Insect Diversity of Sugarcane Field in Theni District, Tamil Nadu, South India

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Abstract

Sugarcane, Saccharum spp. L. (Poaceae), is one of the most widely grown cash crop in India. Sugarcane is attacked by a variety of insects from a broad spectrum of orders, such as Lepidoptera, Homoptera, Coleoptera, Hemiptera, Orthoptera and Isoptera. The study aims to assess the insect diversity in the sugarcane field at Allinagaram village in Theni District, Tamil Nadu, India. 2710 insects belonging to 10 orders were recorded. Diptera recorded a maximum density of 1650 insect with a population percentage of 62% followed by Lepidoptera with a population percentage of 10.6%. The diversity index was high in Diptera due to numerical abundance of individuals. Seasonal factor like rainfall which was high during December and increased the density of Diptera, followed by other orders. The study may be helpful for the biological management of the insect and pests in the sugarcane field. Further, proper timescale precaution measures like application and selection of pesticides and quantity may be predicted from the above diversity indices. This investigation will be helpful in studying insect pest management.

Key words: *Diversity of insects, Sugarcane, Light trap and Predominant pest.*

1. Introduction

Insects are the major components of animal diversity in terms of number of species in most of the habitats and ecosystems. Like many other organisms, an insect is an inseparable component of its environment. In India, a large number of insects occur in the mountains of the Assam, Burma region and southern India. The distribution of insect prey fauna invariably depends on the distribution of their host plants. About 125 species of insects are known to infest

the sugarcane as major pests in various parts of the world (Patil *et al.*, 2004a). In India, nearly 228 insect and non-insect pests have been reported in the sugarcane field (David and Nandagopal, 1986). Reduction in abundance during the wet season of Barro colordo Island panama was reported by Levings and Windsor (1985). A peak in abundance during the wet season of north Queensland and Australia was reported by Frith and Frith (1990). Capinera (2001) demonstrated that there was an inverse relationship between increased rainfall and the sugarcane borer instars found in the field presumably because the larvae drawn in the flooded tunnels. In addition to rainfall, cold winter temperature is reported to depress larval survival rates in Louisiana. Correct identification of an insect requires proper examination of minute details of its morphology and adequate labelling. The methods of collection and when and where to collect insects depend on the purpose of the collection. There are specialized indices for the computation and comparison of species richness, evenness, diversity, distribution, similarity etc., in relationship to the face of biodiversity.

2. Materials and Methods

The study was carried out in the sugarcane fields in Allinagaram village, Periyakulam in Theni District, Tamilnadu. The rainfall is mainly due to North-East (October to December) monsoon and South-West (June to August) monsoon. The insect collection was made in the farmer's field through light trap. The light trap was regularly switched on at 18:00hrs (evening) and switched off at 6:00hrs (in the next morning). The light attracted insects passed through the funnel and got into the killing jar. Thse trap catches were removed soon after the light was switched off and sorted out in the laboratory. The collected entomofauna was counted individually. The insect thus collected from the two sites were pooled together, identified and population status was carried out. The collected insects were identified with the help of related taxonomic materials and biodiversity indices were calculated.

Shannon's index used to estimate the diversity of insects in a given habitat (Ludwig and Reynolds, 1988) was carried out through *Biodiversity pro* software.

3. Tables

Table: 1 Taxonomic diversity of the entomofauna in sugarcane fields at Theni District.

Sl. No	Species	Fortnight Collection Periodicity						Total	Percentage %
		1	2	3	4	5	6		
1.	Odonata	-	-	10	-	2	-	12	12
2.	Orthopera	35	50	50	15	25	20	195	195
3.	Blattaria	-	-	-	10	-	-	10	10
4.	Dermaptera	-	-	5	-	3	-	8	8
5.	Hemiptera	10	15	20	20	5	10	80	80
6.	Homoptera	68	30	20	40	50	30	238	238
7.	Coleoptera	27	15	27	10	5	50	134	134
8.	Lepidoptera	68	50	40	30	55	40	283	283
9.	Diptera	100	150	500	400	200	300	1,650	1,650
10.	Hymenoptera	-	50	-	50	-	-	100	100
	Total	308	360	664	575	353	450	2,710	

Table: 2 Entomofauna of the sugarcane fields correlated to temperature and rainfall at Theni District.

Fortnight collection	Temperature (°C)		Rainfall (mm)	ODO	ORT	BLA	DER	HEM	HOM	COL	LEP	DIP	HYM
	Max	Min											
NOV	33	25	405	-	35	-	-	10	68	27	68	100	-
NOV	31	24	628	-	50	-	-	15	30	15	50	150	50
DEC	31	23	675	2	50	-	5	20	20	27	40	500	-
DEC	30	20	707	-	15	10	-	20	40	10	30	400	50
JAN	30	20	7	10	25	-	3	5	50	5	55	200	-
JAN	31	20	7	-	20	-	-	10	30	50	40	300	-

ODO – ODONATA ORT – ORTHOPTERA BLA – BLATTARIA
DER – DERMAPTERA HEM – HEMIPTERA HOM – HOMOPTERA
COL – COLEOPTERA LEP – LEPIDOPTERA DIP – DIPTERA
HYM – HYMENOPTERA

Table: 3 Overall presentations of richness indices and diversity indices for entomofauna recorded in sugarcane fields at Theni District.

