
39. <i>Crassocephalum crepidioides</i>	2	2	2	1
40. <i>Cucurbita</i> sp.	1	1	1	1
41. <i>Delphinium</i> sp.	1	2	2	1
42. <i>Dianthus</i> sp.	1	1	1	1
43. <i>Dioscorea deltoidea</i>	1	2	2	1
44. <i>Diplazium esculentum</i>	1	1	1	1
45. <i>Duranta erecta</i>	2	2	2	2
46. <i>Duranta</i> sp.	1	1	1	1
47. <i>Emilia sonchifolia</i>	2	2	2	2
48. <i>Eupatorium riparium</i>	1	1	1	1
49. <i>Eurya acuminata</i>	1	1	1	2
50. <i>Fagopyrum</i> sp.	1	1	1	1
51. <i>Foeniculum vulgare</i>	1	1	1	1
52. <i>Geranium nepalense</i>	1	1	1	1
53. <i>Hibiscus rosasinensis</i>	2	2	2	2
54. <i>Hibiscus</i> sp.	1	1	1	1
55. <i>Impatiens balsamina</i>	1	1	1	1
56. <i>Ipomea</i> sp.	2	2	2	2
57. <i>Juglans regia</i>	1	1	1	1
58. <i>Lablab purpureus</i>	2	1	2	2
59. <i>Lantana camara</i>	1	2	2	-
60. <i>Lathyrus odoratus</i>	1	1	1	1
61. <i>Lonicera quinquelocularis</i>	3	3	5	3
62. <i>Louisiella paludosa</i>	2	1	2	1
63. <i>Magnolia champaka</i>	1	1	1	1
64. <i>Malus domestica</i>	2	1	2	1
65. <i>Mentha longifolia</i>	1	1	1	1
66. <i>Nepeta cataria</i>	2	2	2	1
67. <i>Ocimum</i> sp.	1	1	1	1
68. <i>Perilla</i> sp.	1	1	1	1
69. <i>Pericaria chinensis</i>	1	1	1	1
70. <i>Photinia</i> sp.	2	1	2	2
71. <i>Phyllanthus</i> sp.	1	1	1	1
72. <i>Pisum sativum</i>	2	2	3	2
73. <i>Poa</i> sp.	2	2	2	2
74. <i>Polygonum chiloensis</i>	1	1	1	1
75. <i>Polygonum</i> sp.	3	5	5	3
76. <i>Polypodium</i> sp.	1	1	1	1
77. <i>Populus caspica</i>	1	1	1	1
78. <i>Prunus domestica</i>	2	3	3	2
79. <i>Prunus dulcis</i>	1	1	1	1
80. <i>Prunus</i> sp.	2	2	2	2
81. <i>Psidium guajava</i>	3	3	4	1
82. <i>Pyrus communis</i>	2	3	3	1
83. <i>Pyrus pashia</i>	2	2	2	3
84. <i>Quercus</i> sp.	1	1	1	1
85. <i>Rhododendron</i> sp.	1	1	1	3
86. <i>Rhus</i> sp.	1	1	1	1
87. <i>Rosa canina</i>	1	1	1	2
88. <i>Rosa centifolia</i>	1	1	1	1
89. <i>Rosa</i> sp.	2	3	4	4
90. <i>Rose indica</i>	1	1	1	1
91. <i>Rubia cordifolia</i>	1	1	1	1
92. <i>Rubus ellipticus</i>	3	3	3	3
93. <i>Rubus fruticosus</i>	1	1	1	1

Host plant species	Number of			
	Species of parasitoids	Species of aphids	Triplets	States/union territories
94. <i>Rubus rosifolius</i>	1	2	2	-
95. <i>Rumex acetosella</i>	1	1	1	1
96. <i>Rumex</i> sp.	1	1	1	1
97. <i>Saccharum officinarum</i>	1	1	1	1
98. <i>Salix alba</i>	2	4	4	1
99. <i>Salix babylonica</i>	1	2	2	1
100. <i>Salix hastata</i>	1	2	2	3
101. <i>Salix</i> sp.	4	2	4	5
102. <i>Salix tetrasperma</i> .	1	1	1	1
103. <i>Solanum aculeatissimum</i>	1	1	1	1
104. <i>Solanum betaceum</i>	1	2	2	-
105. <i>Solanum melongena</i>	2	1	2	1
106. <i>Solanum nigrum</i>	4	4	6	4
107. <i>Solanum</i> sp.	3	3	3	1
108. <i>Solanum tuberosum</i>	2	1	2	2
109. <i>Sonchus arvensis</i>	1	1	1	1
110. <i>Sonchus oleraceus</i>	6	2	6	2
111. <i>Sonchus</i> sp.	3	2	3	1
112. <i>Sorbaria tomentosa</i>	1	1	1	1
113. <i>Spiraea</i> sp.	2	4	5	2
114. <i>Symplocos</i> sp.	1	1	1	1
115. <i>Tagetes erecta</i>	2	2	3	2
116. <i>Tagetes</i> sp.	1	1	1	1
117. <i>Tanacetum cinerariifolium</i>	1	1	1	1
118. <i>Trigonella foenum-graecum</i>	1	1	1	1
119. <i>Urtica dioica</i>	2	2	3	1
120. <i>Urtica</i> sp.	1	1	1	1
121. <i>Zea mays</i>	1	1	1	1
122. <i>Zingiber</i> sp.	1	1	1	2
123. <i>Zinnia elegans</i>	1	1	1	1
124. Unidentified plant	13	31	50	4
Total	29	94	285	11

Table 4. List of states/union territories of India containing different number of species of Ephedrini parasitoids, aphid hosts, host plants and tritrophic associations (number of triplets).

States	Number of			
	Species of parasitoids	Species of aphids	Species of host plants	Triplets
1. Arunachal Pradesh	5	5	5	5
2. Himachal Pradesh	7	16	18	19
3. Jammu & Kashmir	15	43	49	69
4. Manipur	13	11	22	43
5. Meghalaya	18	41	65	79
6. Mizoram	5	6	6	6
7. Nagaland	3	3	3	4
8. Sikkim	9	16	15	19
9. Uttar Pradesh	2	3	3	4
10. Uttarakhand	7	12	7	14
11. West Bengal	13	23	27	30
12. Not mentioned	2	9	17	23
Total	29	94	124	285

The Indian fauna of Ephedrini includes four genera, *Ephedrus*, *Indoephedrus**, *Neoephedrus** and *Toxares* of which two genera marked by (*) are endemic.

I. *Ephedrus* species

Ephedrus is probably one of the basal genera within the subfamily Aphidiinae (Gårdenfors, 1986; Belshaw & Quicke, 1997) comprising 54 valid species (GBIF, 2025). The genus is widely distributed parasitising aphids mostly feeding on agricultural crops, wild herbs and a few trees (Akhtar et al., 2011a; Das & Chakrabarti, 2023a). Its several species have been utilised as bioagents in the biological control of many species of aphids throughout the world (Hågvar & Hofsvang, 1990; Waterhouse, 1998; Waterhouse & Sands, 2001; Boivin et al., 2012). In India, 20 species of *Ephedrus* were recorded parasitising 70 species of aphids infesting 98 species of host plants in 11 states/union territories of India (Table 1). Among them, *Ephedrus plagiator* is highly polyphagous parasitising 22 aphid species infesting 52 species of host plants with 70 tritrophic associations (triplets, parasitoid - aphid host - host plant associations) followed by *Ephedrus lacertosus* (17 aphid species, 11 host plants, 24 triplets) and *Ephedrus persicae* (10 aphid species, 16 species of host plants, 16 triplets). *Ephedrus plagiator* is distributed in 10 states/union territories of India followed by *Ephedrus lacertosus* (9 states/union territories) and *Ephedrus persicae* (7 states/union territories) of India (Table 1). Records demonstrated that *Myzus persicae* and *Uroleucon souchi* are preferred by 7 species of *Ephedrus* while *Aphis gossypii* is preferred by 6 species of *Ephedrus*. A detailed checklist of *Ephedrus* species along with their aphid host and host plants and distribution are given below.

1. *Ephedrus brevis* Stelfox, 1941

- *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
- *Duranta erecta* L. - Manipur (Singh et al., 2011)

2. *Ephedrus cavariellae* Takada, 1968

- *Cavariella (Cavariella) aegopodii* (Scopoli, 1763)
- *Salix* sp. - Mizoram (Sarkar, 1991); West Bengal (Tamili, 1988)
- *Macrosiphum (Macrosiphum) rosae* (Linnaeus, 1758)
- Unidentified plant - Meghalaya (Samanta & Raychaudhuri, 1984)
- *Nippolachnus piri* Matsumura, 1917
- *Pyrus communis* L. - Meghalaya (Samanta, 1986); West Bengal (Tamili, 1988)
- *Rhopalosiphum nymphaeae* (Linnaeus, 1761)
- *Prunus* sp. - Meghalaya (Samanta, 1986); West Bengal (Tamili, 1988)
- *Rhopalosiphum padi* (Linnaeus, 1758)
- Unidentified plant - Meghalaya (Samanta & Raychaudhuri, 1984)

3. *Ephedrus cerasicola* Starý, 1962

- *Aphis (Aphis) gossypii* Glover, 1877
- *Bidens pilosa* L. - Manipur (Singh, 1987)
- *Solanum melongena* L. - Manipur (Subhrani et al., 2006; Singh et al., 2011)
- *Aphis (Aphis) spiraeicola* Patch, 1914
- *Bidens pilosa* L. - Manipur (Singh et al., 2011)

4. *Ephedrus dioscoreae* Bhagat, 1982

- *Acyrtosiphon (Acyrtosiphon) pisum* (Harris, 1776)
- *Pisum sativum* L. - Manipur (Singh & Singh, 1986a; Subhrani et al., 2006)
- *Aphis (Aphis) verbasci* Schrank, 1801
- *Dioscorea deltoidea* Wall. ex Griseb. - Jammu & Kashmir (Bhagat, 1982a; Chakrabarti & Debnath, 2009)
- *Aphis* sp.
- *Dioscorea deltoidea* Wall. ex Griseb. - Jammu & Kashmir (Bhagat, 1982a)
- *Liosomaphis himalayensis* Basu, 1964
- *Fagopyrum* sp. - Meghalaya (Samanta, 1986)
- *Macrosiphoniella (Macrosiphoniella) sanborni* (Gillette, 1908)

5. *Ephedrus helleni* Mackauer, 1968 [synonym *Ephedrus salicicola* Takada, 1968]

