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DIVERSITY OF APHIDS AND THEIR PREDATORY COCCINELLIDS FROM WEST BENGAL

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ABSTRACT

The terai agroclimatic region of West Bengal has been surveyed in this study for the diversity of aphids and their predatory coccinellids during 2017-19. The collected specimens were studied in the laboratory of Department of Entomology, Uttar Banga Krishi Viswavidyalaya, Pundibari, Cooch Behar. A total of 29 plant hosts were observed which revealed that *Brevicoryne brassicae* (L), *Myzus persicae* (Sulzer), *Lipaphis erysimi* (Kalt), *Aphis gossypii* (Glover) and *Sitobion avenae* (F) are the important species. Many coccinellids were observed predating on these, of which the dominant ones were *Coccinella septempunctata* (L), *C. transversalis* (F), *Micraspis discolor* (F), and *Cheilomenes sexmaculata* (F)

Key words: Aphids, species diversity, agri-horticultural crops, Aphidoidea, Hemiptera, Coccinellidae, Coleoptera, major species, predators, Terai region, *Coccinella septempunctata*

The economic importance of aphids has been widely accepted since they suck the plant sap, affect the growth of the plant, transmit several viral diseases and cause serious production losses in agricultural, horticultural, forest and other all types of plants. Biodiversity, in the recent years, has acquired significant importance as focal point of discussion like some other international issues. For the sustainable management of aphids on different crops it is pertinent to have information of its species composition. The entomophagous arthropods that attack the aphid species can be broadly grouped as specialists and generalists. Generalist aphidophagous predators like coccinellids (Coleoptera, Coccinellidae) play a great role to check the population of the aphid species (Müller and Godfray, 1999). The knowledge of the diversity of coccinellids forms a prerequisite for their successful conservation in the agroecosystems. The purpose of this study was to enlist the economically important aphid species associated with the agricultural, horticultural, forestry and other plants along with their predatory coccinellid fauna. These observations can enable conservation biological control of aphid pests of crops by exploiting the predatory efficiency of native coccinellids.

MATERIALS AND METHODS

The aphids were inspected on different crops like cereals, pulses, vegetables, oilseeds, medicinal and ornamental plants, grasses and weeds in different locations of terai region in different seasons and the aphids were collected from different plant parts by cutting the infested part and placed in a plastic bag and tightened with a rubber band and then brought back to the laboratory. Then, some aphids were transferred into the small vials with 70% ethanol and sent for taxonomic studies. Aphids were identified and confirmed by Dr Sunil Joshi, ICAR-NBAIR (National Bureau of Agricultural Insects Resource), Bangalore, India. Those insect pests which occurred on the crop till harvest, after their first appearance was designated as 'regular', while those insect pests whose population occurred intermittently or otherwise disappear before harvest was categorized as 'sporadic'. The insects which were merely recorded and whose population occurred after a considerable time lag were designated as a stray. The coccinellid specimens were collected by hand netting and hand picking from different plants. The specimens were transfixed by the insect pins passing through the right elytra. But the very small specimens were mounted on the card point and pinned. Each specimen was properly labeled with, the place of collection, date of collection, collector name and host plant. The specimens were identified with the samples preserved at the department identified earlier by Dr J Poorani, ICAR-NRC for Banana, Tiruchirapalli, India.

RESULTS AND DISCUSSION

Twenty species of aphids were recorded infesting 29 plant species from terai region of West Bengal. The aphid species with their host, host family, season

