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Ladybird beetles fauna of Hazara University, garden campus, Mansehra, Pakistan

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Abstract

Present study was carried out as a first documentation of lady bird beetles in Hazara division during 2011. A total of 300 specimens were collected from three sites i.e., residential area (205), administration area (24) and main campus (71) of Hazara University. Identification of these beetles showed that 7 different species in 6 genera belong to the same tribe Coccinellini and a single subfamily, Coccinellinae was present in the area. These species are *A. tetraspilota, C. septempunctata, C. transversalis, H. dimidiata, H. variegata, M. sexmaculatus* and *O. sauzeti*. The most encountered species found was *C. septempunctata*. The least encountered specie to be found was *M. sexmaculatus*. *C. septempunctata* had the maximum length (Mean±SD) 6.7±0.77 and range (5-7mm) and *O. sauzeti* had the minimum length (Mean±SD) 4.7±0.82 and range (3-5 mm). Similarly *C. septempunctata* was found to have the maximum width (Mean±SD) 4.6±0.54 and range (4-5.5 mm) and *O. sauzeti* had the minimum width (Mean±SD) 3.1±0.68 (2.5-3.5 mm).

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Introduction

District Mansehra is geographically located at latitude 34° 20' 24" north of the equator and longitude 73° 12' 0" east of the Prime Meridian on the map of the world in Khyber Pakhtunkhwa Province. It is bounded in the north by Battagram and Kohistan, in the east by Muzafarabad, in the south by Abbottabad and Haripur and in the west by Buner and Shangla Districts. The climate of the District is warm in summer and cold in winter. Kaghan, Konsh, Agror, Bhogarmang and Pakhal valleys are the most popular. Siran and Kunhar are well known rivers of the District (Ali, 2005).

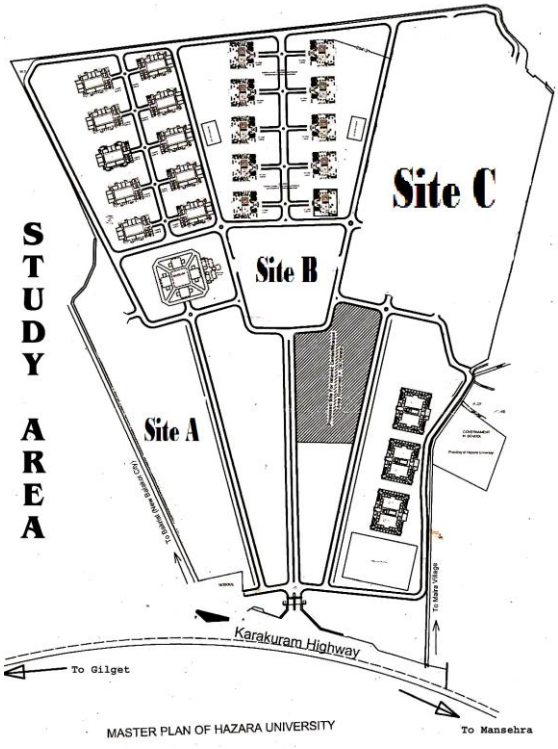


Fig. 1. Map of Hazara University. A: Residential area; B: Administration area; C: Main campus

The family of Coccinellidae belongs to the superfamily Cucujoidea and order Coleoptera. The subfamilies include Chilocorinae, Coccenellinae, Coccedullinae, Scymninae, Sticholotidinae and Epilachininae. Out of these, five subfamilies are predacious and one subfamily Epilachininae is phytophagous in nature. Over 400 species are known from Indo-Pakistan sub-continent and over 5000 species are known from all over the world (Vandenberg, 2002).

Many workers have reported and studied the various aspects of the lady bird beetles from all over the worlds. These includes (Trehan and Malhotra, 1959; Sharma and Joshi, 2010) from India, (Rehman *et al.*, 1960; Gilani, 1976; Irshad, 2001; Khan, 2005; Khan *et al.*, 2007;) from Pakistan, (Magro *et al.*, 1999) from Portugal and many others from various other countries. Coccinellids are of interest and importance in agriculture and forestry and have been employed in biological control since the late 1800s (Obrycki and Kring, 1998). Ladybird larvae and adults may supplement their normal prey in times of scarcity with other types of food. They consume flower nectar, water and honeydew the sugary excretion of piercing sucking insects such as aphids and whiteflies (Gordon, 1985). Hazara division is the habitat of a variety of flora and fauna from sub tropical to alpine zones. There is no complete documentation of the diversity and distribution of ladybird beetles from any locality of Hazara division. Therefore Hazara University was selected as a first documentation of ladybird beetles fauna in Hazara division.

