DIVERSITY AND ASSOCIATION OF LADYBIRD BEETLES WITH THE AGRICULTURAL CROPS

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Abstract : Ladybird Beetles are an economically important group of insects that belongs to family Coccinellidae. Predatory Coccinellidae prefers to prey on most of the destructive and important crop pests, especially the hemipteran insects. Phytophagous Ladybird species feed on leaves, flowers and various plant parts and considered them as agricultural pests. A sampling of Ladybird beetles was done from various localities of Kolhapur district. In all, 13 species were observed from various agricultural fields. Out of which, 11 are predatory and 2 are phytophagous species. *Cheilomenes sexmaculata, Coccinella transversalis, Illeis cincta, Brumoides suturalis, Propylea dissecta* and *Scymnus nubilus* are common and abundantly found species. *Synona* spp. is a rare species. The enormous use of insecticides kill these biological control agents, hence there is a need to apply conservation strategies for these economically important insects.

***IndexTerms* - Ladybird beetle, predatory, phytophagous, hemipteran insects.**

I. INTRODUCTION

Ladybird Beetles (Coleoptera: Coccinellidae) are economically important insects. Coccinellid beetles are commonly known as ladybird beetles, ladybugs, ladybirds or lady beetles. There are about 6000 species of Ladybird beetles distributed worldwide (Seago et al., 2011). On the basis of their food preference, they are divided into two groups, predatory Ladybird beetles and Phytophagous ladybird beetles. Predatory coccinellids prefer to prey on most of the destructive and important crop pests (Giorgi et al., 2009). About 90% of Coccinellid species are predatory in nature and considered as beneficial. Larvae and adult both feed on phytophagous mites and Homopteran insects which are a pest of agriculture as well as forest plants (Megha et al., 2015). In a period of one to three months, about 20 to more than 1000 eggs can be laid on protected sites by a single ladybird female. The newly emerged larva is able to eat about two dozen aphids in a single day. The feeding capacity is doubled up to the adult stage (Sarwar, 2007). Phytophagous ladybird beetles are an agricultural pest as they are herbivorous and feed on crops (Harit, 2015). Phytophagous Coccinellidae feeds on leaves, flowers and various plant parts (Szawaryn et al., 2015). Epilachninae was traditionally addressed as a separate subfamily of Coccinellidae but recently it is noted as a tribe of subfamily Coccinellinae by Seago et al. (2007). There are about 1050 species distributed worldwide under 23 genera of Phytophagous Epilachnini Mulsant, 1846 (Tomaszewska and Szawaryn, 2013). 400 species (excluding Epilachninae subfamily) are described under 79 genera, in the Indian subcontinent (Poorani, 2002). From Maharashtra, there are 20 species of Ladybird beetles were enlisted by Jadhav and Sharma (2012) in the Fauna of Maharashtra. From the northern Western Ghats region of Maharashtra, 16 species were reported which belonging to 14 genera, 3 subfamilies and 6 tribes (Bhatnagar, 2016).

Due to a broad range of Agrochemicals use, the crop yield has increased, leading to the agricultural revolution, on the other hand, its overuse leads to an imbalance in environment harmful effect on humans as well as other living organisms due to environmental toxicity. Focusing on this point, in recent year's biocontrol of pests is in demand. Ladybird beetles are one of the potential remedies in pest management plans (Nelaballe and Beula, 2015).

II.Material and Methods

A sampling of Ladybird beetles was done from various localities of Kolhapur district from June 2017 to May 2019. The collection was done by hand picking method and preserved dry. The identification of the collected specimens was done by available literature of Poorani (2002), Larson (2013), Leeper (2015) etc. Different types of agricultural fields was surveyed during field visits. The crop fields surveyed, which were having crops viz.- Maize, Sorghum, Groundnut, Sesame, Green gram, Guar, Spinach, Black-eyed beans, Brinjal, Lima beans, Coriander, Cabbage, Paddy, Okra, Tomato, Pea, Radish, Chickpea, Chili, Cucumber, Ridge gourd, etc.

III. Results and Discussions

In all, 13 species were observed from various agricultural fields, of which 11 are Predatory Ladybird species and 2 are phytophagous Ladybird species. Predatory Ladybird beetles found are *C. sexmaculata, C. transversalis, I. cincta, S. nubilus, B. suturalis, P. dissecta, Hippodamia variegata, Chilocorus nigrita, Pseudaspidimerus trimotatus, Harnonia octomaculata* and *Synona spp.* The phytophagous Ladybird species found are *Epilachna vigintioctopunctata* and *Epilachna spp. C. sexmaculata, C. transversalis, I. cincta, S. nubilus, B. suturalis* and *P. dissecta* are common and abundantly found species. *Synona* spp. is a rare species observed as the only one specimen of this species is found on from a single collection locality. The population of predatory Ladybird beetles is about five times more than the phytophagous Ladybird beetles. As *C. sexmaculata* is associated with a maximum number of plants (17 plants), it is inferred that this species is significant biocontrol agent of crop pests followed by *C. transversalis, I. cinta* and *S. nubilus* and can be used in Integrated Pest Management Programmes. The abundance of Ladybird

beetles in the field is associated with the maturity of the crop. The number of individuals on a young crop is more than the mature one as the pest population on young plants is more due to their high sap and juice contents. As the crop gets mature and it starts to dry the number of individuals of Ladybirds on the crop is getting decreased. Maize, sorghum and groundnut fields are associated with the maximum number of Ladybird beetle species. This can be due to the high cultivation of these crops in the area of study.

