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RESEARCH

DIVERSITY OF HEMIPTERANS AT AGRICULTURAL COLLEGE CAMPUS, KILLIKULAM, TAMIL NADU, INDIA

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Abstract: Hemipteran bugs are playing a major role in agriculture as pests. An attempt is made to catalogue the Hemipteran bugs diversity in various crop ecosystem *viz*., daincha, redgram and cotton in Agricultural College and Research Institute, Killikulam during April to July 2023. A total of 1189 individuals belonging to 9 species, 9 genera and 6 families were collected during the study. Lygaeidae was the most abundant family (38.35%) followed by Coreidae (30.28%), Pentatomidae (19.26%), Membracidae (10.09%), Dinidoridae (1.51%) and Phyrrhocoridae (0.50%). The dusky cotton bug, *Oxycarenus hyalinipennis* was the most dominant species which constituted 38.35 per cent of the total individuals. The abundance of hemipteran bugs fluctuated widely over the months and June 2023 was the most active month (n=570) followed by May 2023 (n=504), April (n=92) and July 2023 (n=23). The Stink bug, *Nezara viridula* was the dominant species in June 2023 which constitute 43.76% of total insects in Daincha field. In the redgram field, redgram pod bug, *Clavigralla gibbosa* was the dominant species (94.49%) in the month of May. The red cotton bug, *Dysdercus koenigii* was the most dominant species (98.70%) in the month of May 2023 in cotton. The Simpson's Index**,** Shannon-Weiner diversity, Berger-Parker Dominance Index and Margalef's species richness indices for the hemipteran fauna were 0.24, 1.60, 0.38 and 1.10, respectively, indicating their good diversity in the study area.

Keywords: Hemiptera, Diversity, Diversity indices, College campus, Killikulam

INTRODUCTION

Hemiptera is a varied group of true bugs found worldwide, consisting about 1,84,000 to 1,93,000 species pertaining to 133 families (Hodkinson and Casson, 1991). About 80,000 species are present worldwide. A total of 6,500 species belonging to 77 families are reported in India. Out of these, 2,421 species are endemic to India (Alfred, 2003). The Hemipteran bugs are of economic importance causing direct and indirect damage to agricultural crops, horticultural crops, weed plants *etc*. Most of them are phytophagous insects that feed on roots, leaves, stem, fruits and seeds. So far, no comprehensive account of hemipteran is available at Agri College campus, Killikulam. The present study would help to know the diversity and abundance of hemipterans in the locality of Agri College campus, Killikulam. Hence, the present investigation was carried out to document Hemipteran bugs for better understanding the diversity at Agricultural College campus, Killikulam.

MATERIALS AND METHODS

The study area is situated in the foot Hills of Vallanadu Blackbuck Sanctuary about 35 km from Tuticorin, Tamil Nadu, Southern India (Fig. 1). Collections were made from April 2023 to July 2023 and random sampling was done from different habitats of Agricultural college campus. Hemipterans were collected by adopting standard sampling techniques such as hand picking and sweep netting. The collected hemipterans were photographed, sorted, killed using poison bottle and preserved in insect storage boxes with naphthalene balls to enable long storage without any pest damage. All the hemipterans were identified using the taxonomic keys.

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Fig. 1. Study Area - Map showing Agricultural College Campus, Killikulam

DIVERSITY INDEX ANALYSIS

Diversity Index was computed by following the Simpson's Index (D), Simpson Diversity Index (1-D), Simpson's Reciprocal Index (1/D), Shannon - Wiener Diversity index (H) along with its equitability component, Berger-Parker Dominance Index, Margalef's Richness Index (d), Menhinick Index, Buzas and Gibson's Index by using the software 'Biodiversity Calculator' (http://www.alyoung.com/labs/biodiversity_calculator.html).

