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Morphological characteristics of ladybird beetles collected from District Dir Lower, Pakistan

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A survey was conducted in District Dir Lower, over a period of two years. Specimens of coccinellid beetles were collected from four major localities viz; Maidan, Jandool, Timergara and Adenzai. Identification of these beetles showed that 14 different species in 12 genera belonging to sub-families Coccinellinae, Chilocorinae, Scymninae and Epilachninae are present in the selected area. In the sub-family Coccinellinae, 10 species belonging to 9 genera were found which are; *Coccinella septempunctata*, *Coccinella transversalis*, *Hammonia demediate*, *Hippodamia varigata*, *Menochilus sexmaculata*, *Oenopia sauzeti*, *Propylea leuteopustulata*, *Halyzia tschitscherini*, *Illeis confuse* and *Hypraspis rahatiana*. In the sub-family Chilocorinae and Epilachninae, *Brumoides saturalis* and *Epilachna* sp., respectively were recorded and in Scymninae, one genus and two species were recorded which are *Cryptogonus nepalensis* and *Cryptogonus faizihanum*. Out of the 14 species from Dir Lower, two (*Hypraspis rahatiana* and *Cryptogonus faizihanum*) were reported for the first time from Pakistan and is therefore, a new addition to Coccinellid fauna of Pakistan.

Key words: District Dir Lower, coccinellid beetles, Pakistan, morphological characteristics.

INTRODUCTION

The ladybird beetles belong to family Coccinellidae. The family Coccinellidae is placed in the superfamily Cucujoidea, series Cucujiformia within the suborder Polyphaga and order Coleopteran. The sub-families include Chilocorine, Coccinellinae, Coccidulinae, Scymninae, Sticholotidinae and Epilachninae. Out of these, five subfamilies are predacious and one subfamily Epilachninae is phytophagous in nature. Coccinellid subfamilies are more or less worldwide in distribution. About 6000 species of these beetles have been reported worldwide (Vandenberg, 2000). Linnaeus (1758) had described 36 species from Europe under the genus *Coccinella*. The family was established by Latreille in 1807 and was divided into two groups: aphisdophagous and phytophagous (Redtenbacher, 1843).

There are a number of reasons for the popularity of ladybird beetles. Firstly, many ladybirds have bright contrasting color patterns. Secondly, about 90% of the approximately 4200 Coccinellid species are considered beneficial because of their predatory activity, mainly against homopterous insects (aphids and scale insects) and phytophagous mites, which are harmful to various agricultural and forest plants (Shah, 1985).

Ladybird beetles lay their eggs on the leaves, stems and sometimes on the bark of plants often near prey. The eggs of most species are long, usually oval and vary from a light yellow to a deep orange color. Larvae are usually brightly colored, with various protuberances on the body segments. Larvae go through four instars and then pupate on a leaf or branch by attaching the body to leaf surface. Although, the pupae are generally thought to be inactive, they are not completely immobile. Their life cycle is completed in one month, depending upon location and temperature; two or three generations are generally

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produced in a year. Adults are seen during winter in sheltered locations such as tree holes and other natural hiding places (Majerus and Kearns, 1989). Over 300 species are known from Indo-Pakistan sub-continent and over 4000 species are known from all over the world. In Pakistan, some new genera have been described during survey of scale insects and their natural enemies (Shah, 1985). According to Irshad (2001), seventy one species are occurring in Pakistan. Out of which, 71, 20, 4, 16 and 2 species have been reported from KPK, Punjab, Baluchistan, Northern Areas and Kashmir, respectively (Rafi et al., 2005). Keeping in view the importance of these useful predators, the present study was conducted to enlist the species of Coccinellidae in Dir Lower.

The objectives of present study were: To document the Coccinellid species found in District Dir Lower; to record their distribution and seasonal occurrence; to create awareness among the inhabitants of Dir Lower about the importance of Coccinellid in integrated pest management.