The objective of the current study is to explore the different species of ladybird beetles fauna in Hazara University, Garden campus, Mansehra, Pakistan and to create awareness among the students and teachers about the importance of Coccinellids.

Materials and methods

The study was conducted to collect Coccinellids in Hazara University Garden Campus, Mansehra, Khyber Pakhtunkhwa. The study area was divided into 3 sites: A: Residential area; B: Administration area; C: Main campus. Each locality was sampled twice daily during 2011. Several collecting methods were used, depending on the type of habitats sampled. Adult specimens were collected by sweep-net and hand picking. In some localities more than one method was used for insect collection. Adult insects collected from various habitats were killed in a cyanide bottle and pinned. Each specimen was tagged with the information about host plants, locality and date. To protect the specimens from the

insect pests, naphthalene balls were added to collection boxes. Each bottle was labeled with information of host, area and date from which it was collected. The specimens were identified by Dr. Ather Rafi, Director, National Agricultural Research Council (NARC) Islamabad with the help of available literature, key (Reyes, 2010) and already identified species which is placed in museum of NARC. All the identified specimens were deposited in the Zoological museum Department of Zoology, Hazara University, Mansehra.

Results

During the present study on the identification and distribution of Coccinellid fauna of Hazara University, Mansehra, a total number of 300 specimens of Coccinellid beetles were collected from three localities of the University, i.e., residential area, administration area and main campus (Table 1). Identification of these beetles showed that 7 different species in 6 genera belong to the same tribe Coccinellini and a single subfamily, Coccinellinae was present in the area. The slides of general features are presented in figure 2. Detailed description of the specimens is provided bellow:

1. *Adalia tetraspilota* (Hope, 1831)

Body length 4.0–4.5 mm, width 3.5–4.0 mm, body oval, small sized, head black, not much deeply inserted and slightly visible from above, body light brownish, pronotum black, elytra yellowish red with black spots, elytra smooth, head small, antennae three, segmented. Body is black on lower side. A description of the species is made on specimens collected from residential area.

Distribution and seasonal occurrence: *Adalia tetraspilota* was the second least encountered specie; three specimens were collected from residential area and one from main campus. These specie were abundant in April compared to other surveyed months**.** This specie was collected from *Cichorium* spp and *Cynodon dactlyon*.

2. Seven-spotted ladybug, *Coccinella septempunctata* (Linnaeus, 1758)

It is also known as "C-7" Length. Body length 5 – 8 mm, width 4 - 5.5 mm, body slightly elongate, hair on body glabrous, head is black deeply inserted, not visible from above, pronotum black, orange yellow on the anterilateral corners, scutellum brownish-black, elytra red but punctuated with three black spots each, with one further spot being spread over the junction of the two, making a total of seven spots, The black spot pattern on the body is usually 1-4-2, with either red or orange forewings, body black in color from below. Descriptions of the species are made on specimens collected from residential area.

Distribution and seasonal occurrence: *Coccinella septempunctata* was the much encountered specie. Two hundred and twenty specimens were collected from residential area and main campus. These species were abundant in March compared to other surveyed months. This specie was collected from a large numbers of plants including *Cynodon dactlyon, Cichorium* species and *Freadum valgers*.

3. Transverse ladybird, *Coccinella transversalis* (Fabricius, 1781)

Body length 6 – 6.5 mm, width 4.5 - 5 mm, body slightly elongate oval, convex, hairs on body glabrous, head black with a pair of creamy yellow, sub triangular spots on either side of inner margins of eye, pronotum black, elytra dull orange and yellowish brown, elytral pattern variable with the markings in various states of confluence or reduction Spots black in color and with variable arrangement. On each elytron the first irregular patch small, the second patch across elytra large, the third one only rounded spot across the elytra. There is also a broad longitudinal black band along the line of junction of elytra. Body is black from below. Descriptions of the species are made on specimens collected from residential area.

