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Distribution of insects at Gokilapuram paddy field in Theni district, Tamilnadu

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ABSTRACT

A study was carried out to observe the abundance, diversity, richness and evenness of insect species at Gokilapuram paddy fields in two cropping seasons per year during 2018-2020. The insects were collected at every month adapting sweep net, light trap and hand-picking methods. A total of 30 species under 8 orders including 22 families were recorded. Diversity of insects was high during second cropping season followed by first cropping season, 2019-2020 and was low in both the seasons of 2018-2019. Evenness was high during the second cropping season 2018-2019 but low during first cropping season, 2019-2020. The insect abundance was belonging to the families like Grambidae and Noctuidae but high richness was recorded in 2019-2020 during the two crops and the low richness was recorded in second cropping season in 2018-2019 in these families.

Key words: *Insect, Paddy field, Abundance, Diversity, Richness and evenness.*

Introduction

Rice is one of the cheapest energy sources, staple food for more than 65% of the world population (Mathu *et al*., 1999). Rice production got increased out of its demand towards food and livelihood for many people (Hegde and Vijayalakshmi, 2013) weather and the cultivation season influence the rice production. The rice cultivation method, excessive use of nitrogenous fertilizers and abuse of agrochemicals have aggravated the pest population in transplanted conditions. The average yield loss in rice have been caused by stemborers 30% white plant hoppers 20 % gall midge 15% leaf folder 10% and another pest 25% (Krishnaiah and Varma, 2015). The diversity and abundance of insects in the paddy field ecosystem vary according in abiotic and biotic factors and the growth stages of paddy plant. Diversity and abundance of natural enemies, such as parasitoids and predators, contributed the biological pest control in different stages of paddy crop (Gangurde, 2008). Taxonomic identification of insets in diversity studies through para taxonomy and morpho species is the need of the present situation (Krell, 2004). Diversity studies are essential components in monitoring ecosystems (Lawton *et al*., 1998; Losey and Vaughan, 1988). The present study was an attempt to analyse the insect's distribution and their abundance in the paddy cropping seasons during 2018 - 2020.

Materials and Methods

Study Area

Paddy fields at Gokilapuram village, Theni district, Tamil Nadu, India was selected as the study area to observe the abundance, richness and diversity. The study was carried out in two cropping seasons dur-

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ing 2018-2019 and 2019-2020. Paddy fields were visited on the first week of every month to survey the insects. The collected insects were preserved in 70% alcohol and were identified with reference from Insect pests of rice by Pathak and Khan (1994) and confirmed with Entomology department of TNAU, Madurai.

Methodology

Sweep net was used following Noyes and Valentine (1989). Light trapping technique is most common and regular sampling technique used by Szentkiralyi (2002). Using hand picking method, larval forms of lepidopteran insects, crawling insects from stem, leaf blades were collected by using forceps. The collected insects were counted and kept in 70% alcohol which was taken to laboratory for further identification.

Statistical Analysis

Insect species diversity, abundance, richness and evenness was analysed following standard formulas. A number of indices have been used to calculate diversity. Among them, most widely used one is the Shannon-Weaver index (1949) given as follows:

$$H' = -\sum_{i=i}^{s} Pi \log_e Pi$$

$\log_e = \ln$; $Pi = n_I / N$

Where H′ = Diversity

S = Number of species

Pi = Proportion of individuals of the total sample belonging to the i th number.

Evenness index

Evenness 1 is used here, which expresses the ratio of Hill's number (Alatalo, 1981).

Evenness index 1 (Pielou, 1975, 1977)

$$E1 = \frac{H'}{\ln(s)} = \frac{\ln(N_1)}{\ln(N_0)}$$

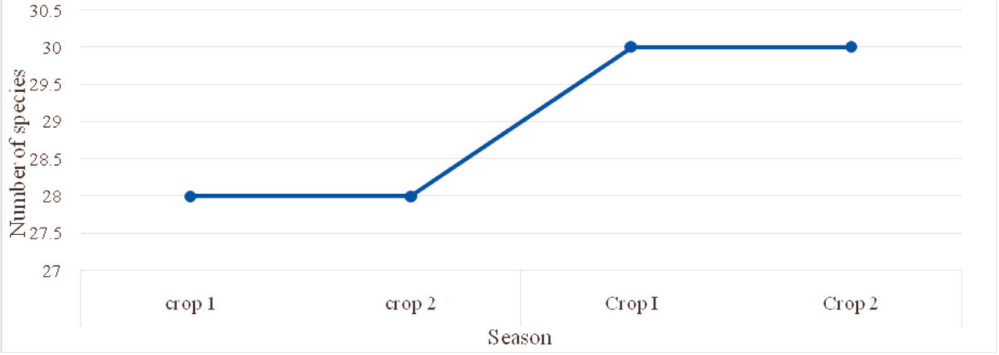
Results

The insect population in paddy field was surveyed at Gokilapuram in four paddy cropping seasons during 2018-2020 where 30 species of insects under 8 orders and 22 families were recorded (Table 1). Family wise insects' abundance in four paddy cropping season during 2018-2020 at Gokilapuram is given in Table 1. Two species of insects were observed from the families like Cicadellidae, Delphacidae, Pentatomidae and Gryllidae. Three species of insects were recorded from the families like Grambidaeand Noctuidae and only one species was observed from the families such as pseudococcidae, Alydidae, Pyralidae, Nymphalidae, Chrysomelidae, Scarabidae, Curculinoidae, Coccinellidae, Acrididae, Gryllotalpidae, Ephydridae, Cecidomyildae, Thripidae and Trichogrammatidae (Table 3).