MATERIALS AND METHODS

The study area

District Dir is stretched over an area of 1,582 km² of Malakand Division, lying along the Afghanistan border between Chitral and Peshawar. Almost all the areas visited to get Coccinellid collection are administratively controlled and included in the Lower Dir District, the lower part of River Panjkora, which rises high in the Hindu Kush at latitude 35.45 and joins the Swat River near Chakdara, which is the main point of entry to the District, at latitude 34.40 in the south-west. Dir is a mountainous area with peaks rising to 4876 m in the north-east and to 3048 m along the watersheds with Swat to the East and Afghanistan to the West. Most of the population is rural, scattered in more than 1200 villages over the plains of Adenzai and Munda and the deep narrow valleys of the Panjkora and its tributaries. The sub valleys of Dir include Barawal, Ushera, Nihag, Karo and Toormang. Dir District was officially split into Upper Dir and Lower Dir in 1996 (Anonymous, 1998).

The present study was conducted to explore species diversity and elaborate distribution of the Coccinellid species in the District Dir Lower. For getting in-depth knowledge of the general ecology with special reference with ladybird beetles, the area was visited frequently from 2008 to 2010. The study area was divided into four sampling regions viz. Maidan, Jandool, Timergara and Adenzai tehsils for collection of the beetles. The Coccinellid specimens were collected by hand netting and hand picking from each selected locality. The collected specimens after killing, in the killing bottle were transfixed by insect pins passing through the right elytra above. Very small specimens were mounted on 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 handled carefully for avoiding damages. The properly fixed specimens were mounted in collection box. Every care was undertaken to protect the specimens' box from humidity/moisture absorption and museum pests attack. Inside the collection boxes, phenolphthalein balls were placed for securing specimens from pests' damages. The specimens were identified with the help of available literature and already identified specimens, which are preserved in the insect Museum of KP Agricultural University, Peshawar. All the identified specimens were preserved in the Zoological Museum, Hazara University, Mansehra. Descriptions of the specimens were made on the visual observation and obviously differentiable traits. Colored plates have been

provided for all the species.

RESULTS AND DISCUSSION

During the present study on the identification and distribution of Coccinellid fauna of District Dir Lower, a total number of 510 specimens of Coccinellid beetles were collected from four localities of the district. These include 255, 160, 50 and 45 species from Maidan, Jandool, Timergara and Adenzai, respectively. Identification of these beetles showed that 14 different species in 12 genera belonging to sub-families Coccinellinae, Chilocorinae, Scymninae and Epilachninae were present in the area. These include: *Bromoaid saturalis* Fabricius, *Coccinella septempunctata* Linnaeus, *Coccinella transversalis* Fabricius, *Halyzia tschitscherini* Semen, *Harmonia demediata* Fabricius, *Hippodimidia variegata*, *Illeis confusa* Timberlake, *Propylea leuteopustulata* Mulsant, *Menochilus sexmaculatus* Fabricius, *Oenopia sauzeti* Mulsant, *Ephilachna* sp., *Cryptogonus nepalensis* Bielawski, *Cryptogonus faizhanum* and *Hyperaspis rahatiana* (Figure 1).

The detail characteristics of the species are presented in Tables 1, 2 and 3, while the species collected from different localities are presented in Table 4 and season of distribution and host plants are presented in Table 5.

During the present study, 14 species from 12 genera belonging to sub families Coccinellinae, Chilocorinae, Scymninae and Epilachninae were collected from the Dir Lower district.

B. saturalis were collected from all localities. The species were most abundantly found on *Pyrus malus* feeding on soft bodied nymphs of aphids. A total of 50 specimens of *C. septempunctata* L., were collected from all localities. This species was previously reported by Irshad (2001), Rehman et al. (1960), Gilani (1976) and Shah (1985) from Pakistan. It was collected from a large number of plants including *Zea mays*, *Hibiscus esculentus*, *Solanum melongena*, *Lactuca sativa*, *Glycine max*, etc. *C. transversalis* was also collected from Maidan and Jandool. It was reported by Gilani (1976), Shah (1985) and Irshad (2001). The species was collected from *Glycine max*, *Lactuca sativa*, *H. esculentus* and *Prunus domestica*. Five specimens of *C. transversalis* were collected from *Helianthus annuus* in Maidan. *H. rahatiana* was also collected from Maidan. This species were reported for the first time from Pakistan and is a new addition to Coccinellidae fauna of Pakistan. The host plants of the species were *Z. mays* and *H. annuus*. *H. variegata* was reported with 12 specimens from Jandool, 20 specimens from Maidan, 4 specimens from Timergara, and 3 specimens from Adenzai. *H. variegata* was reported by Gilani (1976), Shah (1985) and Irshad (2001) from Pakistan. The species was collected from wide range of host plants including *Triticum aestivum*, *Brassica campestris* and *Coriandrum sativum* feeding on *Aphid ophagous* in nature. *H. tschitscherini* was collected

