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THE COCCINELLIDS (COLEOPTERA:COCCINELLIDAE) FAUNA IN MANDUWALA REGION, DEHRADUN, INDIA

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ABSTRACT : The latitude of Manduwala in Dehradun, Uttarakhand, India is 30.321915**, and the longitude is** 78.026619**.** Dehradun, Uttarakhand, India **is located at India Country. These beetles are useful because of their predaceous Nature. The specimens of this research were collected by hand picking. These are of small size and easy to capture by hand. Killing Jar is a device used by entomologists to kill captured insects quickly and with minimum damage. The Jar, typically glass, must be hermetically sealable and one design has a thin layer of hardened plaster of paris on the bottom to absorb the killing agent. The killing agent will then slowly evaporate, allowing the jar to be used many times before needing to refresh the jar. A second method utilizes a wad of cotton placed in the bottom of jar. Liquid killing agent is then added until the absorbent material is nearly saturated. The most common killing agent is Chloroform and ethyl acetate. The species belong the family Coccinellidae; Sub family-Coccinellinae, the total of 9 species, *Coccinella quinquepunctata,* Coccinella hieroglyphica, Coccinella transversalis, Harmonia dimidiata, Coccinella leonine, Harmonia conformis, Coccinella septempunctata, *Hippodamia veriegata, Halmus chalybeus* was identified. Coccinellids are the most important and powerful predators of hemipteran pests including, aphids, mealybugs, scale insects and whiteflies. The present study is helpful in future research on the Bio-control of hemipteran pests due to genetics, physiology and behavior of coccinellids. This study combined with studies of their flight aerodynamics and interactions with agricultural ecosystems will undoubtedly lead to improvements in coccinellid-based hemipteran pests control programs.**

Key words : Coccinella, Manduwala, Dehradun, India.

INTRODUCTION

The predaceous insects of family Coccinellidae are commonly known variously as ladybirds (English English, Australian English, and South African English), ladybugs (North American English), lady beetles or coccinellid beetles (preferred by scientists). The family name comes from its type genus, Coccinella (White, 1983). Most of them are of bright shining colors with a pattern of spots or patches against a contrasting background. Many appear to be distasteful to birds and their conspicuous appearance is an example of warning coloration (Moreton, 1969). These beetles are of extremely diverse habits. The majority of beetles are useful because of their predaceous nature; but some are harmful, being polyphagous. The other coccinellids are predators of a variety of pests' *viz*., aphids, leaf- hoppers, scale insects, mealy bugs, mites and other soft bodied insects (Omkar and Bind, 1993, 1996; Omkar and Pervez, 1999, 2000, 2002). In present study, the Coccinellidae family nine species was reported from Manduwala region, Dehradun as *Coccinella quinquepunctata,* Coccinella hieroglyphica, Coccinella transversalis, Harmonia dimidiata, Coccinella leonine, Harmonia conformis, Coccinella septempunctata, *Hippodamia veriegata* and *Halmus chalybeus.* Coccinellids are the most important and powerful predators of hemipteran pests including, aphids, mealybugs, scale insects and whiteflies. Their migratory abilities pose challenges and opportunities for the development of effective biological control programs against aphids and other hemipteran pests. The present study is helpful in future research on the biocontrol of hemipteran pests due to genetics, physiology and behavior of coccinellids. This study combined with studies of their flight aerodynamics and interactions with agricultural ecosystems will undoubtedly lead to improvements in coccinellid-based hemipteran pests control programs.

MATERIALS AND METHODS

Collection of specimens

Insect nets have been used for collection of live specimens, it is however very much possible to collect Lady Bird Beetles by hand carefully (Harit, 2015). Species were collected killing and preserved dry as per entomological procedures used elsewhere and were identified with the help of standard literature available and with the help of expert scientists at Zoological Survey of India. Killing Jar is a device used by entomologists to kill captured insects quickly and with minimum damage. The Jar, typically glass, must be hermetically sealable and one design has a thin layer of hardened plaster of

paris on the bottom to absorb the killing agent. The killing agent will then slowly evaporate, allowing the jar to be used many times before needing to refresh the jar. A second method utilizes a wad of cotton placed in the bottom of jar. Liquid killing agent is then added until the absorbent material is nearly saturated. The most common killing agent is Chloroform and ethyl acetate. Insects often become rigid and brittle following death. This can make it difficult for entomologist to set specimen correctly without damaging them. In order to facilitate the setting and planning of insects' they are placed in insect box. An insect box is an air tight container that contains a wet sponge or damp sand. Insects are placed in the box and the humid atmosphere relaxes the exoskeleton allowing the insects to be set without damage.