- *Cavariella* (*Cavariella*) *acgopodii* (Scopoli, 1763)
- *Salix* sp. - Meghalaya (Samanta, 1986)
- *Cavariella* sp.
- *Salix babylonica* L. - Jammu & Kashmir (Bhagat, 1984; Chakrabarti & Debnath, 2009)
- *Ceruraphis eastopi* Hille Ris Lambers, 1966
- *Salix babylonica* L. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Hayhurstia atplicis* (Linnaeus, 1761)
- *Nepeta cataria* L. - Jammu & Kashmir (Bhagat, 1984; Chakrabarti & Debnath, 2009)

6. *Ephedrus lacertosus* (Haliday, 1833)

- *Amphorophora* (*Amphorophora*) *ampullata bengalensis* Hille Ris Lamb. & Basu, 1966
- *Polypodium* sp. - West Bengal (Tamili, 1988)
- *Aphis* (*Aphis*) *odinae* (van der Goot, 1917)
- *Rhus* sp. - Meghalaya (Samanta, 1986)
- *Brachysiphoniella montana* (van der Goot, 1917)
- *Louisiella paludosa* (Roxb.) Landge - Manipur (Singh et al., 2011)
- *Brevicoryne brassicae* (Linnaeus, 1758)
- *Beta vulgaris* L. - Meghalaya (Samanta, 1986); Mizoram (Sarkar, 1991);
- *Brassica oleracea* L. - Sikkim (Tamili, 1988); West Bengal (Tamili, 1988)
- *Capitophorus mitegoni* Eastop, 1956
- *Polygonum* sp. - Meghalaya (Samanta, 1986); Mizoram (Sarkar, 1991); Sikkim (Tamili, 1988)
- *Chaitophorus indicus* Ghosh, Ghosh & Raychaudhuri, 1970
- *Polygonum* sp. - Sikkim (Tamili, 1988)
- *Hyperomyzus* (*Hyperomyzus*) *carduellinus* (Theobald, 1915)
- *Ageratum conyzoides* L. - West Bengal (Tamili, 1988); *Rubus ellipticus* Sm. - Jammu & Kashmir (Saha, 1988)
- *Sonchus* sp. - Meghalaya (Samanta, 1986)
- *Impatientinum* (*Impatientinum*) *asiaticum dalhousiensis* Verma, 1969
- Unidentified plant - Himachal Pradesh (Chakrabarti & Debnath, 2009)
- *Macrosiphum* (*Macrosiphum*) *minatii* (Das, Raychaudhuri & Raychaudhuri, 1981)
- *Delphinium* sp. - Himachal Pradesh (Saha et al., 1982)
- *Macrosiphum* (*Macrosiphum*) *rosae* (Linnaeus, 1758)
- *Rosa* sp. - Arunachal Pradesh (Samanta, 1986)
- *Melanaphis vanderghooti* Raychaudhuri & Banerjee, 1974
- *Panicum hygrocharis* Steud. - Manipur (Singh & Singh, 1986a)
- *Sonchus oleraceus* L. - Manipur (Singh, 1987)
- *Myzus* (*Nectarosiphon*) *persicae* (Sulzer, 1776)
- Unidentified plant - Himachal Pradesh (Chakrabarti & Debnath, 2009); Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Neomyzus circumflexus* (Buckton, 1876)
- *Calystegia sepiumsepium* (L.) R.Br. - Himachal Pradesh (Chakrabarti & Debnath, 2009); Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Capsicum annuum* L. - Sikkim (Tamili, 1988)
- *Ipomoea* sp. - Meghalaya (Samanta, 1986)
- *Sitobion* (*Sitobion*) *miscanthi* (Takahashi, 1921)
- *Bambusa* sp. - Uttarakhand (Akhtar et al., 2011b)

- Grass - Himachal Pradesh (Saha et al., 1982)
- *Takecallis affinis affinis* Ghosh, 1986
 - *Bambusa* sp. - Himachal Pradesh (Chakrabarti & Debnath, 2009); Uttarakhand (Das & Chakrabarti, 1989a; Sarkar, 2022)
- Unidentified aphid
 - Unidentified plant - Jammu & Kashmir (Sharma & Subba Rao, 1964)
- *Uroleucon (Uroleucon) sinlaense* Chakrabarti, Ghosh & Raychaudhuri, 1971
 - *Delphinium* sp. - Himachal Pradesh (Chakrabarti & Debnath, 2009)
- 7. *Ephedrus laevicollis* (Thomson, 1895) [synonym *Ephedrus minor* Stelfox, 1941]**
 - *Cavariella (Cavariella) aegopodii* (Scopoli, 1763)
 - *Salix alba* L. - Jammu & Kashmir (Khan & Shah, 2017)
 - *Salix hastata* L. - Jammu & Kashmir (Chakrabarti & Debnath, 2009); Uttarakhand (Das & Chakrabarti, 1991)
 - *Salix* sp. - Jammu & Kashmir (Saha, 1988)
 - *Salix tetrasperma* Roxb. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
 - *Cavariella* sp.
 - *Salix alba* L. - Jammu & Kashmir (Takada & Rishi, 1980)
 - *Salix hastata* L. - Jammu & Kashmir (Chakrabarti & Debnath, 2009); Uttar Pradesh (Das & Chakrabarti, 1991)
 - *Lipaphis (Lipaphis) erysimi* (Kaltenbach, 1843)
 - *Brassica juncea* (L.) Czern. - Manipur (Subhrani et al., 2006)
 - *Brassica nigra* (L.) K. Koch - Manipur (Singh, 1987; Singh et al., 2011)
 - *Uroleucon (Uroleucon) sonchi* (Linnaeus, 1767)
 - *Blumea aromatica* DC. - Manipur (Singh et al., 2011)
 - *Sonchus oleraceus* L. - Manipur (Singh et al., 2011); Nagaland (Singh et al., 1991)
- 8. *Ephedrus longiarticulatus* Rakhshani & Tomanovic, 2012**
 - Unidentified aphid
 - Wild grass - Jammu & Kashmir (Rakhshani et al., 2012)
 - Unidentified aphid
 - *Zea mays* L. - Jammu & Kashmir (Rakhshani et al., 2012)
- 9. *Ephedrus minor* Stelfox, 1941**
 - *Lipaphis (Lipaphis) erysimi* (Kaltenbach, 1843)
 - *Brassica nigra* (L.) K. Koch - Manipur (Singh et al., 2011)
 - *Brassica juncea* (L.) Czern. - Manipur (Subhrani et al., 2006)
 - *Uroleucon (Uroleucon) sonchi* (Linnaeus, 1767)
 - *Blumea aromatica* DC. - Manipur (Singh et al., 2011)
 - *Sonchus oleraceus* L. - Manipur (Singh et al., 2011)
- 10. *Ephedrus nacheri* Quilis, 1934**
 - *Aphis (Aphis) craccivora* Koch, 1854
 - Unidentified plant - Meghalaya (Samanta & Raychaudhuri, 1984)
 - *Aphis (Aphis) gossypii* Glover, 1877
 - *Tagetes erecta* L. - Manipur (Singh et al., 2011)
 - *Hayhurstia atriplicis* (Linnaeus, 1761)
 - *Chenopodium album* L. - Himachal Pradesh (Chakrabarti & Debnath, 2009); Uttarakhand (Das & Chakrabarti, 1990)
 - *Macrosiphum (Macrosiphum) rosae* (Linnaeus, 1758)
 - Unidentified plant - Meghalaya (Samanta & Raychaudhuri, 1984)
 - *Melanaphis* nr. *arundinariae* (Takahashi, 1937)
 - *Pyrus pashia* Buch. - Ham. ex D. Don - Himachal Pradesh (Chakrabarti & Debnath, 2009); Uttarakhand (Das & Chakrabarti, 1990)
 - *Rhopalosiphum padi* (Linnaeus, 1758)

- *Bidens pilosa* L. - Sikkim (Tamili, 1988)
- *Poa* sp. - Arunachal Pradesh (Samanta, 1986)
- *Sinomegoura photiniae* (Takahashi, 1936)
 - *Photinia* sp.- Meghalaya (Samanta, 1986)
- *Uroleucon (Uroleucon) sonchi* (Linnaeus, 1767)
 - *Sonchus oleraceus* L. - Manipur (Singh et al., 2011)
- *Aphis (Aphis) gossypii* Glover, 1877
 - Unidentified plant - Meghalaya (Samanta & Raychaudhuri, 1984)
- 11. ***Ephedrus niger* Gautier, Bonnamour & Gaumont, 1929 [synonym *Ephedrus campestris* Starý, 1962]**
 - *Macrosiphoniella (Macrosiphoniella) pseudoartemisiae* Shinji, 1933
 - *Artemisia vulgaris* L. - West Bengal (Tamili, 1988)
 - Grass - Meghalaya (Samanta, 1986)
 - *Macrosiphoniella (Macrosiphoniella) sanborni* (Gillette, 1908)
 - *Chrysanthemum 'morifolium* (Ramat.) Hemsl. - Jammu & Kashmir (Saha, 1988; Chakrabarti & Debnath, 2009)
 - *Chrysanthemum* sp. - Himachal Pradesh (Chakrabarti & Debnath, 2009); Jammu & Kashmir (Shuja-Uddin, 1978; Chakrabarti & Debnath, 2009); Meghalaya (Ghosh & Raychaudhuri, 1982; Starý & Ghosh, 1975)
 - *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
 - Unidentified plant - Meghalaya (Samanta & Raychaudhuri, 1984)
 - *Uroleucon (Uroleucon) sonchi* (Linnaeus, 1767)
 - *Blumea hieraciifolia* (D.Don) DC. - Manipur (Singh et al., 2011)
 - *Emilia sonchifolia* L. (DC.) - West Bengal (Tamili, 1988)
 - *Sonchus oleraceus* L. - Manipur (Singh, 1987)
 - *Uroleucon (Uroleucon) tanacetii* (Linnaeus, 1758)
 - *Chrysanthemum* sp. - Meghalaya (Starý & Ghosh, 1975)
 - *Uroleucon (Uromelan) gobonis* (Matsumura, 1917)
 - *Tanacetum cinerariifolium* (Trevis.) Sch.Bip. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
 - *Uroleucon* sp.
 - *Chrysanthemum 'morifolium* (Ramat.) Hemsl. - Jammu & Kashmir (Takada & Rishi, 1980; Chakrabarti & Debnath, 2009)
- 12. ***Ephedrus orientalis* Starý & Schlinger, 1967**
 - *Amphorophora (Amphorophora) anpullata bengalensis* Hille Ris Lamb. & Basu, 1966
 - *Asplenium* sp. - Sikkim (Tamili, 1988)
 - *Macromyzus (Anthracosiphoniella) maculatus* (Basu, 1969)
 - *Diplazium esculentum* (Retz.) Sw. - Meghalaya (Samanta, 1986)
 - *Sinomegoura photiniae* (Takahashi, 1936)
 - *Photinia* sp.- Sikkim (Tamili, 1988)
 - *Uroleucon (Uroleucon) cichorii cichorii* (Koch, 1855)
 - *Blumea aromatica* DC. - Manipur (Singh & Singh, 1986b)
 - *Uroleucon (Uroleucon) sonchi* (Linnaeus, 1767)
 - *Blumea hieraciifolia* (D.Don) DC. - Manipur (Singh et al., 2011)
- 13. ***Ephedrus perillae* Tamili & Raychaudhuri, 1984**
 - *Aulacorthum (Perillaphis) perillae* (Shinji, 1924)
 - *Perilla* sp. - West Bengal (Tamili & Raychaudhuri, 1984)
- 14. ***Ephedrus persicae* Froggatt, 1904**
 - *Aphis (Aphis) craccivora* Koch, 1854
 - *Cissampelos glaberrima* A.St. - Hil. - Jammu & Kashmir (Khan & Shah, 2017)