Richness of insects in four cropping seasons during 2018 - 2020 at Gokilapuram field was 28 species in the first cropping season of 2018 - 2019 and 27 species during the second cropping season of 2018 - 2019. 30 species were observed during the first and second cropping seasons of the study period during 2019 - 2020 (Figure 1). Richness was high during the first and second cropping season during 2019 - 2020 and low during second cropping season (2018-19).

Abundance of insects in four paddy cropping seasons during 2018 - 2020 at Gokilapuram field was 1258 individuals in the first crop season, 1232 insects in the second cropping season during 2018 – 2019

Figure 1. Insect species in four paddy cropping seasons during 2018-2020 at Gokilapuram



and 1448 and 1367 insects were observed from the first and second cropping seasons during 2019 – 2020 respectively (Figure 2). The Highest insect abundance was observed during first cropping season of 2019-20 followed by second cropping season (2019-2020) and the lowest was recorded in second cropping season of 2018 - 19 (Figure 2).

In 2018-2019, equal number of diversities was

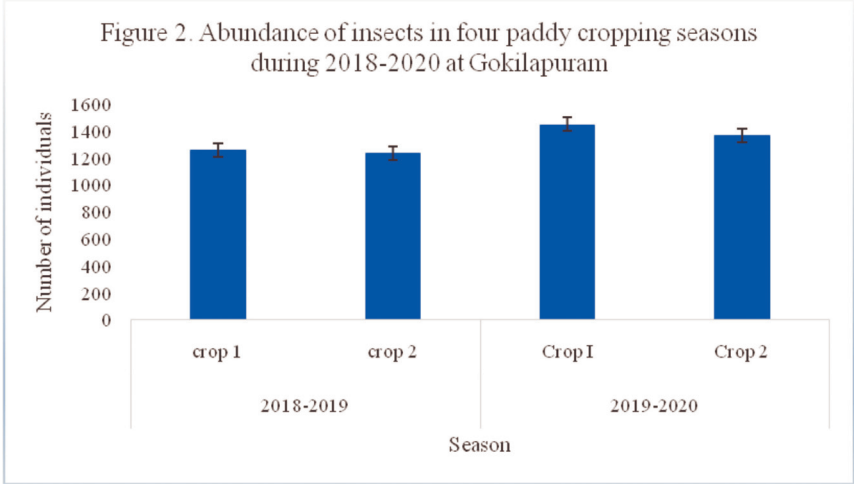


Table 1. Family wise Insect abundance in four paddy cropping season during 2018-2020 at Gokilapuram

Order	Family	No. of Species (2018-20)	2018-19		2019-20	
			Crop 1	Crop 2	Crop 1	Crop 2
Abundance						
Hemiptera	Cicadellidae	2	141	84	100	87
	Delphacidae	2	49	134	48	124
	Pseudococcidae	1	34	98	29	56
	Alydidae	1	55	74	35	54
	Pentatomidae	2	60	45	68	67
	Total	**8**	**339**	**435**	**280**	**388**
Lepidoptera	Crambidae	3	153	120	197	132
	Pyralidae	1	12	64	23	25
	Noctuidae	3	76	100	86	95
	Nymphalidae	1	8	18	18	11
	Total	**8**	**249**	**302**	**324**	**263**
Coleoptera	Chrysomelidae	1	26	26	56	28
	Scarabaeidae	1	54	72	52	54
	Curculionidae	1	14	18	45	25
	Coccinellidae	1	34	25	52	65
	Total	**4**	**128**	**141**	**205**	**172**
Orthoptera	Gryllidae	2	76	81	101	119
	Acrididae	1	138	75	244	189
	Gryllotalpidae	1	27	29	24	34
	Total	**4**	**241**	**185**	**369**	**342**
Odonata	Libellulidae	1	65	18	58	24
	Coenagrionidae	1	45	24	48	29
	Total	**2**	**110**	**42**	**106**	**53**
Diptera	Ephydridae	1	57	27	28	36
	Cecidomylidae	1	49	38	32	48
	Total	**2**	**106**	**65**	**60**	**84**
Thysanoptera	Thripidae	1	85	62	99	54
Hymenoptera	Trichogrammatidae	1	0	0	5	11

observed and in the period 2019-2020 diversity of insects varied between the two cropping seasons (Figure 3). Diversity of insects was high during second cropping season followed by first cropping season 2019-2020 and was low in two seasons during 2018-2019 (Figure 3).

