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Prey and host records of *Coccinella* spp. (Coleoptera: Coccinellidae) in India (A review)

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Abstract

Aphids (Hemiptera: Aphididae) are small soft bodied plant lice, their number rapidly rise above economic threshold level in suitable climatic condition due to parthenogenetic development. They have great agricultural importance due to polyphagism, polymorphism, parthenogenetic viviparity and remarkable ability to transmit various pathogenic viruses. They damage the crops directly by sucking the nutrients that cause devitalisation of plants. Many coccinellids are predators and major biological control agents of hemipteran pests such as aphids, mealy bugs, scale insects, white flies, as well as thrips and mites and other soft bodied insects. Due to predaceous nature, seasonal synchromy with their specific preys, high foraging performance, immense predation potential and high reproductive efficacy, they possess the potential to be effectively employed in Integrated Pest Management. Globally, more than 6000 ladybird beetle species are known to us, out of which, 261 predaceous species belonging to 57 genera reported from India. In biological control programme, several coccinellids predators are reported as effective bioagent against aphids *viz.*, *Aphidecta obliterata* on *Adelges piceae*, *Cheilomenes lunata* on *Aphis craccivora*, *Coccinella sexmaculata* on *Aphis aurantii* and *Myzus persicae*, *Coccinella transversalis* on *Aphis aurantii* and *Myzus persicae*, *Coccinella undecimpunctata* on several aphids. In India, 13 species of coccinellids *viz***.,** *Coccinella krikkeni* Iablokoff-Khnzorian, *Coccinella lama* Kapur, *Coccinella luteopicta* (Mulsant), *Coccinella magnopunctata* Rybakow, *Coccinella marussii* Kapur,*Coccinella nigrovittata* Kapur, *Coccinella repanda* Thunberg, *Coccinella saucerottei* Mulsant, *Coccinella septempunctata* Linnaeus, *Coccinella transversalis* Fabricious, *Coccinella transversoguttata* Faldermann, *Coccinella undecimpunctata* Linnaeus and *Coccinella undecimpunctata aegyptiaca* Reiche are reported. Among these, *C. septempunctata* and *C.transversalis* are very common and widely distributed in India.

Keywords: Coccinella, Prey records, Aphids, Host plants.

INTRODUCTION

Aphids (Hemiptera: Aphididae) are small, soft bodied plant lice and their number rapidly rise above economic threshold level in suitable climatic condition due to parthenogenetic development. They have great agricultural importance due to polyphagism, polymorphism, parthenogenetic viviparity and remarkable ability to transmits various pathogenic viruses[45,53]. Aphids attack all parts of the plant such as stem, leaves, inflorescence and even roots. They damage the crops directly by sucking the nutrients that cause devitalisation of plants. Hence, the management of aphids is essential to control the population. Integrated Pest Management (IPM) is an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pest control methods are applied in a manner that minimizes risks to human health, beneficial and nontarget organisms and the environment. There are several predators are used to insect-pests management as biological control agents.

Many coccinellids are predators and major biological control agents of several hemipteran pests (aphids, mealy bugs, scale insects, white flies etc.) because they possess high foraging performance, predatory efficiency and high reproductive potential. Hence these insects constitute important natural predatory or enemy complex of many agricultural and horticultural crop pests. Globally, more than 6000 ladybird bettle species are known, out of which, 261 predaceous species belonging to 57 genera are reported from India[107]. In contrast, 36 true aphidophagous coccinellids with 16 incidental or doubtful species and 13 unidentified species of predaceous coccinellids have earlier been reported from India[3]. In biological control programme, several coccinellid predators are reported as effective bioagent against aphids *viz., Aphidecta obliterata* on *Adelges piceae*, *Cheilomenes lunata* on *Aphis craccivora*, *Cheilomenes sexmaculata* on *Aphis aurantii* and *Myzus persicae*, *Coccinella transversalis* on *Aphis aurantii* and *Myzus persicae, Coccinella undecimpunctata* on several aphids[108].

13 species of coccinellids *viz*.**,** *Coccinella krikkeni* Iablokoff-Khnzorian, *Coccinella lama* Kapur, *Coccinella luteopicta* (Mulsant), *Coccinella magnopunctata* Rybakow, *Coccinella marussii* Kapur, *Coccinella nigrovittata* Kapur, *Coccinella repanda* Thunberg, *Coccinella saucerottei* Mulsant, *Coccinella septempunctata* Linnaeus, *Coccinella transversalis* Fabricious, *Coccinella transversoguttata* Faldermann, *Coccinella undecimpunctata* Linnaeus and *Coccinella undecimpunctata aegyptiaca* Reiche are reported from India. Among these, *C. septempunctata* and *C.transversalis* are very common and widely distributed in India.