- *Lablab purpureus* (L.) Sweet ssp. *purpureus*- Jammu & Kashmir (Khan & Shah, 2017)
 - *Rumex acetosella* L. - Jammu & Kashmir (Starý & Bhagat, 1978; Saha, 1988)
 - *Aphis* (*Aphis*) *gossypii* Glover, 1877
 - *Solanum* sp. - Manipur (Singh & Singh, 1986c; Singh et al., 2011)
 - Unidentified plant - Meghalaya (Starý & Ghosh, 1983)
 - *Aphis* (*Aphis*) *longisetosa* Basu, 1970
 - Unidentified plant - Meghalaya (Starý & Ghosh, 1983)
 - *Chaitophorus populeti* (Panzer, 1801)
 - *Populus caspica* Bornm. - Jammu & Kashmir (Bhagat, 1984; Saha, 1988)
 - *Hyperomyzus* (*Hyperomyzus*) *lactucae* (Linnaeus, 1758)
 - Unidentified plant - Himachal Pradesh (Saha et al., 1982; Starý & Ghosh, 1983)
 - *Melanaphis donacis* (Passerini, 1862)
 - *Arundo donax* L. - Jammu & Kashmir (Bhagat, 1984; Saha, 1988)
 - *Myzus* (*Myzus*) *sorbi* Bhattacharya & Chakrabarti, 1982
 - *Sorbaria tomentosa* (Lindl.) Rehder- Uttarakhand (Das & Chakrabarti, 1990; Sarkar, 2022)
 - *Myzus* (*Nectarosiphon*) *persicae* (Sulzer, 1776)
 - *Beta vulgaris* L. - Mizoram (Sarkar, 1991)
 - *Hibiscus rosasinensis* L. - West Bengal (Tamili, 1988)
 - Unidentified plant - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
 - Unidentified plant - Meghalaya (Starý & Ghosh, 1983)
 - *Tetraneura* sp.
 - *Ailanthus altissima* (P. Mill.) Swingle - Jammu & Kashmir (Bhagat, 1984)
 - *Uroleucon* (*Uroleucon*) *sonchi* (Linnaeus, 1767)
 - *Blumea aromatica* DC. - Manipur (Singh & Singh, 1986c)
- 15. *Ephedrus plagiator* (Nees, 1811)**
- *Acyrtosiphon* (*Acyrtosiphon*) *pisum* (Harris, 1776)
 - *Lathyrus odoratus* L. - West Bengal (Tamili, 1988)
 - *Pisum sativum* L. - Manipur (Singh, 1987; Subhrani et al., 2006); Sikkim (Agarwala et al., 1980)
 - *Aphis* (*Aphis*) *craccivora* Koch, 1854
 - *Geranium nepalense* Sweet- Himachal Pradesh (Poddar, 1982)
 - *Lablab purpureus* (L.) Sweet ssp. *purpureus*- Manipur (Subhrani et al., 2006; Singh et al., 2011)
 - *Lantana camara* L. -India (Ghosh & Agarwala, 1982)
 - *Psidium guajava* L.-India (Ghosh & Agarwala, 1982)
 - *Solanum nigrum* L. - Manipur (Singh pm & Singh, 1986c)
 - *Solanum* sp. - Manipur (Singh et al., 2011)
 - *Spiraea* sp.-India (Ghosh & Agarwala, 1982)
 - *Trigonella foenum - graecum* L. - Himachal Pradesh (Poddar, 1982)
 - *Aphis* (*Aphis*) *fabae* Scopoli, 1763
 - *Bidens pilosa* L. - West Bengal (Rao et al., 1969)
 - *Rubus ellipticus* Sm. - Arunachal Pradesh (Samanta, 1986)
 - *Tagetes erecta* L. - Uttar Pradesh (Akhtar et al., 2011b)
 - *Urtica* sp. - Himachal Pradesh (Saha et al., 1982)
 - *Aphis* (*Aphis*) *gossypii* Glover, 1877
 - *Capsicum frutescens* L. - Nagaland (Singh et al., 1991)
 - *Duranta erecta* L. - Manipur (Singh et al., 2011)
 - *Hibiscus rosasinensis* L. - Manipur (Singh et al., 2011)
 - *Ipomea* sp. - West Bengal (Tamili, 1988)

- *Rosa* sp. - Manipur (Singh, 1987)
- *Solanum nigrum* L. - Manipur (Singh et al., 2011)
- *Spiraea* sp. - Meghalaya (Starý & Ghosh, 1978)
- *Tagetes erecta* L. - Uttar Pradesh (Singh et al., 1999)
- *Tagetes* sp. - Uttar Pradesh (Ahmad & Singh, 1993)
- Unidentified plant - West Bengal (Rao et al., 1969)
- *Aphis (Aphis) pomi* De Geer, 1773
 - *Malus domestica* (Suckow) Borkh.- Jammu & Kashmir (Rishi & Lone, 1983)
- *Aphis (Aphis) solanella* Theobald, 1854
 - *Solanum nigrum* L. - (Ghosh & Agarwala, 1982)
- *Aphis (Aphis) spiraeicola* Patch, 1914
 - *Bidens pilosa* L. - West Bengal (Rao et al., 1969)
 - *Eupatorium riparium* Sch.Bip. ex Schnittsp. - (Ghosh & Agarwala, 1982)
 - *Solanum betaceum* Cav. - (Ghosh & Agarwala, 1982)
 - *Spiraea* sp. - Meghalaya (Starý & Ghosh, 1978)
 - *Symplocos* sp.- Meghalaya (Samanta, 1986)
- *Brachycaudus (Brachycaudus) helichrysi* (Kaltenbach, 1843
 - *Cucurbita* sp. - Sikkim (Tamili, 1988)
 - *Crassocephalum crepidioides* (Benth.) S.Moore - Meghalaya (Starý & Ghosh, 1978)
- *Brevicoryne brassicae* L.
 - *Brassica oleracea* L. *capitata* - Manipur (Bijaya et al., 1996)
- *Capitophorus* sp.
 - *Polygonum* sp. - (Ghosh & Agarwala, 1982)
- *Ceratovacuna silvestrii* (Takahashi, 1927)
 - *Saccharum officinarum* L. - West Bengal (Raychaudhuri et al., 1979)
- *Eriosoma lanigerum* (Hausmann, 1802)
 - *Malus domestica* (Suckow) Borkh.- Jammu & Kashmir (Rishi & Lone, 1983)
- *Hyalopterus pruni* (Geoffroy, 1762)
 - *Prunus domestica* L. - Jammu & Kashmir (Rishi & Lone, 1983)
- *Hyperomyzus (Hyperomyzus) carduellinus* (Theobald, 1915)
 - *Emilia sonchifolia* L. (DC.) - Himachal Pradesh (Saha et al., 1982)
 - *Sonchus* sp. - Meghalaya (Samanta, 1986)
- *Lipaphis (Lipaphis) erysimi* (Kaltenbach, 1843)
 - *Brassica oleracea* L. - Manipur (Singh & Singh, 1986c)
 - *Brassica oleracea* L. *capitata* - Manipur (Bijaya et al., 1996; Subhrani et al., 2006; Singh et al., 2011)
- *Macrosiphoniella (Macrosiphoniella) sanborni* (Gillette, 1908)
 - *Chrysanthemum* sp. - Not mentioned (Ghosh & Agarwala, 1982)
- *Macrosiphum (Macrosiphum) pachysiphon* Hille Ris Lambers, 1966
 - *Rubus rosifolius* Sm. - Not mentioned (Ghosh & Agarwala, 1982)
- *Macrosiphum (Macrosiphum) rosae* (Linnaeus, 1758)
 - *Rosa canina* L. - Sikkim (Starý & Ghosh, 1983); West Bengal (Raychaudhuri et al., 1978)
 - *Rosa* sp. - Mizoram (Sarkar, 1991)
- *Myzus (Myzus) ornatus* (Laing, 1932)
 - *Duranta* sp. - Not mentioned (Ghosh & Agarwala, 1982)
- *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
 - *Ageratina riparia* (Regel) R.M.King & H.Rob. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Ageratum conyzoides* L. - West Bengal (Tamili, 1988)