Table 1. Aphid diversity in the agroecosystems of Terai region, West Bengal

S. No.	Common name	Aphid species	Host plant	Family/ group	Season	Pest status	Intensity of infestation
1.	Cabbage aphid	*Brevicoryne brassicae* (Linn)	*Brassica oleracea var capitata* (Cabbage)	Brassica	January- March	Regular	Medium
2.	The mango aphid	*Aphis* (*Toxoptera*) *odinae* (Van der Goot)	*Mangifera indica* (Mango)	Cashews	January- March	Sporadic	Medium
3.	The mango aphid	*Aphis* (*Toxoptera*) *odinae* (Van der Goot)	*Neolamarckia cadamba* (Burflower tree)	Rubiaceae	January- April	Sporadic	Medium
4.	Chrysanthemum aphid	*Macrosiphoniella sanborni* (Gillette)	*Chrysanthemum indicum* (Chrysanths)	Asteraceae	December- April	Regular	High
5.	Aphid	*Cervaphis rappardi indica* (Basu)	*Cajanus cajan* (Pigeon pea)	Legumes	January- May	Sporadic	Medium
6.	Green peach aphid	*Myzus persicae* (Sulzer)	*Solanum tuberosum* (Potato)	Solanaceae	January- March	Regular	Medium
7.	Green peach aphid	*Myzus persicae* (Sulzer)	*Helianthus annus* (Sunflower)	Asteraceae	December- February	Sporadic	Low
8.	Aphid	*Sitobion* sp.	*Zea mays* (Maize)	Poaceae	February - April	Sporadic	Low
9.	English grain aphid	*Sitobion avenae* (Fitch)	*Triticum aestivum* (Wheat)	Poaceae	February- April	Regular	High
10.	Cowpea aphid	*Aphis craccivora* (Koch)	*Vigna radiate* (Mung bean)	Legumes	December- March	Regular	Medium
11.	Cowpea aphid	*Aphis craccivora* (Koch)	*Mussaenda acuminate* (Mussaenda)	Rubiaceae	January-March	Sporadic	Medium
12.	Aphid	*Aiceona* sp.	*Persea bombycina* (Som plant)	Lauraceae	January-April	Sporadic	High
13.	Chenopodium aphid	*Hayhurstia atriplicis* (L)	*Chenopodium album* (White Goosefoot)	Amaranthaceae	March	Stray	Low
14.	Mustard aphid	*Lipaphis erysimi* (Kalt)	*Brassica Campestris* (Mustard)	Brassica	January-March	Regular	High
15.	Pea aphid	*Acyrthosiphon pisum* (Harris)	*Pisum sativum* (Pea)	Legumes	January-March	Regular	Medium
16.	Cotton aphid	*Aphis gossypii* (Glover)	*Abelmoschus esculentus* (Ladies finger)	Malvaceae	May	Sporadic	Medium
17.	Cotton aphid	*Aphis gossypii* (Glover)	*Momordica charantia* (Bitter gourd)	Cucurbitaceae	March-April	Regular	Medium
18.	Cotton aphid	*Aphis gossypii* (Glover)	*Gossypium hirsutum* (Cotton)	Malvaceae	December-March	Regular	High
19.	Cotton aphid	*Aphis gossypii* (Glover)	*Capsicum annuum* (Chili)	Solanaceae	January-March	Regular	Medium
20.	Cotton aphid	*Aphis gossypii* (Glover)	*Ocimum tenuiflorum* (Tulsi)	Lamiaceae	December-February	Sporadic	Low

(contd.)

Table 1 (contd.)

21.	Sugarcane woolly aphid	*Ceratovacuna lanigera* (Zehnter)	*Saccharum officinarum* (Sugarcane)	Poaceae	September-February	Sporadic	Medium
22.	Oriental citrus aphid	*Toxoptera citricida* (Kirkaldy)	*Citrus limon* (Lemon)	Rutaceae	January-March	Regular	Medium
23.	Corn leaf aphid	*Rhopalosiphum maidis* (Fitch)	*Zea mays* (Maize)	poaceae	March- April	Sporadic	Medium
24.	Brown citrus aphid	*Toxoptera aurantii* (Boyer de Fonscolombe)	*Phlogacanthus thyrsiformis* (Ram Basak)	Acanthaceae	December- February	Sporadic	High
25.	Coriander aphid	*Hyadaphis coriandri* (Das)	*Coriandrum sativum* (Coriander)	Apiaceae	February- March	Sporadic	High
26.	Aphid	*Aphis* (*Toxoptera*) sp.	*Litchi chinensis* (Litchi)	Sapindaceae	January- February	Sporadic	Medium
27.	Bean aphid	*Aphis fabae*	*Solanum nigrum* (Blackberry nightshade)	Solanaceae	February- March	Sporadic	Medium
28.	Cotton aphid	*Aphis gossypii* (Glover)	*Lantana camara* (Lantana)	Verbenaceae	January	Stray	Low
29.	Cotton aphid	*Aphis gossypii* (Glover)	*Ismelia carinata* (Annual Chrysanthemum)	Asteraceae	February- April	Regular	High
30.	Pomegranate aphid	*Aphis punicae*	*Punica granatum* (Pomegranate)	Punicaceae	February	Sporadic	Low

