



E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(3): 1140-1147
© 2017 JEZS
Received: 09-03-2017
Accepted: 10-04-2017

Akshay Kumar
Department of Entomology,
Sardar Vallabhbhai Patel Uni. of
Agric. and Tech., Meerut,
Uttar Pradesh India

Rajendra Singh
Department of Entomology,
Sardar Vallabhbhai Patel Uni. of
Agric. and Tech., Meerut,
Uttar Pradesh India

CS Prasad
Department of Entomology,
Sardar Vallabhbhai Patel Uni. of
Agric. and Tech., Meerut,
Uttar Pradesh India

GN Tiwari
Department of Entomology,
Sardar Vallabhbhai Patel Uni. of
Agric. and Tech., Meerut,
Uttar Pradesh India

Sudhir Kumar
Department of Entomology,
Sardar Vallabhbhai Patel Uni. of
Agric. and Tech., Meerut,
Uttar Pradesh India

Correspondence
Sudhir Kumar
Department of Entomology,
Sardar Vallabhbhai Patel Uni. of
Agric. and Tech., Meerut,
Uttar Pradesh India

New records of predatory coccinellids beetles (Coccinellidae: Coleoptera) in Western plain zone of Uttar Pradesh

Akshay Kumar, Rajendra Singh, CS Prasad, GN Tiwari and Sudhir Kumar

Abstract

Twenty one species of predatory coccinellid beetles were recorded during survey period Jun, 2010 to May, 2011. Out of them 17 species were identified i.e. *Cheilomenes sexmaculata* (Fab.), *Cheilomenes sexmaculata ab rufafasciata* (Fab.), *Coccinella septempunctata*; *Propylea dissecta* (Muls.), *Coccinella transversalis* (Fab.); *Chilocoris nigrata* (Fab.); *Anegleis cardoni* (Weise); *Micraspis discolor* (Mulsant); *Brumoides suturalis* (Fab.); *Illeis cincta* (Fab.); *Pharoscyrmus horni* (Weise); *Rodolia breviscula* (Weise); *Psyllobora bisoctonotata* (Muls.); *Hippodamia variegata* (Goeze); *Harmonia axyridis* (Pallas), *Hydrapsis maindroni* (Sicard); *Scymnus nubilus* (Mulsant), on the other hand four species were unidentified. The *C. sexmaculata* ranked first (46%) in position and it was recorded as dominant species followed by *C. septempunctata* (30.58%) and *C. transversalis* (8.83%). While, least population *Harmonia axyridis* (1.56%), followed by of *M. allardi* (1.99%) and (2.37%) *Pharoscyrmus horni* (2.61%) were noticed in Meerut region.

Keywords: New records, predatory, coccinellids beetles

1. Introduction

The coccinellid predator is native of Australia. In 1892, it was introduced into California by Albert Koebele for the control of citrus mealy bugs. Following the success, the beetle was introduced into India in 1898 by New Port. It has given effective control of mealy bugs in fruit crops like citrus, grapes, guava, etc. *C. montrouzieri* is one of the outstanding examples in the biological control history. Its importance is also evident by its growing commercialization in India. The family coccinellidae comprises of about 5,200 described species worldwide (Hawkeswood, 1987) [4]. However, Poorani (2002) [17] has listed 400 species of coccinellids from Indian sub-region, which include the erstwhile state of Uttar Pradesh and Uttarakhand. Omkar and Bind (1993) [9] have reported 6 species of coccinellids from Lucknow region of central U.P. Further work of Omkar and Pervez (1999, 2000, and 2002) [12, 13, 14] on coccinellids added 17 more species from the same region. Although, the coccinellid fauna of the Indian subcontinent is rich and diverse but remains very poorly studied as compared to those from other zoogeographical regions of the world. Joshi and Sharma (2008) [5] have reported 31 species of Ladybeetles with 19 new records from district Haridwar, India. Recently, Sharma and Joshi (2010) [22] have also reported 25 species of ladybeetles with 14 new records from district Dehradun, India. The agro-climatic zone of Meerut is different from the other areas of the country and there is no report on such study in this area. Thus, the proposed work to identify local species can prove an efficient tool for the biological control against aphid and mealy bugs.

2. Materials and Methods

2.1. Experimental site

The present investigation were undertaken with object of new records of predatory coccinellids beetles (coccinellidae: coleoptera) in western plain zone of Uttar Pradesh was carried out during Jun, 2010 to May, 2011 at CRC and Bio-control laboratory, S.V.P. University of Agriculture and Technology, Meerut, on the right side of the Dehradun–Delhi Road at a distance of 10.0 km away in the north of Meerut city between 73 & 74 km on National Highway No. 58.