1. *Coccinella septempunctata* Linnaeus

(*Coccinella septempunctata divaricata* Oliver)

Distribution: It is one of the most common and widely distributed in several states in India., Agartala[3], Andra pradesh[27], Assam[35,36,133,156] Bihar[6,7,114], Goa[72],Haryana[151] ,Himachal Pradesh[37,84,85,87,141] ,Jharkhand[30] , Karnataka[15,65,66], Kashmir[16,17,76,77,96],Meghalaya[8,49], Mezoram[147,148], Manipur and Nagaland[97,136,138], Mysore[122],Odisha[95,110]Tamil Nadu[123,129],Tripura[90] , Uttar Pradesh[24,28,46,55,98,106], Uttarakhand[20,51,63,117,140,159], West Bengal[38,48,57,89,118,128,130,134].

Morphological Characters: Beetle is oval in shape and polymorphic in forms**.** Body convex and densely punctate. The black head bears a pair of black eyes and a pair of brown antennae (11 segmented). The reddish and yellowish incolour elytra bear seven small spots, three on each elytron and one situated on median apical margin. Pronotum black and twice broad as long. Scutellum black or brownish-black and mostly equilateral.

Host aphids and plant: Earlier, it has been reported on 91 species of aphids in India (Table-1). However, in agricultural fields of Uttar Pradesh it was found abundantly on the *Aphis craccivora, Aphis gossypii, Aphis nerii, Rhopalosiphum maidis* and *Myzus persicae*.

2. *Coccinella transversalis* Fabricious

(*Coccinella repanda* Thunberg; *C. repanda transversalis* Thunberg)

Distribution: *Coccinella transversalis* is a very common and widely distributed in India. The ladybeetle is uniformly distributed throughout the country., Agartala[2] , Andamans[71], Andra Pradesh[62], Assam[19,22,33,131,133,156] , Bihar[6,7,114],Chhattisgarh[78,82,83], Goa[72], Gujarat[113,143] ,Himachal Pradesh[84,85,86], Jharkhand[47] , Kashmir[92], Karnataka[29,65,66,93,122],Maharastra[68], Manipur[32,39,40,41,97,145,152], Mezoram[147,148], Nainital[64] ,Nagaland[137,138], Tamil Nadu[123,129], Telangana[126] ,Tripura[90] , Uttarakhand[94,117], Uttar Pradesh[46,55,99,100,102,103,104,106,107]; West Bengal[55,57,89,119,130,134] .

Morphological Characters: Body is slightly elongated; oval, convex, dark blackish brown head bears a pair of blackish eyes and brownish antennae. Pronotum with orange spots on anterio-lateral side; dull orange elytra, three transverse and zig-zag black marking on each reddish color elytron. There is a longitudinal black broad band along the inner junction of elytra.

Host aphids and plants: It was reported to feed on more than 35 species of aphids in India (Table- 1). Its high degree of predation was reported on *A. craccivora, A. gossypii, S. miscanthi* and *M. persicae*. Thus, an account of its wide spectrum occurance and wide spectrum of prey with huge predation potential, it may be regarded as most potent biocontrol agent of aphid pests of our crops. Both the adults and grubs are potent predators of aphids.

3. *Coccinella undecimpunctata* Linnaeus

(*Coccinella 4-punctata menestriesi* Mulsant)

Distribution: Distributed in palaearctic region and India[120]. In India, it is distributed only three states viz., Agartala[3] , Kashmir[13,14,16,17,18] , Uttar Pradesh[28]. The ladybeetle was introduced to North America from India[3].

Morphological Characters: Body moderately convex and elongate a pronotum is black except anterio-lateral margin and corners white to creamy yellow. Elytra red with whitish patches on either side of scutellum. One common scutellar spot and five black spots on each elytron.

Host aphid and plant: The predator was reported to feed on 14 aphid species.The most common aphids were *A. gossypii, L. erysimi, S. graminis* and *S. miscanthi* (Table- 1).

