Research Paper Zoology

# Diversity of Insect Fauna in Sugarcane Field at Managaseri Village, Virudhunagar District


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**ABSTRACT**

Sugarcane (Saccharum officinarum) is an important cash crop of the world, occupying 13.5 million hectare of area in India. Sugarcane is highly important cash crop and sugar production in the country mostly depends on this crop. Insects comprise more than half of earth's diversity of spices. Insects are found in different types of environment and they occupy little more than two thirds of the known species of insect and pests. As many species are strictly seasons and prefer only particularly set of habitats they are good indicates of habitat quality. Hence, the present study has been carried out the diversity of insects in sugarcane field at Managaseri village, Virudhunagar District during July 2015 to September 2015. During the study period Hemiptera, Coleoptera, Lepidoptera, Orthoptera and Hymenoptera insects were identified and the results are discussed.

**KEYWORDS** Sugarcane, Hemiptera, Coleoptera, Lepidoptera, Orthoptera and Hymenoptera

## INTRODUCTION

Insects have been around for more than 400 million years and it could be argued that they are the most successful and enduring life form that has ever arisen on this planet. Diverse as well as abundant, insects comprise roughly half of the Earth's one and a half million known species. Insects are important to the continued working of the global ecosystems that, as long as the well-being of insects is safeguarded, the Earth should remain habitable for humans (Berenbaum, 1995). Insects can be important pests in agriculture, forestry and homes, and can threaten to human health. The insect population can reach high numbers and cause a significant amount of damage unless control measures are taken against them. Insects also have a variety of beneficial roles. They are necessary for pollinating many plants, including important fruit and vegetable crops. Insects can also feed on other insects and provide checks on the populations of pest insects, preventing them from reaching damaging levels. Biological control agents can be purchased and used in agriculture and the home garden to reduce pesticide use (Evans, 1984). Sugarcane is a long duration crop with luxuriant vegetative growth and is damaged by a number of insects during its crop growth. Among the insect pests, shoot borer (ESB), *Chilo infuscatellus* (Crambidae; Lepidoptera) is a serious pest in peninsular regions of India and more vital in early stages of crop growth causing economic loss (Avasthy and Tiwari, 1986). Sugarcane worldwide is attacked by a variety of insects from a broad spectrum of orders, such as, Lepidoptera, Homoptera, Coleoptera, Hemiptera, Orthoptera and Isoptera (Assef and Conlong, 2009). Sugarcane is known to be attached by about 200 species of insects and non insects in India (David and Ananthakrishnan, 2006). Hence, the present study has been carried out the diversity of insect fauna in sugarcane field at Managaseri village, Virudhunagar District.

### Methodology

Insect collection was done in the sugarcane field at Managaseri village, Srivilliputhur taluk Virudhunagar District during July 2015 to September 2015. The insects collections were carried out in the early hours of the day because insect are usually active at early sun rise, therefore, it was easy to observe and collect them. Some of the plant feeder insects (phytophagous) were easy to locate on their hosts during sun rise. The collected insects were stored in vial containing formalin 70% solution. Collected insects were identified with the help standard taxonomic keys (Thamariselvi and Dayana, 2015).

## RESULTS AND DISCUSSION

During the period of study a total of seven orders such as, Isoptera, Orthoptera, Hemiptera, Mantodea, Coloeptera, Lepidoptera and Hymenoptera belonging to nine Familes were collected and identified from July 2015 to September 2015 in a sugarcane field at Managaseri Village, Srivilliputhur, Virdhunagar District (Table 1). Similarly (Kagali *et al.* 2013) reported that a total of 1256 insect specimens were collected from amaranth during the period between April 2012 and April 2013. The pest species were grouped into five orders, 15 families and 33 species. A total of 1,928 individuals representing 27 orders, 11 families and 34 species were collected by sweeping method during eight different stage of rice growth (Poolprasert, and Jongjitvimol, 2014). The present study showed that biodiversity parameters as the richness, diversity and composition of these insect communities differ from month to month. Similar results are also observed that (Thamaraiselvi and Dayana, 2015) a total number of seven species in order viz., Odonata, Orthoptera, Hemiptera, Homoptera, Coloeptera, Lepidoptera and Hymenoptera were collected from November 2012 to January 2013 in a sugarcane field at A. Vadipatti, Periyakulam Taluk, Theni District, India.