RESULT AND DISCUSSION

Nine species of Lady Bird Beetles in Manduwala region Dehradun, India was belonging to Coccinellidae family; Sub family-Coccinellinae. The total species, as *Coccinella quinquepunctata*, *Coccinella hieroglyphica*, *Coccinella transversalis*, *Harmonia dimidiata*, *Coccinella leonine*, *Harmonia conformis*, *Coccinella septempunctata*, *Hippodamia veriegata*, *Halmus chalybeus* as listed in (table 1).

The main crops grown during March and April are Wheat, Mustard and vegetable gardens, especially in village Manduwala due to availability of lands for the purpose. All the reported Beetles in this study have been observed in all the ecosystems of the study area.

1. *Coccinella quinquepunctata*: Linnaeus (Fig 1)

Description

Length: 2-5 mm.

Background Color: Red, yellow

Number of spots: 5-9(5)

Spots fusion: Very rare.

Pronotum: Black with anterior-lateral white marks.

Leg color: Black.

Other feature : quite rounded and domed in shape.

Fourth instar larva is dark grey, with black tubercles producing fine hairs; bright orange lateral patches on first thoracic segment; middle and outer tubercles on abdominal segments one and four bright orange; lateral tubercles on segments six and seven also orange.

Biology

Habitats: 5-spot ladybird occurred in more varied habitats, and found in vegetable garden, and the host plant is low-lying herbaceous plants include Wheat, Mustard (Darby, 2005).

Overwintering sites: 5-spot ladybirds overwinter on gorse, under shingle stones and in leaf litter.

Food: Aphids. (Predator)

2. *Coccinella hieroglyphica*: Linnaeus (Fig. 2)

Description:

Length: 4 - 5mm.

Background color: brown or black.

Pattern color: black stripes, spots and patches, sometimes resembling an Egyptian hieroglyph.

Number of spots: 0-7 (5).

Spot fusions: Common.

Melanic (black) forms: Common.

Pronotum: Black with anterior-lateral white marks.

Leg color: Black.

Fourth-instar larva: dark grey/black; with black tubercles producing fine hairs; pale yellow patches in the centre of second and third thoracic segments; middle and outer tubercles on abdominal segments one and four are pale yellow/whitish.

Biology (Robert, 1985)

Habitats: found on Mustard and Wheat plants.

Host plants: Hieroglyphic ladybirds are strongly associated with heathers.

Food: generally Aphids (Predator)

Overwintering sites: Hieroglyphic ladybirds overwinter in litter under heather, pine trees and gorse bushes.

3. *Coccinella transversalis*: Fabricius (Fig. 3)

1781. Coccinella transversalis Fab. Spec. Ins., P. 97. (Type locality : Coromandal, S. India).

1980. Coccinella transversalis Fab. : Chunaram & Sasaji, Oriental Inaects, 14(4) : 485.

Description

Length: 3.8-6.7 mm.

Width: 3.3-5.5 mm.

Background color: Head black with a pair of creamy yellow, sub triangular frontal spots, one on either side of inner margins of eyes. Pronotum Scutellum is Black, elytra bright carmine red or orange or yellow.

Numbers of spots: a large trilobed 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.

Pronotum: black, anterolateral corners light cream.

Leg color: Black

An oval subscutellar spot elytral pattern variable with the markings in various states of confluence or reduction. Post-coxal plates are on abdominal ventrite 1 incomplete with an associate oblique line.

Biology:

Habitat: Commonly associated with aphids infesting grasses and also several crops like groundnut, rice, cotton, sunflower, safflower, mustard, cowpea, cabbage, maize, sorghum, water melon, wheat, brinjal, bhendi, lucerne, etc.

Seasonal occurrence : Present throughout the year. Active during July-November in south India (Farbicius, 1781).

4. *Harmonia dimidiata*: Fabricius (Fig. 4)

Description

Length: 3-7 mm.

Background color: Coloring is variable, even in genus Harmonia. The basic color is red to orange.

No. of spots: 15

Pronotum: The rear edge of the Pronotum is slightly curved.

Leg color: black

Biology:

Habitat: Anywhere with suitable food, from ground level to tree top. Commonly see in gardens, fields, and agriculture areas. Also found in cities.

Food: generally aphids (predator)

Life cycle: Masses of spindle shaped orange eggs hatch into spiky-looking larvae. Mature larva is orange with black markings, up to 12mm long. These larvae pupate and beetle emerges 1-2 weeks later (Hodek, 1973).