RESULTS AND DISCUSSION

A total of 1189 individuals belonging to 9 species, 9 genera and 6 families were collected during the study (Table 1). Kailash *et al*. (2012) reported that distribution and diversity of Hemiptera fauna of Veerangana Durgawati Wildlife Sanctuary, Madhya Pradesh. They reported a total of 136 hemiperans, in which 24 species under 23 genera were identified under 9 families. Kailash *et al*. (2017) recorded that 50 species under 11 families of order Hemiptera in which 6 species were recorded first time from Fudam Bird Sanctuary, Diu Island of India. Chandra and Kushwaha (2013) recorded that 38 species belonging to 13 families of the order Hemiptera and all the species are reported first time from Singhori Wildlife Sanctuary, Raisen District, Madhya Pradesh. Reported the hemipterans of 10 species belonging to 9 genera representing 3 families were recorded in Surgana Tehsil, Nashik district of Maharashtra, India. A total of 12,575 individuals under 22 families of Hemiptera were recorded at Agri-biodiversity park of Professor Jayashankar Telangana State Agricultural University, Hyderabad, Telangana, India by Kishore *et al*. (2021).

Amongst the families, the Lygaeidae was the most abundant family (38.35%); followed by Coreidae (30.28%), Pentatomidae (19.26%), Membracidae (10.09%), Dinidoridae (1.51%) and Phyrrhocoridae (0.50%) (Table 2; Fig. 2). The dusky cotton bug, *Oxycarenus hyalinipennis* was the most dominant species which constituted 38.35 per cent of the total individuals followed by pod bug, *Clavigralla gibbosa* (18.76%), stink bug, *Nezara viridula* (17.66%), bean bug, *Riptortus pedestris* (11.52%), cow bug, *Oxyrachis tarandus* (10.09%), red pumpkin bug, *Coridius janus* (1.51%), horned shield bug, *Rhapigaster nebulosa* (1.26%), red cotton bug, *Dysdercus koenigii* (0.50%) and brown stink bug, *Halyomorpha halys* (0.34%) (Table 3; Fig. 3).

The abundance of hemipteran bugs fluctuated widely over the months and June 2023 was the most active month (n=570) followed by May 2023 (n=504), April (n=92) and July 2023 (n=23) (Table 4; Fig. 4).

The Stink bug, *Nezara viridula* was the dominant species in June 2023 which constitute 43.76% of total insects, followed by the redgram pod bug, *Riptortus pedestris* (28.96%), Cow bug, *Oxyrachis tarandus* (24.10%) and Horned Shield Bug, *Rhaphigaster nebulosa* (3.17%) in Daincha field (Table 5; Fig. 5). In the redgram field, redgram pod bug, *Clavigralla gibbosa* was the dominant species in the month of May 2023 which constitute 94.49 per cent of the total insects, followed by the Cow bug, *Oxyrachis tarandus* (2.54%) in red gram field. The pod bug population was noticed during April month and peak during last week of May 2023. Brown Stink Bug, *Halyomorpha halys* constitute of 1.69 per cent of total insects in redgram field (Table 6; Fig. 6). The cow bug and stink bug incidence was observed in both red gram and daincha crop. The red cotton bug, *Dysdercus koenigii* was the most dominant species in the month of May 2023 which constitute 98.70 per cent of the total insects, followed by the dusky cotton bug, *Oxycarenus hyalinipennis* (1.30%) in cotton. (Table 7; Fig. 7).

The Simpson's Index**,** Shannon-Weiner diversity, Berger-Parker Dominance Index and Margalef's species richness indices for the hemipteran fauna of the study area were 0.24, 1.60, 0.38 and 1.10

(Table 8), respectively, indicating their good diversity in the study area. The abundance of vegetation and flowers are key factors for species richness, abundance and species composition of bugs (Zurbrugg and Frank, 2006). A good vegetation cover throughout the study period can be the reason for the diversity of hemipterans in this area. The present study records the hemipteran fauna for the first time from this area and it provides a preliminary data, which will be helpful for future works focusing on individual hemipteran families and their identification up to species level.