Table 1. List of Aphids preyed by *Coccinella* species in India

Coccinellid /Aphids	**Host Plants**	**References**
1. ***Coccinella krikkeni* Iablokoff-Khnzorian**		
Aphis gossypii	-	Poorani, 2002
2. ***Coccinella lama* Kapur**		
Undet. Aphids	-	Kapur, 1963, Poorani, 2002
3. *Coccinella luteopicta* (Mulsant)		
Aphis craccivora	-	Poorani, 2002
Adelges piceae	-	Kapur, 1963
Cavariella sp.	*Chaerophyllum reflexum*	Ghosh *et al*., 1991
4. *Coccinella magnopunctata* Rybakow		
Aphids	-	Kapur, 1963 , Poorani, 2002
5. *Coccinella marussii* Kapur	-	
Aphids		Kapur, 1973
6. *Coccinella nigrovittata* Kapur	-	
Undet. Aphids		Kapur, 1963, Poorani, 2002
7. *Coccinella saucerottei* Mulsant	-	
Aphis pomi	-	Bhagat *et al.*, 1988
8. *Coccinella septempunctata* Linnaeus		
Acyrthosiphon pisum	*Pisum sativa*	Agarwala & Ghosh, 1988; Srivastava *et al*., 1978; Yadav & Patel, 2015
Acyrthosiphon rubi	*Rubus ellipticus*Sm.	Ghosh *et al*., 1991
Aphis affinis	*Mentha arvensis*	Singh & Bali, 1993
Aphis asclepiadis	-	Agarwala & Ghosh, 1988
Aphis aurantii	*Camellia sinensis* *Citrus* x*aurantium* *Citrus* x*limon* *Schima wallichii* -	Agarwala & Ghosh, 1988; Chaudhary & Singh, 2012; Raychaudhuri *et al*., 1998; Debnath, 2020; Gurung *et al.*, 2019; Das, 1974;

		Das &Kakoty, 1992
Aphis citricidus	*Citrus limon*	Gurung *et al*., 2019
Aphis craccivora	*Arachis hypogaea* *Cajanus cajan* *Lablab purpureus* *Lathyrus* sp *Phaseolus mungo* *Phaseolus roxburghii* *Phaseolus vulgaris* *Pisum sativum* *Solanum melongena* *Vicia faba* *Vigna mungo* *Vigna radiata* *Vigna unguiculata*	Agarwala & Ghosh, 1988; Ahmad *et al*., 2012; Ahmad *et al*., 2020; Chakrabarti *et al*., 2012; Chanmamla, 2009; Ghosh & Raychaudhuri, 1982; Jat & Rana, 2018 Joshi *et al*., 1999; Joshi *et al*., 1997; Kumar *et al*., 2023 Maji *et al*., 2023; Omkar & Bind, 1993; Omkar *et al*., 1997; Pal *et al*., 2023; Satpathi& Mandal, 2006; Sharma & Yadav, 1994;
Aphis fabae	*Rumex nepalensis* *Lagenaria siceraria* *Luffa acutangula* *Luffa cylindrica* *Solanum nigrum* *Vicia faba*	Agarwala *et al*., 1981; Agarwala & Ghosh, 1988; Ahmad *et al*., 2020; Babu & Ananthakrishnan, 1993 Bhat, 2008; Maji *et al*., 2023
Aphis gossypii	*Abelmoschus esculentus* *Ageratum conyzoides* *Anethum graveolens* *Benincasa hispida* *Bidens pilosa* *Brassica oleracea* *Cajanus cajan* *Capsicum annuum* *Capsicum chinense* *Capsicum frutescens* *Carum copticum* *Coccinia grandis* *Colocasia antiquorum* *Colocasia esculenta* *Coriandrum sativum* *Cucumis sativus* *Duranta erecta* *Fagopyrum esculentum* *Gossypium herbaceum* *Gossypium hirsutum* *Lagenaria siceraria* *Luffa aegyptiaca* *Lycopersicon esculentum* *Momordica charantia* *Psidium guajava* *Solanum betaceum* *Solanum lycopersicum* *Solanum melongena* *Solanum tuberosum* *Trachyspermum ammi*	Agarwala & Ghosh, 1988; Agarwala *et al*., 1987 Ahmad *et al*. 2012; Ahmad *et al*., 2020; Azad Thakur & Barwal, 1987; Begam *et al*., 2016; Borah & Saikia, 2017; Butani & Kapadia, 2000a &b; Ghosh & Raychaudhuri, 1982; Joshi *et al*., 1999; Khokhar &Rolania, 2021; Maji *et al*., 2023; Nonita *et al*., 2002; Omkar & Bind, 1993; Omkar *et al*., 1997; Omkar & Srivastava, 2003; Prakash & Rani, 2015; Raychaudhuri *et al*., 1979;
Aphis indica	-	Agarwala & Ghosh, 1988
Aphis longisetosa	*Rubus ellipticus*	Agarwala & Ghosh, 1988; Das & Raychaudhuri, 1983
Aphis nasturtii	*Ageratum conyzoides*	Ahmad *et al*., 2020
Aphis nerii	*Calotropis gigantean*	Agarwala & Ghosh, 1988;

