



TRITROPHIC ASSOCIATION AND DISTRIBUTION OF APHIDOPHAGOUS COCCINELLID *CHEILOMENES* SPP. (COCCINELLIDAE: COLEOPTERA: INSECTA) IN INDIA

Rajendra Singh^{1*}, Ajeet Kumar Tiwari¹ and Krishna Mohan Tiwari²

¹Department of Zoology, D.D.U. Gorakhpur University, Gorakhpur, U.P., India

²Department of Zoology, K.S. Saket P.G. College, Ayodhya, U.P., India

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ABSTRACT

The paper deals with the prey records of *Cheilomenes* spp. in different states of India. In India, only two species of the genus *Cheilomenes* Chevrolat, 1837 - *Cheilomenes propinqua* (Mulsant, 1850) and *Cheilomenes sexmaculata* (Fabricius, 1781) are known to prey aphids. *Cheilomenes propinqua* is recorded in India on only one aphid species *Aphis* (*Aphis*) *gossypii* Glover, 1877 infesting brinjal in Assam and Meghalaya. The *Cheilomenes sexmaculata* (Fabricius, 1781), also known as six-spotted zigzag ladybird, preys on 76 species of aphids infesting 160 species of plants belonging to several families distributed throughout India except Jharkhand and Mizoram states. In union territories, it is recorded preying on aphids only in Jammu and Kashmir and Delhi. The most preferred prey is *Aphis* (*Aphis*) *gossypii* Glover which was found infesting 53 plant species distributed in 21 states/union territories followed by *Aphis* (*Aphis*) *craccivora* Koch infesting 35 plant species distributed in 24 states/union territories and *Myzus* (*Nectarosiphon*) *persicae* (Sulzer) infesting on 20 plant species distributed in 16 states/union territories. Total number of tritrophic relationship of *Cheilomenes sexmaculata* (Fabricius) (predator-prey-host plant) reported in India was 282; maximally being in Gujarat (72) followed by Uttar Pradesh (56), West Bengal (46), Bihar (43), Karnataka (41), Manipur (38), Maharashtra (25), and less than it in other states.

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INTRODUCTION

The ladybird beetles (Coccinellidae: Coleoptera) have attracted more attention for a long time because majority of them prey on several notorious insect pests of agricultural and horticultural crops, particularly, soft-bodied ones such as aphids, mealybugs, scale insects, thrips, leafhoppers, etc. keeping their population under check. The beetles belong to class Insecta, which is the largest class of Animals (Verma

and Prakash, 2020). Long back, Hodek and Honek (1996) presented a comprehensive account of their natural history, biology and ecology. Later, Dixon (2000) presented a systematic account of their ecological relationships with their preys highlighting their importance as bioagents in biocontrol programmes of these insect pests, particularly aphids. *Cheilomenes* Chevrolat, 1837 is a very small genus of ladybirds. Only three species are ecologically

*Corresponding author: rsinghgpu@gmail.com

important, e.g., *Cheilomenes lunata* (Fabricius, 1775), a predator of the citrus aphids (Scholtz and Holm, 1985) and wheat aphids (Picker *et al.*, 2004) in Africa; *Cheilomenes propinqua* (Mulsant, 1850), used as a bioagent in greenhouses against several aphid pests and distributed widely in its native range in the Afrotropical and the Middle East region (Ofuya, 1986; Reznik *et al.*, 2021); and *Cheilomenes sexmaculata* (Fabricius, 1781), a generalist predator of several aphid species (Agarwala and Yasuda, 2000) and is widely distributed across intermediate and equatorial latitudes (Sasaji, 1971) including Indian subcontinent (Agarwala and Ghosh, 1988), Far East (Kawakami *et al.*, 2016), and South and South East Asia (Sugiura and Takada, 1998) and also introduced in North America (Cartwright *et al.*, 1977; Romanowski *et al.*, 2020) and South America (Ramírez *et al.*, 2018). Among these species, *Cheilomenes sexmaculata* (Fabricius, 1781), commonly known as six-spotted zigzag ladybird, is one of the most significant species with high biocontrol potential against several aphid species of aphids, mealybugs, scale insects and other soft-bodied insects infesting agricultural and horticultural crops in India (Agarwala and Yasuda, 2000). It is polymorphic with variation in its elytral colour (Kawakami *et al.*, 2013). Earlier, Agarwala and Yasuda (2000) reviewed its life history, reproductive physiology, prey range, prey consumption by larvae and adults both, feeding efficiency between sexes, etc.

The prey records of *Cheilomenes* spp. compiled by Agarwala and Ghosh (1988), Shantibala and Singh (1991), Agarwala and Yasuda (2000), Omkar and Pervez (2004) and Satpathi (2009) do not provide complete information regarding the association of predator - prey - host plant (triplet) and their distribution in different states and union territories of India. As predatory efficiency of *Cheilomenes sexmaculata* (Fabricius, 1781) varies with aphid species (Chaudhary *et al.*, 1983; Pandi *et al.*, 2012; Kumar *et al.*, 2016; Aniyaliya *et al.*, 2022), host plant species on which its prey feed (Murugan *et al.*, 2000; Rakhshan and Ahmad, 2015a; Routray *et al.*, 2016; Pervez and Chandra, 2018) and habitats (distribution in different ecological region) (Hodek and Honek, 1996; Agarwala and Yasuda, 2000), record of its prey along with their food plants and distribution is essential if they are to be assessed as bioagents against the said prey species in a particular area.

MATERIALS AND METHODS

This empirical checklist of aphidophagous

Cheilomenes spp. is based on the literature published in recent past books, journals and few authentic theses, and websites, up to May 31, 2024. In most of the literature published earlier, several errors crept in the scientific names of the predators, aphids and host plants even in the recent ones. It happened because such contents become outdated quickly and, due to their perceived comprehensiveness, readers sometimes overlook newer sources of information. Additionally, the researches on prey-predator relationship are continued with the new records, their modified status, and the publication of other nomenclatural decisions. In the present checklist, attempts have been made to correct the errors in the scientific names of the aphid prey following the Aphid Species File (Favret, 2024) and food plants following World Flora Online (WFO, 2024) and Global Biodiversity Information Facility (GBIF, 2024). For synonymy of aphids Favret (2024) may be consulted. Only those synonymies of plants are mentioned that are reported in India.

RESULTS AND DISCUSSION

In India, only two species of the genus *Cheilomenes* Chevrolat, 1837 - *Cheilomenes propinqua* (Mulsant, 1850) and *Cheilomenes sexmaculata* (Fabricius, 1781) are known to prey aphids. Following is the detail list of their prey records along with their food plants and distribution in Indian states and union territories.

A. *Cheilomenes propinqua* (Mulsant, 1850) (Type species: *Cydonia propinqua* Mulsant, 1850)

This species is mostly distributed in african countries (GBIF, 2024), it is recorded in India on only one aphid species infesting brinjal in Assam and Meghalaya as mentioned below.

1. *Aphis* (*Aphis*) *gossypii* Glover, 1877

- *Solanum melongena* L. - Assam (Borkakati *et al.*, 2019); - Meghalaya (Boruah and Pathak, 2023); Uttar Pradesh (Singh, 2023)

B. *Cheilomenes sexmaculata* (Fabricius, 1781) (Type species: *Coccinella sexmaculata* Fabricius, 1781; Syn. *Cheilomenes sexmachlata* (Fabricius, 1781; *Chilomenes quadriplagiata* (Swartz, 1808); *Menochilus sexmaculatus* (Fabricius, 1781))

The six-spotted zigzag ladybird, *Cheilomenes sexmaculata* (Fabricius, 1781), is one of the highly significant aphidophagous coccinellid and has been used in biocontrol of several soft-bodied insect pests

including aphids. It is widely distributed in the Oriental and Australasian regions, throughout India, Bangladesh, Pakistan, Sri Lanka, Bhutan, Myanmar, Malaysia, Indonesia, The Philippines, Vietnam, China, Japan, Australasia, introduced in the Caribbeans and spread to parts of North and South America. Data displayed in Table 1 and 2 demonstrated that the six-spotted zigzag ladybird preys on 77 species of aphids infesting 164 species of plants belonging to several families distributed throughout India except Jharkhand and Mizoram states. In union territories, it is recorded preying on aphids only in Jammu and Kashmir and Delhi. The most preferred prey is *Aphis gossypii* Glover which was

found infesting 53 plant species distributed in 21 states/union territories followed by *Aphis (Aphis) craccivora* Koch infesting 35 plant species distributed in 25 states/union territories and *Myzus (Nectarosiphon) persicae* (Sulzer) infesting on 20 plant species distributed in 19 states/union territories (Table 1). Total number of tritrophic relationship of *Cheilomenes sexmaculata* (Fabricius) (predator-prey-host plant) reported in India was 270; maximally in Gujarat (72) followed by Uttar Pradesh (56), West Bengal (46), Bihar (43), Karnataka (40), Manipur (38), Maharashtra (25), and less than it in other states (Table 2, Figure 1).