2.2. Geographical situation

District Meerut is situated between 29° 01N latitude and 77° 45E longitude at an altitude of 237 meters above the mean sea level. This district falls under north western plains sub- region of Upper Gangatic plains and is spread over a geographical area of 2564 km². The general climate of this district is semi-arid and sub-tropical characterized by very hot summer and cold winters. The maximum temperature ranged up to 42 °C during summer season whereas, minimum temperature remaining 7-8 °C and below during winter season. The average annual rainfall is 863 mm, 75-80 per cent of which is received through south west monsoon during the month of July to September. But few of rain shower occasionally occur in the winter and summer season, respectively.

2.3. Sampling Method

Sampling of adult coccinellid beetles were carried out continuously during the study period. The insects were collected by a "Sweep net sampling Method", as per Gadakar *et al.*, (1990)^[3]. Other methods, based upon visual encounters, like aspirator and hand picking were also used, depending on the type of habitat sampled.

2.4. Preservation and identification of specimens

The collected insects were brought to the laboratory and transferred into killing bottles containing ethyl acetate soaked cotton. The dead insects were tagged and pinned promptly and oven dried at 60 °C for 72 hours in order to preserve them. These dried samples were set into wooden boxes and labeled according to their systematic position. Each specimen was tagged with the information like host plant, locality and date of collection. To protect the specimens from the insect pests, naphthalene balls were kept in the collection boxes. The adult specimens of each species were carefully studied for all details under binocular microscope. The sampled specimens were identified to the Division of Entomology, IARI, New Delhi.

3. Results and Discussion

3.1. Identification of different predatory coccinellid beetles

Seventeen species i.e. *Cheilomenes sexmaculata* (Fab.); *Cheilomenes sexmaculata ab rufafasciata* (Fab.); *Coccinella septempunctata*; *Propylea dissecta* (Muls.); *Coccinella transversallis* (Fab.); *Chilocoris nigrita* (Fab.); *Anegleis cardoni* (Weise); *Micraspis discolour* (Mulsant); *Brumoides suturalis* (Fab.); *Illeis cincta* (Fab.); *Pharoscyrnus horni* (Weise); *Rodolia breviscula* (Weise); *Psyllobora bisoconotata* (Muls.); *Hippodamia variegata* (Goeze); *Harmonia axyridis* (Pallas), *Hydrapsis maindroni* (Sicard); *Scymnus nubilis* (Mulsant); and four unidentified species of coccinellid beetles were recorded from agriculture, orchard and garden ecosystem during the study period.

3.2. *Cheilomenes (=Menochilus) sexmaculata*

The *Cheilomenes sexmaculata* was noticed feeding voraciously on aphid of different host plant i.e. Bean, Oak, *Parthanium* and *Hibiscus* (Table: 1). 5149 beetles were recorded during the study period from June 2010 to May 2011 and observed to be dominant species in the western plain zone of U.P. The adult beetle elongate oval, pale yellow in colour measuring about 5.0–5.2 mm in length and 3.7–4.0 mm in width (Fig. 2). Its head was dark brown with black eyes and brown antennae. Elytra are pale yellow in colour with three blackish zig-zag stripes on them.

3.3. Seven spotted Lady Beetle, *Coccinella septempunctata*

The observed data (Table: 1) shows that this coccinellid beetle species was the next dominant species (3395 beetles/year) to *C. sexmaculata* in Meerut region throughout the year. The maximum population of this species was found in February (612 beetles) followed by March (600 beetles) and in January (503 beetles). This predatory beetle was found predated voraciously on aphids of different host plant i.e. bean, mustard and *Hibiscus*. Comparatively large sized (7-8 mm) with a white or pale spot on either side of the head (Fig. 3 and 7). The body was oval, and has a domed shape. There are seven black spots on the orange or red elytra, the spot pattern was usually 1:4:2.

3.4. *Propylea dissecta* (Mulsant)

This predatory beetle was noticed predated on aphids of different host plants. A total number of 171 beetles were recorded from different host plant during the study period (Table: 1). Maximum population of this species was found in December (40 beetles), followed by November (24 beetles) and in January (21 beetles). Adults measure 4.5 to 4.8 mm in length and 5.0 mm in width and was attractive bright red colour having a pair of prominent black spots on the posterior side of the elytra (Fig. 4).