Table 1. List of hemipteran bugs at Agricultural College campus, Killikulam

S.No	Common Name	Scientific Name	Family	Order
1.	Redgram pod bug	*Clavigralla gibbosa*	Coreidae	Hemiptera
2.	Bean bug	*Riptortus pedestris*	Coreidae	Hemiptera
3.	Dusky cotton bug	*Oxycarenus hyalinipennis*	Lygaeidae	Hemiptera
4.	Stink bug	*Nezara viridula*	Pentatomidae	Hemiptera
5.	Brown stink bug	*Halyomorpha halys*	Pentatomidae	Hemiptera
6.	Horned Shield bug	*Rhaphigaster nebulosa*	Pentatomidae	Hemiptera
7.	Red Pumpkin bug	*Coridus janus*	Dinidoridae	Hemiptera
8.	Red Cotton bug	*Dysdercus koenigii*	Pyrrhocoridae	Hemiptera
9.	Cow bug	*Oxyrachis tarandus*	Membracidae	Hemiptera

Table 2. Relative Abundance of hemipterans at Agricultural College campus, Killikulam

S.No	Family	No. of Genus	No. of Species	No. of Individuals	Abundance (%)
1.	Coreidae	2 (22.22)	2 (22.22)	360	30.28
2.	Lygaeidae	1 (11.11)	1 (11.11)	456	38.35
3.	Pentatomidae	3 (33.33)	3 (33.33)	229	19.26
4.	Dinidoridae	1 (11.11)	1 (11.11)	18	1.51
5.	Pyrrhocoridae	1 (11.11)	1 (11.11)	6	0.50
6.	Membracidae	1 (11.11)	1 (11.11)	120	10.09
	Total	**9**	**9**	**1189**	**100**

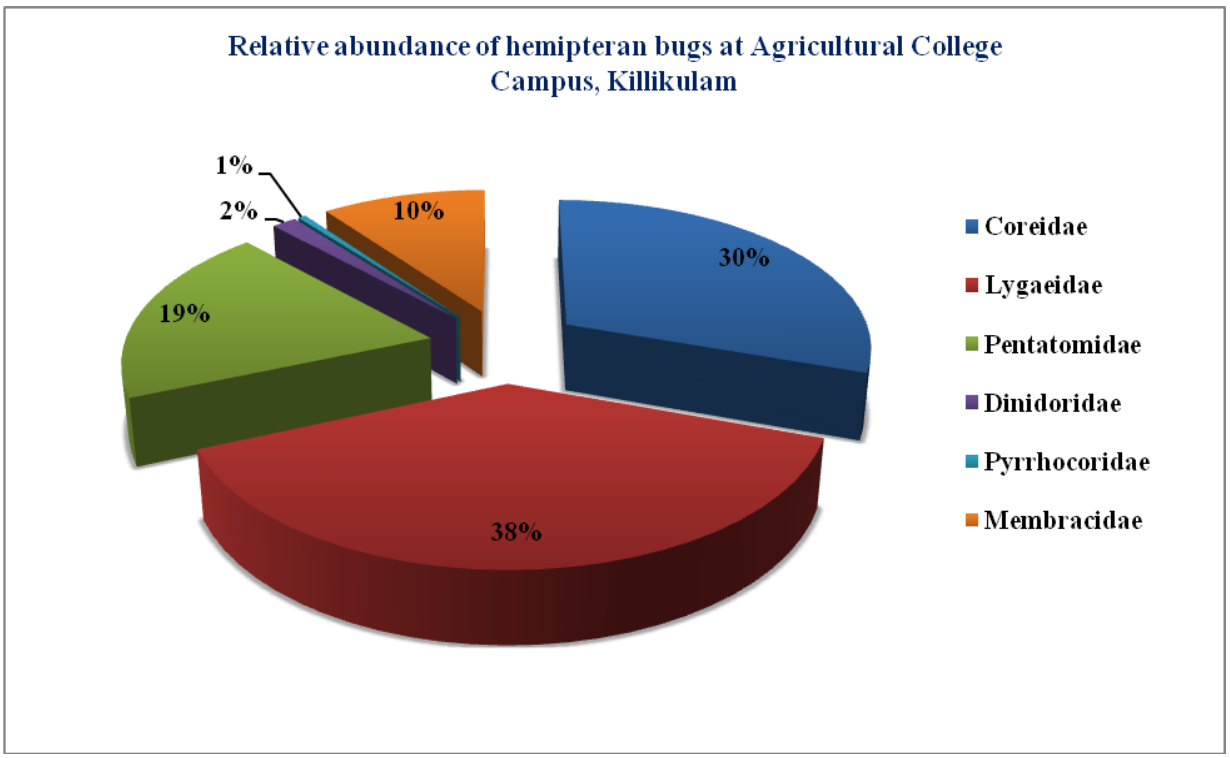

Fig. 2. Relative Abundance of hemipteran bugs at Agricultural College campus, Killikulam