Based on the observation, evenness of insects during the second cropping season in 2018-2019 showed the maximum where the species were evenly distributed and the minimum was observed in the first cropping season during 2019-2020. The first cropping season of 2018-2019 and the second cropping season on 2019-2020 showed the same evenness index (Figure 4).

Discussion

The current study recorded 30 species of insects belonging to pest and non pest categories from the paddy field at Gokilapuram village, Uthamapalayam Taluk, Theni Dt. It constitutes Hemiptera (8 species), Lepidoptera (8 species), Coleoptera (4 species), orthoptera (4 species), Diptera (2 species), Thysanoptera (1 species) and Hymenoptera (1 species). During the study period 2018-19, Green leaf hopper (122), Brown plant hopper (123), Leaf folder (107), Grass hopper (244), Yellow stem borer (79), Thrips (85) were the highly abundant species recorded from the paddy field. Major kind of the damaging incidence of Green leaf hopper, yellow stem borer, Brown plant hopper, Leaf folder and Rice gall midge was observed in Patna district by Singh and Kumari (2020). The same observations were made by Gangwar *et al*. (2015). Other insects like Rice water weevil, Lady bird beetle, Dragon fly, Field cricket, Mole cricket and Grass hopper species were found in abundant. The species diversity and complexity of association

Figure 3. Diversity of insects in four different paddy cropping seasons during 2018-2020 at Gokilapuram

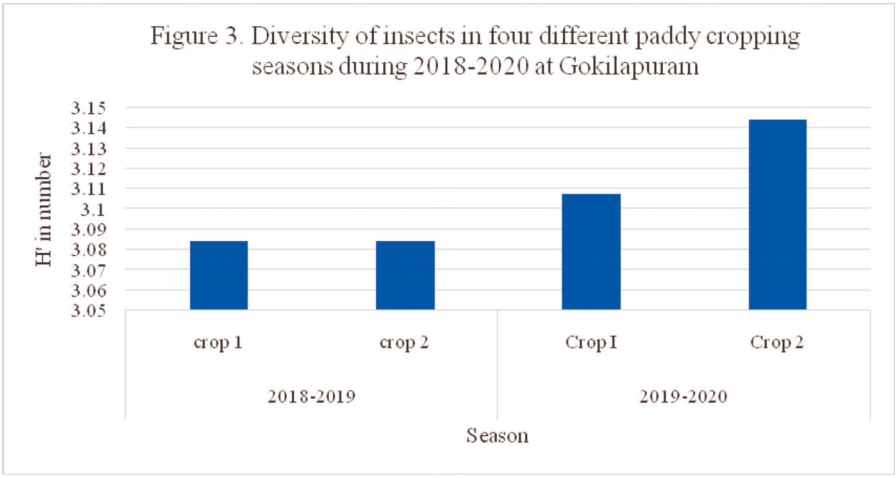
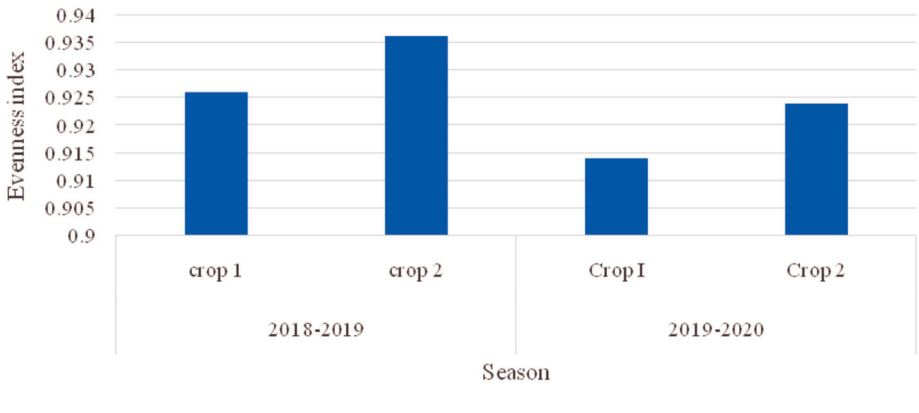


Figure 4. Evenness of insects in four different paddy cropping seasons during 2018-2020 at Gokilapuram



among species are essential factors to the community stability as reported by Van Emden and Williams (1974). High population was recorded from orthoptera but lepidopteran diversity was higher than orthopteran diversity as reported by Siregar *et al*. (2017). Diversity of insect was high in the second cropping season during 2019-20 but abundance was low while richness and abundance was low in the second cropping season with high evenness during 2018-19. Hemiptera was high among the orders recorded from paddy fields unlike the study of Innocent and Merlindayana (2012) where it was diptera in sugarcane field.

Conclusion

This study revealed that there were 30 insect species found in Gokilapuram paddy field. Stem borers and plant hoppers were the major pests, coccinellids, dragon fly and damsel fly were the predators found throughout the period of study. Crop rotation, stop using pesticides, start using organic manure and organic pesticides practicing integrated pest management can help the farmers to control the abundance of pests and improve the yield of production. Thus the balanced ecosystem can be maintained.

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