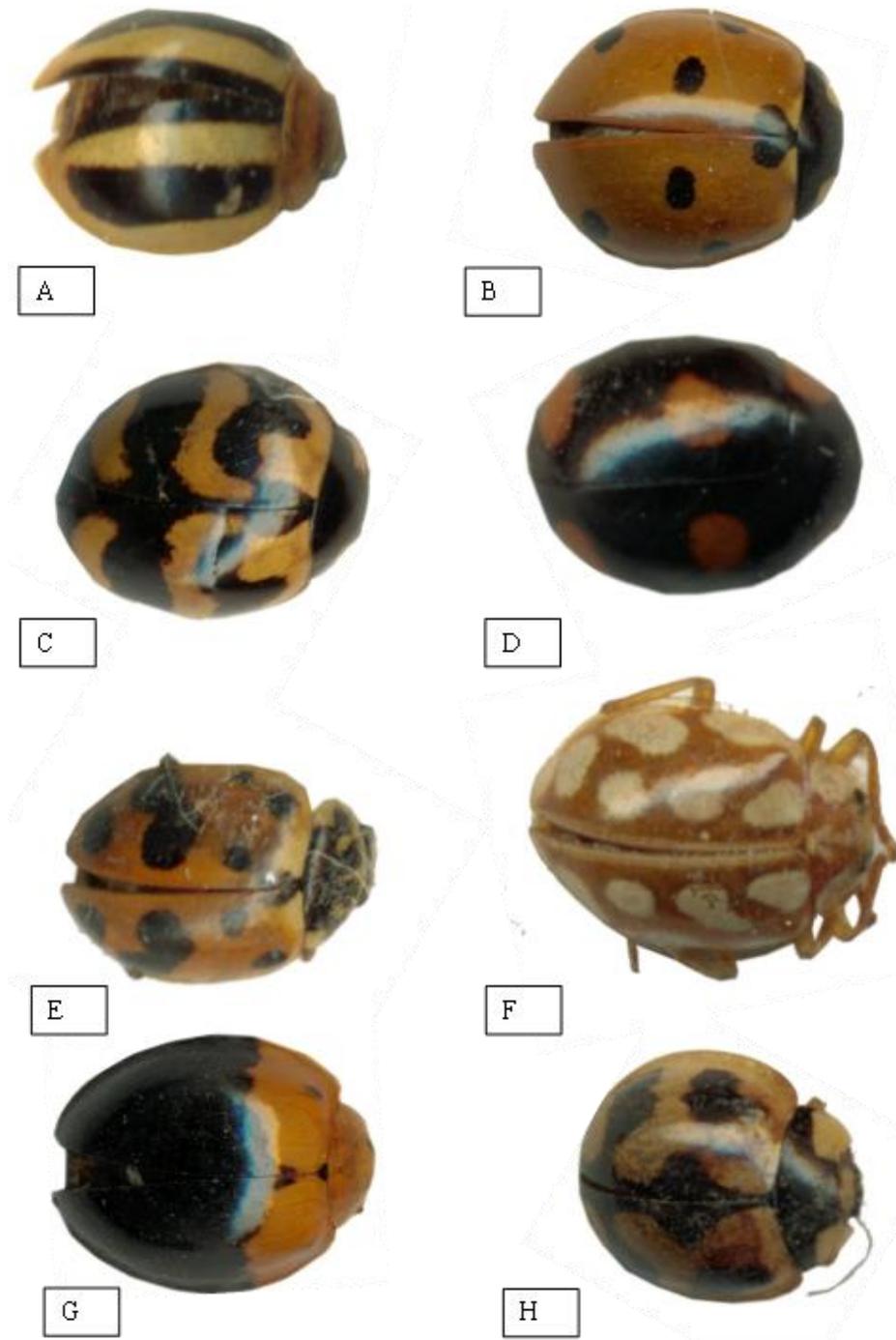


Figure 1. General features of *Brumoides suturalis* (A), *Coccinella septempunctata* (B), *Coccinella transversalis* (C), *Hyperaspis rahatiana* (D), *Hippodamia variegata* (E), *Halyzia tschischerini* (F), *Harmonia dimidiata* (G), *Oenopia sauzeti* (H), *Illies confusa* (I), *Menochilus sexmaculata* (J), *Propylea leuteopustulata* (K), *Cryptogonus nepalensis* (L), *Cryptogonus fazihana* (M), *Epilachna* sp. (N).

from Maidan and Jandool from *Dilbergia sisso* feeding on powdery mildew, also attacks different species of Aphids. *H. dimidiata* were found in all localities. These species were collected from *Dilbergia sisso*, and *Z. mays*; feeding

on *Adelges* sp. and *Aphis craccivora* Koch. *O. sauzeti* was collected from Maidan and Jandool. Host plants of these species were *Z. mays*, *H. annus*, an undetermined ornamental plant feeding on *Aphis craccivora* Koch,



Figure 1. contd.

Aphis fabae Scopoli and *Aphis gossypii* Glover. *I. cunfusa* was collected from Timergara and Adenzai. This species was collected from *Dilbergia sisso*. *M. sexmaculata* was collected from all localities. A total 35 specimens were collected. Previously, it was reported by Shah (1885) from Peshawar, Pakistan. It was collected from *H. annus*, *Z. mays*, *H. esculentus* and *P. domestica*

feeding on *Adelgids* sp. *Bemisia tabaci* and *Pyrilla perpusilla*. *P. leuteopustulata* was recorded from all localities. These species were collected from *Triticum aestivum* and *Brassica campestris*; feeding on aphids, psyllids and whiteflies. *C. nepalunsis* was rarely distributed in Maidan and collected from mot grass. *C. faizhanum* was collected with two adults from Maidan

Table 1. Ground coloration of different parts of the body of Coccinellids.

Name of Species	Head	Pronotum	Scutellum	Elytra	Ventral side of body