Table 3. Relative Abundance of hemipteran species at Agricultural College campus, Killikulam

S.No	Family	Species	No. of Individuals	Abundance (%)
1.	Coreidae	*Clavigralla gibbosa*	223	18.76
2.		*Riptortus pedestris*	137	11.52
3.	Lygaeidae	*Oxycarenus hyalinipennis*	456	38.35
4.	Pentatomidae	*Nezara viridula*	210	17.66
5.		*Halyomorpha halys*	04	0.34
6.		*Rhaphigaster nebulosa*	15	1.26
7.	Dinidoridae	*Coridus janus*	18	1.51
8.	Pyrrhocoridae	*Dysdercus koenigii*	06	0.50
9.	Membracidae	*Oxyrachis tarandus*	120	10.09
		Total	**1189**	

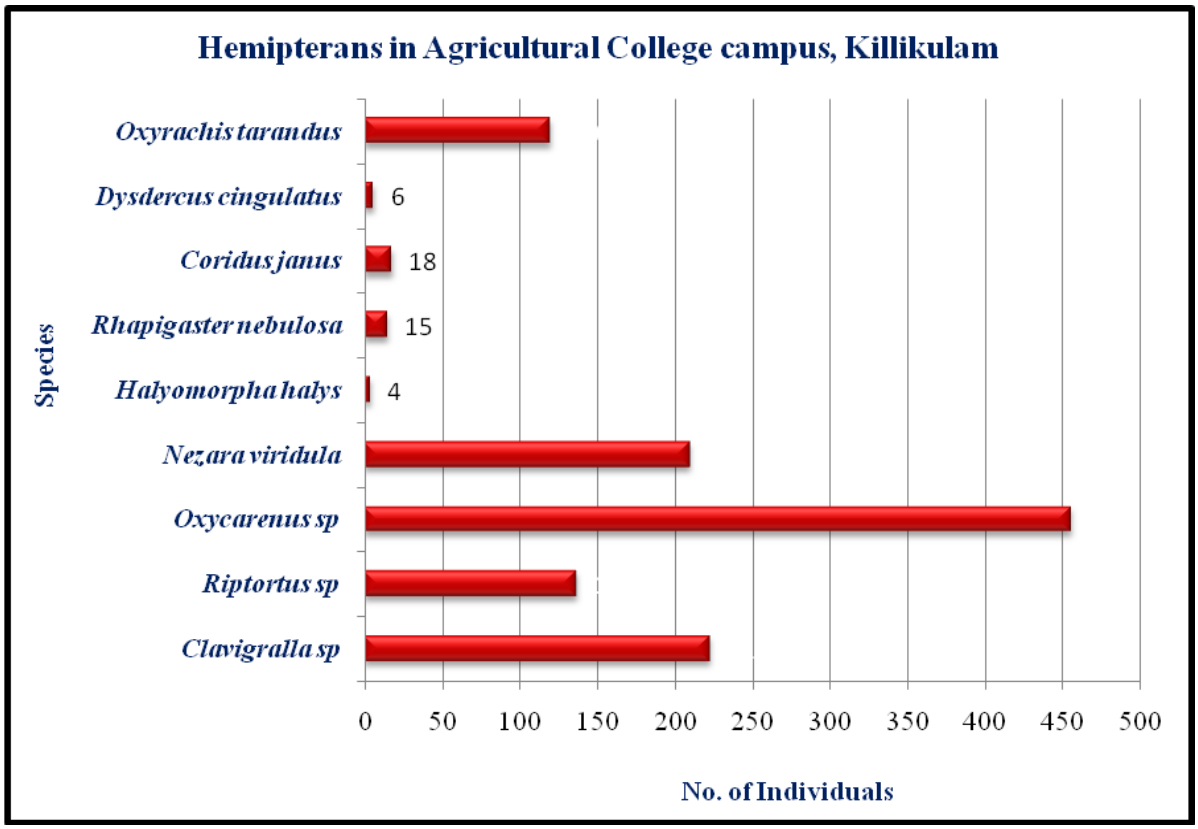

Fig. 3. Abundance of species of hemipteran bugs at Agricultural College campus, Killikulam