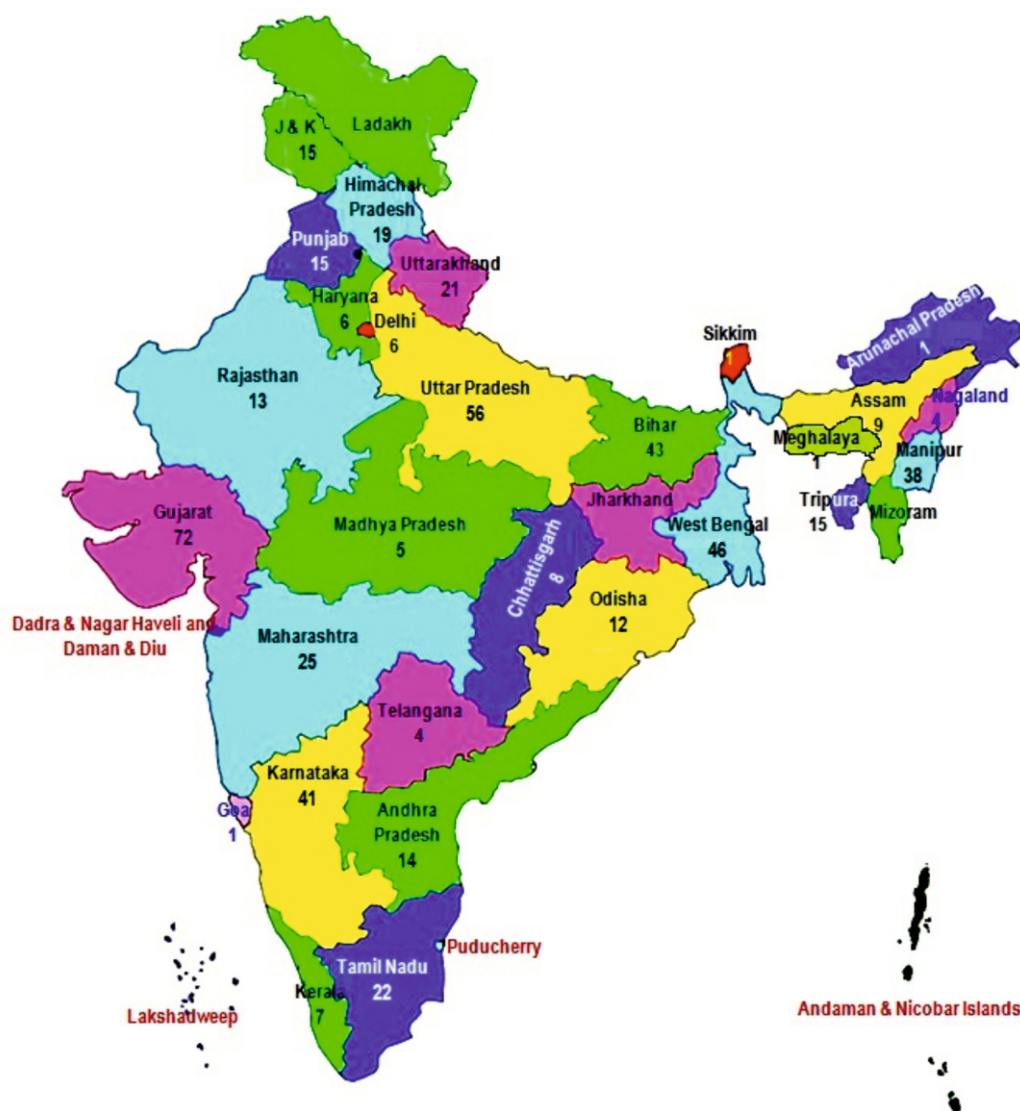


Fig. 1: Map showing the number of tritrophic association (predator-prey-food plant) and distribution of aphidophagous coccinellid *Cheilomenes* spp. in India.

Record of aphid preys and food plants in different states/union territories are given below.

***Acyrtosiphon (Acyrtosiphon) pisum* (Harris, 1776)**

- *Medicago sativa* L. - Karnataka (Megha et al., 2015)
- *Pisum sativum* L. - Manipur (Shantibala, 1989); - Nagaland (Shantibala, 1989); - Rajasthan (Sharma, 1973); - Uttar Pradesh (Mishra et al., 2011; Chaudhary and Singh, 2012); - West Bengal (Maji et al., 2023)
- *Vicia faba* L. - Uttar Pradesh (Tiwari et al., 2024)

***Acyrtosiphon* sp.**

- *Medicago sativa* L. - Gujarat (Chakraborty, 2012)

***Aphis (Aphis) affinis* del Guercio, 1911**

- *Mentha arvensis* L. - Himachal Pradesh (Singh and Bali, 1993); - Uttar Pradesh (Singh and Bali, 1993)
- *Hyoscyamus muticus* L. - Himachal Pradesh (Singh and Bali, 1993); - Uttar Pradesh (Singh and Bali, 1993)

***Aphis (Aphis) asclepiadis* Fitch, 1851**

- Unknown plant - Uttar Pradesh (Agarwala, 1983)

***Aphis (Aphis) craccivora* Koch, 1854**

- *Aeschynomene indica* L. - Gujarat (Thamilvel, 2009)
- *Amaranthus tricolor* L. - Gujarat (Thamilvel, 2009)
- *Arachis hypogaea* L. - Andhra Pradesh (Routray et al., 2016); - Gujarat (Patel and Vyas, 1984; Parsana et al., 1997); - Karnataka (Megha et al., 2015); - Punjab (Bakhetia and Sidhu, 1977)
- *Cajanus cajan* (L.) Millsp. (syn. *Cajanus indicus* Spreng.) - Bihar (Ahmad et al., 2020); - Karnataka (Chinnu et al., 2023); - Tamil Nadu (Rekha et al., 2009)
- *Canavalia gladiata* (Jack) DC. - Gujarat (Thamilvel, 2009)
- *Crotolaria pallida* Aiton - Gujarat (Thamilvel, 2009)
- *Cyamopsis tetragonoloba* (L.) Taub. - Gujarat (Thamilvel, 2009); - Karnataka (Chinnu et al., 2023)
- *Gliricidia maculata* (Kunth) Steud. - Karnataka (Megha et al., 2015); - Tamil Nadu (Basheer, 1958; Chelliah, 1971)
- *Glycine max* L. - Karnataka (Megha et al., 2015)

- *Gossypium hirsutum* L. - Andhra Pradesh (Routray et al., 2016)
- *Helianthus annuus* L. - Andhra Pradesh (Routray et al., 2016)
- *Indigofera tinctoria* L. - Gujarat (Thamilvel, 2009)
- *Lablab purpureus* (L.) Sweet ssp. *purpureus* (syn. *Dolichos lablab* L.) - Bihar (Prabhakar and Roy, 2010; Rakhshan and Ahmad, 2015b; Ahmad et al., 2020); - Gujarat (Patel, 2015; Ashwini and Shukla, 2022); - Karnataka (Joshi et al., 1997; Chinnu et al., 2023); - Kerala (Jose, 2003); - Madhya Pradesh (Verma et al., 1983); - Maharashtra (Kale et al., 2020); - Manipur (Shantibala, 1989; Lokeshwari et al., 2006); - Nagaland (Shantibala, 1989); - Rajasthan (Sharma, 1973); - Tamil Nadu (Rekha et al., 2009); - Tripura (Agarwala et al., 1987a); - Uttar Pradesh (Omkar and Bind, 1998; Omkar and Bind, 2004; Chaudhary and Singh, 2012); - Uttarakhand (Pervez and Chandra, 2018); - West Bengal (Ghosh et al., 1981; Gurung et al., 2019)
- *Lathyrus aphaca* L. - West Bengal (Poddar, 1982)
- *Lathyrus* sp. - Bihar (Sharma and Yadav, 1994)
- *Macroptilium atropurpureum* (DC.) Urb. - Telangana (Shanker et al., 2018)
- *Medicago sativa* L. - Karnataka (Megha et al., 2015)
- *Mussaenda acuminata* Blume - West Bengal (Maji et al., 2023)
- *Phaseolus vulgaris* L. (syn. *Phaseolus sinensis* Schur) - Bihar (Prabhakar and Roy, 2010; Rakhshan and Ahmad, 2015b; Ahmad et al., 2020)
- *Pisum sativum* L. - Kerala (Mathew et al., 1971); - West Bengal (Pal et al., 2023)
- *Psophocarpus tetragonolobus* (L.) DC. - Gujarat (Thamilvel, 2009)
- *Ranunculus sceleratus* L. - Uttarakhand (Pervez and Chandra, 2018)
- *Rumex nepalensis* Spreng. - Sikkim (Poddar, 1982)
- *Senna sophora* (L.) Roxb. (syn. *Cassia sophora* L.) - West Bengal (Poddar, 1982)
- *Senna tora* (L.) Roxb. (syn. *Cassia tora* L.) - West Bengal (Poddar, 1982)