of occurrence, pest status and intensity of infestation are listed in Table 1 while their predatory coccinellids are in Table 2. Among the aphids, *Aphis gossypii* (Glover) was the most dominant and it infested five host plants. Ghosh (1974) observed that *A. gossypii* causing severe damage to vegetable crops like okra, chilli, bitter gourd etc. Ebert et al. (1997) observed that cotton (*Gossypium hirsutum*) is one of the economically important cash crops which is highly susceptible to cotton aphid. The other dominant aphids observed include *Myzus persicae* (Sulzer) and *Aphis craccivora* (Koch). Nikolakakis et al. (2003) noticed that *M. persicae* can attack potato until harvest, especially high population being found at young leaves stage. Ghosh (1975) observed that *A. craccivora* is an important cosmopolitan and polyphagous species causing heavy damage on mungbean and remains active throughout the year. The grain aphid *Sitobion avenae* (F) was found to occur regularly during February-April; Deol (1990) observed it causing serious damage on cereal crops and reducing the yield. Woolly aphid *Ceratovacuna lanigera* (Zehnter) on sugarcane and *Lipaphis erysimi* (Kalt) on mustard are the others. In 1995, Gupta and Goswami reported that heavy infestation of *C. lanigera* causing reduction in the yield and up to 15% reduction in sugar content. Pal et al. (2013) observed the mustard aphid *L. erysimi* as one of the most important pests in the Terai region of West Bengal. Among the predaceous coccinellids, *Micraspis discolor* (F.) was the most dominant species in rice, wheat and linseed whereas, *Coccinella transversalis* (F.) was the most abundant in maize and mustard followed by *M. discolor* (Gurung et al., 2019). The Sub-Himalayan Terai region of Northern West Bengal, thus inhabits many aphids and predaceous coccinellids. The potential of exercising a natural check on the population buildup of aphids thus exists with their conservation.

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Table 2. Diversity of predatory coccinellids on aphids in the agroecosystems of Terai region, West Bengal