3.5. *Cheilomenes (=Menochilus) sexmaculata ab rufafasciata* (Fabricius)

The adults were found feeding on cotton aphid, *Aphis gossypii* and mustard aphid, *L. erysimis* and also some other aphid species found on herbal plant in the garden ecosystem. This predatory beetle was noticed feeding on aphids of different host plants (Table: 1). Only 31 beetles were recorded during the study period (i.e., June 2010 to May 2010). The adult beetle was brown in colour measuring about 5.0–5.2 mm in length and 3.7–4.0 mm in width (Fig. 5, 12, 13 and 15). Head was dark brown, eyes are black and antennae are brown in colour. There are two black spots on the distal end of each elytra. There was a triangular black patch on the middle part of the elytra.

3.6. *Coccinella transversalis*

This predatory beetle was noticed predated voraciously on aphids of different host plants (Table: 1) and recorded 972 beetles during the study period. The maximum population of this species was found in March (196 beetles) followed by April (191 beetles), and in February (171 beetles). The observed data shows that this species was next dominant species after *C. sexmaculata* and *C. septempunctata* in Meerut region (Table: 1). Adult beetle was elongate and oval in shape measuring 3.8-6.7 mm in length and 3.3-5.5 mm in width with convex (Fig. 6). The head was black with a pair of creamy yellow, sub-triangular frontal spots, one on either side of inner margins of eyes. Elytra are bright carmine red or orange or yellow, with an oval sub-scutellar spot, a large tri-lobed spot on humeral callus, a transverse band at apical third not reaching lateral margin, and three smaller apical spots-one sutural and two lateral, usually fused to form a transverse marking, sutural line with an irregular black stripe. The elytral pattern was variable with the markings in various states of confluence or reduction.

3.7. *Chilocorus nigrita* (Fabricius)

This predatory beetle was found predated on bean aphid, *A. craccivora*. This species was noticed as a rare species in Meerut region (Table: 1). The bright black coloured and

medium sized beetle measures about 5.0 mm long and 3.9 mm broad across the middle elytra (Fig. 8).

3.8. *Anegleis cardoni* (Weise)

This beetle was found preying on aphids and mealy bugs and also on scale insects of *Hibiscus*. This species was recorded 118 beetles in the study period. The maximum population (Table: 1) of this species was found in January (60 beetles), followed by February (21 beetles) and in December (15 beetles). It was oval in shape and measures about 4.0–5.0 mm in length and 3.5–4.5 mm in width (Fig. 9). The elytra are bright pinkish yellow in colour with one black median stripe at the joint of both the elytra and two linear markings on each elytron; the anterior end of outer one was inwardly curved, whereas the inner one was outwardly curved posteriorly. Besides, there was one small rounded black spot towards the posterior end of each elytron.

3.9. *Micraspis allardi* (Mulsant)

This predatory beetle was found preying on aphids of *Hibiscus* and other weeds. 219 beetles were recorded during July (2010) to April (2011). However, the maximum population of this species was recorded in November (62 beetles) followed by December (41 beetles) and October (40 beetles) (Table: 1). Adult beetles are oval measuring about 4.5–5.0 mm in length and 3.5–4.0 mm in width (Fig. 14). The creamish white pronotum bears distinct black patches; two dot shaped patches towards the proximal end and two almost triangular ones towards the distal end. There was a curved line, almost across the mid-dorsal line on each red coloured elytron, starting approximately from the proximal end and continuing up to the distal end. It has a close morphological resemblance with *Micraspis discolor* (Fab.) with respect to the patches over the pronotum and the elytra colour.

3.10. *Brumoides* (= *Brumus*) *suturalis* (Fabricius)

This predatory beetle was found preying on mealy bug and scale insect of different host plants through out the study period (Table: 1). However, the maximum population of this species was found in May (10 beetles) followed by April (9 beetles) and in December (8 beetles). The adult beetle was oval in shape, about 4.0 mm long and 2.6 mm broad across the mid elytra (Fig. 16). The head was brown in colour with a pair of prominent black eyes. The eyes are slightly covered by pronotum when the head was retracted. The elytra were brownish yellow except at their apical, basal and lateral margins. There was a median longitudinal black stripe at the apex of the elytra. Besides, there was a lateral longitudinal black stripe on each elytra starting from the humeral angle.

3.11. *Illeis cincta* (Fabricius)

The appearance of this predatory beetle was first time noticed in the month of October. It was found preying on aphids (Table: 1). Given data indicates that the population of this beetle was maximum in the month of December (12 beetles), while in other months population was less (October, 1 beetle). The presence of this beetle was noticed October to February only. Adult beetle was about 5.2 mm long and 4.0 mm broad across the middle elytra (Fig. 17). The head was yellowish in colour with a pair of prominent black eyes. Two spots were situated on the dorso-lateral aspects of posterior margin of the thorax. The thorax and elytra were shiny yellowish in colour.