- *Solanum melongena* L. - Jammu and Kashmir (Bhat, 2017); - West Bengal (Satpathi and Mandal, 2006)
 - *Tephrosia purpurea* (L.) Pers. - Gujarat (Thamilvel, 2009)
 - *Trigonella foenum-graecum* L. - Himachal Pradesh (Poddar, 1982); - West Bengal (Poddar, 1982)
 - *Vicia faba* L. - Andhra Pradesh (Rao et al., 1997); - Bihar (Sharma and Yadav, 1994; Ahmad et al., 2020); - Himachal Pradesh (Poddar, 1982); - Manipur (Shantibala, 1989); - West Bengal (Poddar, 1982)
 - *Vicia lens* (L.) Coss. and Germ. (syn. *Lens esculenta* Moench) - Bihar (Sharma and Yadav, 1994)
 - *Vigna mungo* (L.) Hepper (syn. *Phaseolus roxburghii* Wight and Arn.; *Phaseolus mungo* L.) - Andhra Pradesh (Routray et al., 2016); - Bihar (Rakhshan and Ahmad, 2015b; Rakhshan et al., 2018); - Gujarat (Chakraborty, 2012); - Karnataka (Megha et al., 2015); - Rajasthan (Jat and Rana, 2018); - Tamil Nadu (Rekha et al., 2009); - West Bengal (Poddar, 1982)
 - *Vigna radiata* (L.) R. Wiczek (syn. *Phaseolus radiatus* L.) (syn. *Phaseolus aureus* Roxb.) - Andhra Pradesh (Routray et al., 2016); - Assam (Sorokhaibam and Dutta, 2011); - Bihar (Rakhshan and Ahmad, 2015b; Rakhshan et al., 2018); - Karnataka (Megha et al., 2015)
 - *Vigna trilobata* (L.) Verdc. - Telangana (Shanker et al., 2018)
 - *Vigna unguiculata* (L.) Walp. (syn. *Vigna catjang* (Burm.f.) Walp.) - Andhra Pradesh (Routray et al., 2016; Vasista et al., 2021); - Chhattisgarh (Nagdev et al., 2022); - Delhi (Rai et al., 2003; Pandi et al., 2012); - Gujarat (Aniyaliya et al., 2022; Singh et al., 2024); - Karnataka (Srikanth and Lakkundi, 1990; Joshi et al., 1997; Megha et al., 2015); - Kerala (Nandakumar and Sheela, 1996; Jagdish et al., 2011); - Odisha (Mishra et al., 2022); - Rajasthan (Chhangani et al., 2022); - Tripura (Agarwala and Bardhanroy, 1997); - West Bengal (Poddar, 1982)
 - *Vigna unguiculata* ssp. *unguiculata* (L.) Walp. (syn. *Vigna sinensis* (L.) Savi ex Hassk.) - Tamil Nadu (Rajamohan and Jayaraj, 1973; Walawalkar et al., 2019); - West Bengal (Poddar, 1982)
- Aphis (Aphis) cytisorum Hartig, 1841**
- *Laburnum anagyroides* Medik., 1787 (syn. *Cytisus laburnum* L.) - Punjab (Modawal, 1941)
- Aphis (Aphis) fabae Scopoli, 1763**
- *Vicia faba* L. Odisha (Behura and Parida, 1979); - Tamil Nadu (Babu and Ananthakrishnan, 1993)
- Aphis (Aphis) glycines Matsumura, 1917**
- *Glycine max* L. - Manipur (Singh and Singh, 2000)
- Aphis (Aphis) gossypii Glover, 1877**
- *Abelmoschus esculentus* (L.) Moench (syn. *Hibiscus esculentus* L.) - Assam (Das et al., 2021); - Bihar (Prabhakar and Roy, 2010; Ahmad et al., 2020); - Gujarat (Chakraborty, 2012); - Maharashtra (Kale et al., 2020); - Tamil Nadu (Rajamohan and Jayaraj, 1973; Rekha et al., 2009); - Uttarakhand (Bhatt et al., 2018); - West Bengal (Gurung et al., 2019)
 - *Acalypha indica* L. - Gujarat (Thamilvel, 2009)
 - *Ageratum conyzoides* L. - Gujarat (Thamilvel, 2009); - Tripura (Ghosh et al., 2017)
 - *Amaranthus tricolor* L. - Gujarat (Thamilvel, 2009)
 - *Anethum graveolens* L. - Jammu and Kashmir (Butani and Kapadia, 2000a)
 - *Arachis hypogaea* L. - Andhra Pradesh (Vasista et al., 2021)
 - *Artocarpus integer* (Thunb.) Merr. (syn. *Artocarpus integrifolia* L.f.) - Manipur (Devi and Singh, 1987)
 - *Barleria prionitis* L. - Gujarat (Thamilvel, 2009)
 - *Benincasa hispida* Cogn. - Chhattisgarh (Bisen et al., 2017)
 - *Boerhavia repens* L. - Gujarat (Thamilvel, 2009)
 - *Brassica oleracea* L. - Bihar (Prakash and Rani, 2015); - Manipur (Devjani and Singh, 1998; Singh et al., 2002)
 - *Cajanus cajan* (L.) Millsp. (syn. *Cajanus indicus* Spreng.) - Bihar (Ahmad et al., 2020)
 - *Capsicum annuum* L. - Chhattisgarh (Kumar et al., 2020b); - Gujarat (Thamilvel, 2009); Uttar Pradesh (Tiwari et al., 2024); - West Bengal (Maji et al., 2023)
 - *Capsicum chinense* Jacq. - Assam (Begam et al., 2016; Thangjam et al., 2020)

- *Capsicum frutescens* L. - Bihar (Ahmad et al., 2020); - Gujarat (Thamilvel, 2009); - Tamil Nadu (Rekha et al., 2009); Uttar Pradesh (Tiwari et al., 2024); - West Bengal (Gurung et al., 2019)
- *Cardiospermum halicacabum* L. - Gujarat (Thamilvel, 2009)
- *Catharanthus pusillus* (Murray) G.Don - Gujarat (Thamilvel, 2009)
- *Catharanthus roseus* (L.) G.Don - Bihar (Ahmad et al., 2020); - Gujarat (Thamilvel, 2009)
- *Centella asiatica* (L.) Urb. - Gujarat (Thamilvel, 2009)
- *Chromolaena odorata* (L.) R.M.King and H.Rob. (syn. *Eupatorium odoratum* L.) - Manipur (Shantibala, 1989)
- *Coccinia grandis* (L.) Voigt (syn. *Coccinia indica* Wight and Arn.) - Gujarat (Thamilvel, 2009)
- *Commelina benghalensis* L. - Gujarat (Thamilvel, 2009)
- *Coriandrum sativum* L. - Gujarat (Butani and Kapadia, 2000a)
- *Cucumis sativus* L. - Gujarat (Thamilvel, 2009); - Manipur (Shantibala, 1989)
- *Cucurbita maxima* Duchesne - Tripura (Ghosh et al., 2017); Uttar Pradesh (Tiwari et al., 2024)
- *Cyanthillium cinereum* (L.) H.Rob. (syn. *Vernonia cinerea* (L.) Less.) - Gujarat (Thamilvel, 2009)
- *Foeniculum vulgare* Mill. - Bihar (Ahmad et al., 2020)
- *Gloriosa superba* L. - Gujarat (Thamilvel, 2009)
- *Gossypium arboreum* L. (syn. *Gossypium indicum* Medik.) - West Bengal (Agarwala and Saha, 1986)
- *Gossypium herbaceum* L. - Gujarat (Butani and Kapadia, 2000b)
- *Gossypium hirsutum* L. - Andhra Pradesh (Gunneswara Rao, 2013); - Delhi (Pandi et al., 2012; Venkanna et al., 2020); - Gujarat (Chakraborty, 2012; Patel, 2015; Aniyaliya et al., 2022); - Karnataka (Jalali and Singh, 1994; Joshi et al., 1999; Megha et al., 2015); - Maharashtra (Vennila, 1998; Vennila et al., 2007; Kale et al., 2020); - Odisha (Bhattacharyya et al., 2019); - Rajasthan (Dhaka, 2013); - Tamil Nadu (Veeravel and Jeganathan, 2002); - Uttarakhand (Joshi and Sharma, 2008); - West Bengal (Maji et al., 2023)
- *Helianthus annuus* L. - Maharashtra (Kale et al., 2020)
- *Hibiscus rosasinensis* L. - Bihar (Ahmad et al., 2020)
- *Lagenaria siceraria* (Molino) Standl. (syn. *Lagenaria leucantha* Rusby; *Lagenaria vulgaris* Ser.) - Bihar (Kumar et al., 2016; Ahmad et al., 2020); - Jammu and Kashmir (Bhat, 2017); - Uttar Pradesh (Omkar and Bind, 1998; Omkar and Bind, 2004); - West Bengal (Saha et al., 2016)
- *Luffa aegyptiaca* Mill. (syn. *Luffa cylindrica* M. Roem.) - Bihar (Ahmad et al., 2020)
- *Luffa acutangula* (L.) Roxb. - Uttar Pradesh (Tiwari et al., 2024)
- *Magnolia champaka* (L.) Baill. ex Pierre (syn. *Michelia champaka* L.) - Manipur (Shantibala, 1989)
- *Malus domestica* (Suckow) Borkh. (syn. *Pyrus malus* L.) - Manipur (Devi and Singh, 1987); - West Bengal (Chakrabarti et al., 2012)
- *Momordica charantia* L. - Bihar (Ahmad et al., 2020); - Gujarat (Thamilvel, 2009); - Kerala (Jose, 2003)
- *Ocimum tenuiflorum* L. (syn. *Ocimum sanctum* L.) - West Bengal (Maji et al., 2023)
- *Plantago ovata* Forssk. - Rajasthan (Ola et al., 2024)
- *Psidium guajava* L. - Karnataka (Mani and Krishnamoorthy, 1989); - Manipur (Devi and Singh, 1987)
- *Cleome rutidosperma* DC. var. *burmanni* (Wight and Arn.) Siddiqui and S.N.Dixit (syn. *Cleome burmanni* Wight and Arn.) - Gujarat (Thamilvel, 2009)
- *Solanum lycopersicum* L. (syn. *Lycopersicon esculentum* Mill.) - Haryana (Khokhar and Rolania, 2021); - Gujarat (Thamilvel, 2009); - Kerala (Jose, 2003); - Tamil Nadu (Rekha et al., 2009)
- *Solanum melongena* L. - Andhra Pradesh (Rao et al., 1997); - Assam (Kalita et al., 1998; Borah and Saikia, 2017); - Bihar (Ahmad et al., 2020); - Delhi (Anand, 1984); - Gujarat (Thamilvel, 2009); - Jammu and Kashmir (Bhat, 2017); - Karnataka (Prashanth et al., 2024); - Madhya Pradesh (Verma et al., 1983); - Manipur (Lokeshwari et al., 2006); - Meghalaya (Boruah