- *Antirrhinum majus* L. - Meghalaya (Starý & Ghosh, 1978)
 - *Artemisia vulgaris* L. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Brassica oleracea* L. - Sikkim (Raychaudhuri et al., 1979)
 - *Brassica oleracea* L. *capitata* - Manipur (Bijaya et al., 1996; Devi et al., 1999)
 - *Brassica oleracea* L. *gongylodes* - Manipur (Bijaya et al., 2001)
 - *Brassica rapa* L. - Manipur (Bijaya et al., 2001)
 - *Capsicum annuum* L. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Chenopodium album* L. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Impatiens balsamina* L. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Lantana camara* L. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Pisum sativum* L. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Polygonum* sp. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Prunus dulcis* (Mill.) D.A. Webb. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Psidium guajava* L. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Rubus rosifolius* Sm. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Solanum betaceum* Cav. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Solanum nigrum* L. - West Bengal (Agarwala, 1983)
 - *Solanum tuberosum* L. - Sikkim (Agarwala et al., 1980)
 - *Sonchus arvensis* L. - Not mentioned (Ghosh & Agarwala, 1982)
 - *Panaphis juglandis* (Goeze, 1778)
 - *Juglans regia* L. - Himachal Pradesh (Chakrabarti & Debnath, 2009)
 - *Prociphilus (Prociphilus) micheliae* Hille Ris Lambers, 1933
 - *Magnolia champaka* (L.) Baill. ex Pierre - Jammu & Kashmir (Khan & Shah, 2017)
 - *Prociphilus* sp. - *Lonicera quinquelocularis* Hardw. - Jammu & Kashmir (Bhagat, 1982b)
 - *Sitobion (Sitobion) rosaeiformis* (Das, 1918)
 - *Rosa* sp. - Sikkim (Agarwala et al., 1980; Tamili, 1988)
 - *Sitobion (Sitobion) rosaeiformis* (Das, 1918)
 - Unidentified plant - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
 - *Tetraneura* sp.
 - *Ailanthus altissima* (Mill.) Swingle - Jammu & Kashmir (Bhagat, 1982b)
 - *Uroleucon (Uroleucon) sonchi* (Linnaeus, 1767)
 - *Sonchus oleraceus* L. - Nagaland (Singh et al., 1991)
- 16. *Ephedrus ramnagarensis* Akhtar, 2011**
- Unknown aphid - Unidentified plant - Uttarakhand (Akhtar et al., 2011c)
- 17. *Ephedrus srinagarensis* Starý & Bhagat, 1978**
- *Aphis (Aphis) gossypii* Glover, 1877
 - *Rosa centifolia* L. - Manipur (Singh, 1987; Singh et al., 2011)
 - *Solanum melongena* L. - Manipur (Subhrani et al., 2006; Singh et al., 2011)
 - *Brachysiphoniella montana* (van der Goot, 1917)
 - *Louisiella paludosa* (Roxb.) Landge - Manipur (Singh, 1987; Singh et al., 2011)
 - *Myzus (Myzus) numecola* (Matsumura, 1917)
 - *Rubia cordifolia* L. - Jammu & Kashmir (Khan & Shah, 2017)
 - *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
 - *Ageratum conyzoides* L. - Meghalaya (Samanta, 1986); Sikkim (Tamili, 1988)
 - *Solanum nigrum* L. - Manipur (Singh et al., 2011)
 - *Myzus* sp.
 - *Lonicera quinquelocularis* Hardw. - Jammu & Kashmir (Starý & Bhagat, 1978)
 - *Prociphilus (Stagona) himalayaensis* Chakrabarti, 1976

- *Cotoneaster* sp. - Himachal Pradesh (Chakrabarti & Debnath, 2009); Uttarakhand (Chakrabarti et al., 2002)
 - *Lonicera quinquelocularis* Hardw. - Himachal Pradesh (Chakrabarti & Debnath, 2009); Uttarakhand (Chakrabarti et al., 2002)
 - *Prociphilus* sp.
 - *Cotoneaster* sp. - Uttarakhand (Das & Chakrabarti, 1990)
 - *Lonicera quinquelocularis* Hardw. - Jammu & Kashmir (Bhagat, 1982b); Uttarakhand (Das & Chakrabarti, 1990)
- 18. *Ephedrus trichosiphoniellae* Takada, 1968**
- *Capitophorus formosartemisiae* (Takahashi, 1921)
 - *Artemesia vulgaris* L. - Meghalaya (Samanta, 1986)
 - *Capitophorus hippophaes* (Walker, 1852)
 - *Polygonum* sp. - Meghalaya (Samanta, 1986)
 - *Myzus (Myzus) ornatus* Laing, 1932
 - Unidentified plant - Meghalaya (Samanta & Raychaudhuri, 1984)
 - *Neomyzus circumflexus* (Buckton, 1876)
 - Unidentified plant - Meghalaya (Samanta & Raychaudhuri, 1984)
- 19. *Ephedrus urticae* Bhagat, 1982**
- *Microlophium carnosum* (Buckton, 1876)
 - *Urtica dioica* L. - Jammu & Kashmir (Bhagat, 1982a)
 - *Micromyzus kalimpongensis* Basu, 1968
 - *Zingiber* sp. - Sikkim (Tamili, 1988); West Bengal (Tamili, 1988)
 - *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
 - *Solanum nigrum* L. - Nagaland (Pramanik, 1986)
- 20. *Ephedrus* sp.**
- *Aphis (Aphis) fabae* Scopoli, 1763
 - Unidentified plant - Himachal Pradesh (Chakrabarti & Debnath, 2009)
 - *Aphis (Aphis) gossypii* Glover, 1877
 - *Ocimum* sp. - Manipur (Singh, 1987; Singh et al., 2011)
 - *Aphis (Aphis) longisetosa* Basu, 1970
 - *Rubus ellipticus* Sm. - Meghalaya (Starý & Ghosh, 1975; Raychaudhuri et al., 1979)
 - *Aphis (Aphis) pomii* De Geer, 1773
 - *Malus domestica* (Suckow) Borkh.- Jammu & Kashmir (Khan & Shah, 2018)
 - *Aphis (Aphis) solanella* Theobald, 1914
 - Unidentified plant - Meghalaya (Starý & Ghosh, 1975)
 - *Aphis (Aphis) spiraeicola* Patch, 1914
 - *Spiraea* sp. - Meghalaya (Starý & Ghosh, 1975)
 - *Aphis (Toxoptera) aurantii* Boyer de Fonsc., 1841
 - *Citrus* sp. - Meghalaya (Starý & Ghosh, 1983)
 - *Aphis* sp.
 - *Rumex* sp. - Uttarakhand (Chakrabarti & Debnath, 2009)
 - *Aulacorthum* sp.
 - *Quercus* sp. - Jammu & Kashmir (Bhagat & Ahmad, 1991)
 - *Spiraea* sp. - Jammu & Kashmir (Bhagat & Ahmad, 1991)
 - Unidentified plant - Meghalaya (Starý & Ghosh, 1983)
 - *Brachycaudus (Brachycaudus) helichrysi* (Kaltenbach, 1843)
 - *Pyrus pashia* Buch. - Ham. ex D. Don - Uttarakhand (Chakrabarti & Debnath, 2009)
 - *Cavariella* sp.
 - *Salix* sp. - Himachal Pradesh (Chakrabarti & Debnath, 2009)

- *Eutrichosiphum flavum* (Takahashi, 1941)
- Unidentified plant - Meghalaya (Starý & Ghosh, 1983)
- *Lipaphis (Lipaphis) erysimi* (Kaltenbach, 1843)
- *Brassica napus* L. - Sikkim (Agarwala, 1979)
- *Myzus (Myzus) dycei* Carver, 1961
- *Urtica* sp. - Meghalaya (Starý & Ghosh, 1975)
- Urticaceae - Meghalaya (Starý & Ghosh, 1983)
- *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
- *Coriander* sp. - Manipur (Singh, 1987; Singh et al., 2011)
- *Solanum* sp. - Manipur (Singh, 1987; Singh et al., 2011)
- *Sitobion (Sitobion) miscanthi* (Takahashi, 1921)
- *Triticum aestivum* L. - Uttarakhand (Chakrabarti, 1993)
- *Uroleucon (Uroleucon) sonchi* (Linnaeus, 1767)
- *Blumea hieraciifolia* (D. Don) DC. - Manipur (Singh, 1987; Singh et al., 2011)

II. *Indoephedrus* *species

Samanta et al. (1983a) erected the genus *Indoephedrus* and described two species from Meghalaya as mentioned below.

1. *Indoephedrus neoficicola* Samanta, Pramanik & Raychaudhuri, 1983

- *Greenidea (Greenidea) ficicola* Takahashi, 1921
- *Psidium guajava* L. - Meghalaya (Samanta et al., 1983a)

2. *Indoephedrus reticulatus* Samanta, Pramanik & Raychaudhuri, 1983

- *Greenidea (Greenidea) ficicola* Takahashi, 1921
- *Psidium guajava* L. - Meghalaya (Samanta et al., 1983a)

III. *Neoephedrus* *species

Samanta et al. (1983b) erected another genus *Neoephedrus* and described two species from West Bengal as mentioned below.

1. *Neoephedrus helichrysi* Samanta, Tamili, Saha & Raychaudhuri, 1983

- *Brachycaudus (Brachycaudus) helichrysi* (Kaltenbach, 1843)
- *Poaceae* - West Bengal (Samanta et al., 1983b)

2. *Neoephedrus kalimpongensis* Samanta, Tamili, Saha & Raychaudhuri, 1983

- *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
- *Foeniculum vulgare* Mill. - West Bengal (Samanta et al., 1983b)

IV. *Toxares* species

The genus *Toxares* Haliday, 1840 is a small genus of Ephedrini with only six known species: *Toxares deltiger* (Haliday, 1833), *Toxares fovealis* Tomanović et al., 2024, *Toxares koreanus* Tomanovic, Kim & Petrovic, 2022, *Toxares macrosiphophagum* Shuja-Uddin, 1974, *Toxares shigai* Takada, 1965 and *Toxares zakai* Shuja-Uddin, 1974. The *Toxares deltiger* was reported from Europe, USA and several Asian countries (Choi et al., 2017); *Toxares koreanus* was reported from Korea (Kim et al., 2022), *Toxares fovealis* from the Netherlands (Tomanović et al., 2024), *Toxares macrosiphophagum* and *Toxares zakai* from India (Shuja-Uddin, 1974), and *Toxares shigai* from Japan (Takada, 1965). The aphid hosts of *Toxares* species mostly belong to the subfamily Aphidinae including some pest aphids (Starý & Ghosh, 1975, 1983; Powell, 1980; Raychaudhuri, 1990; Akhtar et al., 2011a). However, their biology is poorly known, and there is little information on their host, aphid, and host plant associations. Moreover, none of the species has been utilised for the biological control of aphids. In India, except *Toxares fovealis* and *Toxares koreanus*, other four species were reported to parasitise 35 species of aphids, mostly Aphidinae, infesting 59 host plants (several unidentified), comprising 66 tritrophic associations. They are distributed across five states in northeast India (Arunachal Pradesh, Meghalaya, Mizoram, Sikkim, and West Bengal) and two states in northwest India (Jammu & Kashmir and Uttarakhand) (Table 1). Among them,

Toxares deltiger is highly polyphagous parasitising 27 aphid species infesting 28 species of host plants with 32 tritrophic associations (triplets, parasitoid-aphid host-host plant associations) followed by *Toxares macrosiphophagum* (18 aphid species, 20 host plants, 22 triplets) and *Toxares shigai* (6 aphid species, 5 species of host plants, 6 triplets). *Toxares macrosiphophagum* is distributed in 6 states/union territories (Arunachal Pradesh, Jammu & Kashmir, Meghalaya, Mizoram, Sikkim, West Bengal), followed by *Toxares zakai* distributed in 4 states/union territories (Jammu & Kashmir, Meghalaya, Sikkim, West Bengal), and *Toxares deltiger* and *Toxares shigai* each distributed only in 3 states/union territories (Jammu & Kashmir, Meghalaya, West Bengal) of India (Table 1). The records demonstrated that *Myzus persicae* is preferred by all 4 species of *Toxares* while *Brachycaudus helichrysi* is preferred by 3 species of *Toxares*. A detailed checklist of *Toxares* species, along with their aphid hosts, host plants, and distribution, is provided below.