3.12. *Pharoscymnus horni* (Weise)

This species of coccinellid beetle was recorded preying on

mealy bug and scale insect during the period (October 2010 to February 2011) on different host plant like *Hibiscus* and *Parthenium*. A total of 261 beetles were recorded during study period (Table: 1). The adult beetle was 2.00–2.20 mm in length and 1.70–1.90 mm in width with round densely pubescent dorsal side (Fig. 18 and 19). Ground colour was dark brown, each elytron with a pair of reddish/orange yellow spots, while anterior spot sub-quadrate and larger, posterior spot roundish. Ventral side was uniformly dark brown. Head quadrate, clypeal margin narrowly extending laterally over eyes, eyes not emarginate around antennal insertions. Last segment of maxillary palpi were elongate and sub-conical. Pro-sternal inter-coxal processes were quadrate, with a pair of sub-parallel carinae.

3.13. *Rodolia breviscula* (Weise)

It was found preying on pink *Hibiscus* mealy bugs. However, this species was recorded as a rare species around Meerut region (Table: 1). This was an oval shaped medium sized ladybeetle, measuring about 5.0–5.5 mm in length and 4.0–4.5 mm in width. The colour of this ladybeetle was dark brownish red with the rough elytra (Fig. 21).

3.14. *Psyllobora bisoctonotata* (Mulsant)

Twenty two samples were collected from Meerut region during the study period. Maximum population of this predatory coccinellid beetle was recorded in February (14 beetles), followed by March (6 beetles). It was also found preying on aphids (Table: 1). No specimen was recorded before November 2010 and after March 2011. Adult beetles were oval in shape, measuring about 3.0–3.5 mm in length and 2.4–3.0 mm in width and were white or creamish in colour with sixteen black spots present on the two elytra as eight spots on each elytron, arranged in four rows i.e., 2:3:2:1 fashion (Fig. 22).

3.15. *Hippodamia* (= *Adonia*) *variegata* (Goeze)

During the study, the adult beetle of this species was recorded preying on aphid colony of *Chenopodium album* and *Parthenium hysterophorus*. Its first appearance was recorded in the month of January and continued till May. The maximum number of the species was recorded in May (25 beetle), followed by February (17 beetle) (Table: 1). The adult beetle was elongated oval in shape, about 4.0–4.5 mm in length and 2.5–3.0 mm in width across the middle elytra (Fig. 23). The body colour was creamish red. The brown head bears a pair of prominent black eyes. Two spots were present towards the anterior portion of the elytra one on each elytron and both spots were connected with each other by a black horizontal strip which swells in the middle at the joint of two elytra to form another black spot at the junction. This middle spot was extended by a black line anteriorly up to the thorax and posteriorly up to a spot situated at the junction of both elytra toward the posterior extremity. Besides these markings two more black spots (one on each elytron) were situated on the dorso-lateral aspect towards the posterior portion of elytra.

3.16. *Harmonia axyliridis* (Pallas)

The adult beetle was recorded preying on aphids, mealy bugs and scale insects of different host plants (*Parthenium* and Chickpea). The total population of this species was recorded 172 beetles. The maximum number of this species was recorded in the month of September (46 beetle), followed by March (26 beetle). Its presence was noticed through out the study period except the in month of June and July (Table:

1). It was oval, large sized beetle measured about 7.5–8.0 mm in length and 7.0–7.5 mm in width across the middle of the elytra (Fig. 25). The head bears two small black coloured spots. The elytra were black in the posterior two third portions and dark reddish in the anterior part. Its colour ranges from yellow-orange to black and the number of spots between 0 and 22.

3.17. *Hyperaspis maindroni* (Sicard)

The population of this predatory beetle was reached to its maximum (46 beetles) in December. This species was recorded predated on mealy bug of different host plant almost through out the study period (Table: 1). The adult beetle was oval in shape, about 3.8 mm long and 2.7 mm broad across the mid elytra (Fig. 26). The head was brown in colour with a black strip on the head and a pair of prominent brown eyes. The elytra were brownish yellow except at their apical, basal and lateral margins. There was a median longitudinal black stripe at the apex of the elytra. Besides, there was a lateral longitudinal light curved black stripe on each elytron.