and Pathak, 2023); - Rajasthan (Sharma, 1973); - Tamil Nadu (Veeravel and Baskaran, 1995; Rekha et al., 2009); - Uttar Pradesh (Afroze, 2001; Chaudhary and Singh, 2012); - West Bengal (Chaudhuri et al., 1983; Satpathi, 1999; Satpathi and Mandal, 2006; Gurung et al., 2019)

- *Solanum nigrum* L. - Manipur (Shantibala, 1989)
- *Solanum tuberosum* L. - Manipur (Nonita et al., 2002); - Uttar Pradesh (Raj, 1989)
- *Solanum* sp. - Manipur (Shantibala, 1989)
- *Stachytarpheta jamaicensis* (L.) Vahl - Gujarat (Thamilvel, 2009)
- *Trachyspermum ammi* Sprague (syn. *Carum copticum* (L.) Benth. and Hook.f. ex Hiern - Gujarat (Butani and Kapadia, 2000a)
- *Trichosanthes cucumerina* L. (syn. *Trichosanthes anguina* L.) - Gujarat (Thamilvel, 2009)
- *Tridax procumbens* L. - Telangana (Shanker et al., 2018)

***Aphis (Aphis) kurosawai* Takahashi, 1921**

- *Artemisia vulgaris* L. - Manipur (Shantibala, 1989); - Uttarakhand (Ghosh et al., 1991)

***Aphis (Aphis) longisetosa* Basu, 1970**

- *Abelmoschus esculentus* Moench (syn. *Hibiscus esculentus* L.) - Himachal Pradesh (Agarwala et al., 1981)

***Aphis (Aphis) nasturtii* Kaltenbach, 1843**

- *Capsicum frutescens* L. - Uttar Pradesh (Chaudhary and Singh, 2012)
- *Solanum melongena* L. - Bihar (Ahmad et al., 2020)

***Aphis (Aphis) nerii* Boyer de Fonsc., 1841**

- *Calotropis gigantea* (L.) W.T. Aiton - Bihar (Ahmad et al., 2020); - Gujarat (Thamilvel, 2009); - Karnataka (Joshi et al., 1999); - Tamil Nadu (Babu and Ananthakrishnan, 1993; Pugalenti and Livingstone, 1997; Murugan et al., 2000)
- *Calotropis procera* (Aiton) Dryand. - Gujarat (Patel, 2015); Odisha (Behura and Parida, 1979); - Tripura (Agarwala et al., 1987b); - Uttar Pradesh (Omkar and Bind, 1998; Chaudhary and Singh, 2012); - West Bengal (Chaudhary et al., 1983)

- *Calotropis* sp. - Karnataka (Puttarudriah and Channa Basavanna, 1956)

- *Capsicum annuum* L. - Gujarat (Thamilvel, 2009)
- *Gymnema sylvestre* (Retz.) R.Br. ex Sm. - Gujarat (Tiwari et al., 2014; Shivakumara et al., 2022)
- *Leptadenia reticulata* (Retz.) Wight and Arn. - Gujarat (Chakraborty, 2012)

***Aphis (Aphis) odinae* (van der Goot, 1917)**

- *Anacardium occidentale* L. - Goa (Maruthadurai and Singh, 2017; Maruthadurai, 2019); - Karnataka (Mulimani and Rajanna, 2014; Chinnu et al., 2023)
- *Mangifera indica* L. - Uttar Pradesh (Chaudhary and Singh, 2012); - West Bengal (Maji et al., 2023)

***Aphis (Aphis) pomi* de Geer, 1773**

- *Malus domestica* (Suckow) Borkh. (syn. *Pyrus malus* L.) - Himachal Pradesh (Kumari et al., 2006; Kumari, 2019); - Jammu and Kashmir (Bhagat et al., 1988; Khan and Shah, 2018)

***Aphis (Aphis) punicae* Passerini, 1863**

- *Punica granatum* L. - Jammu and Kashmir (Mohi-ud-din et al., 2019); - Karnataka (Mani and Krishnamoorthy, 1995; Sreedevi, 2003; Sreedevi and Verghese, 2007)

***Aphis (Aphis) rumicis* Linnaeus, 1758**

- *Vigna unguiculata* (L.) Walp. (syn. *Vigna catjang* (Burm.f.) Walp.) - Karnataka (Puttarudriah and Channa Basavanna, 1956)

***Aphis (Aphis) solanella* Theobald, 1854**

- *Capsicum frutescens* L. - Uttar Pradesh (Chaudhary and Singh, 2012; Tiwari et al., 2024)

***Aphis (Aphis) spiraecola* Patch, 1914**

- *Ageratum conyzoides* L. - Tripura (Ghosh et al., 2017)
- *Cestrum diurnum* L. - Uttar Pradesh (Chaudhary and Singh, 2012)
- *Cestrum nocturnum* L. - Uttar Pradesh (Tiwari et al., 2024)
- *Citrus jambhiri* Lush. - Maharashtra (Rao and Shivanhar, 2012)
- *Citrus reticulata* Blanco - Maharashtra (Rao and Shivanhar, 2012)
- *Coriandrum sativum* L. - Bihar (Ahmad et al., 2020); - Uttar Pradesh (Tiwari et al., 2024)

- *Cosmos bipinnatus* Cav. - Uttar Pradesh (Dubey and Singh, 2011)
- *Cosmos* sp. - Bihar (Ahmad et al., 2020)
- *Solanum melongena* L. - Bihar (Ahmad et al., 2020); Uttar Pradesh (Tiwari et al., 2024)
- *Vicia faba* L. - Uttar Pradesh (Tiwari et al., 2024)
- Unknown - Tripura (Agarwala et al., 1987b)

***Aphis (Aphis) umbrellae* (Börner, 1950)**

- *Cucurbita moschata* Duchesne - Tamil Nadu (Rajamohan and Jayaraj, 1973)

***Aphis (Toxoptera) aurantii* Boyer de Fonsc., 1841**

- *Camellia sinensis* (L.) Kuntze (syn. *Camellia thea* Link) - Assam (Das and Rava, 1968; Das and Kakoty, 1992; Roy and Rahman, 2014); - Karnataka (Muraleedharan et al., 1988; Radhakrishnan and Muraaleedharan, 1991); - Kerala (Muraleedharan et al., 1988; Radhakrishnan and Muraaleedharan, 1995); - Tamil Nadu (Radhakrishnan and Muraaleedharan, 1995)
- *Chrysanthemum indicum* L. - Bihar (Ahmad et al., 2012)
- *Citrus aurantium* L. - Manipur (Devi and Singh, 1987; Chakrabarti et al., 2012); - Uttar Pradesh (Chaudhary and Singh, 2012)
- *Citrus* sp. - Karnataka (Mani and Krishnamoorthy, 2005)
- *Mangifera indica* L. - Manipur (Devi and Singh, 1987)
- *Phlogacanthus thyrsiformis* (Roxb. ex Hardw.) Mabb. (syn. *Phlogacanthus thyrsiflorus* (Roxb.) Nees) - West Bengal (Maji et al., 2023)
- *Schima wallichii* (DC.) Korth. - West Bengal (Raychaudhuri et al., 1998)
- Unknown - Tripura (Agarwala et al., 1987b)