	Calotropis procera *Nerium indicum* *Nerium oleander*	Agarwala *et al.*, 1987 Ahmad *et al*., 2012; Khan & Shah, 2017; Omkar & Bind, 1993; Omkar *et al.*, 1997;
Aphis odinae	*Rhus chinensis* *Wendlandia glabrata*	Agarwala & Ghosh, 1988; Singh & Singh, 1987
Aphis pomi	*Cissampelos glaberrima* *Lablab purpureus* *Malus domestica*	Khan & Shah, 2017; Kumari *et al.*, 2006; Kumari, 2019
Aphis punicae	*Punica granatum*	Mohi-ud-din *et al.*, 2019
Aphis solanella	*Euonymus japonicus* *Phaseolus* sp *Solanum villosum*	Khan & Shah, 2017
Aphis spiraecola	*Ageratum conyzoides* *Capsicum frutescens* *Cestrum diurnum* *Clerodendrum infortunatum* *Cosmos bipinnatus* *Cucumis sativus* *Lageneria siceraria* *Magnolia champaka* *Malus domestica*	Agarwala & Ghosh, 1988 Ahmad *et al*., 2020; Chaudhary & Singh, 2012; Dubey & Singh, 2011; Ghosh & Raychaudhuri, 1982; Khan & Shah, 2017; Raychaudhuri *et al*., 1998
Aulacorthum magnolia	-	Agarwala & Ghosh, 1988
Aulacorthum solani	*Abelmoschus esculentus*	Khan & Shah, 2017
Brachycaudus helichrysi	*Artemesia* sp *Brassica oleracea* *Erigeron Canadensis* *Kleinia grandiflora* *Prunus persica*	Agarwala & Ghosh, 1988; Debnath, 2020; Khan & Shah, 2017; Verma & Chowdhuri, 1975b
Brevicoryne brassicae	*Brassica Juncea* *Brassica oleracea* *Brassica rapa* *Descurainia* sp *Malus domestica*	Agarwala & Ghosh, 1988; Khan & Shah, 2017; Lakhanpal & Raj, 1998; Omkar *et al.*, 1997; Soni *et al*., 2021; Srivastava *et al*., 1978; Sharma *et al.* 2021; Yadav & Patel, 2015;
Capitophorus sp.	-	Agarwala & Ghosh, 1988
Cavariella aegopodii	*Salix* sp. *Salix tetrasperma*	Agarwala & Ghosh, 1988; Das & Raychaudhuri, 1983; Ghosh *et al*.,1986; Ghosh *et al*.,1991
Cavariella indica	*Salix babylonica*	Ghosh *et al*.,1991
Ceratovacuna lanigera	*Saccharum officinarum*	Patil *et al*., 2006
Cervaphis rappardi	*Cajanus cajan*	Shantibala *et al*., 1997
Chaetosiphon gracilicorne	*Rosa* sp.	Agarwala & Ghosh, 1988; Das & Raychaudhuri, 1983
Chromaphis juglandicola	*Juglans regia*	Khan & Shah, 2017
Cinara tujafilina	*Cupressus* sp *Thuja* sp.	Bisht *et al*., 2001; Raychaudhuri *et al*., 1998
Dyasaphis emicis	-	Agarwala & Ghosh, 1988
Ericolophium Holsti	*Rhododendron* sp.	Agarwala *et al*., 1981 Agarwala & Ghosh, 1988
Eriosoma lanigerum	*Malus domestica* *Pyrus malus* -	Agarwala & Ghosh, 1988 Behura, 1963
Epipemphigus imaicus	*Populus ciliata*	Bisht *et al.*, 2001
Greenidea psidii	*Psidium guajava* *Pisum sativum*	Ahmad *et al*., 2012; Chaudhary & Singh, 2012;