3.18. *Scymnus (Scymnus) nubilus* (Mulsant)

The beetle was recorded predated on mealy bug of *Chenopodium*, *Parthenium* and *Hibiscus* plants during study period (Table: 1). The population of this species was reached to maximum in January. This was a small sized predatory coccinellid beetle measuring 1.75-2.20 mm in length and 1.30-1.65 mm width with oblong oval, dorsum moderately convex (Fig. 27). The head was dark brown and lighter in males than the females. Pronotum was dark pitchy brown to black in middle, anterior while the lateral margins were reddish brown and lighter. Scutellum was dark brown while, elytra was yellowish to reddish brown in colour with a dark brown to black sutural stripe starting from basal margin and gradually narrowed towards apex and lateral borders were narrowly dark brown to black in colour at middle. While, ventral side was reddish to yellowish brown in colour, except pro, meso and meta sterna whereas, middle of abdominal segments was dark brown in colour.

3.19. Unidentified predatory coccinellid beetles:

Out of collected samples of predatory coccinellid beetles, four were unidentified (Table: 1, Fig. 10, 11, 20 and 24). The above findings on different species of predatory coccinellid beetles, were closely associated with the reports of Omkar and Bind, 1993, 1995 and 1996^[9, 10, 11]; Omkar and Pervez, 1999 and 2000^[12, 13], who reported nine coccinellid beetles (*B. suturalis*, *C. nigrita*, *A. cardoni*, *C. ramosa*, *H. variegata*, *I. cincta*, *M. discolour*, *M. vincta* and *P. bisoetonata*) from the Lucknow region of Central U.P., India similarly, *H. variegata* was reported from Kashmir region, India (Bhagat and Masoodi, 1988)^[2]. Historically, from the initial work by Subramaniam (1923)^[23], Aiyar (1924)^[11], Kapur (1948)^[7] and Puttarudriah and Channabasavanna (1953)^[18] listed 67 coccinellid species from India belonging to 23 genera of eight tribes and five sub families. Further, Usman and Puttarudriah (1955)^[25] recorded 48 species of predaceous coccinellids from the Mysore state. The recording of 30 coccinellid species from Chandigarh, belonging to 18 genera (Pajni and Singh, 1982)^[15] and 25 coccinellid species scattered across 15 genera from the Chandigarh region (Pajni and Varma, 1985)^[16]; 19 new coccinellids species were recorded from Haridwar district (Joshi and Sharma, 2008)^[5] and 14 new recorded species belonging to 11 genera of 4 tribes and 3 sub-families

from Dehradun (Sharma and Joshi, 2010)^[22]. Perhaps more on a par was the report of 21 species of Coccinellid beetles feeding on aphids and several soft bodied homopterous pests of agricultural and forest plants from Maharashtra (Sathe and Bhosale, 2001)^[20]. Whilst within one ecosystem the diversity seen at any one of the four sites in this report was in accord with seven species of predatory coccinellids in an irrigated rice ecosystem at Madurai, Tamil Nadu (Kandibane *et al.*, 2005)^[6]. In contrast, to this report, only four species of coccinellids (*C. undecimpunctata*, *A. tetraspilota*, *H. variegata* and *S. gracilis*) who observed from Kashmir (Bhagat and Masoodi, 1988)^[2], whilst only six or 7 species of coccinellids from agricultural and horticultural plants (Omkar and Bind, 1993 and 1995)^[9, 10] in the Lucknow district and 10 or 7 coccinellid species from within the Lucknow region of Central Uttar Pradesh (Omkar and Pervez, 1999 and 2000)^[12, 13]. However, Poorani (2002)^[17] has given an annotated checklist of the family coccinellidae for the Indian sub-region, which lists 400 species, under 79 genera, 22 tribes and five subfamilies. The areas covered in her study include 25 states of India and some neighboring countries. Regardless, due to the tremendous increase of population pressure in the natural areas of the Meerut district, during last few years with increasing the indiscriminate use of chemical pesticides and industrialization, the chances of disturbances and loss of natural habitats in this district were high, which may result in changes in the species composition and abundance of the predatory coccinellid beetle community.