Table 4. Monthwise abundance of hemipteran bugs at Agricultural College campus, Killikulam

S.No	Family	April 2023	May 2023	June 2023	July 2023	Total
1.	Coreidae	69	154	135	02	**360**
2.	Lygaeidae	0	340	110	06	**456**
3.	Pentatomidae	07	0	222	0	**229**
4.	Dinidoridae	10	08	0	0	**18**
5.	Pyrrhocoridae	06	0	0	0	**06**
6.	Membracidae	0	02	103	15	**120**
	Total	**92**	**504**	**570**	**23**	**1189**

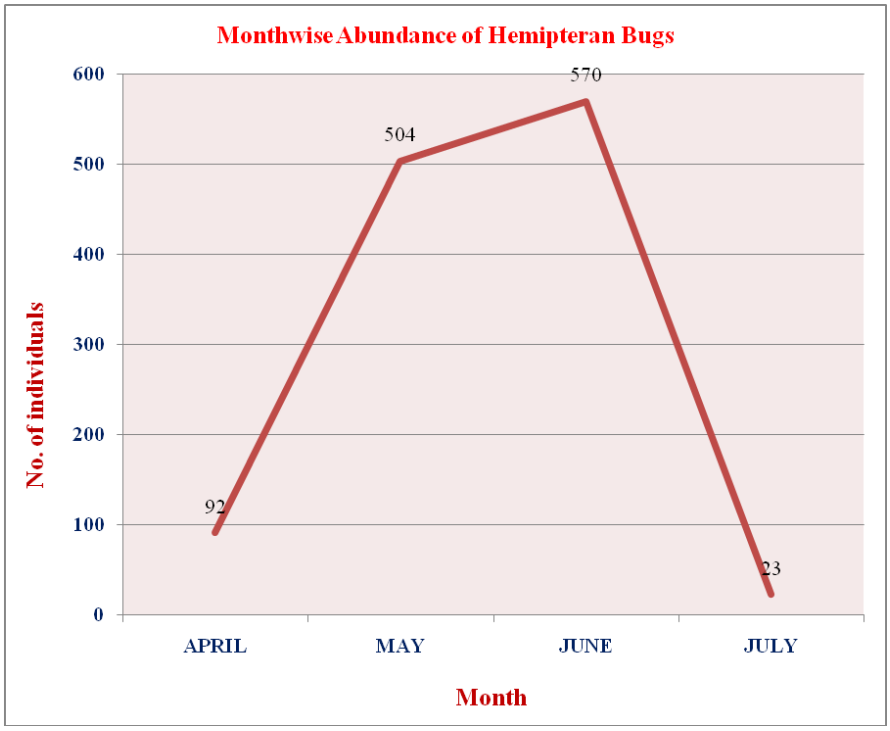

Fig. 4. Monthwise Abundance of Hemipteran Bugs at Agri College campus, Killikulam

Table 5. Monthwise Abundance of Hemipteran Bugs in Daincha

S. No.	Hemipteran species	Family	April '23	May '23	June '23	July '23	Total
1.	*Riptortus pedestris*	Coreidae	0	51	84	2	**137**
2.	*Oxyrachis tarandus*	Membracidae	0	0	99	15	**114**
3.	*Nezara viridula*	Pentatomidae	0	0	207	0	**207**
4.	*Rhapigaster nebulosa*	Pentatomidae	0	0	15	0	**15**
		Total	**0**	**51**	**405**	**17**	**473**