1. *Toxares deltiger* (Haliday, 1833)

- *Aphis* (*Aphis*) *nerii* Boyer de Fonsc., 1841
- *Calotropis procera* (Aiton) Dryand.- Meghalaya (Samanta, 1986)
- *Aphis* (*Aphis*) *pomi* De Geer, 1773
- *Malus domestica* (Suckow) Borkh.- Jammu & Kashmir (Khan & Shah, 2018)
- *Aphis* (*Aphis*) *solanella* Theobald, 1854
- Not mentioned - Meghalaya (Starý & Ghosh, 1978)
- *Aphis* (*Aphis*) *spiraecola* Patch, 1914
- *Hibiscus* sp. - Meghalaya (Starý & Ghosh, 1979)
- *Aphis* sp.
- *Zinnia elegans* L. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Betacallis sikkimensis* Basu, Ghosh & Raychaudhuri, 1974
- *Conium maculatum* L. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Betacallis* sp.
- *Conium maculatum* L. - Jammu & Kashmir (Bhagat, 1983; Bhagat, 1984)
- *Brachycaudus* (*Brachycaudus*) *helichrysi* (Kaltenbach, 1843)
- *Prunus domestica* L. - Meghalaya (Starý & Ghosh, 1979)
- *Brachycaudus* sp.
- *Carduus edelbergii* Rech.f.- Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Capitophorus hippophaes* (Walker, 1852)
- *Polygonum chiloensis* Rech.f. - Meghalaya (Starý & Ghosh, 1978)
- *Eriocolophium euryae* (Takahashi, 1937)
- *Eurya acuminata* DC.- Jammu & Kashmir (Starý & Bhagat, 1978); Meghalaya (Starý & Ghosh, 1978)
- *Eumyzus* sp.
- *Nepeta cataria* L. - Jammu & Kashmir (Bhagat, 1984)
- *Hyalopterus pruni* (Geoffroy, 1762)
- *Prunus domestica* L. - Jammu & Kashmir (Saha, 1988)
- *Hyperomyzus* sp.
- *Artemisia vestita* Wall ex Besser- Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Rubus fruticosus* Lour.- Jammu & Kashmir (Starý & Bhagat, 1978)
- *Lachnus tropicalis*
- Not mentioned - Meghalaya (Starý & Bhagat, 1978)
- *Macrosiphoniella* sp.
- Not mentioned - Jammu & Kashmir (Starý & Bhagat, 1978)
- *Metopolophium* (*Metopolophium*) *montanum* Hille Ris Lambers, 1966
- *Rose indica* L. - Jammu & Kashmir (Khan & Shah, 2017)

- *Myzus (Myzus) boehmeriae* Takahashi, 1923
 - Not mentioned - Meghalaya (Starý & Ghosh, 1978)
- *Myzus (Myzus) obtusirostris* David, Narayanan & Rajasingh, 1972
 - Not mentioned - Meghalaya (Starý & Ghosh, 1978)
- *Myzus (Myzus) ornatus* Laing, 1932
 - Unidentified plant - Meghalaya (Starý & Ghosh, 1978)
- *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
 - *Crassocephalum crepidioides* (Benth.) S.Moore - Meghalaya (Starý & Ghosh, 1978)
 - *Dianthus* sp. - Meghalaya (Starý & Bhagat, 1978)
 - *Solanum aculeatissimum* Jack. - Meghalaya (Starý & Ghosh, 1978)
- *Ovatus (Ovatus) nr. crataegarius* (Walker, 1850)
 - *Mentha longifolia* (L.) L.- Jammu & Kashmir (Bhagat, 1984)
- *Persicaria chinensis* (L.) H.Gross
 - Not mentioned - Meghalaya (Starý & Ghosh, 1979)
- *Prociphilus* sp.
 - *Lonicera quinquelocularis* Hardw.- Jammu & Kashmir (Bhagat, 1984)
- *Rhopalosiphum nymphaeae* (Linnaeus, 1761)
 - *Pyrus communis* L. - Meghalaya (Starý & Ghosh, 1979)
- *Schizaphis (Schizaphis) rotundiventris* (Signoret, 1860)
 - *Pyrus communis* L. - Meghalaya (Starý & Ghosh, 1978)
 - Not mentioned- Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- Unidentified aphid
 - *Calotropis* sp. - West Bengal (Tamili, 1988)
 - *Solanum lycopersicum* L. - Jammu & Kashmir (Bhat, 2008)

2. *Toxares macrosiphophagum* Shuja-Uddin, 1974

- *Aphis (Aphis) gossypii* Glover, 1877
 - *Bidens pilosa* L.- Sikkim (Tamili, 1988); West Bengal (Tamili, 1988)
- *Aphis (Aphis) solanella* Theobald, 1914
 - Not mentioned - Meghalaya (Starý & Ghosh, 1983)
- *Brachycaudus (Brachycaudus) helichrysi* (Kaltenbach, 1843)
 - *Capsicum annuum* L. - Sikkim (Tamili, 1988); West Bengal (Tamili, 1988)
 - *Capsicum* sp.- Arunachal Pradesh (Samanta, 1986)
 - Not mentioned - Meghalaya (Starý & Ghosh, 1983)
- *Brachycaudus* sp.
 - Not mentioned - Jammu & Kashmir (Starý & Ghosh, 1983)
- *Capitophorus hippophaes* (Walker, 1852)
 - Not mentioned - Meghalaya (Starý & Ghosh, 1983)
- *Capitophorus mitegoni* Eastop, 1956
 - *Persicaria chinensis* (L.) H. Gross - Meghalaya (Samanta, 1986)
- *Eriocolophium euryae* (Takahashi, 1937)
 - Not mentioned - Meghalaya (Starý & Ghosh, 1983)
- *Hyperomyzus* sp.
 - Not mentioned - Jammu & Kashmir (Starý & Ghosh, 1983)
- *Lachnus tropicalis* (van der Goot, 1916)
 - Not mentioned - Meghalaya (Starý & Ghosh, 1983)
- *Macrosiphoniella (Macrosiphoniella) pseudoartenisiae* Shinji, 1933
 - *Artemisia absinthium* L.- Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Macrosiphoniella (Macrosiphoniella) sanborni* (Gillette, 1908)
 - *Chrysanthemum* sp.- Jammu & Kashmir (Shuja-Uddin, 1974; Saha, 1988); Meghalaya (Samanta, 1986)

- *Macrosiphoniella* sp.
 - Not mentioned - Jammu & Kashmir (Starý & Ghosh, 1983)
 - *Myzus (Myzus) obtusirostris* David, Narayanan & Rajasingh, 1972
 - Not mentioned - Meghalaya (Starý & Ghosh, 1983)
 - *Myzus (Myzus) ornatus* (Laing, 1932)
 - *Capsicum* sp.- West Bengal (Tamili, 1988)
 - *Chrysanthemum* sp.- Mizoram (Sarkar, 1991)
 - Not mentioned - Meghalaya (Starý & Ghosh, 1983)
 - *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
 - Not mentioned - West Bengal (Tamili, 1988); Meghalaya (Starý & Ghosh, 1983)
 - *Myzus (Myzus) boehmeriae* Takahashi, 1923
 - Not mentioned - Meghalaya (Starý & Ghosh, 1983)
 - *Rhopalosiphum nymphaeae* (Linnaeus, 1761)
 - Not mentioned - Meghalaya (Starý & Ghosh, 1983)
 - *Schizaphis (Schizaphis) rotundiventris* (Signoret, 1860)
 - Not mentioned - Meghalaya (Starý & Ghosh, 1983)
- 3. *Toxares shigai* Takada, 1965**
- *Aphis (Aphis) farinosa* Gmelin, 1790
 - *Salix alba* L.- Jammu & Kashmir (Takada & Rishi, 1980; Saha, 1988)
 - *Brachycaudus (Brachycaudus) helichrysi* (Kaltenbach, 1843)
 - *Prunus* sp. - Meghalaya (Starý & Ghosh, 1975)
 - *Chaitophorus leucomelas* Koch, 1854
 - *Salix alba* L. - Jammu & Kashmir (Takada & Rishi, 1980)
 - *Macrosiphoniella (Macrosiphoniella) sanborni* (Gillette, 1908)
 - Not mentioned - West Bengal (Dharmadhikari & Ramaseshiah, 1970)
 - *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
 - Not mentioned - Meghalaya (Starý & Ghosh, 1975)
 - *Uroleucon (Uroleucon) tanacetii* (Linnaeus, 1758)
 - *Chrysanthemum leucanthum* (Makino) Makino- Jammu & Kashmir (Takada & Rishi, 1980; Saha, 1988)
- 4. *Toxares zakai* Shuja-Uddin, 1974**
- *Aphis (Aphis) craccivora* Koch, 1854
 - *Sonchus* sp. - Meghalaya (Samanta, 1986)
 - *Microlophium carnosum* (Buckton, 1876)
 - *Urtica dioica* L. - Jammu & Kashmir (Saha, 1988)
 - *Microlophium* sp.
 - *Urtica dioica* L. - Jammu & Kashmir (Bhagat, 1983; Chakrabarti & Debnath, 2009)
 - *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
 - *Solanum nigrum* L. - Jammu & Kashmir (Shuja-Uddin, 1974; Dey & Akhtar, 2007)
 - *Solanum tuberosum* L. - Jammu & Kashmir (Khan & Shah, 2017)
 - *Sinomegoura rhododendri* (Takahashi, 1937)
 - *Rhododendron* sp. - Meghalaya (Samanta, 1986); Sikkim (Tamili, 1988); West Bengal (Tamili, 1988)
- 5. *Toxares* sp.**
- *Shinjia orientalis* (Mordvilko, 1929)
 - Not mentioned - Uttarakhand (Das & Chakrabarti, 1991)

B. Tritrophic associations and distribution of Praini parasitoids

Two genera of the tribe Praini, *Areopraon* Mackauer, 1959 (a single species *Areopraon lepellei* (Waterston, 1926)) and *Praon* Haliday, 1833 had been recorded from India (Rishi & Bhagat, 1980; Bhagat, 1981; Khan & Shah, 2017; Das & Chakrabarti, 2023b). Recently, *Areopraon lepellei* has been synonymised with *Praon lepellei* Waterston, 1926. *Areopraon* sp. recorded by Rishi (1976) also seems to belong *Praon* sp. Thus, *Praon* is the only genus of the tribe Praini reported from India. It is the largest genus of the tribe Praini comprising about 80 valid species (GBIF, 2025), and is widely distributed in Europe, Asia and North America parasitising several species of aphids mostly feeding on agricultural crops, wild herbs and a few trees (Farahani et al., 2017; Gadallah et al., 2022). Its few species have been utilised as bioagents in the biological control of many species of aphids particularly in the USA (Boivin et al., 2012; Singh & Singh, 2016).