Table 2 shows appearance of insects during the study period the maximum insect was observed in the month of August 2015, when compared with July and September white fly, ant species, grasshopper and marsh grasshopper were present

throughout the study period. The large brown mantid and leaf hopper appear only September month and red cotton bug appear in August month. In the present study maximum number of insect were observed in August 2015 and minimum insects were observed in September 2016. Due to the climatic changes of study area during the period of study the ant, species and whiteflies dominant remaining species was less dominant. The red cotton bug, long winged katydid and large brown mantid were observed in least number when compared with other insect species. (Norela *et al*.,2013) reported that Orthoptera recorded the highest percentage (22.9% of the total catch), while Diptera recorded the lowest percentage (2.3%). Likewise, the family Pentatomidae from order Homoptera recorded the highest number of individuals for the whole study period, followed by Coccinellidae (order Coleoptera) and Tettigoniidae (order Orthoptera), respectively in the paddy field. During the sampling visits, the percentage abundance of insects decreased in tandem with the developmental stages of the plants. However, other factors also played a role in affecting the population profile of the pest and non-pest insects, and these included the populations of prey and predator insects and vertebrates (e.g. birds, frogs and fishes), life cycle of each species, vegetation, sampling period, time (day or night), rainfall pattern and other meteorological factors (Pinheiro *et al.,* 2002).

Total number of species percentage and density of insects were also recorded in the sugarcane study area. The Hymenopteran insects shows maximum density followed by Orthoptera and Hemiptera, similarly the percentage of insect were higher in Orthoptera followed by Hemiptera and Hymenoptera. The presentage and abundance of insects decreased in due to the environmental factors like rainfall pattern and other metrological factors played a role in the affecting the populations of prey and non-pest insects warm climate and active vegetative growth phase of the host plants would stimulate insect development and abundance, because of the availability of abundant food and optimum temperature for their proliferation (Priyanka, 2009)

The present investigation, the diversity indices such as, Simpson index, Shanon index and Margaret index were calculated. The Simpson index (0.8977), Shannon (2.384) and Margaret index were higher in the month of Auguest when compared with other month. The diversity indices were also calculated by Norela *et al*. (2013). They reported that diversity index for the various stages showed that the highest diversity was at the active tillering stage (H' = 1.17), followed by the flowering (H'= 0.69) and ripening (H'= 0.60) stages, respectively. Likewise, the Shannon-wiener evenness index gave an overall value of E'= 0.89, at decreased in tandem with the growth stage of the paddy plants. The Margalef richness index was relatively high for the overall insect population, with the value of R'=4.77. It can be concluded that the overall abundance, evenness and richness of insect population in the paddy plants. The present study the insect abundance was analysed one way ANOVA classification the P=0.332 is greater than calculated value. The abundance of insect was significantly different during the study period. The gryllids had the relative density values above 10 ranging between 12.88 to 15.39 per cent, while the other three families, Pyrgomorphidae, Tetrigidae and Tettigonidae registered a relative density between 10 and 12 per cent. The Shanon-Wiener Index values did not differ much for the months within the Acrididae (2.02 to 2.28) as well as among the different families of Orthoptera (2.87 to 3.01)(Dhakad, *et al*., 2014). This results to provide the essential information for development of appropriate sampling plan and reduce the cost of pest management strategy and reduce the toxicity from pesticide application.

**Table 1. List of insects were indentified on sugarcane agro-ecosystem during July 2015 to Sep. 2015**

| S.No. | Common Name | *Zoological Name* | Family | Order |
|---|---|---|---|---|
| 1 | Leaf hopper | *Pyrilla perpusilla* | Lophophidae | Hemiptera |
| 2 | White fly | *Aleurobus barodenis* | Aleyrodidae | Hemiptera |
| 3 | Red cotton bug | *Dysdercus cingulatus* | Pyrrhocoridae | Hemiptera |
| 4 | Termites | *Odontoterms obesus* | Termidae | Isoptera |
| 5 | American grasshopper | *Schistocera Americana* | Acrididae | Orthoptera |
| 6 | Lady bird beetle | *Coccinella novemnotata* | Coccenellidae | Coleoptera |
| 7 | Lady bird beetle | *Hippodamia convergens* | Coccenellidae | Coleoptera |
| 8 | Ant | *Ochetellus itoi* | Formicidae | Hymenoptera |
| 9 | Ant | *Camponatus itoi* | Formicidae | Hymenoptera |
| 10 | Ant | *Formica lemani* | Formicidae | Hymenoptera |
| 11 | Grasshopper | *Hieroglyphus banyan* | Caelifera | Orthoptera |
| 12 | Marsh Grasshopper | *Chorthippus albomarginatus* | - | Orthoptera |
| 13 | Field Grasshopper | *Chorthippus brunneus* | - | Orthoptera |
| 14 | Oblong-winged Katydid | *Amblycorypha oblongifolia* | - | Orthoptera |
| 15 | Large brown mantid, | *Archimantis latistyla* | Mantidae | Mantodea |