<i>Brumoides saturalis</i>	Brownish	Brownish anteriorly laterally and creamy in the centre	Brownish	Yellowish white	Brownish
<i>Coccinella septempunctata</i>	Black	Black, anteriorly laterally orange yellow	Black	Yellowish brown to reddish brown	Black
<i>Cryptogonus nepalensis</i>	Brownish	Black	Black	Reddish brown	Black
<i>Coccinella transversalis</i>	Black	Black, anteriorly laterally orange	Black	Dull orange to yellowish brown	Black
<i>Cryptogonus faizihanum</i>	Yellowish black	Black yellowish	Black	Yellowish to brownish	Yellowish black
<i>Epilachna</i> sp.	Brownish	Brownish with black coloration in centre	Black	Brownish	Black
<i>Halyzia tschitscherini</i>	Black	Brownish, anteriorly laterally and in centre creamy	Brownish	Brownish	Brownish
<i>Harmonia dimidiata</i>	Black	Straw yellow, black	Brownish	Brownish	Black
<i>Hippodimidiata varigata</i>	Black	Yellowish white black large areas in form of four finger like projection in centre	Black	Yellow to orange	Dark brown
<i>Hyperaspis rahatiana</i>	Yellowish	Black, anteriorly laterally yellowish	Black	Yellowish to brownish	Black
<i>Illeis confusa</i>	Creamy to brownish	Creamy with two black spots in the centre	Creamy to brownish	Creamy to brownish	Creamy to brownish
<i>Menochilus sexmaculata</i>	Yellowish brown	Yellowish brown with transverse black band in the middle near the posterior margin	Black	Generally brownish yellow	Brownish black
<i>Oenopia sauzeti</i>	Black	Black, anteriorly laterally yellowish white	Black	Yellowish white	Brownish black
<i>Propylea leuteopustulata</i>	Yellowish black	Black, anteriorly laterally brownish	Black	Yellowish to orange	Black

and Jandool. The host plants of this species were mot grass. *C. faizihanum* was reported for the first time from Pakistan. *Epilachna* sp. was collected from Jandool and Adenzai. Species of subfamily Epilachninae were reported by Ghani and Mohyuddin (1982) from Pakistan. Shah (1985) reported species of the subfamily from