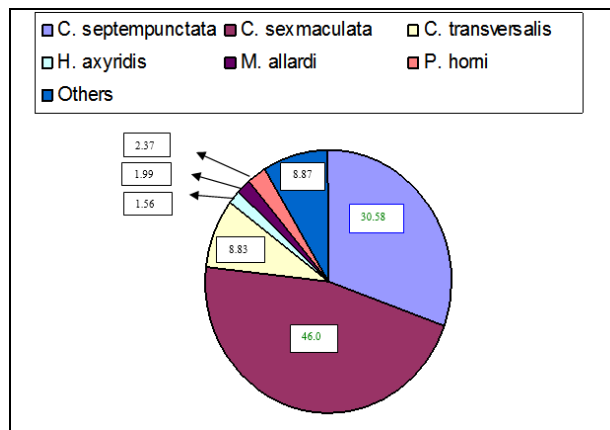


Fig 1: Distribution of predatory coccinellid beetles in Meerut during 2010-011

Among the total number of predatory coccinellid beetle of different species recorded on various localities of Meerut district and surrounding areas of University (Table: 1). The *C. sexmaculata* ranked first (46%) in position by registering maximum (5149) number of beetle in a year and it was recorded as dominant species. It was followed by *C. septempunctata* (30.58%) and *C. transversalis* (8.83%). While, the least population was recorded of *Harmonia axyridis* (1.56%), followed by *M. allardi* (1.99%) and *Pharoscyrmus horni* (2.37%) in Meerut region. Similar observations were reported by Tank *et al.* (2007)^[24] who observed *C. sexmaculata* as a dominant species, representing 81.36 per cent of different predatory coccinellids at Anand region followed by *H. variegata* (11.61 %) and *I. cincta* (4.58 %) who observed a few number of *H. variegata*, *C. transversalis*, *B. suturalis* and *P. dissecta*. But in contrary, Raj (1991)^[19] listed *C. septempunctata* and *M. sexmaculatus* as predominant predators on aphids infesting potato in Indo-

Gangetic plains of India. However, *C. septempunctata* was found as the predominant predator of *A. craccivora* at Kanpur, India (Kumar *et al.*, 1997)^[8]. According to Sharma *et al.* (2003)^[21], the *C. septempunctata* (75 %), *C. repanda* (6 %), *C. sexmaculata* (13 %) and *B. suturalis* (6 %) were the

main predators in Punjab, India. It seems that variation in cropping pattern in a particular region, presence or absence of preferred host (prey) species and agro-ecosystem in which the study was made may account in part for such discrepancy in dominant status.



Fig 1: *Cheilomenus sexmaculata* (Fab.)



Fig 2: *Coccinella septempunctata* (Linn.)



Fig 3: *Propylea dissecta* (Mulsant)



Fig 4: *Cheilomenus sexmaculata* (Fab.)



Fig 5: *Coccinella transversalis* (Fab.)



Fig 6: *Coccinella septempunctata* (Linn.)



Fig 7: *Chilocorus nigrita* (Fab.)



Fig 8: *Anegleis cardoni* (Weise)



Fig 9: Unidentified



Fig 10: Unidentified



Fig 11: *Cheilomenus sexmaculata* (Fab.)



Fig 12: *Cheilomenus sexmaculata* (Fab.)



Fig 13: *Micraspis allardi* (Mulsant)



Fig 14: *Cheilomenus sexmaculata* (Fab.)



Fig 15: *Brumoides suturalis* (Fab.)



Fig 16: *Illeis cincta* (Fab.)

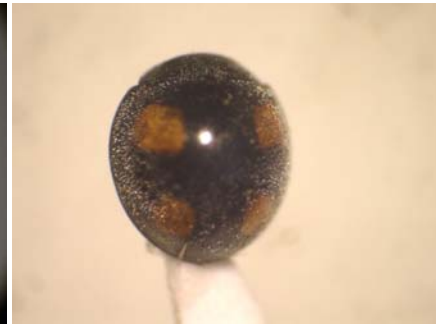


Fig 17: *Pharoscymnus horni* (Weise)



Fig 18: *Pharoscymnus horni* (Weise)

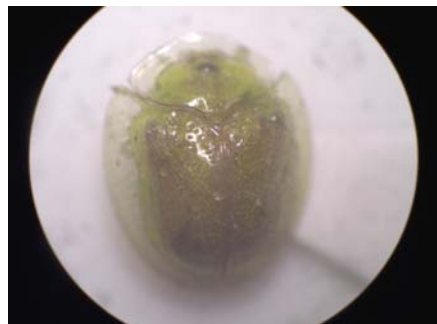


Fig 19: Unidentified



Fig 20: *Rodolia breviscula* (Weise)



Fig 21: *Psyllobora bisoctonata* (Mulsant)



Fig 22: *Hippodamia variegata* (Zoeze)



Fig 23: Unidentified



Fig 24: *Harmonia axyridis* (Pallas)



Fig 25: *Hyperaspis maindroni* (Sicard)



Fig 26: *Scymnus nubilus* (Mulsant)

Table 1: Different species of predatory coccinellid beetles recorded on various crops, ornamentals, fruits and others during 2010-2011.