Table 5. List of species of *Praon* associated with different number of species of aphids, host plants, tritrophic associations (triplets) in different number of states and union territories of India.

Parasitoid species	Number of			
	Species of aphid hosts	Species of host plants	Triples	States/union territories
1. <i>Praon abjectum</i>	10	13	15	8
2. <i>Praon dorsale</i>	9	10	10	4
3. <i>Praon flavinode</i>	7	3	7	3
4. <i>Praon himalayensis</i>	1	1	1	2
5. <i>Praon hyperomyzus</i>	1	1	1	1
6. <i>Praon kashmirensis</i>	2	1	2	1
7. <i>Praon lepellei</i>	4	3	5	1
8. <i>Praon longicorne</i>	2	2	2	2
9. <i>Praon megourae</i>	1	1	1	1
10. <i>Praon mollitrichosiphi</i>	1	1	1	1
11. <i>Praon necans</i>	2	4	4	3
12. <i>Praon orientale</i>	5	5	6	4
13. <i>Praon pubescens</i>	1	1	1	1
14. <i>Praon stagona</i>	1	1	1	1
15. <i>Praon volucre</i>	21	27	38	8
16. <i>Praon</i> sp.	15	14	16	5
Total	63	62	111	13

Table 5 demonstrated that 16 species of *Praon* parasitised 63 species of aphids, which infest 62 species of host plants and are distributed across 13 states/union territories of India. *Praon volucre* is highly polyphagous parasitising 21 species of aphids infesting 27 species of host plants followed by *Praon abjectum* (10 species of aphids, 13 species of host plants), *Praon dorsale* (9 species of aphids, 10 species of host plants), *Praon orientale* (5 species of aphids, 5 species of host plants), and others with 1-4 aphid hosts feeding on 1-4 species of host plants. All the aphid species are parasitised by 1-3 species of *Praon* parasitoids (Table 6). Table 7 shows that all the host plants are infested by 1-5 species of aphids and parasitised by 1-3 species of parasitoids.

Regarding the distribution of Praini parasitoids, almost 94% of species (44 out of 47 species) were recorded in northeast and northwest India. Two-thirds *Praon* species (11 species) were recorded in Jammu & Kashmir followed by Meghalaya (7 species), Uttarakhand (6 species), Himachal Pradesh and West Bengal (each 5 species) and less than 5 species in the remaining 8 states. Two species, *Praon abjectum* and *Praon volucre* are reported from 8 states/union territories of India, whereas other species are distributed in 1-4 states/union territories (Table 5). Jammu & Kashmir hosts a maximum of 11 species of *Praon* parasitising

34 species of aphids feeding on 32 species of food plants followed by Meghalaya (7 species of parasitoids parasitising 20 species of aphids feeding on 18 species of food plants), Uttarakhand (6 species of parasitoids parasitising 8 species of aphids feeding on 6 species of food plants), West Bengal (5 species of parasitoids parasitising 11 species of aphids feeding on 11 species of food plants), Himachal Pradesh (5 species of parasitoids parasitising 7 species of aphids feeding on 9 species of food plants) and other states 1-4 species of parasitoids parasitising 1-6 species of aphids infesting 1-7 species of host plants (Table 8).

Table 6. List of aphid species associated with different number of species of *Praon*, host plants and tritrophic associations (number of triplets) in different number of states and union territories of India.

Species of aphids	Number of			
	Species of parasitoids	Species of host plants	Triplets	States/union territories
1. <i>Acyrtosiphon gossypii</i>	2	4	4	6
2. <i>Acyrtosiphon rubi</i>	1	1	1	1
3. <i>Amphicercidius tuberculatus</i>	1	1	1	1
4. <i>Aphis arundinis</i>	1	1	1	1
5. <i>Aphis craccivora</i>	2	1	2	3
6. <i>Aphis fabae</i>	1	2	2	1
7. <i>Aphis farinosa</i>	1	1	1	1
8. <i>Aphis gossypii</i>	3	7	7	4
9. <i>Aphis grossulariae</i>	1	1	1	1
10. <i>Aphis pomi</i>	1	1	1	1
11. <i>Aphis</i> sp.	2	2	2	1
12. <i>Aphis spiraeicola</i>	1	1	1	1
13. <i>Aulacorthum solani</i>	1	1	1	1
14. <i>Brachycaudus helichrysi</i>	1	1	1	1
15. <i>Chaetosiphon</i> sp.	1	2	2	1
16. <i>Chaitophorus pakistanicus</i>	1	1	1	1
17. <i>Dactynotus</i> sp.	1	1	1	1
18. <i>Eriosoma lanigerum</i>	2	1	2	1
19. <i>Eriosoma</i> sp.	2	3	3	1
20. <i>Eriosoma ulmi</i>	2	1	2	1
21. <i>Hyadaphis coriandri</i>	1	1	1	1
22. <i>Hyalopterus pruni</i>	1	2	2	1
23. <i>Hyperomyzus carduellinus</i>	1	1	1	1
24. <i>Hyperomyzus lactucae</i>	1	2	2	1
25. <i>Liosomaphis atra</i>	1	1	1	1
26. <i>Liosomaphis berberidis</i>	1	1	1	
27. <i>Liosomaphis himalayensis</i>	1	1	1	2
28. <i>Lipaphis erysimi</i>	1	3	3	5
29. <i>Macromyzus maculatus</i>	1	1	1	1
30. <i>Macrosiphoniella pseudoartemisiae</i>	1	1	1	1
31. <i>Macrosiphoniella sanborni</i>	2	2	3	1
32. <i>Macrosiphoniella</i> sp.	2	2	2	1
33. <i>Macrosiphoniella spinipes</i>	1	1	1	1
34. <i>Macrosiphoniella yomogifoliae</i>	2	1	2	1
35. <i>Macrosiphum pachysiphon</i>	1	1	1	1
36. <i>Macrosiphum rosae</i>	1	1	1	1
37. <i>Macrosiphum</i> sp.	1	1	1	2
38. <i>Melanaphis donacis</i>	1	2	2	3
39. <i>Melanaphis meghalayensis</i>	1	1	1	1
40. <i>Mollitrichosiphum tenuicorpus</i>	1	1	1	1
41. <i>Myzaphis rosarum</i>	2	2	3	1
42. <i>Myzaphis turanica</i>	2	1	2	1
43. <i>Myzus ornatus</i>	2	2	2	2
44. <i>Myzus persicae</i>	2	7	7	4

Species of aphids	Number of			
	Species of parasitoids	Species of host plants	Triplets	States/union territories
45. <i>Myzus persicae nicotianae</i>	1	1	1	1
46. <i>Myzus</i> sp.	2	3	3	2
47. <i>Nasonovia</i> sp.	1	1	1	1
48. <i>Panaphis juglandis</i>	2	1	2	2
49. <i>Periphyllus aesculi</i>	1	1	1	1
50. <i>Prociphilus (Stagona) sp.</i>	1	1	1	1
51. <i>Pseudomegoura magnoliae</i>	1	1	1	1
52. <i>Rhopalosiphum maidis</i>	1	1	1	1
53. <i>Rhopalosiphum nymphaeae</i>	3	5	5	3
54. <i>Rhopalosiphum padi</i>	1	1	1	1
55. <i>Schizoneurella indica</i>	1	1	1	1
56. <i>Sitobion avenae</i>	1	1	1	1
57. <i>Sitobion miscanthi</i>	1	1	1	1
58. <i>Sitobion rosaeiformis</i>	1	1	1	1
59. <i>Sitobion</i> sp.	1	1	1	1
60. <i>Subovatomyzus leucosceptri</i>	1	1	1	1
61. <i>Uroleucon (Uroleucon) sonchi</i>	2	2	2	2
62. <i>Uroleucon</i> sp.	4	5	7	4
63. Unidentified aphid	3	3	3	2
Total	16	63	112	13

Table 7. The list of host plant species associated with *Praon* parasitoids and number of species of host aphids and tritrophic associations (triplets) in different number of states and union territories of India.

Species of plants	Number of			
	Species of aphids	Species of parasitoids	Triplets	States/union territories
1. <i>Antirrhinum majus</i>	1	1	1	1
2. <i>Argemone mexicana</i>	2	1	2	1
3. <i>Artemisia absinthium</i>	1	1	1	1
4. <i>Artemisia</i> sp.	1	1	1	1
5. <i>Artemisia vulgaris</i>	5	2	6	3
6. <i>Arundo donax</i>	1	1	1	2
7. <i>Berberis pseudoumbellata</i>	2	1	2	1
8. <i>Berberis</i> sp.	1	1	1	2
9. <i>Bidens pilosa</i>	1	1	1	1
10. <i>Brassica napus</i>	1	1	1	1
11. <i>Brassica oleracea</i>	1	1	1	1
12. <i>Brassica</i> sp.	2	1	2	3
13. <i>Chronolaena odorata</i>	1	1	1	1
14. <i>Chrysanthemum</i> sp.	2	2	2	1
15. <i>Chrysanthemum morifolium</i>	1	2	2	1
16. <i>Duhaldea cappa</i>	1	1	1	1
17. <i>Duranta</i> sp.	1	1	1	1
18. <i>Emilia souhifolia</i>	1	1	1	1
19. <i>Epilobium hirsutum</i>	2	1	2	1
20. <i>Hibiscus rosasinensis</i>	1	1	1	1
21. <i>Hordeum vulgare</i>	2	1	2	1
22. <i>Juglans regia</i>	1	1	1	2
23. <i>Lablab purpureus</i>	2	3	3	3
24. <i>Lantana camara</i>	1	1	1	1
25. <i>Lespedeza</i> sp.	1	1	1	1
26. <i>Lonicera quinquelocularis</i>	2	2	3	1
27. <i>Malus domestica</i>	1	1	1	1
28. <i>Melanoseris brunoniana</i>	1	1	1	1

Species of plants	Number of			
	Species of aphids	Species of parasitoids	Triplets	States/union territories
29. <i>Nepeta racemosa racemosa</i>	1	1	1	1
30. <i>Nicotiana</i> sp.	1	1	1	1
31. <i>Nicotiana tabacum</i>	1	1	1	1
32. <i>Nymphaea alba</i>	1	1	1	1
33. <i>Nymphaea</i> sp.	1	1	1	1
34. <i>Phragmites australis</i>	2	1	2	1
35. <i>Phragmites</i> sp.	1	1	1	1
36. <i>Pisum sativum</i>	1	1	1	2
37. <i>Poa</i> sp.	2	2	2	2
38. <i>Polygonum perfoliatum</i>	1	1	1	1
39. <i>Prunus domestica</i>	4	2	4	2
40. <i>Quercus</i> sp.	1	1	1	1
41. <i>Raphanus sativus</i>	1	1	1	1
42. <i>Rosa macrophylla</i> Lindl.	1	1	1	1
43. <i>Rosa webbiana</i>	2	2	2	1
44. <i>Rubus fruticosus</i>	1	1	1	1
45. <i>Salix babylonica</i>	1	1	1	1
46. <i>Salix</i> sp.	2	1	2	1
47. <i>Solanum betaceum</i>	1	1	1	1
48. <i>Solanum donianum</i>	1	1	1	1
49. <i>Solanum nigrum</i>	2	2	2	3
50. <i>Solanum tuberosum</i>	1	1	1	1
51. <i>Sonchus arvensis</i>	2	1	2	2
52. <i>Sonchus asper</i>	1	1	1	1
53. <i>Sonchus oleraceus</i>	2	2	2	2
54. <i>Sonchus</i> sp.	2	3	3	2
55. <i>Stauntonia</i> sp.	1	1	1	1
56. <i>Strobilanthes</i> sp.	1	1	1	1
57. <i>Trapa natans</i> var. <i>bispinosa</i>	1	1	1	1
58. <i>Ulmus villosa</i>	1	1	1	1
59. <i>Ulmus wallichiana</i>	3	1	3	1
60. <i>Ulmus</i> sp.	1	1	1	1
61. <i>Vicia faba</i>	1	1	1	1
62. <i>Zea mays</i>	1	1	1	1
63. Unidentified plants	9	8	9	2
Total	63	16	112	13

Table 8. List of states/union territories of India containing different number of species of *Praon* parasitoids, aphid hosts, host plants and tritrophic associations (number of triplets).