Peshawar valley. These species were collected from *Z. mays*, *T. aestivum* and *Solenum tuberosum*. It is phytophagous in nature.

Among the fourteen species recorded in the present study from Dir Lower, *H. rahatiana* and *C. faizihanum* were reported for the first time from Pakistan.

Table 2. Length, width, hairs and shape of the body of Coccinellids.

Name of species	Length (mm)	Width (mm)	Hairs on body	Body shape
<i>Brumoides saturalis</i>	3 - 5	3.5	Glabrous	Rounded
<i>Coccinella septempunctata</i>	5 - 8	4 - 5.5	Glabrous	Slightly elongated
<i>Cryptogonus nepalensis</i>	3	2	Silky hair on body	Slightly rounded
<i>Coccinella transversalis</i>	6 - 6.5	4.5 - 5	Glabrous	Slightly elongated
<i>Cryptogonus faizihanum</i>	2 - 3	1.5 - 2	Glabrous	Rounded
<i>Epilachna sp.</i>	4 - 7.5	3 - 6	Hairs on elytra	Slightly rounded
<i>Halyzia tschitscherini</i>	5 - 5.5	3 - 3.5	Glabrous	Elongate
<i>Harmonia dimidiata</i>	4 - 5	3 - 5	Glabrous	Slightly elongated
<i>Hippodimidiata varigata</i>	4 - 5.5	2.9 - 3.5	Glabrous	Elongate
<i>Hyperaspis rahatiana</i>	3 - 5	2.6	Glabrous	Rounded
<i>Illeis confusa</i>	4 - 5.5	3.5 - 4.5	Glabrous	Slightly elongated
<i>Menochilus sexmaculata</i>	3.6 - 5.5	2.8 - 4.5	Glabrous	Rounded
<i>Oenopia sauzeti</i>	3 - 5	2.5 - 3.5	Glabrous	Rounded
<i>Propylea leuteopustulata</i>	4 - 5	3 - 4	Glabrous	Slightly elongated

Table 3. Number and shape of spots on elytra, mid dorsal line on elytron.

Name of species	Total number spots on elytra	Colour	Dorsal line on elytra
<i>Brumoides Saturalis</i>	3, 4 on each of the elytron	Black	A narrow black longitudinal line near the junction
<i>Coccinella septempunctata</i>	7, 3 on each elytron	Black	1 spot on mid dorsal line of the junction of elytra
<i>Cryptogonus nepalensis</i>	5 at least 2 on each elytron	Black	Two spots on mid dorsal line of the junction of elytra
<i>Coccinella transversalis</i>	8, 3 on each elytron	Black	Two spots on mid dorsal line. A broad longitudinal black band along the line of the junction of elytra
<i>Cryptogonus faizihanum</i>	5, at least 2 on each elytron	Black	Two spots on mid dorsal line of the junction of elytra
<i>Epilachna sp.</i>	14, 7 on each elytron	Black	-
<i>Halyzia tschitscherini</i>	18, at least 9 on each elytron	Creamy	A narrow longitudinal creamy band on the junction of elytra
<i>Harmonia dimidiata</i>	6, 2 on each elytron	Black	A narrow longitudinal mid dorsal line at the junction of elytra
<i>Hyperaspis rahatiana</i>	6, 2 on each elytron	Black	Two spots on mid dorsal line of the junction of elytra
<i>Hippodimidiata varigata</i>	13, 6 on each elytron	Black	-
<i>Illeis confuse</i>	Without spots	-	-
<i>Menochilus sexmaculata</i>	6, 3 on each elytron	Black	A narrow black longitudinal band on the mid dorsal line of the junction of elytra
<i>Oenopia sauzeti</i>	6, 2 on each elytron	Black	Two spots on mid dorsal line
<i>Propylea leuteopustulata</i>	8, 3 on each elytron	Black	Mid dorsal line of the junction of elytra black

Table 4. List of total number of species collected from different localities.