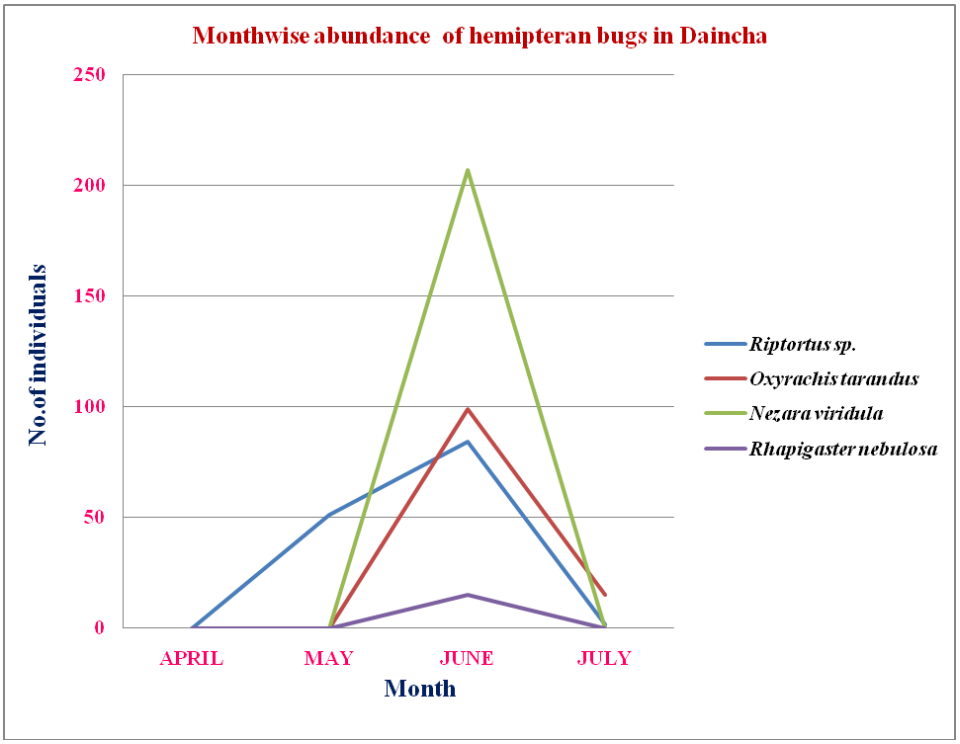

Fig. 5. Monthwise Abundance of Hemipteran Bugs in Daincha

Table 6. Monthwise Abundance of Hemipteran Bugs in Red Gram

S. No.	Hemipteran species	Family	April '23	May '23	June '23	July '23	Total
1.	*Clavigralla gibbosa*	Coreidae	69	103	51	0	**223**
2.	*Nezara viridula*	Pentatomidae	3	0	0	0	**03**
3.	*Halyomorpha halys*	Pentatomidae	4	0	0	0	**04**
4.	*Oxyrachis tarandus*	Membracidae	0	2	4	0	**06**
		Total	**76**	**105**	**55**	**0**	**236**