Sample No./Predatory coccinellid beetle	Host plant	Host insect	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	April	May	Total
1. <i>Cheilomenus sexmaculata</i> (Fab.)	2, 3, 4, 5, 6, 7, 8, 10, 11, 14, 18	a	90	60	110	250	400	525	478	325	600	212	196	153	3399
2. <i>Coccinella septempunctata</i> (Linn.)	1, 2, 3, 4, 5, 6, 7, 8, 10,11,13,14,18	a	85	30	32	41	178	322	400	503	612	600	401	152	3356
3. <i>Propylea dissecta</i> (Mulsant)	2,3,4,14,18	a	12	01	03	06	18	24	40	21	19	15	10	02	171
4. <i>Cheilomenus sexmaculata</i> (Fab.)	2,3,4,5,6,7,8, 10,11,14,18	a	06	15	26	150	300	106	342	148	143	97	40	15	1388
5. <i>Coccinella transversalis</i> (Fab.)	1,2,3,4,5,6,7,8, 10,11,13,14,18	a	45	00	00	15	28	38	58	150	171	196	191	80	972
6. <i>Coccinella septempunctata</i> (Linn.)	1,2,3,6,11,14,18	a	00	00	00	00	04	09	06	07	03	03	05	01	38
7. <i>Chilocorus nigrita</i> (Fab.)	14	a	00	00	01	00	00	00	00	00	00	00	00	00	1
8. <i>Anegleis cardoni</i> (Weise)	4,6,9,16	a, b, c	00	00	00	01	03	06	15	60	21	09	03	00	118
9. Unidentified	2,3,4,14,18	a	01	00	00	03	06	09	20	12	18	10	11	00	90
10. Unidentified	2,3,14,18	a	00	01	07	06	07	05	06	04	02	03	00	00	41
11. <i>Cheilomenus sexmaculata</i> (Fab.)	1,2,3,14,18	a	00	00	02	05	20	56	100	86	40	13	04	00	326
12. <i>Cheilomenus sexmaculata</i> (Fab.)	1,2,3,4,5,6,7,8, 10,11,13,14,18	a	00	07	01	08	06	02	09	02	01	00	00	00	36
13. <i>Micraspis allardi</i> (Mulsant)	3,6,18	a	00	05	08	13	40	62	41	29	09	02	10	00	219
14. <i>Cheilomenus sexmaculata</i> (Fab.)	2,3,4,5,6,7,8, 10,11,14,18	a	00	00	02	01	07	06	04	06	05	00	00	00	31
15. <i>Brumoides suturalis</i> (Fab.)	4,6,16,18	b, c	05	02	03	07	06	09	08	03	07	05	09	10	74
16. <i>Illeis cincta</i> (Fab.)	18	a	00	00	00	00	01	06	12	06	02	00	00	00	27
17. <i>Pharoscyrmus horni</i> (Weise)	4,6	b, c	00	00	00	00	05	15	27	13	03	10	06	09	88
18. <i>Pharoscyrmus horni</i> (Weise)	4,6	b, c	00	00	00	00	00	18	36	71	38	10	00	00	173
19. Unidentified	4	a	00	00	00	00	00	01	00	00	00	00	00	00	1
20. <i>Rodolia breviscula</i> (Wei)	18	b	00	00	00	00	00	00	00	00	01	00	00	00	1
21. <i>Psyllobora bisoconatata</i> (Mulsant)	3,18	a	00	00	00	00	00	01	01	00	14	06	00	00	22
22. <i>Hippodamia variegata</i> (Zoeze)	5,6	a	00	00	00	00	00	00	00	15	17	06	09	25	72
23. Unidentified	17	b	00	00	00	00	00	00	00	09	12	02	04	00	27
24. <i>Harmonia axyridis</i> (Pallas)	5,6	a, c	00	00	12	46	19	13	09	08	15	26	09	15	172
25. <i>Hyperaspis maindroni</i> (Sicard)	5,6	b	00	02	00	06	07	13	46	06	12	02	00	00	94
26. <i>Scymnus nubilus</i> (Mul.)	5,6,16	b	06	00	09	04	01	07	18	17	03	00	00	00	65
Total			250	123	216	562	1056	1253	1676	1501	1768	1227	908	462	11002

*N= Number of observation (48)

Host plants: Wheat=1, Maize=2, Cowpea=3, *Hibiscus*=4, *Chenopodium*=5, *Parthenium*=6, Chickpea=7, Crucifers=8, Okra=9, Brinjal=10, Oak=11, Tomato=12, Potato=13, Bean=14, Pigeon pea=15, Marigold=16, Mango=17 and other weeds=18; **Host insects:** Aphid=a, Mealy bug =b, scale insects=c and other insects=d

4. Acknowledgement

Authors are very thankful to ICAR funded project "Niche Area of Excellence Programme" for their financial and technical support obtained during the course of this work. I am also thankful to Dr. V.V. Ramamurthy, Principal Scientist Division of Entomology, IARI and NPIB for the identification of predatory coccinellid beetles.