S/N	Maidan	Jandool	Timergara	Adenzai
1	<i>Brumoides saturalis</i>	<i>Brumoides saturalis</i>	<i>Brumoides saturalis</i>	<i>Brumoides saturalis</i>
2	<i>Coccinella septempunctata</i>	<i>Coccinella septempunctata</i>	<i>Coccinella septempunctata</i>	<i>Coccinella septempunctata</i>
3	<i>Coccinella transversalis</i>	<i>Coccinella transversalis</i>	-	-
4	<i>Hyperaspis rahatiana</i>	-	-	-
5	<i>Hippodamia varigata</i>	<i>Hippodamia varigata</i>	<i>Hippodamia varigata</i>	<i>Hippodamia varigata</i>
6	<i>Halyzia tschitscherini</i>	<i>Halyzia tschitscherini</i>	-	-
7	<i>Harmonia dimidata</i>	<i>Harmonia dimidata</i>	<i>Harmonia dimidata</i>	<i>Harmonia dimidata</i>
8	<i>Oenopia sauzeti</i>	<i>Oenopia sauzeti</i>	-	-
9	-	-	<i>Illeis confusa</i>	<i>Illeis confusa</i>
10	<i>Menochilus sexmaculata</i>	<i>Menochilus sexmaculata</i>	<i>Menochilus sexmaculata</i>	<i>Menochilus sexmaculata</i>
11	<i>Propylea leuteopustulata</i>	<i>Propylea leuteopustulata</i>	<i>Propylea leuteopustulata</i>	<i>Propylea leuteopustulata</i>
12	<i>Cryptogonus nepalensis</i>	-	-	-
13	<i>Cryptogonus faizihanum</i>	<i>Cryptogonus faizihanum</i>	-	-
14	-	<i>Epilachna</i> sp.	-	<i>Epilachna</i> sp.

Table 5. Coccinellids and their host plant relationships.

Name of species	Host plant	Season of collection
<i>Brumoides saturalis</i>	<i>Pyrus malus</i>	September
<i>Coccinella septempunctata</i>	<i>Zea mays</i> , <i>Solanum melongena</i> , <i>Lactuca sativa</i> , <i>Triticum aestivum</i> , <i>Morus alba</i> and <i>Brassica compestris</i>	April - October
<i>Coccinella transversalis</i>	<i>Triticum aestivum</i> , <i>Helianthus annus</i> , <i>Morus alba</i> and <i>Brassica compestris</i>	June – July
<i>Hyperaspis rahatiana</i>	<i>Zea mays</i> and <i>Helianthus annus</i>	July-August
<i>Hippodamia varigata</i>	<i>Triticum aestivum</i> , <i>Brassica compestris</i> and <i>Coriandrum sativum</i> .	April- August
<i>Halyzia tschitscherini</i>	<i>Delbergia sisso</i>	September-October
<i>Harmonia dimidiata</i>	<i>Zea mays</i> and <i>Delbergia sisso</i>	August-September
<i>Oenopia sauzeti</i>	<i>Zea mays</i> and other ornamental plants	April- August
<i>Illeis confusa</i>	<i>Delbergia sisso</i>	September-October
<i>Menochilus sexmaculata</i>	<i>Helianthus annus</i> , <i>Zea mays</i> and other ornamental plants	April- August
<i>Propylea leuteopustulata</i>	<i>Triticum aestivum</i> and <i>Brassica compestris</i>	April- June
<i>Cryptogonus nepalensis</i>	Mot grass	June
<i>Cryptogonus faizihanum</i>	Mot grass	August
<i>Epilachna</i> sp.	<i>Zea mays</i> , <i>Triticum aestivum</i> and <i>Solanum tuberosum</i>	May-July

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