***Aphis (Toxoptera) citricidus* (Kirkaldy, 1907)**

- *Citrus maxima* (Burm.) Merr. (syn. *Citrus decumana* L., *Citrus grandis* (L.) Osbeck) - Manipur (Devi and Singh, 1987; Shantibala, 1989)
- *Citrus* sp. - Maharashtra (Kale et al., 2020)

***Brachycaudus (Brachycaudus) helichrysi* (Kaltenbach, 1843)**

- *Artemisia vulgaris* L. - Nagaland (Shantibala, 1989)
- *Chromolaena odorata* (L.) R.M.King and H.Rob. (syn. *Eupatorium odoratum* L.) -

Nagaland (Raychaudhuri et al., 1978; Chakrabarti et al., 2012)

- *Clerodendron* sp. - Uttar Pradesh (Chaudhary and Singh, 2012)

***Brevicoryne brassicae* (Linnaeus, 1758)**

- *Brassica juncea* (L.) Czern - Himachal Pradesh (Soni et al., 2021); - Uttarakhand (Verma et al., 2023)
- *Brassica napus* L. - Uttar Pradesh (Tiwari et al., 2024)
- *Brassica oleracea* L. - Assam (Sarma et al., 2021); - Bihar (Prakash and Rani, 2015); Delhi (Anand, 1984); - Gujarat (Chakraborty, 2012; Patel, 2015); - Himachal Pradesh (Sharma and Verma, 1993); - Jammu and Kashmir (Mir, 2013; Bhat, 2017); - Karnataka (Bhaskar and Viraktamath, 2002; Chinnu et al., 2023); - Manipur (Debraj et al., 1997; Devjani and Singh, 1998; Singh et al., 2002); - Odisha (Mandal and Patnaik, 2006a, 2008); - Rajasthan (Sharma, 1973; Jat et al., 2017); - Uttar Pradesh (Omkar and Bind, 1998; Afroze, 2001; Chaudhary and Singh, 2012)
- *Brassica oleracea* L. var. *capitata* - Chhattisgarh (Singh, 2014); - Uttar Pradesh (Pal and Singh, 2012)
- *Brassica rapa* L. - Uttar Pradesh (Tiwari et al., 2024); - Uttarakhand (Sharma and Joshi, 2012)
- *Brassica* sp. - Jammu and Kashmir (Khan et al., 2009)
- *Raphanus sativus* L. - Uttar Pradesh (Tiwari et al., 2024)

***Capitophorus himalayensis* Ghosh, Ghosh and Raychaudhuri, 1971**

- Unidentified plant of Polygonaceae ? - West Bengal (Agarwala, 1983)

***Cavariella (Cavariella) aegopodii* (Scopoli, 1763)**

- *Salix tetrasperma* Roxb. - Uttarakhand (Ghosh et al., 1986)

***Cavariella (Cavariella) indica* Maity and Chakrabarti, 1982**

- *Salix babylonica* L. - Uttarakhand (Ghosh et al., 1991)

***Cavariella (Cavariella) simlaensis* Chowdhuri, Basu and Raychaudhuri, 1969**

- Indet - Himachal Pradesh (Das and Raychaudhuri, 1983)

***Ceratovacuna lanigera* Zehntner, 1897**

- *Saccharum officinarum* L. - Karnataka (Patil et al., 2006; Kiran et al., 2019); - Maharashtra (Rabindra et al., 2002); - Manipur (Shantibala, 1989); - West Bengal (Maji et al., 2023)

***Cervaphis rappardi indica* Basu, 1961**

- *Cajanus cajan* (L.) Millsp. (syn. *Cajanus indicus* Spreng.) - Manipur (Shantibala et al., 1994; Shantibala et al., 1997); - West Bengal (Maji et al., 2023)
- *Cannabis sativa* L. - Manipur (Shantibala, 1989)

***Cervaphis schouteniae* van der Goot, 1917**

- Unknown - Tripura (Agarwala et al., 1987b)

***Chaitophorus himalayensis* (Das, 1918)**

- *Salix* sp. - Himachal Pradesh (Das, 1918; Das and Raychaudhuri, 1983)

***Coloradoa rufomaculata* (Wilson, 1908)**

- *Chrysanthemum* sp. - Himachal Pradesh (Das and Raychaudhuri, 1983)

***Eriosoma lanigerum* (Hausmann, 1802)**

- *Malus domestica* (Suckow) Borkh- Uttarakhand (Maurya, 2011)

***Epipemphigus imaicus* (Cholodkovsky, 1912)**

- *Populus ciliata* Wall. ex Royle - Uttarakhand (Ghosh et al., 1991)

***Greenidea (Trichosiphum) psidii* van der Goot, 1917**

- *Psidium guajava* L. - Bihar (Ahmad et al., 2012); - Manipur (Devjani and Singh, 2007); - Uttar Pradesh (Tiwari et al., 2024); - West Bengal (Ghosh and Raychaudhuri, 1982; Chakrabarti et al., 2012)
- *Syzygium cumini* (L.) Skeels (syn. *Eugenia jambolana* Lam.) - Manipur (Devi and Singh, 1987)

***Greenideoida (Greenideoida) ceyloniae* van der Goot, 1917**

- *Mesua ferrea* L. - Chhattisgarh (Rawat and Modi, 1969)
- Unknown - Tripura (Agarwala et al., 1987b)

***Hyadaphis coriandri* (Das, 1918)**

- *Anethum graveolens* L. - Jammu and Kashmir (Butani and Kapadia, 2000a); - Karnataka (Chinnu et al., 2023)

- *Coriandrum sativum* L. - Haryana (Purti et al., 2017); - Jammu and Kashmir (Butani and Kapadia, 2000a); - Punjab (Sagar and Kumar, 1996); - Rajasthan (Lekha and Jat, 2002; Meena et al., 2009); - Uttar Pradesh (Chaudhary and Singh, 2012; Tiwari et al., 2024); - West Bengal (Maji et al., 2023)
- *Foeniculum vulgare* Mill. - Gujarat (Patel, 2015; Kanjiya et al., 2018)
- *Trachyspermum ammi* Sprague (syn. *Carum copticum* (L.) Benth. and Hook.f. ex Hiern - Gujarat (Butani and Kapadia, 2000a)
- Unknown - Tripura (Agarwala et al., 1987b)

***Hyalopterus pruni* (Geoffroy, 1762)**

- *Phragmites karka* (Retz.) Trin. ex Steud. - Uttar Pradesh (Chaudhary and Singh, 2012)
- *Prunus amygdalus* Batsch - Manipur (Devi and Singh, 1987)
- *Prunus persica* (L.) Batsch - Manipur (Devi and Singh, 1987; Varatharajan et al., 1991)

***Hysteroneura setariae* (Thomas, 1878)**

- *Amaranthus tricolor* L. - Gujarat (Thamilvel, 2009)
- *Andropogon* sp. - Bihar (Ahmad et al., 2012)
- *Chloris barbata* Sw. - Gujarat (Thamilvel, 2009)
- *Cynodon dactylon* (L.) Pers. - Uttar Pradesh (Omkar and Bind, 1993, 1995)
- *Cyperus rotundus* L. - Uttar Pradesh (Chaudhary and Singh, 2012)
- *Dactyloctenium aegyptium* (L.) Willd. - Gujarat (Thamilvel, 2009)
- *Digitaria ciliaris* (Retz.) Koeler - Gujarat (Thamilvel, 2009)
- *Elaeis guineensis* Jacq. - Karnataka (Dhileepan, 1996)
- *Melinis repens* (Willd.) Zizka - Karnataka (Chinnu et al., 2023)
- *Triticum aestivum* L. (syn. *Triticum sativum* Lam., *Triticum vulgare* Vill.) - Maharashtra (Kale et al., 2020)

***Liosomaphis atra* Hille Ris Lambers, 1966**

- *Berberis* sp. - Himachal Pradesh (Das and Raychaudhuri, 1983)

***Lipaphis (Lipaphis) erysimi* (Kaltenbach, 1843)**

- *Arivela viscosa* (L.) Raf. (syn. *Cleome viscosa* L.) - Gujarat (Thamilvel, 2009)