		Ghosh & Raychaudhuri, 1982
Hayhurstia atriplicis	*Chenopodium album*	Ghosh *et al.*, 1991
Hyadaphis coriandri	*Anethum graveolens* *Foeniculum vulgare* *Trachyspermum ammi* *Carum copticum* *Coriandrum sativum*	Agarwala & Ghosh, 1988; Butani & Kapadia, 2000b; Chaudhary & Singh, 2012; Kanjiya*et al*., 2018; Lekha & Jat, 2002 Omkar *et al.* 1997 Srivastava *et al*., 1978; Yadav & Patel, 2015
Hyalopterus pruni	*Arundo donax* *Prunus amygdalus* *Prunus persica*	Chaudhary & Singh, 2012; Singh & Singh, 1987
Hysteroneura setariae	*Andropogon* sp. *Cyperus rotundus*	Agarwala & Ghosh, 1988; Ahmad *et al*. 2012; Chaudhary & Singh, 2012; Jagdish *et al.*, 1996
Lachnus tropicalis	*Quercus* sp -	Agarwala & Ghosh, 1988; Ghosh & Raychaudhuri. 1982; Chakrabarti *et al.*, 2012
Liosomaphis atra	*Valeriana jatamansi*	Agarwala & Ghosh, 1988; Das & Raychaudhuri, 1983
Liosomaphis himalayensis	*Berberis aristata*	Ghosh *et al.*, 1991
Lipaphis erysimi	*Brassica rapa* *Brassica carinata* *Brassica oleracea* var. *botrytis* *Brassica juncea* *Brassica nigra* *Eruca vesicaria* *Ranunculus* sp. *Raphanus sativus*	Agarwala & Ghosh, 1988 ; Ahmad *et al*., 2012; Omkar *et al.*, 1997; Ghosh *et al*., 1981; Ghosh *et al*., 1991; Kashyap *et al*., 2018; Kumar, 2015
Lipaphis pseudobrassicae	*Brassica juncaea*	Khan & Shah, 2017
Macrosiphoniella sanborni	*Chrysanthemum* sp. *Tanacetum cinerariifolium*	Afroz, 2001 Behera *et al*., 1999;
Macrosiphum centrathi	-	Agarwala & Ghosh, 1988
Macrosiphum euphorbiae	*Solanum melongena*	Khan & Shah, 2017
Macrosiphum graminis	-	Agarwala & Ghosh, 1988
Macrosiphum miscanthi	*Avena sativa* *Triticum aestivum* *Zea mays*	Agarwala & Ghosh, 1988; Ahmad *et al*., 2012
Macrosiphum rosae	*Rosa canina* *Rosa indica*	Agarwala & Ghosh, 1988; Ghosh & Raychaudhuri, 1982; Khan & Shah, 2017
Macrosiphum rosaeiformis	-	Agarwala & Ghosh, 1988
Matsumuraja capitophoroides	*Rosa* sp.	Agarwala & Ghosh, 1988; Das & Raychaudhuri, 1983
Melanaphis donacis	*Arundo donax*	Chaudhary & Singh, 2012
Melanaphis sacchari	*Sorghum bicolor* *Zea mays*	Chaudhary & Singh, 2012 Sharma & Dhillon, 2005
Myzocallis polychaeta	*Quercus* sp.	Ghosh *et al*., 1991
Myzus cymbalariae	-	Agarwala & Ghosh, 1988
Myzus dycei	*Urtica dioica* -	Agarwala & Ghosh, 1988; Ghosh *et al*., 1991
Myzus mumecola	-	Agarwala & Ghosh, 1988
Myzus ornatus	*Salvia* sp.	Agarwala & Ghosh, 1988; Das & Raychaudhuri, 1983
Myzus persicae	*Abelmoschus esculentus* *Brassica juncea* *Braasica rapa* *Brassica oleracea* var. *capitata* *Capsella bursa-pastoris*	Agarwala & Ghosh, 1988; Ahmad *et al*., 2012; Azad Thakur &Barwal, 1987 Bhat, 2017; Borah & Saikia, 2017;