States	Number of			
	Species of parasitoids	Species of aphids	Species of host plants	Triplets
1. Assam	1	1	1	1
2. Delhi	1	1	1	1
3. Karnataka	1	1	1	1
4. Rajasthan	1	1	1	1
5. Uttar Pradesh	1	2	1	2
6. Manipur	2	1	1	2
7. Mizoram	2	3	3	3
8. Sikkim	4	6	7	7
9. Himachal Pradesh	5	7	9	9
10. West Bengal	5	11	11	12
11. Uttarakhand	6	8	6	10
12. Meghalaya	7	20	18	23
13. Jammu & Kashmir	11	34	32	48
Total	16	63	63	112

Detail tritrophic associations of *Praon* species in India are listed below.

1. *Praon abjectum* (Haliday, 1833)

- *Aphis* (*Aphis*) *craccivora* Koch, 1854
 - *Lablab purpureus* (L.) Sweet ssp. *purpureus* - Karnataka (Dharmadhikari & Ramaseshiah, 1970); Sikkim (Tamili, 1988)
- *Aphis* (*Aphis*) *fabae* Scopoli, 1763
 - *Solanum nigrum* L. - Sikkim (Tamili, 1988)
 - *Vicia faba* L. - Sikkim (Tamili, 1988)
- *Aphis* (*Aphis*) *farinosa* Gmelin, 1790
 - *Salix babylonica* L. - Jammu & Kashmir (Bhagat, 1984; Saha, 1988)
- *Aphis* (*Aphis*) *gossypii* Glover, 1877
 - *Stantonia* sp. - Meghalaya (Samanta, 1986)
 - Unidentified plant - Jammu & Kashmir (Chakrabarti & Debnath, 2009); Mizoram (Sarkar, 1991)
- *Aphis* (*Bursaphis*) *grossulariae* Kaltenbach, 1843
 - *Epilobium hirsutum* L. - Jammu & Kashmir (Bhagat, 1983; Bhagat, 1984)
- *Aphis* sp.
 - *Nepeta racemosa racemosa* Lam. - Jammu & Kashmir (Bhagat, 1984)
- *Melanaphis donacis* (Passerini, 1862)
 - *Arundo donax* L. - Himachal Pradesh (Chakrabarti & Debnath, 2009); Jammu & Kashmir (Bhagat, 1984)
 - *Phragmites* sp. - Uttarakhand (Chakrabarti & Debnath, 2009)
- *Myzaphis rosarum* (Kaltenbach, 1843)
 - *Rosa* sp. - Jammu & Kashmir (Bhagat, 1984)
- *Myzaphis turanica* Nevsky, 1929
 - *Rosa* sp. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Rhopalosiphum nymphaeae* (Linnaeus, 1761)
 - *Epilobium hirsutum* L. - Jammu & Kashmir (Starý & Bhagat, 1978)
- *Rhopalosiphum padi* (Linnaeus, 1758)
 - *Poa* sp. - West Bengal (Tamili, 1988)

2. *Praon dorsale* (Haliday, 1833)

- *Acyrtosiphon* (*Acyrtosiphon*) *gossypii* Mordvilko, 1914
 - Unknown plant - Jammu & Kashmir (Subba Rao & Sharma 1960)
- *Acyrtosiphon* (*Acyrtosiphon*) *pisum* (Harris, 1776)
 - *Pisum sativum* L. - Sikkim (Tamili, 1988); West Bengal (Tamili, 1988)
- *Acyrtosiphon* (*Acyrtosiphon*) *rubi* (Narzikulov, 1957)
 - *Rubus fruticosus* Lour. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Amphicercidus tuberculatus* David, Narayanan & Rajasingh, 1971
 - *Lonicera quinquelocularis* Hardw. - Jammu & Kashmir (Bhagat, 1984; Das & Chakrabarti, 2023b)
- *Liosomaphis himalayensis* Basu, 1964
 - *Berberis* sp. - Meghalaya (Samanta, 1986); Sikkim (Tamili, 1988)
- *Macrosiphoniella* (*Macrosiphoniella*) *sanborni* (Gillette, 1908)
 - *Chrysanthemum* sp. - Jammu & Kashmir (Bhagat, 1984; Das & Chakrabarti, 2023b)
 - *Chrysanthemum morifolium* (Ramat.) Hemsl. - Jammu & Kashmir (Bhagat, 1984; Saha, 1988)
- *Melanaphis meghalayensis* Raychaudhuri & Banerjee, 1974
 - *Poa* sp. - Meghalaya (Samanta, 1986)

- *Subovatomyzus leucosceptri* Basu, 1964
 - *Duhaldea cappa* (Buch.- Ham. ex D.Don) Pruski & Anderb. - Meghalaya (Samanta, 1986)
- *Uroleucon (Uroleucon) sonchi* (Linnaeus, 1767)
 - *Sonchus oleraceus* L. - West Bengal (Tamili, 1988)
- 3. ***Praon flavinode* (Haliday, 1833) [synonym *Praon absinthii* Bignell, 1894]**
 - *Aphis (Aphis) gossypii* Glover, 1877
 - *Artemisia vulgaris* L. - Meghalaya (Dharmadhikari & Ramaseshiah, 1970)
 - *Dactynotus* sp.
 - *Artemisia vulgaris* L. - Meghalaya (Dharmadhikari & Ramaseshiah, 1970)
 - *Macrosiphoniella (Macrosiphoniella) pseudoartemisiae* Shinji, 1933
 - *Artemisia absinthium* L. - Jammu & Kashmir (Saha, 1988)
 - *Macrosiphoniella (Macrosiphoniella) sanborni* (Gillette, 1908)
 - *Chrysanthemum morifolium* (Ramat.) Hemsl. - Jammu & Kashmir (Saha, 1988)
 - *Macrosiphoniella (Macrosiphoniella) yomogifoliae* (Shinji, 1922)
 - *Artemisia vulgaris* L. - Manipur (Singh, 1987)
 - *Macrosiphoniella* sp. - *Artemisia vulgaris* L. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
 - *Uroleucon* sp.
 - *Artemisia vulgaris* L. - Meghalaya (Dharmadhikari & Ramaseshiah, 1970)
- 4. ***Praon himalayensis* Das & Chakrabarti, 1989**
 - *Panaphis juglandis* (Goeze, 1778)
 - *Juglans regia* L. - Himachal Pradesh (Chakrabarti & Debnath, 2009); Uttarakhand (Das & Chakrabarti, 1989b; Sarkar, 2022)
- 5. ***Praon hyperomyzus* Saha, Poddar, Das, Agarwala & Raychaudhuri, 1982**
 - *Hyperomyzus (Hyperomyzus) carduellinus* (Theobald, 1915)
 - *Emilia sonchifolia* L.(DC.) - Himachal Pradesh (Saha et al., 1982; Chakrabarti & Debnath, 2009)
- 6. ***Praon kashmirensis* Bhagat, 1982**
 - *Chaitophorus pakistanicus* Hille Ris Lambers, 1966
 - *Salix* sp. - Jammu & Kashmir (Bhagat, 1982a)
 - *Periphyllus aesculi* Hille Ris Lambers, 1933
 - *Salix* sp. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- 7. ***Praon lepelleyi* Waterston, 1926 [synonym *Areopraon lepelleyi* (Waterston, 1926)]**
 - *Eriosoma ulmi* (Linnaeus, 1758)
 - *Ulmus villosa* Brandis ex Gamble - Jammu & Kashmir (Bhagat, 1981, 1982a)
 - *Eriosoma* sp.
 - *Ulmus* sp. - Jammu & Kashmir (Rishi & Bhagat, 1980)
 - *Ulmus villosa* Brandis ex Gamble - Jammu & Kashmir (Bhagat, 1982b)
 - *Schizoneurella indica* Hille Ris Lambers, 1973
 - *Ulmus wallichiana* Planch. - Jammu & Kashmir (Bhagat, 1982b; Saha, 1988)
 - *Eriosoma lanigerum* (Hausmann, 1802)
 - *Malus domestica* (Suckow) Borkh.- Jammu & Kashmir (Khan & Shah, 2017)
- 8. ***Praon longicorne* Marshall, 1896 [synonym *Praon grossum* Starý, 1971]**
 - *Macrosiphoniella (Macrosiphoniella) yomogifoliae* (Shinji, 1922)
 - *Artemisia vulgaris* L. - Manipur (Singh, 1987)
 - Unidentified aphid- Unidentified plant - Jammu & Kashmir (Subba Rao & Sharma, 1960)
- 9. ***Praon megourae* Starý, 1971**
 - *Macromyzus (Anthracosiphoniella) maculatus* (Basu, 1969)