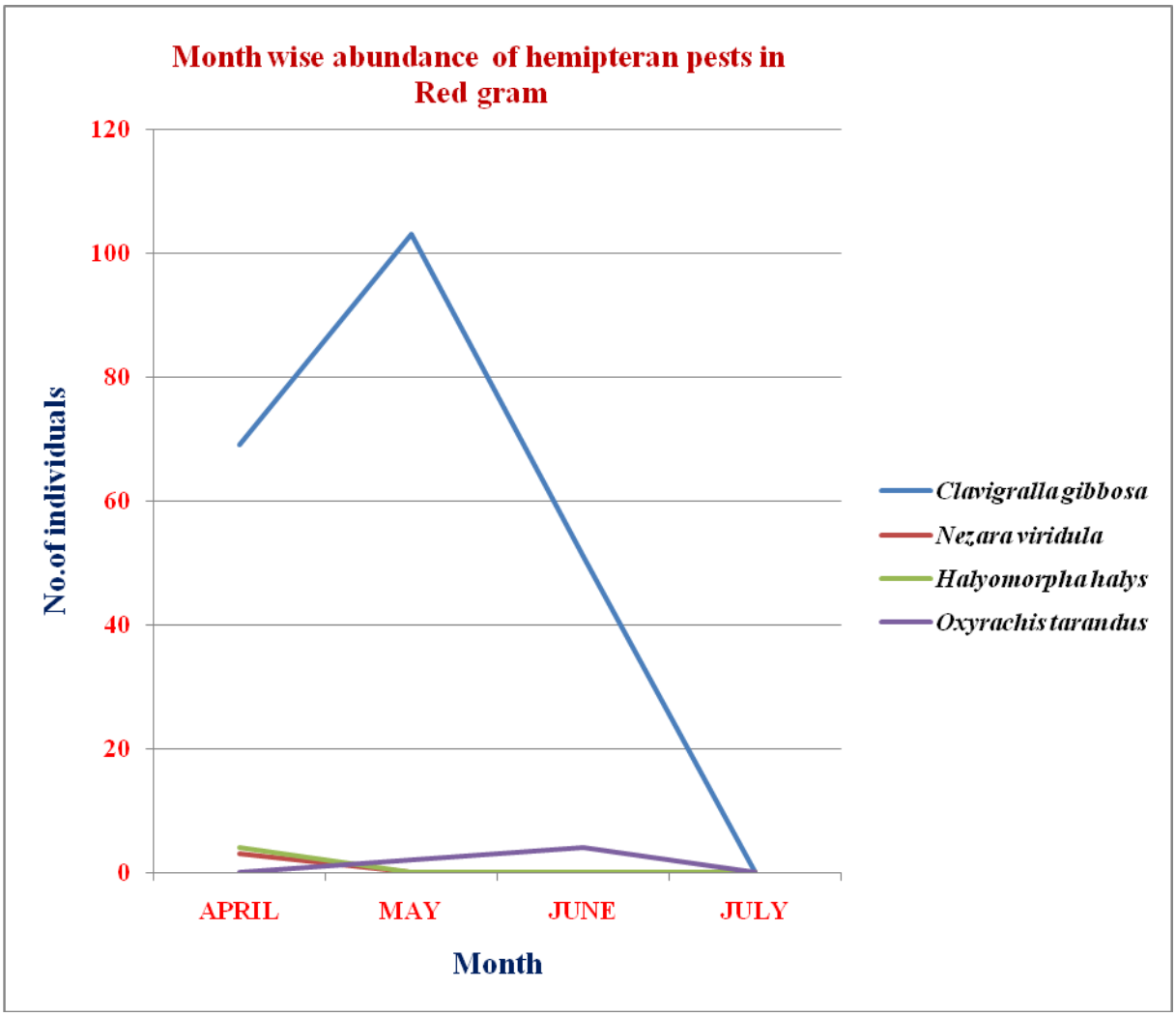

Fig. 6. Monthwise Abundance of Hemipteran Bugs in Red Gram

Table 7. Monthwise Abundance of Hemipteran Bugs in Cotton

S. No.	Hemipteran species	Family	April '23	May '23	June '23	July '23	Total
1.	*Dysdercus koenigii*	Pyrrhocoridae	6	0	0	0	**06**
2.	*Oxycarenus hyalinipennis*	Lygaeidae	0	340	110	6	**456**
		Total	**6**	**340**	**110**	**6**	**462**