3.1 Crop and associated ladybird beetle.

Maize- *C. sexmaculata* is found with a higher number than any other crop. The other species observed are *C.transversalis, I. cincta, S. nubilus, B.suturalis, P. dissecta, C. nigrita,* and *Synona spp.*

Sorghum- The ladybird species observed from Sorghum fields were *H. variegata, P. trimotatus, C. sexmaculata, C. transversalis, I. cincta, S. nubilus, B. suturalis* and a phytophagous *E. vigintioctopunctata.*

Groundnut- The Ladybird species observed in groundnut are *P. dissecta, C. sexmaculata, C. transversalis, I. cincta, S. nubilus* and *B.suturalis.*

Lima beans- The Ladybird species observed in Lima beans crop are *C. sexmaculata, C. transversalis and B. suturalis.*

Millet- The Ladybird species observed in millet crop are *C. sexmaculata* and *S. nubilus*.

Brinjal- The ladybird species observed on Brinjal fields were *C. sexmaculata, C. transversalis, S. nubilus* and *B. suturalis*.

Spinach- The Ladybird species observed in spinach are *P. dissecta, C. sexmaculata* and phytophagous *Epilachna spp.*

Sesame- The sesame crops observed with the highest population of *I. cincta* than any other crop field. The other species found are *C. sexmaculata, C.transversalis* and *S. nubilus*.

Coriander- The Ladybird species observed in coriander crop are *C. sexmaculata, C.transversalis, I. cincta* and *S. nubilus*.

Gaur- Ladybird species observed in gaur crop are *C. sexmaculata* and *C. transversalis*.

Cabbage- The ladybird species observed from cabbage fields were *C. sexmaculata, C. transversalis,* and *I. cincta*.

Black eyed beans- The ladybird beetles reported on black eyed beans were *C. sexmaculata, C.transversalis,* and *I. cincta*.

Okra- The Ladybird species observed in okra crop are *C. sexmaculata* and *I. cincta*.

Fenugreek- The Ladybird species observed in fenugreek crop are *C. sexmaculata* and *I. cincta*.

Radish- The ladybird species observed from radish fields were *P. dissecta* and *H. variegata*.

Green beans- the Ladybird beetle fauna found in green beans fields was *H. octomaculata, H. variegata* and *B. suturalis*.

Paddy- The paddy crop is associated with ladybird beetle species *C. transversalis* and *B. suturalis*.

Ridge gourd- Ladybird species *P. dissecta* was observed on the ridge gourd crop.

Chilli- Ladybird species *C. sexmaculata* was observed on the chilli crop.

Cucumber- Phytophagous Ladybird beetle *Epilachna spp.* Found on cucumber with a high number.

Table No. 1 The Ladybird beetle species association with crops.

Sr. No.	Ladybird beetle species	Associated crop fields	No. of associated crops
1	*Cheilomenes sexmaculata*	Maize, Millet, Sorghum, Brinjal, spinach, groundnut, Chick pea, Lima beans, Sesame, coriander, gaur, cabbage, black eyed beans, okra, fenugreek, chilli, raddish,	17
2	*Coccinella transversalis*	Maize, Sorghum, Brinjal, groundnut, Chick pea, Lima beans, Sesame, coriander, gaur, cabbage, black eyed beans, radish Paddy	12
3	*Illeis cincta*	Maize, Sorghum, groundnut, Sesame, coriander, cabbage, okra, fenugreek, black eyed beans	9
4	*Scymnus nubilus*	Maize, Millet, Sorghum, Blak eyed beans, Brinjal, Coriander, Groundnut, Sesame	8
5	*Brumoides suturalis*	Maize, Sorghum, Paddy, Brinjal, groundnut, Lima beans, Green beans	6
6	*Propylea dissecta*	Maize, Spinach, Radish, groundnut, Ridge gourd	5
7	*Hippodamia variegata*	Sorghum, Green beans, radish	3
8	*Chilocorus nigrita*	Maize	1
9	*Pseudaspidimerus trimotatus*	Sorghum	1
10	*Harnonia octomaculata*	Green beans	1
11	*Synona spp.*	Maize	1
12	*Epilachna spp.*	Cucumber, Spinach	2
13	*Epilachna vigintioctopunctata*	Sorghum	1

Omkar and Pervez (2004) recorded 160 predatory Coccinellids belonging to 57 genera from India. Chakrabarti et al. (2012) studied the diversity of the aphidophagous predators of eastern Himalaya and Northeast India along with bioecology and biosystematics. They also mentioned a plant host and locations of availability. The present study reports 11 predatory and 2 phytophagous ladybird species. More or less similar observations are made by Desai et al. (2015) who studied predatory Ladybird beetles from Nashik district and recorded 16 species on agricultural crops and vegetables of the region. Franzmann, (2002) reported *H. variegata*, a predacious ladybird beetle reported on crops sorghum, sunflower, lucerne, triticale and citrus . The present study reports two new associated plants with *H. variegata* i.e. Green beans, radish in addition to Sorghum. Katakura and Shirai (1999), recorded *E.*

vigintioctopunctata on *Solanum melongena, S. tuberosum, S. photeinocarpum, S. torrum* and *Centrosema pubescens*. However, *E. vigintioctopunctata* reported only on Sorghum in the agricultural fields of Kolhapur district.
It was observed that larvae and adults of Ladybird beetles were killed due to the use of insecticides. There is a need to apply conservation strategies as the enormous use of insecticides kill these biological control agents.

IV. ACKNOWLEDGMENT

The Authors would like to thank Head, Department of Zoology, Shivaji University, Kolhapur for providing laboratory facilities and DST-PURSE Phase II for Research Assistant fellowship.

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