5. *Coccinella leonina*: Fabricius (Fig 5)

Description:

Length: 5-6 mm.

Background Color: black

Number of spots: 16 spots

Pronotum: black

Leg color: black.

Biology:

Habitat: Common in agricultural area.

Food: predator. Feeds on aphids adult and the larvae that prey on grass (Hodek *et al*, 2012).

6. *Harmonia Conformis*: (Boisduval) (Fig. 6)

Description:

Length: 4 - 5mm.

Background color: a light reddish appearance.

Number of spots: 20 spots

Spot fusions: common.

Pronotum: brownish black

And its coloration includes 20 large black spots, 18 of which are found on the elytra (wing covers). They is quite large for ladybirds.

Biology:

Habitat: common in gardens.

Food: Both adults and larvae eat small insects such as aphids, scale insects and mites. The adult and larval ladybirds eat small insects such as aphids, psyllids and mealybugs. The jaws are the primarily structures used for holding and chewing the prey. Legs do not appear to be used for holding food (Crowe, 2002).

Breeding: Common Spotted Ladybirds lay eggs on food plants. The eggs hatch into carnivorous larvae, and then pupate into oval pupae before hatching out as adults.

Walking and flying: Both adult and larval stages of this ladybird have three pairs of legs that can be used for Walking. Larvae also use the tip of the abdomen for holding onto the substrate. Adults have wings and can fly.

7. *Coccinella septempunctata*: (Linnaeus) (Fig. 7)

1758. *Coccinella septempunctata* Linn. *Syst. Nat.,* (ed. X): 365. (Type locality: Europe).

1932. *Coccinella septempunctata,* Korschefsky, *Coleoptm. Cat.,* 16(120): 486.

Description:

Length: 7.6–10.0 mm (0.3–0.4 in).

Background color: orange, reddish orange.

Number of spots: 7 spots

Spot fusions: rare

Pronotum: black

Their distinctive spots and attractive colors apparently make them unappealing to predators. The species can secrete a fluid from joints in their legs which gives them a foul taste. A threatened ladybird may both play dead and secrete the unappetizing substance to protect itself. The seven-spot ladybird synthesizes the toxic alkaloids,