	Capsicum annuum *Capsicum frutescens* *Cucurbita maxima* *Cuminum cyminum* *Hyoscyamus muticus* *Lycopersicon esculentum* *Nicotiana tabacum* *Ranunculus* sp. *Sesamum indicum* *Solanum betaceum* *Solanum lycopersicum* *Solanum melongena* *Solanum nigrum* *Solanum tuberosum*	Chaudhary & Singh, 2012; Gupta & Yadav, 1989b; Gurung *et al*., 2019; Khan & Shah, 2017; Khokhar &Rolania, 2021; Omkar & Bind 1993; Omkar *et al.*, 1997; Padhy*et al*., 2020; Prabhakar & Roy, 2010; Singh & Bali, 1993
Myzus sorbi	*Sorbaria tomentosa*	Ghosh *et al*., 1991
Neoacrythosiphon holsti	-	Agarwala & Ghosh, 1988
Nippolachnus sp.	*Quercus* sp.	Agarwala & Ghosh, 1988 Das & Raychaudhuri, 1983
Panaphis juglandis	*Juglans regia*	Khan & Shah, 2017
Pemphigus mordvilkovi	-	Bisht *et al*., 2001
Pentalonia nigronervosa	*Musa acuminata*	Agarwala & Ghosh, 1988; Padmalatha & Singh, 1998
Phorodon cannabis	*Cannabis sativa*	Khan & Shah, 2017
Rhopalosiphum maidis	*Hordeum vulgare* *Nymphaea alba* *Triticum aestivum* *Zea mays*	Agarwala & Ghosh, 1988; Ahmad *et al*. 2012; Choudhary *et al*., 2022; Kaur *et al*., 2009; Khan & Shah, 2017; Omkar & Bind, 1993;
Rhopalosiphum nymphaeae	*Euryale ferox* *Sorghum bicolor*	Agarwala & Ghosh, 1988; Rekha *et al*., 2009; Saraswati & Ghosh, 1996
Rhopalosiphum padi	*Avena sativa* *Triticum aestivum*	Kaur *et al*., 2009 Singh & Dhaliwal, 2004
Pseudomegoura magnoliae	-	Agarwala & Ghosh, 1988
Prociphilus micheliae	*Magnolia champaka*	Khan & Shah, 2017
Pterochloroides persicae	*Prunus persica*	Khan & Shah, 2017
Rhopalosiphum padi	*Triticum aestivum*	Kaur *et al.*, 2009
Schoutedenia emblica	*Phyllanthus emblica*	Bharpoda*et al*., 2009
Schizoneuraphis himalayensis	*Machilus gamblei*	Ponnusamy *et al*., 2019
Shinjia orientalis	*Pteris* sp.	Ghosh *et al*., 1991
Sitobion graminis	-	Agarwala & Ghosh, 1988
Sitobion avenae	*Cymbopogon nardus* *Triticum aestivum*	Khan & Shah, 2017
Sitobion miscanthi	*Avena sativa* *Triticum aestivum* *Zea mays*	Ahmad *et al*. 2012
Sitobion rosaeiformis	*Rosa bourboniana* *Rosa canina*	Agarwala, 1983 Agarwala & Ghosh, 1988; Kakar & Sood, 1989
Subovatomyzus leucosceptri	-	Agarwala & Ghosh, 1988
Takecallis affinis	*Bambusa* sp.	Ghosh *et al*., 1991
Taoia indica	*Alnus nepalensis*	Ghosh *et al*., 1991
Therioaphis ononidis	-	Agarwala & Ghosh, 1988
Therioaphis trifolii	*Medicago sativa*	Agarwala & Ghosh, 1988; Chaudhary & Singh, 2012
Tricaudatus polygoni	*Spiraea cantoniensis*	Das & Raychaudhuri, 1983
Tuberculatus paiki	*Quercus serrata*	Singh *et al*., 1985
Uroleucon carthami	*Carthamus tinctorius* -	Agarwala & Ghosh, 1988;

		Srivastava *et al*., 1978
Uroleucon compositae	*Carthemus tinctorius* *Gaillardia pulchella*	Ahmad *et al*. 2012; Bhatt *et al.*, 2007; Omkar *et al.*, 1997;
Uroleucon sonchi	*Sonchus arvensis*	Ghosh *et al*., 1991
9.*Coccinella transversalis* Fabricius		
Acyrthosiphon pisum	*Medicago sativa* *Pisum sativum*	Chaudhary & Singh, 2012; Debraj & Singh, 1995; Megha *et al*., 2015
Aphis affinis	*Mentha arvensis*	Singh & Bali, 1993;
Aphis aurantii	*Camellia sinensis* *Citrus* ^{x}*aurantium* *Phlogacanthusthyrsiformis*	Bhattacharya & Dutta, 1998; Chaudhary & Singh, 2012; Das *et al*., 2010; Maji *et al*., 2023; Radhakrishnan &Muraleedharan 1995;
Aphis craccivora	*Arachis hypogeal* *Cajanus cajan* *Lablab purpureus* *Medicago sativa* *Phaseolus sinensis* *Phaseolus vulgaris* *Pisum sativum* *Portulaca oleracea* *Ranunculus sceleratus* *Solanum melongena* *Vicia faba* *Vicia lens* *Vigna mungo* var. *Mungo* *Vigna radiate* *Vigna unguiculata*	Ahmad *et al.*, 2012 & 2020; Chinnu *et al*., 2023; Debraj & Singh, 1989; Joshi *et al*., 1997; Kumari *et al*., 2022; Megha *et al*., 2015; Omkar *et al*., 1999; Pal *et al*., 2023; Parsana *et al.*, 1997; Pervez *et al.*, 2020; Rekha *et al*., 2009; Saharia, 1980; Satpathi& Mandal, 2006; Sharma *et al*., 1996; Sharma &yadav, 1994; Vasista *et al.*, 2021
Aphis fabae	*Solanum nigrum* *Vicia faba*	Babu & AnanthaKrishnan, 1993; Maji *et al*., 2023; Pervez *et al.*, 2020;
Aphis gossypii	*Abelmoschus esculentus* *Ageratum conyzoides* *Arachis hypogaea* *Artocarpus integer* *Brassica oleracea* *Capsicum annuum* *Capsicum chinensis* *Capsicum frutescens* *Gossypium hirsutum* *Ismelia carinata* *Lagenaria siceraria* *Luffa aegyptiaca* *Luffa cylindrica* *Momordica charantia* *Ocimum tenuiflorum* *Psidium guajava* *Ranunculus sceleratus* *Solanum lycopersicum* *Solanum melongena*	Ahmad *et al.* 2012 & 2020; Babu and AnanthaKrishnan, 1993; Bagum, *et al*., 2016; Borkakati *et al.*, 2019; Devjani & Singh, 1998; Joshi *et al*., 1999; Kale *et al*., 2020; Kalita *et al*., 2008 Kumar *et al*., 2020; Kumari *et al*., 2022; Maji *et al*., 2023; Omkar & Bind, 1993; Omkar *et al*., 1999; Omkar & James, 2004; Pervez *et al.*, 2020; Rekha *et al*., 2009; Singh & Singh, 1987; Vasista *et al*., 2021
Aphis glycines	*Glycine max*	Singh & Singh, 2000
Aphis indica	-	Debraj & Singh, 1995
Aphis nasturtii	*Ageratum conyzoides*	Ahmad *et al.*, 2020