**Table 2. Appearance of insects during the study period July 2015 to September 2015**

| **S.No.** | **Common Name** | **Zoological Name** | Study period | | |
|---|---|---|---|---|---|
| | | | July | August | Septemper |
| 1 | Leaf hopper | *Pyrilla perpusilla* | - | - | + |
| 2 | White fly | *Aleurobus barodenis* | + | + | + |
| 3 | Red cotton bug | *Dysdercus cingulatus* | - | + | - |
| 4 | Termites | *Odontoterms obesus* | - | + | + |
| 5 | American grasshopper | *Schistocera americana* | + | + | - |
| 6 | Lady bird beetle | *Coccinella novemnotata* | + | + | - |
| 7 | Lady bird beetle | *Hippodamia convergens* | - | + | - |
| 8 | Ant | *Ochetellus itoi* | + | + | + |

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| 9 | Ant | *Camponatus itoi* | + | + | + |
| 10 | Ant | *Formica lemani* | + | + | + |
| 11 | Grasshopper | *Hieroglyphus banyan* | + | + | + |
| 12 | *Marsh Grasshopper* | *Chorthippus albomarginatus* | + | + | + |
| 13 | *Field Grasshopper* | *Chorthippus brunneus* | + | + | _ |
| 14 | Oblong-winged Katydid | *Amblycorypha oblongifolia* | + | + | - |
| 15 | Large brown mantid, | *Archimantis latistyla* | - | - | + |

**Table 3. Abundance of insects on sugarcane agro-ecosystem during July 2015 to September 2015**

| S.No. | Common Name | Zoological Name | Number of insects | | | Total |
|---|---|---|---|---|---|---|
| | | | July | **August** | September | |
| 1 | Leaf hopper | *Pyrilla perpusilla* | - | - | 30 | 30 |
| 2 | White fly | *Aleurobus barodenis* | 15 | 27 | 21 | 63 |
| 3 | Red cotton bug | *Dysdercus cingulatus* | - | 05 | - | 05 |
| 4 | Termites | *Odontoterms obesus* | - | 30 | 15 | 45 |
| 5 | American grasshopper | *Schistocera americana* | 10 | 17 | - | 27 |
| 6 | Lady bird beetle | *Coccinella novemnotata* | 05 | 10 | - | 15 |
| 7 | Lady bird beetle | *Hippodamia convergens* | - | 07 | - | 07 |
| 8 | Ant | *Ochetellus itoi* | 15 | 27 | 17 | 59 |
| 9 | Ant | *Camponatus itoi* | 20 | 26 | 12 | 58 |
| 10 | Ant | *Formica lemani* | 23 | 18 | 14 | 55 |
| 11 | Grasshopper | *Hieroglyphus banyan* | 19 | 18 | 10 | 47 |
| 12 | *Marsh Grasshopper* | *Chorthippus albomarginatus* | 12 | 7 | 4 | 23 |
| 13 | *Field Grasshopper* | *Chorthippus brunneus* | 15 | 12 | - | 27 |
| 14 | Oblong-winged Katydid | *Amblycorypha oblongifolia* | 6 | 2 | - | 8 |
| 15 | Large brown mantid | *Archimantis latistyla* | 4 | - | 3 | 7 |
| | | **TOTAL** | 144 | 206 | 126 | 476 |
| Mean | | | 9.6 | 13.73 | 8.4 | |
| Std. error | | | 2.074 | 2.68 | 2.45 | |
| | | Std. Deviation | 8.034 | 10.40 | 9.49 | |
| | | Coeff. var | 83.69 | 75.70 | 113.01 | |

**Table 4. Total number of species, percentage and density of insects recorded in sugarcane field at Managaseri Village during July 2015 to September 2015.**

| S.No | Order | Number of Species | Percentage | Density |
|---|---|---|---|---|
| 1 | Hemiptera | 3 | 20.0 | 21.68 |
| 2 | Isoptera | 1 | 6.67 | 9.96 |
| 3 | Orthoptera | 5 | 33.33 | 25.44 |
| 4 | Mantodea | 1 | 6.67 | 0.66 |
| 5 | Hymenoptera | 3 | 20.0 | 37.39 |
| 6 | Coleoptera | 2 | 13.33 | 4.87 |

**Table 5. Diversity indices of insects during the study period.**

| Diversity Indices | July | August | Septemper |
|---|---|---|---|
| Taxa_S | 11 | 13 | 9 |
| Individuals | 144 | 206 | 126 |
| Dominance_D | 0.1102 | 0.1023 | 0.1461 |
| Simpson_1D (dominance) | 0.8898 | 0.8977 | 0.8539 |
| Shannon_H | 2.282 | 2.384 | 2.032 |
| Evenness_e^H/S | 0.8907 | 0.8344 | 0.8474 |
| Brillouin | 2.142 | 2.263 | 1.905 |
| Menhinick | 0.9167 | 0.9058 | 0.8018 |

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|---|---|---|---|
| Margalef (richness) | 2.012 | 2.252 | 1.654 |
| Equitability_J | 0.9517 | 0.9294 | 0.9246 |
| Fisher_alpha | 2.771 | 3.083 | 2.218 |
| Berger-Parker (dominance) | 0.1597 | 0.1456 | 0.2381 |

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