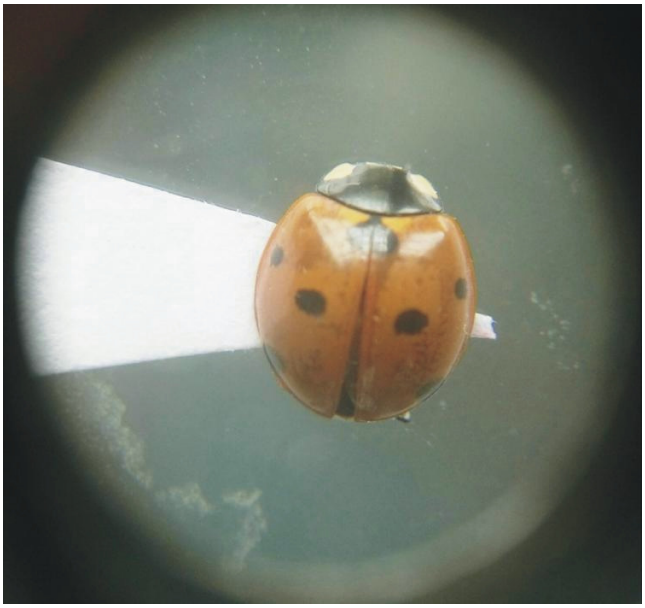

Fig. 1 : *Coccinella quinquepunctata.*

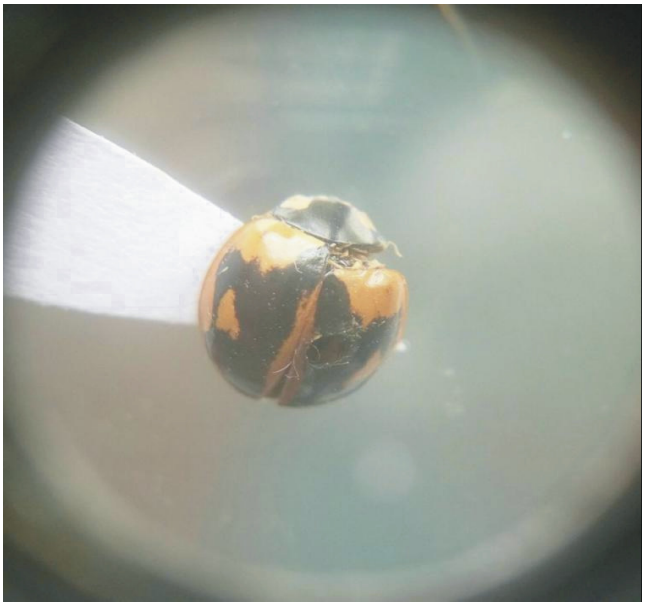

Fig. 2 : *Coccinella hieroglyphica.*

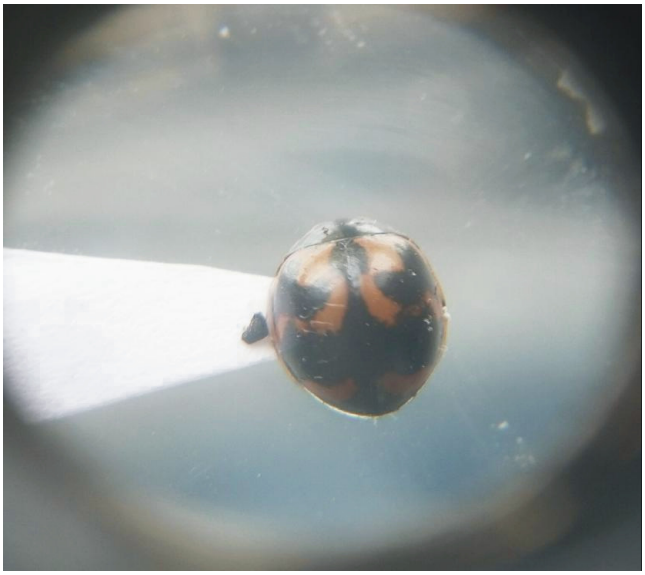

Fig. 3 : *Coccinella transversalis.*

Fig. 4 : *Harmonia dimidiata.*

Noxide coccinellae and its free base precoccinelline; depending on sex and diet, the spot size and coloration can provide some indication of how toxic the individual bug is to potential predators.

Biology:

Habitat: common in Field area, Vegetables area.

Food: Both adults and larvae are voracious predators of aphids, and are one of the gardener's greatest natural allies.

Ladybirds lay their yellow eggs in small groups on leaves. The black larvae have relatively long legs, and they are active predators. When threatened, adults exude a bright yellow distasteful substance from the joints of the legs, which dissuades potential predators from eating a ladybird (Blount *et al*, 2012).

Overwinter: In garden sheds, amongst vegetation, in crevices in fences and a range of similar locations, and can often be discovered in fairly large numbers during this time. They emerge in March and April.

8. *Hippodamia variegata*: Goeze (Fig. 8)

Description:

Length: 4 to 5 mm.

Background color: orange, reddish orange, red elytra.

Number of spots: 3 and 15 black spots, which are sometimes fused together and tend to be concentrated to the rear.