Distribution and seasonal occurrence: Ten specimens of *Coccinella transversalis* were collected from residential area. These specie were

abundant in April compared to other surveyed months. This specie was collected from *Cynodon dactlyon, Cihorium* species and *Freadum valgers* feeding on *Aphis craccivora*.

4. Fifteen-spotted ladybird, *Harmonia dimidiata* (Fabricius, 1781)

Body length 4-5 mm, width 3-5 mm, body oval and convex, hairs on body glabrous, its color may vary from pale yellow-orange to bright red-orange with or without black spots or one third of anterior portion of elytra brownish yellow, head bears two small black colored spot, pronotum straw yellow, elytra black in the posterior two third portion and dark reddish in the anterior part, elytra moderately to strongly convex, winged, glabrous, elytral colour pattern, variable. Descriptions of the species are made on specimens collected from residential area.

Distribution and seasonal occurrence: *Harmonia dimidiata* was the third most encountered specie collected from residential area, twenty four specimens. These species were abundant in April and May compared to other surveyed months. This specie was collected from *Cynodon dactlyon* feeding on *Aphis craccivora* Koch, *Aphis fabae*, Scopoli.

5. Adonis ladybird, *Hippodamia variegata* (Goeze, 1777)

It is also known as variegated ladybird. Body length 4–5.5, width 2.5–3.0 mm, body elongate, glabrous hair on body, head triangular in shape, not deeply inserted and visible from above, head and pronotum white yellowish with a central black spot mask shaped, brown head bears a pair of prominent black eyes, body color creamish red, elytra red with a very variable number of black points from zero up to thirteen. Each elytron with six spots. Four spots in line along the outer margin, in which the first one is smallest and the second slightly larger than the first. The third and fourth spots about of equal size and larger than the first two spots. The remaining two spots in line with the posterior spot near the inner margin of each elytron. In these spots, the second one is the largest of all the spots of the elytron. Two spots that are present towards the anterior portion of the elytra one on each elytron and both spots are 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 is extended by a black line interiorly up to the thorax and posteriorly up to a spot situated at the junction of both elytra toward the posterior extremity. Body is dark-brown on lower side. Description of the species is made on specimens collected from administration area.

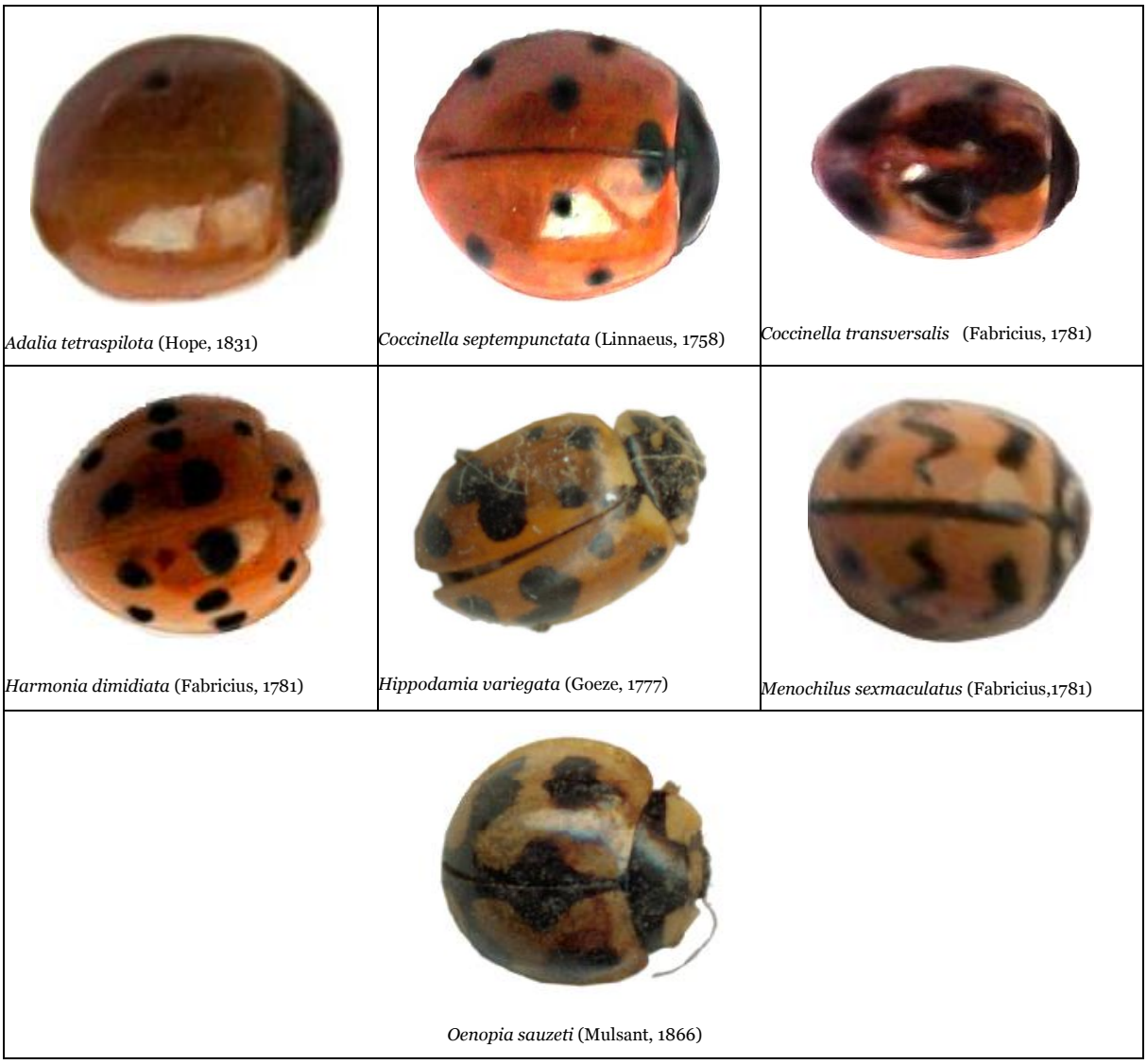
Distribution and seasonal occurrence: *Hippodamia variegata* was the most encountered specie after *Coccinella septempunctata*. Thirty two specimens were collected from administration area and main campus. This specie was abundant in May compared to other surveyed months. This species was collected from *Canzya* spp. and *Rubus fruticosus* mainly feeding aphidophagous in nature.