- *Brassica carinata* A. Braun - Punjab (Kumar, 2015)
 - *Brassica juncea* (L.) Czern - Assam (Das, 2020); - Chhattisgarh (Kolhekar et al., 2019); - Delhi (Pandi et al., 2012); - Gujarat (Patel, 2015); - Haryana (Kalra, 1988); - Himachal Pradesh (Soni et al., 2021); - Karnataka (Joshi et al., 1999); - Madhya Pradesh (Mishra and Kanwat, 2017); - Manipur (Rajeshwari and Singh, 2022); - Punjab (Sharma et al., 1997; Soni et al., 2004; Kumar, 2015); - Uttar Pradesh (Shukla and Kumar, 2024; Tiwari et al., 2024); - Uttarakhand (Verma et al., 2023); - West Bengal (Ghosh, 1983)
 - *Brassica napus* L. - Manipur (Shantibala, 1989); - Punjab (Kumar, 2015); - Uttar Pradesh (Tiwari et al., 2024)
 - *Brassica nigra* L. - West Bengal (Ghosh et al., 1981)
 - *Brassica oleracea* L. - Andhra Pradesh (Rao et al., 1997); - Bihar (Prakash and Rani, 2015); - Gujarat (Chakraborty, 2012); - Maharashtra (Shaikh et al., 2020); - Manipur (Devjani and Singh, 1998); - Odisha (Mandal and Patnaik, 2006b)
 - *Brassica oleracea* L. var. *capitata* - Chhattisgarh (Singh, 2014); - Uttar Pradesh (Tiwari et al., 2024)
 - *Brassica rapa* L. (syn. *Brassica campestris* L.) - Bihar (Prabhakar and Roy, 2010; Kumar et al., 2016); Delhi (Anand, 1984); - Gujarat (Chakraborty, 2012; Singh et al., 2024); - Haryana (Rana, 2006); - Jammu and Kashmir (Mir, 2013; Bhat, 2017); - Madhya Pradesh (Verma et al., 1983); - Maharashtra (Kale et al., 2020; Shaikh et al., 2020); - Punjab (Kumar, 2015; Shenhmar and Brar, 1995); - Rajasthan (Sharma, 1973; Singh et al., 2008); - Uttar Pradesh (Omkar and Bind, 1998; Hugar et al., 2008; Chaudhary and Singh, 2012); - Uttarakhand (Joshi and Sharma, 2008; Pervez and Chandra, 2018); - West Bengal (Chaudhuri et al., 1983)
 - *Brassica* sp. - Jammu and Kashmir (Khan et al., 2009); - Punjab (Modawal, 1941)
 - *Eruca vesicaria* (L.) Cav. (syn. *Eruca sativa* Miller) - Punjab (Kumar, 2015)
 - *Raphanus sativus* L. - Gujarat (Thamilvel, 2009); - Maharashtra (Shaikh et al., 2020); - Uttarakhand (Pervez and Chandra, 2018)
 - *Vigna unguiculata* (L.) Walp. (syn. *Vigna catjang* (Burm.f.) Walp.) - Andhra Pradesh (Rao et al., 1997)
 - Unknown - Tripura (Agarwala et al., 1987b)
- Lipaphis (Lipaphis) pseudobrassicae* (Davis, 1914)**
- *Brassica juncea* (L.) Czern - Gujarat (Aniyaliya et al., 2022); - Jammu and Kashmir (Khan and Shah, 2017)
 - *Brassica oleracea* L. - Jammu and Kashmir (Khan and Shah, 2017)
- Macrosiphoniella (Macrosiphoniella) kalimpongensis* Basu and Raychaudhuri, 1976**
- Unknown - Tripura (Agarwala et al., 1987b)
- Macrosiphoniella (Macrosiphoniella) pseudoartemisiae* Shinji, 1933**
- *Artemisia vulgaris* L. - Uttarakhand (Ghosh et al., 1991)
- Macrosiphoniella (Macrosiphoniella) sanborni* (Gillette, 1908)**
- *Chrysanthemum indicum* L. - Bihar (Ahmad et al., 2012); - Uttar Pradesh (Chaudhary and Singh, 2012); - West Bengal (Maji et al., 2023)
 - *Chrysanthemum* sp. - Odisha (Nayak and Behura, 1969); - Uttarakhand (Ghosh et al., 1991)
 - *Tanacetum cinerariifolium* Sch. Bip. (syn. *Chrysanthemum cinerariifolium* Vis.) - Uttar Pradesh (Afroze, 2001)
- Macrosiphum (Macrosiphum) rosae* (Linnaeus, 1758)**
- *Brassica juncea* (L.) Czern - Uttarakhand (Verma et al., 2023)
 - *Rosa indica* L. - Uttar Pradesh (Chaudhary and Singh, 2012; Tiwari et al., 2024)
 - *Rosa* sp. - Himachal Pradesh (Agarwala et al., 1981); - Karnataka (Raj, 1989; Chinnu et al., 2023)
- Melanaphis bambusae* (Fullaway, 1910)**
- *Bambusa* sp. - Manipur (Shantibala, 1989)
- Melanaphis donacis* (Passerini, 1862)**
- *Arundo donax* L. - Manipur (Shantibala, 1989)
- Melanaphis sacchari* (Zehntner, 1897)**
- *Sorghum bicolor* (L.) Moench (syn. *Sorghum vulgare* Pers.) - Andhra Pradesh (Sharma and Dhillon, 2005); - Odisha (Patnaik et al., 1977); - Tamil Nadu (Rekha et al., 2009); - Uttar Pradesh (Tiwari et al., 2024)

- *Zea mays* L. - Odisha (Patnaik et al., 1977)
- Unknown - Tripura (Agarwala et al., 1987b)

***Melanaphis sacchari indosacchari* (David, 1956)**

- *Saccharum officinarum* L. - Tamil Nadu (Easwaramoorthy et al., 1998)

***Myzus (Nectarosiphon) persicae* (Sulzer, 1776)**

- *Abelmoschus esculentus* Moench - Karnataka (Megha et al., 2015); - West Bengal (Gurung et al., 2019)
- *Ageratum conyzoides* L. - Telangana (Shanker et al., 2018)
- *Brassica juncea* (L.) Czern - Bihar (Prabhakar and Roy, 2010); - Himachal Pradesh (Soni et al., 2021); - Karnataka (Chinnu et al., 2023)
- *Brassica oleracea* L. - Bihar (Prakash and Rani, 2015); - Gujarat (Chakraborty, 2012); - Karnataka (Bhaskar and Viraktamath, 2002; Megha et al., 2015); - Manipur (Devjani and Singh, 1998; Singh et al., 2002; Bijaya et al., 2006); - Odisha (Mandal and Patnaik, 2006a; 2008)
- *Brassica rapa* L. (syn. *Brassica pekinensis* Skeels; *Brassica campestris* L.; *Brassica rapa* subsp. *oleifera* (DC.) Metzg.) - Gujarat (Chakraborty, 2012); - Manipur (Bijaya et al., 2001); Uttarakhand (Sharma and Joshi, 2012); - West Bengal (Chaudhuri et al., 1983)
- *Capsicum annuum* L. - Punjab (Kaur and Sangha, 2016)
- *Capsicum chinense* Jacq. - Assam (Thangjam et al., 2020)
- *Capsicum frutescens* L. - Karnataka (Megha et al., 2015); - Tamil Nadu (Rajagopal and Karim, 1979)
- *Cuminum cyminum* L. (syn. *Cuminum sativum* L.) - Rajasthan (Gupta and Yadav, 1989a)
- *Hyoscyamus muticus* L. - Himachal Pradesh (Singh and Bali, 1993); - Uttar Pradesh (Singh and Bali, 1993)
- *Linum usitatissimum* L. - West Bengal (Gurung et al., 2019)
- *Raphanus sativus* L. - Uttar Pradesh (Tiwari et al., 2024)
- *Sesamum indicum* L. (syn. *Sesamum orientale* L.) - Manipur (Shantibala, 1989)
- *Solanum lycopersicum* L. (syn. *Lycopersicon esculentum* Mill.) - Gujarat (Thamilvel, 2009);

- Haryana (Khokhar and Rolania, 2021); - Jammu and Kashmir (Bhat, 2017); - Tamil Nadu (Rekha et al., 2009); - Uttar Pradesh (Chaudhary and Singh, 2012)

- *Solanum melongena* L. - Assam (Borah and Saikia, 2017); - Bihar (Ahmad et al., 2012); - Gujarat (Thamilvel, 2009); - Uttar Pradesh (Omkar and Bind, 2004; Tiwari et al., 2024); - West Bengal (Satpathi and Mandal, 2006; Gurung et al., 2019)
- *Solanum nigrum* L. - Gujarat (Thamilvel, 2009); - Uttar Pradesh (Omkar and Bind, 1998; Tiwari et al., 2024)
- *Solanum tuberosum* L. - Bihar (Parween et al., 2023); - Manipur (Shantibala, 1989; Nonita et al., 2002); - Uttar Pradesh (Raj, 1989)
- *Spinacia oleracea* L. - Bihar (Parween et al., 2023)
- *Tagetes erecta* L. - Chhattisgarh (Bhagat et al., 2018)
- *Urtica dioica* L. - Manipur (Shantibala, 1989)