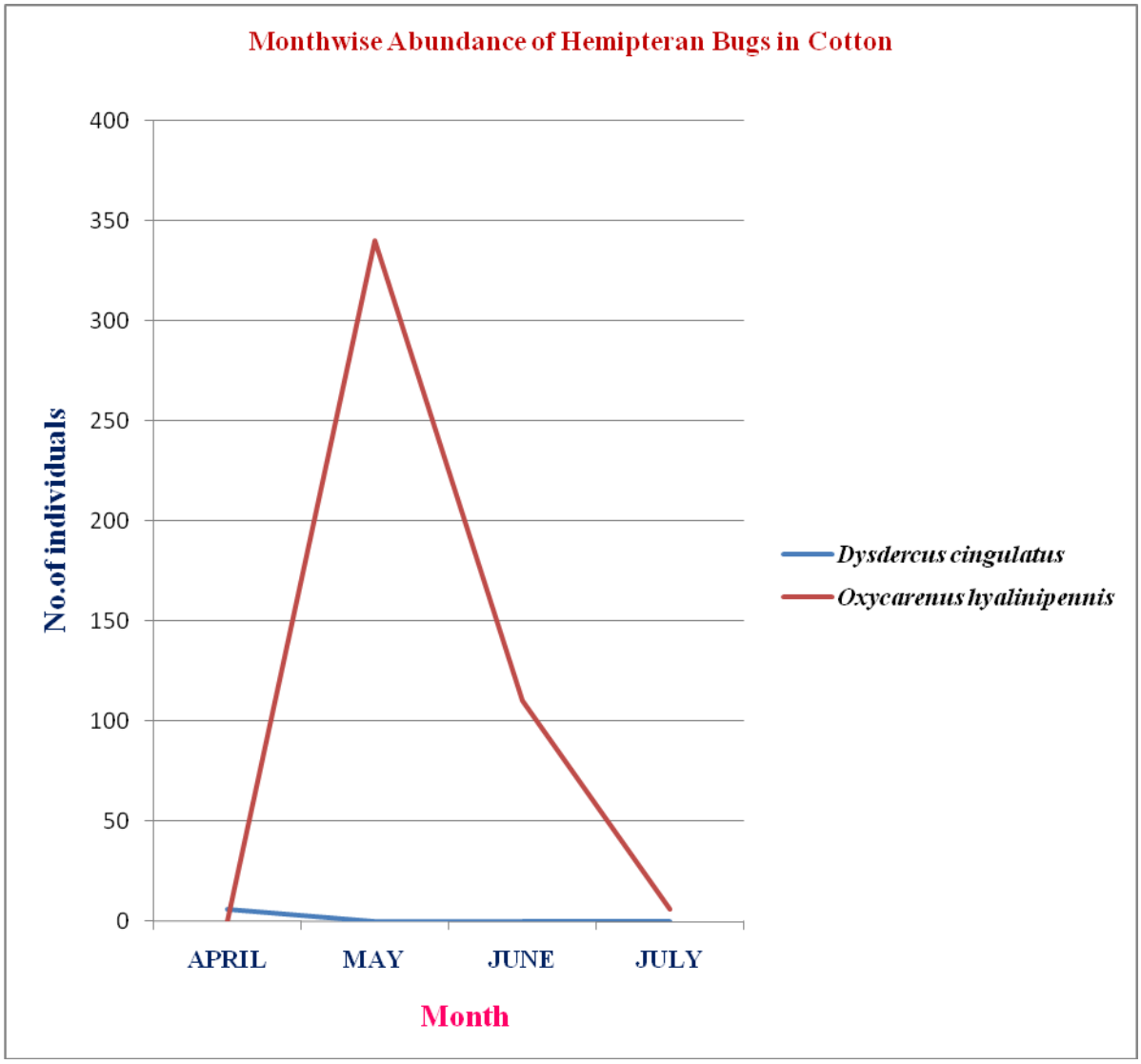

Fig. 7. Monthwise Abundance of Hemipteran Bugs in Cotton

Table 8. Diversity Indices of different Hemipteran species at Agricultural College Campus, Killikulam

S. No	No. of Genus	No. of species	No. of individuals	Shannon-Wiener Diversity Index (H)	Simpson's Index (D)	Simpson's Index of Diversity (1-D)	Simpson's Reciprocal Index (1/D)	Berger-Parker Dominance Index	Margalef Richness Index (d)
1.	9	9	1189	1.60	0.24	0.76	4.20	0.38	1.10

CONCLUSION

The present study deals preliminary information on the hemipteran bugs of the study area. From the above study, a total of 1189 individuals belonging to 9 species, 9 genera and 6 families were collected. The present study shown that the order Hemiptera is highly diverse and abundant in the Agricultural College campus, Killikulam. Species diversity and richness varied all along the study sites. Variation in distribution is due to different environmental conditions. It depends upon the presence of wetland, grassland, shrubs, water bodies, trees etc. This is an indication of healthy ecosystem and availability of rich resources vital for Hemiptera life stages and survival.

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