Aphis nerii	*Calotropis gigantean*	Babu &AnanthaKrishnan, 1993; Joshi *et al*., 1999; Omkar *et al*., 1999
Aphis odinae	*Neolamarckia cadamba*	Maji *et al*., 2023;
Aphis pomi	*Malus domestica*	Kumari *et al*., 2006; Kumari, 2019
Aphis spiraecola	*Ageratum conyzoides* *Chromolaena odorata* *Cosmos bipinnatus*	Ahmad *et al.* 2012 & 2020 ; Debraj & Singh, 1995; Dubey & Singh, 2011; Ghosh *et al*., 2017
Brevicoryne brassicae	*Brassica oleracea* var. *capitata* *Raphanus sativus*	Debraj & Singh 1998 ; Omkar &Bind 1993; Omkar *et al.*, 1999; Prakash & Rani, 2015; Sharma *et al*., 2021
Brachycaudus helichrysi	-	Debraj & Singh, 1995
Cervaphis guercus	-	Debraj & Singh, 1995
Cervaphis rappardi indica	*Cajanus cajan*	Debraj & Singh, 1995; Shantibala*et al*., 1997, 1994
Hyadaphis coriandri	*Coriandrum sativum* *Foeniculum vulgare*	Kanjiya*et al*., 2018 ; Maji *et al*., 2023
Lipaphis erysimi	*Brassica juncea* *Brassica oleracea* var. *botrytis* *Brassica nigra* *Brassica rapa*	Ahmad *et al.*, 2012; Das, 2020; Devjani & Singh, 2006; Ghosh *et al*.,1981; Kishore *et al*., 2023 Kumar, 2015 Omkar *et al*. 1999; Omkar & Bind,1993; Prakash & Rani, 2015;
Macrosiphoniella yomogifoliae	-	Debraj & Singh, 1995
Macrosiphum rosae	*Rosa indica*	Chaudhary & Singh, 2012
Macrosiphum rosaeiformis	*Rosa indica*	Debraj & Singh, 1995; Chaudhary & Singh, 2012
Melanaphis donacis	-	Debraj & Singh, 1995
Melanaphis sacchari	*Sorghum bicolor* *Zea mays*	Agarwala & Ghosh1988; Rekha *et al*., 2009
Myzus persicae	*Brassica juncea* *Brassica nigra* *Brassica oleracea* var. *botrytis* *Brassica rapa* *Capsicum frutescens* *Helianthus annuus* *Linum usitatissimum* *Lycopersicon esculentum* *Nicotiana tabacum* *Pisum sativum* *Raphanus sativus* *Solanum tuberosum* *Solanum melongena*	Ahmad *et al*., 2012; Borah & Saikia, 2017 ; Chaudhary & Singh, 2012; Chinnu *et al*., 2023; Devjani & Singh, 1998; Ghosh *et al*., 1981; Gurung *et al*., 2019; Jayaramaiah*et al*., 1996; Joshi *et al*., 1979; Maji *et al*., 2023; Mandal & Patnaik, 2008; Megha *et al*., 2015; Nonita *et al*., 2002; Omkar *et al.*, 1999; Omkar & Bind 1993; Parween *et al*., 2023; Pervez *et al.*, 2020 ; Raj, 1989
Rhopalosiphum maidis	*Cenchrus americanus* *Sorghum bicolor* *Triticum aestivum*	Chinnu *et al*., 2023; Debraj & Singh, 1995; Joshi *et al*., 1996;