5. Reference

1. Aiyar TVR. An undescribed Coccinellid beetle of economic importance. Journal of Bombay Natural History Society. 1924; 30:491-493.
2. Bhagat KC, Masood MA. Natural enemies of mealy plum aphid, *Hyalopterus arundinis* Fab. (Aphididae: Homoptera) in Kashmir. Journal of Advance Zoology. 1988; 9:145-147
3. Gadagkar R, Chandrashekhara K, Nair P. Insect species diversity in the tropics: sampling method and case study. Journal of Bombay Natural History Society. 1990; 87:328-353.
4. Hawkeswood T. Beetles of Australia. Angus and Roberston, Sydney, Australia, 1987.
5. Joshi PC, Sharma PK. First Records of Coccinellid Beetles (Coccinellidae) from the Haridwar, (Uttarakhand), India. The Natural History Journal of Chulalongkorn University. 2008; 8(2):157-167.
6. Kandibane M, Rahuraman S, Ganapathy N. Diversity, relative and rank abundances of predatory coccinellids in an irrigated rice ecosystem, Madurai, Tamil Nadu. Indian Journal of Environment and Ecoplant. 2005; 10:297-300.
7. Kapur AP. On the old world species of the genus *Stethorus weise* (Coleoptera: Coccinellidae). Bulletins of Entomological Research. 1948; 39:297-320.
8. Kumar A, Mathur YK, Rath S, Singh O. Effect of coccinellids (*Coccinella septempunctata* L.) predation on the aphid (*Aphis craccivora* Koch) population on Indian bean (*Dolichos lablab* Linn.). Annals of Agricultural Research. 1997; 18:318-320.
9. Omkar, Bind RB. Records of aphid natural enemies complex of Uttar Pradesh. II. The Coccinellids. Journal of Advance Zoology. 1993; 14:96-99.
10. Omkar, Bind RB. Records of aphid natural enemies complex of Uttar Pradesh. IV. The coccinellids. Journal of Advance Zoology. 1995; 16:67-71.
11. Omkar, Bind RB. Records of aphid natural enemies complex of Uttar Pradesh. V. The coccinellids. Journal of Advance Zoology. 1996; 17:44-48.
12. Omkar, Pervez A. New records of Coccinellids from Uttar Pradesh. I. Journal of Advance Zoology. 1999; 20:106-112.
13. Omkar, Pervez A. New records of Coccinellids from Uttar Pradesh. II. Journal of Advance Zoology. 2000; 21:43-47.
14. Omkar, Pervez A. New records of Coccinellids from Uttar Pradesh. III. Journal of Advance Zoology. 2002; 23:63-65.
15. Pajni HR, Singh JA. Report on the family Coccinellidae of Chandigarh and its surrounding area (Coleoptera). Research Bulletin of Punjab University of Science. 1982; 33:79-86.
16. Pajni HR, Verma S. Studies on the structure of the male genitalia in some Indian Coccinellidae (Coleoptera). Research Bulletin of Punjab University of Science. 1985; 36:195-201.
17. Poorani J. An annotated checklist of the Coccinellidae (Coleoptera) (excluding Epilachninae) of the India sub-region. Oriental Insect. 2002; 36:307-383.
18. Puttarudraiah M, Channabasavanna GP. Beneficial coccinellids of Mysore-I. Indian Journal of Entomology. 1953; 15:87-96.
19. Raj BT. Seasonal abundance of natural enemies of aphids infesting potato crop. Journal of Aphidology. 1991; 3:157-161.
20. Sathe TV, Bhosale YA. Insect pest predators. Daya Publishing House, Delhi. 2001, 1-169.
21. Sharma DR, Kumar R, Batra RC. Influence of abiotic and biotic factors on the spatial distribution of *Dialeurodes citri* (Ashmead). Annals of Plant Protection Science. 2003; 11:264-268
22. Sharma PK, Joshi PC. First Records of Coccinellid Beetles (Coccinellidae) from the Dehradun, (Uttarakhand), India. New York Science Journal. 2010; 3(6):112-120.
23. Subramaniam TV. A note on color variations in a common ladybird beetle, *Chilomenes sexmaculata* Fb. In Fletcher (ed.): Report of the Proceedings of the Fifth Entomological Meeting held at Pusa. 1923, 108-118.
24. Tank BD, Korat DM, Borad PK. Determination of Dominant Species of Predatory Coccinellid in Anand Region of Gujarat. Karnataka Journal of Agricultural Sciences. 2007; 20(3):637-638.
25. Usman S, Putarudraiah M. A list of the insects of Mysore including the mites. Entomology Series Bulletin. 1955, 1-189.