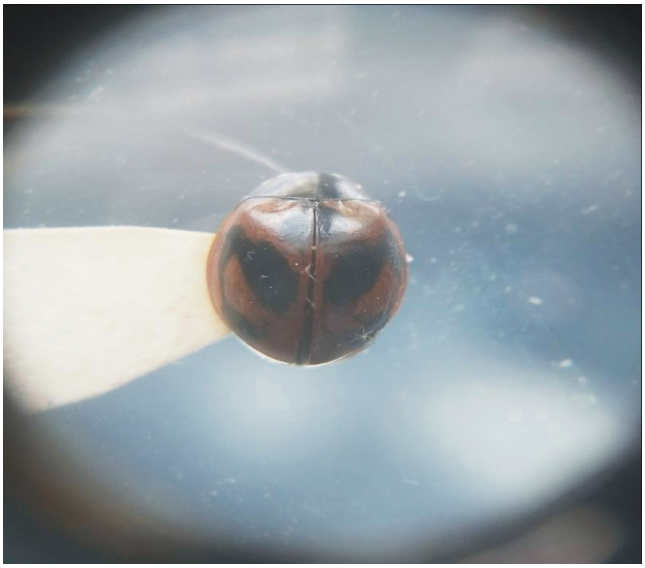

Fig. 5 : *Coccinella leonina.*

Fig. 6 : *Harmonia conformis.*

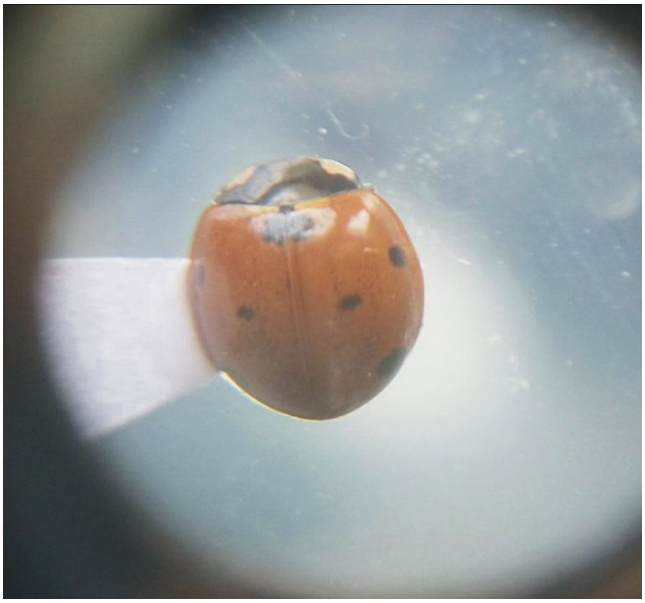

Fig. 7 : *Coccinella septempunctata.*

Fig. 8 : *Hippodamia veriegata.*

Table 1 : Collected and Identified specimens of Coccinella.

Specimen Name	Common Name	Family	Sub family
1. *Coccinella quinquepunctata*	Five-spot ladybird	Coccinellidae	Coccinellinae
2. *Coccinella hieroglyphica*	Hieroglyphic ladybird beetle	Coccinellidae	Coccinellinae
3. *Coccinella transversalis*	Transverse ladybird	Coccinellidae	Coccinellinae
4. *Harmonia dimidiata*	Fifteen-spot ladybird	Coccinellidae	Coccinellinae
5. *Coccinella leonina*	Orange spotted ladybird	Coccinellidae	Coccinellinae
6. *Harmonia conformis*	Large spotted ladybird	Coccinellidae	Coccinellinae
7. *Coccinella septempunctata*	Seven-spot ladybird	Coccinellidae	Coccinellinae
8. *Hippodamia veriegata*	Adonis ladybird	Coccinellidae	Coccinellinae
9. *Halmus chalybeus*	Steel-blue beetle	Coccinellidae	Chilocorini

Spot fusions: rare

Pronotum: mostly covered with a black pattern.

Leg color: the legs are mainly black, but are brown near the end.

It is smaller and has a slightly more elongated, oval shaped body than the common Seven Spot Ladybird.

Identification:

Variable spotting is present on elytra. With elytral ground color orange to red. Pronotum has white edging on anterior and lateral borders, two isolated white spots.

Similar Species

It could be confused with the 7 Spot Ladybirds but the Adonis is smaller and more elongate.

Biology:

Habitat:It is usually most frequent on gardens, Mustard plants, open soils but is sometimes found in leaf litter or on rather derelict or industrial sites (Hesler and Lundgren, 2011).

Food: generally aphids (predator)

9. *Halmus chalybeus*

Description:

Length- 3-4mm long

Background color- Dark metallic blue color

Number of spots-No spots

Pronotum-Black

Leg color- Yellowish brown

Food- Scale insects (Predator)

Female ladybirds lay yellow eggs probably near infestations of prey. Some eggs have dark material on top. A long, pale grey larva hatches from each egg. The newly hatched larva has long dark scoli (pointed fleshy extensions) with a single long seta (hair) at the tip. Older larvae have a darker base to the scoli which bear several dark setae. As the larva grows, it moults (changes skin). There are four larval instars (stages). When the fourth larval instar is fully grown, it attaches itself to a sheltered place on a plant and moults into a pupa. The pale pupa remains inside the moulted larval skin and is itself covered with short dense hairs. Adults hatch from pupae and mate. The length of time of each life stage depends on temperature, being shorter at higher temperatures (Martin, 2016).

CONCLUSION

The species belong the family Coccinellidae; Sub family-Coccinellinae, the total of 9 species, *Coccinella quinquepunctata, Coccinella hieroglyphica, Coccinella* transversalis, Harmonia dimidiata, Coccinella leonine, Harmonia conformis, *Coccinella septempunctata, Hippodamia veriegata*, *Halmus chalybeus* was identified.

Coccinellids are the most important and powerful predators of hemipteran pests including, aphids, mealybugs, scale insects and whiteflies. Their migratory abilities pose challenges and opportunities for the development of effective biological control programs against aphids and other hemipteran pests. The present study is helpful in future research on the bio-control of hemipteran pests due to genetics, physiology and behavior of coccinellids. This study Combined with studies of their flight aerodynamics and interactions with agricultural ecosystems will undoubtedly lead to improvements in coccinellid-based hemipteran pests control programs.

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