	Zea mays	Kale *et al*., 2020; Megha *et al*., 2015; Rekha *et al*., 2009
Rhopalosiphum padi	*Triticum aestivum*	Dixit *et al*., 2019
Schizaphis graminum	*Echinochloa colonum*	Shanker *et al*., 2018
Sitobion avenae	*Avena sativa* *Triticum aestivum*	Ahmad *et al*., 2012; Dixit *et al*., 2019
Sitobion miscanthi	*Avena sativa* *Triticum aestivum* *Zea mays*	Ahmad *et al*., 2012; Chaudhary & Singh, 2012
Sitobion rosaeiformis	*Rosa indica*	Chaudhary & Singh, 2012
Therioaphis ononidis	-	Omkar & Ahmad, 2004
Therioaphis trifolii	*Medicago sativa*	Agarwala & Ghosh, 1988; Chaudhary & Singh, 2012
Tuberculatus paiki	*Quercus serrata*	Singh *et al*., 1985
Uroleucon compositae	*Carthamus tinctorius*	Omkar *et al.*, 1999; Khandekar *et al*., 2023
Uroleucon sp.	*Parthenium hysterophorus*	Shanker *et al.*, 2018
10.*Coccinella transversoguttata* Faldermann		
Aphis craccivora	-	Ghosh *et al.*, 1977
Aphis gossypii	-	Ghosh *et al.*, 1977
11. *Coccinella undecimpunctata* Linnaeus		
Acyrthosiphon pisum	*Pisum sativum*	Bhat, 2008
Aphis craccivora	*Cucumis sativus* *Lablab purpureus* *Phaseolus vulgaris* *Rumex acetosella* *Solanum lycopersicum* *Solanum melongena* *Solanum tuberosum*	Bhat, 2017 ; Chaudhary & Singh, 2012
Aphis gossypii	*Fagopyrum esculentum* *Fagopyrum kashmirianum* *Fagopyrum tataricum* *Gossypium hirsutum* *Solanum tuberosum*	Agarwala & Ghosh, 1988; Bhat *et al*., 1986; Chaudhary & Singh, 2012; Rahman, 1940
Brevicoryne brassicae	*Brassica rapa*	Chaudhary & Singh, 2012
Aphi nerii	-	Chaudhary & Singh, 2012
Aphi punicae	-	Chaudhary & Singh, 2012
Hyalopterous arundinis	-	Bhagat & Masoodi, 1988
Hyalopterous pruni		Chaudhary & Singh, 2012
Lipaphis erysimi	*Brassica napus* *Brassica compestris* *Lagenaria siceraria*	Agarwala & Ghosh, 1988; Bhat, 2017; Chaudhary & Singh, 2012
Macrosiphoniella sanborni	*Chrysanthemum indicum*	Chaudhary & Singh, 2012
Myzus persicae	*Braasica rapa*	Chaudhary & Singh, 2012
Rhopalosiphum maidis	-	Chaudhary & Singh, 2012
Sitobion graminis	-	Agarwala & Ghosh, 1988
Sitobion miscanthi	*Triticum aestivum*	Agarwala & Ghosh, 1988; Rahman, 1940
12. *Coccinella undecimpunctata aegyptiaca* Reiche		Poorani, 2002
Aphids	-	
13. *Coccinella repanda* Thunberg		
Aphis aurantii	*Camellia sinensis*	Das, 1974; Das &Kakoty, 1992
Aphis craccivora	*Vicia faba*	Srivastava *et al*., 1982
Aphis gossypii	*Gossypium hirsutum*	Srivastava *et al.*, 1982

Brevicoryne brassicae	*Brassica oleracea*	Srivastava *et al*., 1982
Lipaphis erysimi	*Brassica juncea*	Kishor *et al*., 2023
Melanaphis sacchari	*Sorghum bicolor* *Zea mays*	Patnaik *et al*., 1977
Myzus persicae	*Brassica rapa*	Srivastava *et al*., 1982
Rhopalosiphum maidis	*Zea mays*	Srivastava *et al*., 1982
Uroleucon carthami	*Carthamus tinctorius*	Srivastava *et al*., 1982

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