6. Six spotted zigzag ladybird, *Menochilus sexmaculatus* (Fabricius, 1781)

Body length 3.6-5.5 mm, width 3.0-5.3 mm, body oval to sub rounded, dorsum moderately convex and shiny, ground color orange, yellow, head with a black marking in posterior half, pronotum with a T-shaped median marking connected to a broad black band along posterior margin, scutellum brownish-black, color of elytra highly variable, generally brownish-yellow, with black spots, their arrangement highly variable. Elytra with six black maculae including two zigzag lines and a posterior black spot, sutural line with a narrow to moderately broad black stripe. On each elytron the first patch may be small, inverted V- shaped, the second one complete W-shaped and the third one a rounded spot. A narrow longitudinal brownish-black band along the line of junction of elytra is present, ventral side uniformly yellow. Descriptions of the species are made on specimens collected from residential area.

Table: 1. Total number of species collected from different sites.

Zoological Name	Residential area	Main campus	Administration area
Adalia tetraspilota	03	01	00
Coccinella septempunctata	150	70	00
Coccinella transversalis	10	00	00
Harmonia dimidiata	24	00	00
Hippodamia variegata	08	00	24
Menochilus sexmaculatus	02	00	00
Oenopia sauzeti	09	00	00
Total	205	71	24



Adalia tetraspilota (Hope, 1831)

Coccinella septempunctata (Linnaeus, 1758)

Coccinella transversalis (Fabricius, 1781)

Harmonia dimidiata (Fabricius, 1781)

Hippodamia variegata (Goeze, 1777)

Menochilus sexmaculatus (Fabricius,1781)

Oenopia sauzeti (Mulsant, 1866)

Fig. 2. General features of ladybird beetles.

Distribution and seasonal occurrence: *Menochilus sexmaculatus* was the least encountered species. Its two specimens were collected from residential area. These species were abundant in April compared to other surveyed months. This specie was collected from *Cichorium* species feeding on soft bodied nymphs of aphids.