- Unknown plant - Meghalaya (Samanta & Raychaudhuri, 1984)
- 10. ***Praon mollitrichosiphi* Agarwala, Saha & Mahapatra, 1987**
 - *Mollitrichosiphum (Mollitrichosiphum) tenuicorpus* (Okajima, 1908)
 - *Quercus* sp. - Sikkim (Agarwala et al., 1987)
- 11. ***Praon necans* Mackauer, 1959 [synonym *Praon nymphaeae* Subba Rao, Sarup & Sharma, 1963]**
 - *Rhopalosiphum nymphaeae* (Linnaeus, 1761)
 - *Nymphaea* sp. - Jammu & Kashmir (Bhagat, 1984; Saha, 1988)
 - *Rhopalosiphum nymphaeae* (Linnaeus, 1761)
 - *Trapa natans* var. *bispinosa* (Roxb.) Makino - Delhi (Subba Rao et al., 1963)
 - *Nymphaea alba* L. - Jammu & Kashmir (Bhagat, 1983; Chakrabarti & Debnath, 2009)
 - Unidentified aphid- *Rosa* sp. - West Bengal (Tamili, 1988)
- 12. ***Praon orientale* Starý & Schlinger, 1967**
 - *Aulacorthum (Aulacorthum) solani* (Kaltenbach, 1843)
 - *Solanum donianum* Walp. - Meghalaya (Samanta, 1986)
 - *Macrosiphum (Macrosiphum) rosae* (Linnaeus, 1758)
 - Unknown plant - Meghalaya (Samanta & Raychaudhuri, 1984)
 - *Pseudomegouramagnoliae* (Essig & Kuwana, 1918)
 - *Magnolia* sp. - West Bengal (Tamili, 1988)
 - *Uroleucon (Uroleucon) sonchi* (Linnaeus, 1767)
 - *Sonchus arvensis* L. - Uttarakhand (Das & Chakrabarti, 2018)
 - *Uroleucon* sp.
 - *Sonchus arvensis* L. - Himachal Pradesh (Chakrabarti & Debnath, 2009); Uttarakhand (Das & Chakrabarti, 1991; Sarkar, 2022)
 - *Sonchus* sp. - Uttarakhand (Das & Chakrabarti, 1991)
- 13. ***Praon pubescens* Starý, 1961**
 - *Nasonovia* sp.
 - *Strobilanthes* sp. - Uttarakhand (Das & Chakrabarti, 1991; Sarkar, 2022)
- 14. ***Praon stagona* Takada & Rishi, 1980**
 - *Prociphilus (Stagona)* sp.
 - *Lonicera quinquelocularis* Hardw. - Jammu & Kashmir (Takada & Rishi, 1980; Saha, 1988)
- 15. ***Praon volucre* (Haliday, 1833) [synonym *Praon myzophagum* Mackauer, 1959]**
 - *Acyrtosiphon (Acyrtosiphon) pisum* (Harris, 1776)
 - *Lablab purpureus* (L.) Sweet ssp. *purpureus* - Meghalaya (Samanta, 1986)
 - *Solanum nigrum* L. - Assam (Sarkar, 1991); Mizoram (Pramanik, 1986; Sarkar, 1991)
 - *Aphis (Aphis) arundinis* Fabricius, 1775
 - *Prunus domestica* L. - Jammu & Kashmir (Bhagat, 1984)
 - *Aphis (Aphis) gossypii* Glover, 1877
 - *Lantana camara* L. - Meghalaya (Rao, 1969)
 - *Nicotiana* sp. - West Bengal (Rao et al., 1969)
 - *Solanum betaceum* Cav. - West Bengal (Rao et al., 1969)
 - *Aphis (Aphis) pomi* De Geer, 1773
 - *Malus domestica* (Suckow) Borkh.- Jammu & Kashmir (Rishi & Lone, 1983)
 - *Aphis (Aphis) spiraeicola* Patch, 1914
 - *Bidens pilosa* L. - West Bengal (Dharmadhikari & Ramaseshiah, 1970)
 - *Aphis* sp.
 - *Lespedeza* sp. - Jammu & Kashmir (Bhagat, 1984)
 - *Eriosoma lanigerum* (Hausmann, 1802)

- *Malus domestica* (Suckow) Borkh.- Jammu & Kashmir (Rishi & Lone, 1983)
- *Hyadaphis coriandri* (Das, 1918)
 - *Phragmites australis* (Cav.) Trin. ex Steud. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Hyalopterus pruni* (Geoffroy, 1762)
 - *Phragmites australis* (Cav.) Trin. ex Steud. - Jammu & Kashmir (Bhagat, 1984)
 - *Prunus domestica* L. - Jammu & Kashmir (Bhagat, 1983; Chakrabarti & Debnath, 2009)
- *Hyperomyzus (Hyperomyzus) lactucae* (Linnaeus, 1758)
 - *Sonchus oleraceus* L. - Jammu & Kashmir (Bhagat, 1984)
 - *Sonchus* sp. - Jammu & Kashmir (Saha, 1988)
- *Liosomaphis atra* Hille Ris Lambers, 1966
 - *Berberis pseudoumbellata* R. Parker - Jammu & Kashmir (Bhagat, 1984)
- *Liosomaphis berberidis* (Kaltenbach, 1843)
 - *Berberis pseudoumbellata* R. Parker - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Lipaphis (Lipaphis) erysini* (Kaltenbach, 1843)
 - *Brassica napus* L. - West Bengal (Tamili, 1988)
 - *Brassica* sp. - Jammu & Kashmir (Starý & Bhagat, 1978); Meghalaya (Samanta, 1986); Mizoram (Sarkar, 1991)
 - Unidentified plant - Himachal Pradesh (Starý & Ghosh, 1983)
- *Macrosiphum* sp.
 - *Rosa* sp. - Jammu & Kashmir (Bhagat, 1983; Bhagat, 1984); Uttarakhand (Das & Chakrabarti, 1991)
- *Myzaphis rosarum* (Kaltenbach, 1843)
 - *Rosa* sp. - Jammu & Kashmir (Bhagat, 1983; Chakrabarti & Debnath, 2009)
- *Myzaphis rosarum* (Kaltenbach, 1843)
 - *Rosa webbiana* Wall. - Jammu & Kashmir (Bhagat, 1987)
- *Myzaphis turanica* Nevsky, 1929
 - *Rosa* sp. - Jammu & Kashmir (Bhagat, 1984)
- *Myzus (Myzus) ornatus* (Laing, 1932)
 - *Duranta* sp. - India (Ghosh & Agarwala, 1982)
- *Myzus (Nectarosiphon) persicae* (Sulzer, 1776)
 - *Argemone mexicana* L. - West Bengal (Dharmadhikari & Ramaseshiah, 1970)
 - *Brassica oleracea* L. - Himachal Pradesh (Chakrabarti & Debnath, 2009)
 - *Hibiscus rosasinensis* L. - Sikkim (Tamili, 1988)
 - *Polygonum perfoliatum* L. - India (Ghosh & Agarwala, 1982)
 - *Raphanus sativus* L. - India (Ghosh & Agarwala, 1982)
 - *Solanum tuberosum* L. - Himachal Pradesh (Ghosh & Agarwala, 1982)
- *Myzus (Nectarosiphon) persicae nicotianae* Blackman, 1987
 - *Nicotiana tabacum* L. - West Bengal (Dharmadhikari & Ramaseshiah, 1970)
- *Myzus* sp.
 - *Brassica* sp. - Jammu & Kashmir (Starý & Bhagat, 1978)
 - *Prunus domestica* L. - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Panaphis juglandis* (Goeze, 1778)
 - *Juglans regia* L. - Jammu & Kashmir (Rishi & Lone, 1983)
- *Sitobion* sp.
 - *Rosa* sp. - Himachal Pradesh (Chakrabarti & Debnath, 2009); Uttarakhand (Sarkar, 2022)
- Unidentified aphid
 - *Argemone mexicana* L. - West Bengal (Dharmadhikari & Ramaseshiah, 1970)

- *Uroleucon* sp.
 - *Melanoseris brunoniiana* (Wall. ex DC.) N.Kilian and Ze H.Wang - Himachal Pradesh (Chakrabarti & Debnath, 2009)
 - *Sonchus asper* (L.) Hill. - Jammu & Kashmir (Bhagat, 1984; Chakrabarti & Debnath, 2009)

16. *Praon* sp.

- *Aphis* (*Aphis*) *craccivora* Koch, 1854
 - *Lablab purpureus* (L.) Sweet ssp. *purpureus* - Meghalaya (Starý & Ghosh, 1975)
- *Brachycaudus* (*Brachycaudus*) *helichrysi* (Kaltenbach, 1843)
 - *Prunus domestica* L. - Meghalaya (Starý & Ghosh, 1975)
- *Chaetosiphon* sp.
 - *Rosa macrophylla* Lindl. - Jammu & Kashmir (Bhagat, 1983; Chakrabarti & Debnath, 2009)
 - *Rosa webbiana* Wall. ex Royle - Jammu & Kashmir (Chakrabarti & Debnath, 2009)
- *Eriosoma* sp.
 - Unknown plant - Jammu & Kashmir (Rishi, 1976)
- *Macrosiphoniella* (*Chosoniella*) *spinipes* Basu, 1968
 - *Artemisia* sp. - Meghalaya (Starý & Ghosh, 1975)
- *Macrosiphoniella* sp.
 - *Chrysanthemum* sp. - Jammu & Kashmir (Starý & Ghosh, 1978)
- *Macrosiphum* (*Macrosiphum*) *pachysiphon* Hille Ris Lambers, 1966
 - Unidentified plant - Meghalaya (Starý & Ghosh, 1978)
- *Myzus* (*Myzus*) *ornatus* Laing, 1932
 - *Chromolaena odorata* (L.) R.M.King & H.Rob. - Meghalaya (Starý & Ghosh, 1983)
- *Myzus* (*Nectarosiphon*) *persicae* (Sulzer, 1776)
 - *Antirrhinum majus* L. - Meghalaya (Starý & Ghosh, 1978)
- *Myzus* sp.
 - Rubiaceae - Meghalaya (Starý & Ghosh, 1978)
- *Rhopalosiphum* *maidis* (Fitch, 1856)
 - *Zea mays* L. - Rajasthan (Singh et al., 2023)
- *Rhopalosiphum* *nymphphaeae* (Linnaeus, 1761)
 - *Rosa* sp. - Meghalaya (Starý & Ghosh, 1978)
- *Sitobion* (*Sitobion*) *avenae* (Fabricius, 1775)
 - *Hordeum vulgare* L. - Uttar Pradesh (Singh & Tripathi, 1987)
- *Sitobion* (*Sitobion*) *miscanthi* (Takahashi, 1921)
 - *Hordeum vulgare* L. - Uttar Pradesh (Ahmad & Singh, 1993; Ahmad & Singh, 1995)
 - *Triticum aestivum* L. - Uttarakhand (Chakrabarti, 1993)
- *Sitobion* (*Sitobion*) *rosaeiformis* (Das, 1918)
 - *Rosa* sp. - Meghalaya (Starý & Ghosh, 1975); Uttarakhand (Bisht et al., 2001)
- *Uroleucon* sp.
 - *Sonchus* sp. - Uttarakhand (Chakrabarti & Debnath, 2009)

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Conflict of interests

I declare that I have no competing interests.

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