***Myzus (Nectarosiphon) persicae nicotianae* Blackman, 1987**

- *Nicotiana tabacum* L. - Andhra Pradesh (Joshi et al., 1979; Rao et al., 2007); - Bihar (Parween et al., 2023); - Karnataka (Venkatesan et al., 2002; Jagadish et al., 2010)

***Pemphigus (Pemphigus) napaeus* Buckton, 1896**

- *Populus* sp. - Himachal Pradesh (Agarwala et al., 1981)

***Pentalonia nigronervosa* Coquerel, 1859**

- *Musa acuminata* Colla (syn. *Musa cavendishii* Lamb.) - Kerala (Padmalatha and Singh, 1998); - Tamil Nadu (Poorani et al., 2023)

***Phorodon (Diphorodon) cannabis* Passerini, 1860**

- *Cannabis sativa* L. - Bihar (Ahmad et al., 2012); - Uttarakhand (Ghosh et al., 1991)

***Prociphilus* sp.**

- *Lonicera quinquelocularis* Hardw. - Uttarakhand (Ghosh et al., 1991)

***Rhopalosiphum maidis* (Fitch, 1856)**

- *Cenchrus americanus* (L.) Morrone (syn. *Pennisetum glaucum* R. Br.; *Pennisetum typhoides* (Burm.f.) Stapf and C.E.Hubb.) - Gujarat (Chakraborty, 2012); - Karnataka (Savithri and Prakash, 2023); - Rajasthan (Sharma, 1973); - Tamil Nadu (Rekha et al., 2009)

- *Pennisetum purpureum* Schumach. - Gujarat (Chakraborty, 2012)
- *Sorghum bicolor* (L.) Moench (syn. *Sorghum vulgare* Pers.) - Delhi (Gautam, 1989); - Gujarat (Chakraborty, 2012); - Karnataka (Megha et al., 2015); - Maharashtra (Kale et al., 2020); Odisha (Nayak et al., 1981); - Punjab (Modawal, 1941); - Tamil Nadu (Rajamohan. and Jayaraj, 1973; Rekha et al., 2009)
- *Triticum aestivum* L. (syn. *Triticum sativum* Lam., *Triticum vulgare* Vill.) - Karnataka (Megha et al., 2015); - West Bengal (Gurung et al., 2019)
- *Zea mays* L. - Bihar (Kumar and Ahmad, 2017); - Delhi (Pandi et al., 2012); - Gujarat (Patel, 1998; Chakraborty, 2012; Singh et al., 2024); - Karnataka (Joshi et al., 1999; Chinnu et al., 2023); - Karnataka (Megha et al., 2015); - Rajasthan (Swaminathan et al., 2015; Swami and Bajpai, 2009); - Tamil Nadu (Rekha et al., 2009); - Uttar Pradesh (Omkar and Bind, 2004; Chaudhary and Singh, 2012); - West Bengal (Gurung et al., 2019; Maji et al., 2023)

***Rhopalosiphum nymphaeae* (Linnaeus, 1761)**

- *Euryale ferox* Salisb. - Bihar (Saraswati and Ghosh, 1996)

***Rhopalosiphum padi* (Linnaeus, 1758)**

- *Avena sativa* L. - Punjab (Singh and Dhaliwal, 2004)
- *Oryza sativa* L. - Uttar Pradesh (Chaudhary and Singh, 2012)
- *Triticum aestivum* L. (syn. *Triticum sativum* Lam., *Triticum vulgare* Vill.) - Uttar Pradesh (Omkar and Bind, 1993)

***Sarucallis kahawaluokalani* (Kirkaldy, 1907)**

- Unknown - Tripura (Agarwala et al., 1987b)

***Schizaphis (Schizaphis) graminum* (Rondani, 1852)**

- *Cenchrus americanus* (L.) Morrone (syn. *Pennisetum glaucum* R. Br.; *Pennisetum typhoides* (Burm.f.) Stapf and C.E.Hubb.) - Uttar Pradesh (Chaudhary and Singh, 2012)

***Schizaphis rotundiventris* (Signoret, 1860)**

- *Elaeis guineensis* Jacq. - Karnataka (Dhileepan, 1996)

***Schizoneuraphis himalayensis* (Ghosh and Raychaudhuri, 1973)**

- *Machilus gamblei* King ex Hook.fil. (syn. *Persea bombycina* (King ex Hook.fil.) Kosterm.) - West Bengal (Ponnusamy et al., 2019)

***Schoutedenia emblica* (Patel and Kulkarni, 1952)**

- *Phyllanthus emblica* L. (syn. *Emblica officinalis* Gaertn.) - Gujarat (Bharpoda et al., 2009); - Karnataka (Chinnu et al., 2023); - Uttar Pradesh (Singh et al., 2018)

***Shivaphis (Shivaphis) celti* Das, 1918**

- *Celtis tetrandra* Roxb. - Himachal Pradesh (Das and Raychaudhuri, 1983)

***Sinomegoura citricola* (van der Goot, 1917)**

- *Schima wallichii* (DC.) Korth. - West Bengal (Raychaudhuri et al., 1998)

***Sitobion (Sitobion) alopecuri* (Takahashi, 1921)**

- *Hordeum vulgare* L. - Gujarat (Chakraborty, 2012)
- *Triticum aestivum* L. (syn. *Triticum sativum* Lam., *Triticum vulgare* Vill.) - Gujarat (Chakraborty, 2012)

***Sitobion (Sitobion) avenae* (Fabricius, 1775)**

- *Triticum aestivum* L. (syn. *Triticum sativum* Lam., *Triticum vulgare* Vill.) - Punjab (Modawal, 1941); - West Bengal (Maji et al., 2023)

***Sitobion (Sitobion) graminis* Takahashi, 1950**

- *Triticum aestivum* L. (syn. *Triticum sativum* Lam., *Triticum vulgare* Vill.) - Punjab (Modawal, 1941)

***Sitobion (Sitobion) miscanthi* (Takahashi, 1921)**

- *Triticum aestivum* L. (syn. *Triticum sativum* Lam., *Triticum vulgare* Vill.) - Bihar (Ahmad et al., 2012); - Gujarat (Tank et al., 2008); - Haryana (Ranjith et al., 2018); - Uttar Pradesh (Chaudhary and Singh, 2012; Tiwari et al., 2024); - Uttarakhand (Ghosh et al., 1991); - West Bengal (Gurung et al., 2019)
- *Zea mays* L. - Bihar (Ahmad et al., 2012)

***Sitobion (Sitobion) rosaeiformis* (Das, 1918)**

- *Rosa bourboniana* L. - Himachal Pradesh (Kakkar and Sood, 1989)
- *Rosa indica* L. - Uttar Pradesh (Chaudhary and Singh, 2012; Tiwari et al., 2024)
- *Rosa* sp. - West Bengal (Agarwala, 1983)

Sitobion sp.

- *Zea mays* L. - West Bengal (Maji et al., 2023)

Therioaphis (Pterocallidium) trifolii (Monell, 1882)

- *Medicago sativa* L. - Gujarat (Patel, 2015) ; - Karnataka (Megha et al., 2015); - Uttar Pradesh (Chaudhary and Singh, 2012)

Tuberculatulus (Orientuberculooides) nervatus**Chakrabarti and Raychaudhuri, 1976**

- *Quercus serrata* Murray - Manipur (Somen Singh et al., 1995)

Tuberculatulus (Orientuberculooides) paiki Hille Ris Lambers, 1974

- *Quercus serrata* Murray - Manipur (Singh et al., 1985; Shantibala, 1989)

Uroleucon (Uroleucon) sonchi (Linnaeus, 1767)

- Unknown - Tripura (Agarwala et al., 1987b)

Uroleucon (Uromelan) carthami (Hille Ris Lambers, 1948)

- *Carthamus tinctorius* L. - Madhya Pradesh (Verma et al., 1983); - West Bengal (Chaudhuri et al., 1983)

Uroleucon (Uromelan) compositae (Theobald, 1915)

- *Cannabis sativa* L. - Bihar (Ahmad et al., 2012)
- *Carthamus tinctorius* L. - Chhattisgarh (Khandekar et al., 2023); - Karnataka (Joshi et al., 1999; Megha et al., 2015); - Maharashtra (Kale et al., 2020); - Uttar Pradesh (Omkar and Bind, 1998, 2004)
- *Gaillardia pulchella* Foug. - Gujarat (Bhatt et al., 2007)

Uroleucon (Uromelan) solidaginis (Fabricius, 1779)

- *Solidago virgaurea* L. - Punjab (Modawal, 1941)

Unknown

- *Brassica oleracea* L. var. *capitata* - Maharashtra (Bagal and Trehan, 1945)