S. No.	Aphid species	Crop	Natural enemies observed associated with the aphid species in the field	Status of the N.E.
1.	*Brevicoryne brassicae* (Linn)	*Brassica oleracea* var *capitata* (Cabbage)	*Micraspis discolor* (F)	High
			Coccinella septempunctata (L)	Medium
			Coccinella transversalis (F)	High
2.	*Aphis* (*Toxoptera*) *odinae* (Van der Goot)	*Mangifera indica* (Mango)	*Micraspis discolor* (F)	High
			Cheilomenes sexmaculata (F)	Low
3.	*Aphis* (*Toxoptera*) *odinae* (Van der Goot)	*Neolamarckia Cadamba* (Burflower tree)	*Synonychimorpha chittagoni* (Vazirani)	Medium
			Coccinella transversalis(F)	Medium
4.	*Macrosiphoniella sanborni* (Gillette)	*Chrysanthemum indicum* (Chrysanths)	*Cheilomenes sexmaculata* (F)	Medium
			Propylea dissecta (Mulsant)	Low
5.	*Cervaphis rappardi indica* (Basu)	*Cajanus cajan* (Pigeon pea)	*Micraspis discolor* (F)	High
			Cheilomenes sexmaculata (F)	Low
6.	*Myzus persicae* (Sulzer)	*Solanum tuberosum* (Potato)	*Coccinella septempunctata* (L)	Medium
			Micraspis discolor (F)	High
7.	*Myzus persicae* (Sulzer)	*Helianthus annus* (Sunflower)	*Micraspis discolor* (F)	Medium
			Coccinella transversalis (F)	Medium
8.	*Sitobion* sp. and *Rhopalosiphum maidis* (Fitch)	*Zea mays* (Maize)	*Micraspis discolor* (F)	Medium
			Cheilomenes sexmaculata (F)	Low
			Coccinella transversalis (F)	Medium
9.	*Sitobion avenae* (F)	*Triticum aestivum* (Wheat)	*Micraspis discolor* (F)	High
			Brumoides suturalis (F)	Low
			Cheilomenes sexmaculata(F)	Medium
			Coccinella septempunctata (L)	Medium
			Illeis indica (F)	Medium
10.	*Aphis craccivora* (Koch)	*Vigna radiate* (Mung bean)	*Micraspis discolor* (F)	High
			Coccinella septempunctata (L)	Medium
11.	*Aphis craccivora* (Koch)	*Mussaenda acuminate* (Mussaenda)	*Cheilomenes sexmaculata* (F)	Low
			Micraspis discolor (F)	Medium
12.	*Aiceona* sp.	*Persea bombycina* (Som plant)	*Anisolemnia dilatata* (F)	Medium
			Harmonia dimidiata (F)	Medium
13.	*Hayhurstia atriplicis* (L)	*Chenopodium album* (White Goosefoot)	*Micraspis discolor* (F)	Low
14.	*Lipaphis erysimi* (Kalt)	*Brassica Campestris* (Mustard)	*Coccinella septempunctata* (L)	Medium
			Coccinella transversalis (F)	High
			Micraspis discolor (F)	Medium
15.	*Acyrthosiphon pisum* (Harris)	*Pisum sativum* (Pea)	*Coccinella transversalis* (F)	Medium
			Cheilomenes sexmaculata (F)	Low
			Micraspis discolor (F)	Medium
16.	*Aphis gossypii* (Glover)	*Abelmoschus esculentus* (Ladies finger)	*Micraspis discolor* (F)	Medium
			Coccinella transversalis (F)	High
			Brumoides suturalis (F)	Medium
17.	*Aphis gossypii* (Glover)	*Momordica charantia* (Bitter gourd)	*Coccinella transversalis* (F)	Medium
			Micraspis discolor (F)	Low
18.	*Aphis gossypii* (Glover)	*Gossypium hirsutum* (Cotton)	*Cheilomenes sexmaculata* (F)	Medium
			Micraspis discolor (F)	High
			Cheilomenes sexmaculata (F)	Medium
19.	*Aphis gossypii* (Glover)	*Capsicum annuum* (Chili)	*Anegleis cardoni* (Weise)	Low
			Coccinella transversalis(F)	High
			Coccinella septempunctata (L)	Medium

(contd.)

Table 2 (contd.)

20.	*Aphis gossypii* (Glover)	*Ocimum tenuiflorum* (Tulsi)	*Cheilomenes sexmaculata* (F)	Medium
			Coccinella transversalis (F)	High
21.	*Ceratovacuna lanigera* (Zehnter)	*Saccharum officinarum* (Sugarcane)	*Cheilomenes sexmaculata* (F)	Medium
			Propylea dissecta (Mulsant)	High
			Micrasps yasumatsui (Sasaji)	Medium
			Coccinella septempunctata (L)	Medium
22.	*Toxoptera citricida* (Kirkaldy)	*Citrus limon* (Lemon)	*Cryptogonus bimaculatus* (Kapur)	Low
			Micraspis discolor (F)	Medium
23.	*Toxoptera aurantii* (Boyer de Fonscolombe)	*Phlogacanthus thyrsiformis* (Ram Basak)	*Cheilomenes sexmaculata* (F)	Medium
			Coccinella transversalis (F)	High
24.	*Hyadaphis coriandri* (Das)	*Coriandrum sativum* (Coriander)	*Micraspis discolor* (F)	Medium
			Cheilomenes sexmaculata (F)	Low
			Coccinella transversalis (F)	Medium
25.	*Aphis* (Toxoptera) sp.	Litchi chinensis (Litchi)	-	-
26.	*Aphis fabae*	*Solanum nigrum* (Blackberry nightshade)	*Coccinella transversalis* (F)	Low
			Coccinella septempunctata (L).	Medium
27.	*Aphis gossypii* (Glover)	*Lantana camara* (Lantana)	-	-
28	*Aphis gossypii* (Glover)	*Ismelia carinata* (Annual Chrysanthemum)	*Coccinella transversalis* (F)	Medium
29.	*Aphis punicae*	*Punica granatum* (Pomegranate)	*Micraspis discolor* (F)	Low

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