No.	Order	Richness indices	Diversity indices	Diversity indices
		Menhinick index (R_2)	Simpson's index	Shannon Weiner index
1.	Odonata	0.578	0.696	0.44
2.	Orthopera	0.2837	0.3135	1.1049
3.	Blattaria	0.316	-	-
4.	Dermaptera	0.707	0.464	0.65
5.	Hemiptera	0.2975	0.3689	0.8963
6.	Homoptera	0.064	-	-
7.	Coleoptera	0.2584	0.3109	0.9935
8.	Lepidoptera	0.5031	0.3998	0.8688
9.	Diptera	0.0537	0.3344	1.1175
10.	Hymenoptera	0.141	-	-

4. Results and Discussion

A total number of 2,710 insects belonging to 10 orders *viz.*, Odonata, Orthoptera, Blattaria, Dermaptera, Hemiptera, Homoptera, Coleoptera, Lepidoptera, Diptera and Hymenoptera were collected from November 2010 to January 2011 from sugarcane fields at Theni District, Tamil Nadu, South India (Table – 1). It shows 10 different orders of insect community. Among the ten orders of insects, the diptera reveals high density (400-500) especially during the season of high rainfall (707mm), compared to other orders. Diptera was numerically abundant (1,665 individuals) with 62% throughout the period, followed by Lepidoptera (283 individuals) and Homoptera (238 individuals). However, high rainfall caused a decrease in the density of Lepidoptera and Coleoptera. Nevertheless it also stimulates the appearance of Hymenoptera and Blattaria. However, an increase in the insect population in all the groups was observed in the month of December

especially during high rainfall. Further, lowest density observed in the order Dermaptera (8 individuals) and Blattaria (10 individuals). Rainfall is the crucial factor for increase the insect population followed by temperature. Significant correlation was increasing with the rainfall, temperature and increased in insect population. Similar findings have reported by Inayat *et al.,* (2010). The effects of temperature on life history parameters of insects such as longevity and fecundity have been intensively studied by (Mbapila, 1997 and Rahim *et al.,* 1991)

Lepidoptera was a very large order that includes the most important insect pests (Pedigo, 2002). Cartea *et al.* (2009) studied Lepidopteran pest populations that fluctuate with the change in environmental conditions. Diptera has high density but less species richness which indicates only numerical abundance of individuals (Table – 1), Shannon index of diversity shows that Dipetra and Orthopera has the high diversity H = 1.11 and H'=1.10 respectively due to high density or numerical abundance of the individuals. In Lepidoptera and Orthoptera the numbers of individuals are stable. The role of biodiversity in the dynamics and management of insect pests of croplands highlighted by Way and Heong (1994) is further substantiated by the present study. This insect diversity study strongly supports the predictive approach of classical biological control whereby extensive pre release studies should be conducted before the release of biological control agents in the sugarcane fields.

5. References

1. Cartea, M.E., Padilla, G., Vilar, M. and Valesco, P. 2009. Incidence of the major Brassica Pests in Northwestern Spain. *J. Econom. Entomol.*, 102: 767-773.
2. Frith, D Frith, C. 1990. Seasonality of litter invertebrate populations in Australian upland tropical rain forest Biotropica 22(2): 181-190.
3. Inayat, T.P., Rana, S.A., Khan, H.A. and Khalil-ur-Rehman. 2010. Diversity of Insect fauna in croplands of district Faisalabad, *Pak. J. Agri. Sci.*, 47(3): 245-250.
4. Levings, S.C. and Windsor, D.M. 1985. Litter arthropod population in a tropical deciduous forest: Relationships between years and arthropod groups. Journal of Animal Ecology. 54(1): 61 – 69.

5. Ludwig, A.J. and Reynolds, F.J. 1988. Statistical ecology, Wiley press, New York. 317.
6. Mbapila, J. C. 1997. Comparative adaptation of *Cotesia flavipes* Cameron and *Cotesia sesamiae* (Cameron) (Hymenoptera: Braconidae) to *Chilo partellus* Swinhoe (Lepidoptera; Pyralidae) on the Kenya Coast. Ph.D. thesis, University of Dares - Salaam.
7. Patil, A.S., Shinde, V.D. and Mager, S.B., Yadhav, R.G. and Nerkar, Y.S., 2004a. Sugarcane woolly aphid (*Ceratovacuna lanigera)* its history and control measures. *Proc. of Sugarcane Technologists Association in India.* pp.133-155.
8. Pedigo, P.L. 2002. Entomology and Pest Management, 4th edition. pp. 246-247.
9. Rahim, A., Asghar, A.H. and Alam, N.K. 1991. Effect of temperature and relative humidity on longevity and development of *Ooencyrtus papilionis* Ashmead (Hymenoptera: Eulophidae), a parasite of the Sugar cane pest, *Pyrilla perpusilla* Walker (Homoptera: Cicadellidae). *Environ. Entomol.*, 20: 774-775.
10. Way, M.J and Heong, K.L. 1994. The role of biodiversity in the dynamics and management of insect pests on tropical irrigated rice. *Rev. Bull. Ento. Res.*, 84: 567-587.
11. Yadav, R.L., Verma, R.S. and Rajesh Kumar, 2005, Need for new technologies. *The Hindu Survey of Indian Agriculture*, pp. 96-100.

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