7. *Oenopia sauzeti* (Mulsant, 1866)

Body length 3.0-5 mm, width 2.5-3.5 mm, body rounded, hairs on body glabrous, body round, elongated, head black, medium sized, not visible from above, pronotum black with yellowish spot, elytra light yellowish with brownish black spot, six spots on elytra. The spots are quite large and rounded. The anterio-lateral spot sub rounded. The spots are six in all, two complete on each elytron and two on the mid-dorsal line of junction of the elytra. The two central spots are connected by band of the same color to one another, antennae eleven and segmented, body brownish black from below. Description of the species is made on specimens collected from Residential area.

Distribution and seasonal occurrence: Nine Specimens of *Oenopia sauzeti* were collected from residential area. Specimens of these specie were abundant in April compared to other surveyed months. This specie was collected from *Cichorium* species feeding on *Aphis crasccivora*.

Conclusions

With only one example (study site) of same ecosystem and altitude setting being studied no clear and firm conclusions can be drawn with respect to either altitude or ecosystem type upon Coccinellid biodiversity, species distribution and abundance. Rather these interesting trends set the field for further future study. Seven species in the same study area with just three different study sites and the separation of species between sites suggests that this region may have a diverse and rich fauna of coccinellid beetles.

Discussion

The survey of "Exploring the lady bird beetles fauna of Hazara University Garden campus Mansehra" was carried out during 2011. The present study is among the first documented reports for surveying the ladybird beetles fauna in Hazara division. During the survey total of 300 specimens were collected three sites i.e., residential area, administration area and main campus. Identification of these beetles showed that 7 different species in 6 genera belong to the same tribe Coccinellini and a single subfamily, Coccinellinae was present in the area. These species are *A. tetraspilota, C. septempunctata, C. transversalis, H. dimidiata, H. variegata, M. sexmaculatus* and *O. sauzeti*. These species were found on different host plants. A total of 205 specimens were collected from residential area, 24 from administration area and 71 from main campus. The most encountered species found was *C. septempunctata* whose 220 Specimens were collected from all the localities, of which 150 from residential area and 70 from main campus. The specimens was reported by Irshad (2001) and Rehman *et al.* (1960) from Pakistan and Gilani (1976) it from Faisal Abad. Shah (1985) reported it from Peshawar valley. The second most encountered species was the *H. variegate,* whose 32 specimens were collected, 8 from residential area and 24 from administration area.

The least encountered specie to be found was *M. sexmaculatus*, whose only 2 specimens were collected from residential area. The second least encountered species was the *A. tetraspilota*, whose only 4 specimen were collected of which 3 from residential area and 1 from main campus. Within genus *Coccinellinea* another species *C. transversalis* was also collected from residential area. Three coccinellids *C. septempunctata, H. variegate, A. tetraspilota* reported from Chitral District, Pakistan, and three *C. septempunctata, H. variegate, M. sexmaculatus* reported from the later survey of nine sites showed resemblance with the 7

recorded coccinellids for the Hazara University, Mansehra.

C. septempunctata had the maximum length (Mean±SD) 6.7±0.77 and range (5-7mm) and *O. sauzeti* had the minimum length (Mean±SD) 4.7±0.82 and range (3-5 mm). Similarly *C. septempunctata* was found to have the maximum width (Mean±SD) 4.6±0.54 and range (4-5.5 mm) and *O. sauzeti* had the minimum width (Mean±SD) 3.1±0.68 (2.5-3.5 mm). Data was analysed by one–way Anova and not significantly different at $P<0.05$. It is evident from the results that the Coccinellid community structure in three study sites with different vegetations differs greatly. The number of species found in the administration area was much lower compared to main campus and residential area. Regardless, due to the tremendous increase of population pressure in the natural areas of the Hazara University, especially during last few years with increasing construction, the chances of disturbances and loss of natural habitats in this area is high, which may result in changes in the species composition and abundance of the Coccinellid community. This may be the reason of least abundance of Coocinellids in main campus area and its abundance in the residential area. Another factor to consider is the time spent on the study area, which was only three months. If more time was allowed to accumulate, there would have been a substantial increase in the number of beetles for the collection.

Recommendations

The following recommendations have been proposed: Similar surveys should be conducted on large scale in this region to fully evaluate the predatory Coccinellid fauna of the Hazara division. Further research should be carried out on biodiversity of the Coccinellids as it plays a major role in biological control. Proper measures should be taken to minimize the chances of disturbances and loss of natural habitats as it adversely affects the composition and abundance of the Coccinellid community.

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