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Taxonomic composition and diversity of coccinellids in an irrigated rice ecosystem of Tamil Nadu, India

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ABSTRACT

A total of eight species of coccinellids (Lady bird beetles) were recorded in rice ecosystem during *kharif* 2000. In partially weeded plot, all the eight species were present, where as in weeded plot, five taxa *viz*., *Coccinella transversalis* (Fab.), *Hormonia octomaculata* (Fab.), *Chilomenes sexmaculatus* (Fab.), *Micraspis discolor* (Fab.) and *Micraspis* spp., were recorded. The coccinellids showed more abundance in partially weeded plot than in weeded plot. Among the coccinellids, *M. discolor* (Fab.) was the dominant species in both the ecosystems and the other species showed dominance only in partially weeded rice ecosystem. The coccinellids exhibited greater diversity during tillering and flowering stages of rice crop however with lesser diversity at initial and maturity stages of rice crop. Of the eight species of coccinellids *Epilachna vigintioctopunctata* (Fab.) was found to be the only phytophagous species in partially weeded rice ecosystem. A total of 18 weed species were recorded in partially weeded rice ecosystem. Among them, *Echinochloa colonum, Cyperus rotundus*, *C. iria*, *C. difformis, Panicum repens* and *Bracharia mutica* were dominant. The species of weed plants present in partially weeded rice ecosystem provided pollen and nectar and favourable climates for the survival of coccinellids. The coccinellids present on the weed hosts in partially weeded plot migrated to weeded plot, when the population of herbivores increased. Hence, maintenance of biotic balance of sucking herbivores could be possible.

Key words: Phytophagous coccinellid, Predatory coccinellids, Diversity, Relative abundance, Rank abundance, Irrigated rice ecosystem.

INTRODUCTION

The ladybird beetles (Coleoptera: Coccinellidae) are brightly coloured, oval, convex insects, comprising of about 5000 species. The greater numbers of these species are predaceous both as grubs and adults, they feed on wide variety of soft-bodied insects such as leafhoppers, planthoppers, mealybugs, aphids and on the eggs of various insects. The most common and widely distributed species in rice ecosystem are *Microspis discolor* (Fabricius) and *M. crocea* (Mulsant) (Pathak and Khan, 1991). The immature stage (grubs) of the coccinellid, *Coccinella repanda* Thumb was noticed feeding on nymphs of brown planthopper, where as the adults feed on the scrapping of the rice leaves (Samal and Misra, 1982). The grubs of the beetle, *Varania discolor* Fabricius were found predating on nymphs and adults of the brown planthopper, *Nilaparvatha lugens* (Stal) a major pest of rice, where as the adult beetles feed on rice pollen (Samal and Misra, 1982). In Tamil Nadu, taxonomic composition, diversity and abundance of coccinellids in weeded and partially weeded rice ecosystems had not clearly been studied earlier. Keeping the above points in mind, the present investigation was taken up to study the species composition, diversity and abundance of coccinellids in an irrigated rice ecosystem.

MATERIALS AND METHODS

The field trial was conducted in irrigated rice ecosystem at the wetlands of Agricultural College and Research Institute, Madurai, Tamil Nadu during *Kharif* 2000. Four ruling rice varieties *viz.,* MDU 5, ADT 36, ADT 39 and ADT 43 were used and each variety replicated into two treatments namely weeded plot (all the weeds removed) and partially weeded plot (10 weeds allowed /m^2 with rice plants). The size of the experimental plots was 8 x 6m. The study area receives water from the vaigai dam. Monthly minimum and maximum temperatures varied between 28° and 38°, May being the warmest (40° C maximum temperature) and January the coolest (28° C minimum temperature) months during 2000. The average rainfall of Madurai was 893 mm during 2000. The collection of coccinellids was done with sweep net at weekly intervals and the collected insects sorted out into respective taxa based on taxonomic characters. A total of seven samplings were taken during the season. The number of taxa in weeded and partially weeded rice ecosystems were recorded in each week. The species of weed plants allowed in partially weeded plots were collected and identified. In the present investigation, Jaccard coefficient index of similarity (Jaccard, 1908) was used to study the similarity of coccinellid fauna in weeded and partially weeded rice ecosystems; data will be expressed as percentage of similarity (100 times Cj).

Jaccard index (Cj) = $j/(a + b - j)$

Where,

j	=	Number of taxa occurring in both samples A (weeded) and B (partially weeded)
a	=	Number of taxa in sample A (weeded) and
b	=	Number of taxa in sample B (Partially weeded)

RESULTS AND DISCUSSION

The present study revealed the occurrence of eight species of predatory coccinellids in rice ecosystem during *kharif* 2000 (Fig. 1). The relative abundance of coccinellids showed that among the eight species, *Micraspis discolor* was the dominant species and exhibited more abundance in weeded plot (56 individuals) than in partially weeded plots (42 individuals). Sheltan and Edwards (1988) stated that common species of insects always had greater abundance only in undiversified ecosystem and also had ability to survive in existing maximum and minimum environmental conditions. *Coccinella transversalis*, *Hormonia octomaculata*, *Cheilomenes sexmaculatus*, *Brumoides sutralis* and *Epilachna vigintioctopunctata*, *Chilocorus nigritus, M. discolor* and *M.* sp. Showed 2, 4, 3, 5, 7, 1 and 6 rank, respectively and had more abundance in partially weeded plots. All the eight taxa were recorded only in partially weeded rice ecosystem. The rare species like *C. sexmaculatus*, *B. suturalis* and *C. nigritus* exhibited more abundance in diversified ecosystem (partially weeded rice ecosystem) due to the availability of alternate resources like pollen and nectar as stated by Pimm (1998). The diversity of coccinellids exhibited less similarity values of 0.60, 0.50, 0.40 and 0.33 in third, fourth fifth and sixth week, respectively (Table 1). During tillering and flowering stages of the crop, the diversity of coccinellids was more due to the availability of favourable microclimates and abundance of alternate resources as indicated by Ohgushi (1992). The coccinellids exhibited 0.80 similarity value in the first and the last week of the crop growth, possibly due to the presence of common species of coccinellids (*M. discolor, M.* spp) at these stages. This finding is in consonance with the statement of

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