- *Brassica oleracea* L. var. *gongylodes* - Maharashtra (Bagal and Trehan, 1945)
- *Brassica rapa* L. - Maharashtra (Bagal and Trehan, 1945)
- *Capsicum annuum* L. - Maharashtra (Bagal and Trehan, 1945)
- *Carthamus tinctorius* L. - Maharashtra (Bagal and Trehan, 1945)
- *Coccinia grandis* (L.) Voigt (syn. *Coccinia indica* Wight and Arn.) - Maharashtra (Bagal and Trehan, 1945)
- *Cyamopsis psoralioides* DC. - Maharashtra (Bagal and Trehan, 1945)
- *Lens culinaris* Medik. (syn. *Lens esculenta* Moench) - Maharashtra (Bagal and Trehan, 1945)
- *Linum usitatissimum* L. - Maharashtra (Bagal and Trehan, 1945)
- *Moringa oleifera* Lam. - Karnataka (Math et al., 2013)
- *Medicago sativa* L. - Maharashtra (Bagal and Trehan, 1945)
- *Nicotiana tabacum* L. - Maharashtra (Bagal and Trehan, 1945)
- *Pisum sativum* L. - Maharashtra (Bagal and Trehan, 1945)
- *Solanum melongena* L. - Maharashtra (Bagal and Trehan, 1945)
- *Raphanus sativus* L. - Maharashtra (Bagal and Trehan, 1945)
- *Solanum tuberosum* L. - Maharashtra (Bagal and Trehan, 1945)
- *Vicia lens* (L.) Coss. and Germ. (syn. *Lens esculenta* Moench) - Maharashtra (Bagal and Trehan, 1945)
- *Sorghum bicolor* (L.) Moench (syn. *Andropogon sorghum* Roxb. - Maharashtra (Bagal and Trehan, 1945)
- Unknown - Arunachal Pradesh (Hemchandra et al., 2010)

Table 1. The number of species of food plants of aphid preys of *Cheilomenes sexmaculata* and its distribution different states/union territories of India.

Sl. No.	Species of aphid prey	No. of food plant species	No. of states recorded
1.	<i>Acyrtosiphon (Acyrtosiphon) pisum</i>	3	6
2.	<i>Acyrtosiphon sp.</i>	1	1
3.	<i>Aphis (Aphis) affinis</i>	2	2
4.	<i>Aphis (Aphis) craccivora</i>	35	24
5.	<i>Aphis (Aphis) cytisorum</i>	1	1
6.	<i>Aphis (Aphis) fabae</i>	1	1
7.	<i>Aphis (Aphis) glycines</i>	1	1
8.	<i>Aphis (Aphis) gossypii</i>	53	21
9.	<i>Aphis (Aphis) kurosawai</i>	1	2
10.	<i>Aphis (Aphis) longisetosa</i>	1	1
11.	<i>Aphis (Aphis) nasturtii</i>	2	2
12.	<i>Aphis (Aphis) nerii</i>	4	7
13.	<i>Aphis (Aphis) odinae</i>	2	4
14.	<i>Aphis (Aphis) pomi</i>	1	2
15.	<i>Aphis (Aphis) punicae</i>	1	2
16.	<i>Aphis (Aphis) rumicis</i>	1	1
17.	<i>Aphis (Aphis) solanella</i>	1	1
18.	<i>Aphis (Aphis) spiraecola</i>	9	4
19.	<i>Aphis (Aphis) umbrella</i>	1	1
20.	<i>Aphis (Toxoptera) aurantii</i>	5	8
21.	<i>Aphis (Toxoptera) citricidus</i>	2	2
22.	<i>Brachycaudus (Brachycaudus) helichrysi</i>	3	2
23.	<i>Brevicoryne brassicae</i>	6	12
24.	<i>Capitophorus himalayensis</i>	1	1
25.	<i>Cavariella (Cavariella) aegopodii</i>	1	1
26.	<i>Cavariella (Cavariella) indica</i>	1	1
27.	<i>Cavariella (Cavariella) simlaensis</i>	1	1
28.	<i>Ceratovacuna lanigera</i>	1	4
29.	<i>Cervaphis rappardi indica</i>	2	2
30.	<i>Cervaphis schouteniae</i>	1	1
31.	<i>Chaitophorus himalayensis</i>	1	1
32.	<i>Coloradoa rufomaculata</i>	1	1
33.	<i>Epipemphigus imaicus</i>	1	1
34.	<i>Eriosoma lanigerum</i>	1	1

34.	<i>Greenidea (Trichosiphum) psidii</i>	2	3
35.	<i>Greenideoida (Greenideoida) ceyloniae</i>	2	2
36.	<i>Hyadaphis coriandri</i>	4	10
37.	<i>Hyalopterus pruni</i>	3	2
38.	<i>Hysteroneura setariae</i>	10	5
39.	<i>Liosomaphis atra</i>	1	1
40.	<i>Lipaphis (Lipaphis) erysimi</i>	10	20
41.	<i>Lipaphis (Lipaphis) pseudobrassicae</i>	2	2
42.	<i>Macrosiphoniella (Macrosiphoniella) kalimpongensis</i>	1	1
43.	<i>Macrosiphoniella (Macrosiphoniella) pseudoartemisiae</i>	1	1
44.	<i>Macrosiphoniella (Macrosiphoniella) sanborni</i>	3	5
45.	<i>Macrosiphum (Macrosiphum) rosae</i>	3	4
46.	<i>Melanaphis bambusae</i>	1	1
47.	<i>Melanaphis donacis</i>	1	1
48.	<i>Melanaphis sacchari</i>	2	5
49.	<i>Melanaphis sacchari indosacchari</i>	1	1
50.	<i>Myzus (Nectarosiphon) persicae</i>	20	19
51.	<i>Myzus (Nectarosiphon) persicae nicotianae</i>	1	3
52.	<i>Pemphigus (Pemphigus) napaesus</i>	1	1
53.	<i>Pentalonia nigronervosa</i>	1	2
54.	<i>Phorodon (Diphorodon) cannabis</i>	1	1
55.	<i>Prociphilus sp.</i>	1	1
56.	<i>Rhopalosiphum maidis</i>	5	10
57.	<i>Sarucallis kahawaluokalani</i>	1	1
58.	<i>Schizaphis (Schizaphis) graminum</i>	1	1
59.	<i>Schizaphis rotundiventris</i>	1	1
60.	<i>Schizoneuraphis himalayensis</i>	1	1
61.	<i>Schoutedenia emblica</i>	1	2
62.	<i>Shivaphis (Shivaphis) celti</i>	1	1
63.	<i>Sinomegoura citricola</i>	2	1
64.	<i>Sitobion (Sitobion) alopecuri</i>	2	1
65.	<i>Sitobion (Sitobion) alopecuri</i>	1	3
66.	<i>Sitobion (Sitobion) graminis</i>	1	1
67.	<i>Sitobion (Sitobion) miscanthi</i>	2	7
68.	<i>Sitobion (Sitobion) rosaeiformis</i>	3	3
69.	<i>Sitobion sp.</i>	1	1
70.	<i>Therioaphis (Pterocallidium) trifolii</i>	1	3
71.	<i>Tuberculatus (Orientotuberculoides) nervatus</i>	1	1

72.	<i>Tuberculatus (Orienttuberculoides) paiki</i>	1	1
73.	<i>Uroleucon (Uroleucon) sonchi</i>	1	1
74.	<i>Uroleucon (Uromelan) carthami</i>	1	2
75.	<i>Uroleucon (Uromelan) compositae</i>	2	6
76.	<i>Uroleucon (Uromelan) solidaginis</i>	1	1
77.	<i>Unidentified aphid</i>	13	3
Total		164	28

Table 2: Distribution of prey species, host plant species and aphid-host plant associations of *Cheilomenes sexmaculata* in different states/union territories of India.

Sl. No.	States/Union territories	Number of species of aphid preys	Number of host plant species	Number of Aphid-host plant associations
1.	Andhra Pradesh	5	12	14
2.	Arunachal Pradesh	1	1	1
3.	Assam	6	7	9
4.	Bihar	18	32	43
5.	Chhattisgarh	6	7	8
6.	Delhi	4	5	6
7.	Goa	1	1	1
8.	Gujarat	15	60	72
9.	Haryana	5	5	6
10.	Himachal Pradesh	15	16	19
11.	Jammu and Kashmir	9	11	15
12.	Karnataka	21	34	41
13.	Kerala	4	7	7
14.	Madhya Pradesh	4	5	5
15.	Maharashtra	10	25	25
16.	Manipur	18	32	38
17.	Meghalaya	1	1	1
18.	Nagaland	3	4	4
19.	Odisha	10	9	12
20.	Punjab	10	14	15
21.	Rajasthan	21	13	41
22.	Sikkim	1	1	1
23.	Tamil Nadu	11	19	22
24.	Telangana	3	4	4
25.	Tripura	13	6	15
26.	Uttar Pradesh	28	41	56
27.	Uttarakhand	16	15	21
28.	West Bengal	20	38	46
Total		77	164	282

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