International Journal of Entomology Research
www.entomologyjournals.com
ISSN: 2455-4758
Received: 30-04-2022, Accepted: 16-05-2022, Published: 31-05-2022
Volume 7, Issue 5, 2022, Page No. 175-182

Biodiversity of butterflies in ayya nadar janaki ammal college campus, Sivakasi, Tamil Nadu, India

P Ponmanickam[1*], K Gowsalya[1], T Rajagopal[2], S Muniasamy[3], Kishore Kumar Meenakshi Sundaram[4]
[1] Department of Zoology, Ayya Nadar Janaki Ammal College (Autonomous), Sivakasi, Tamil Nadu, India
[2] Department of Zoology, Thiagarajar College (Autonomous), Madurai, Tamil Nadu, India
[3] Department of Microbiology, Ayya Nadar Janaki Ammal College (Autonomous), Sivakasi, Tamil Nadu, India
[4] Department of Biotechnology, Research and Publication Division, Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India

Abstract
The present study was undertaken to study the butterfly diversity in Ayya Nadar Janaki Ammal College campus during January and February, 2021. Totally 28 species belonging to Papilionidae (4 species), Pieridae (3 species), Nymphalidae (14 species) and Lycaenidae (7 species) were observed except Hesperiidae. It become found that family Nymphalidae was the most dominant (45 %) followed by family Lycaenidae (30 %), family Papilionidae and family Pieridae (8 %). In family Papilionidae, there are four species of butterflies (*Pachliopta bector, Papilio polytes, Papilio aristolocbiae* and *Belenois aurota*) were identified. In family Pieridae, three species of butterflies (*Eurema blanda*, *Appias libythea* and *Delias eucharis*) were noted. In family Nymphalidae, fourteen species *Acraea violae*, *Mycalesis visala*, *Ariadne ariadne*, *Melanitis leda*, *Euploea klugii*, *Danaus genutia*, *Danaus chrysippus*, *Hypolimnas bolina*, *Acraea violae*, *Tirumala septentrionis*, *Junonia almanac*, *Junonia iphita*, *Parantica aglea* and *Ypthima asterope* were observed. In family Lacaenidae, seven species *Curetis acuta, Freyeria putili, Castalins rosimon, Virachola Isocrates, Leptosia nina, Leptotes plinius* and *Zizina otis* were noticed. Recently study on butterflies is extending in campus of Educational institutions like Colleges, Universities and research stations. The widespread campus with trees, peaceful environment and irrigated garden with host plants are supporting the butterfly diversity in College campus. It will create interest among the students about importance of maintaining biodiversity of butterflies. Butterflies are "ecological indicators" since they are susceptible to varying seasons and climates. Further butterflies are good pollinators and are supporting the plant diversity. Studying butterfly diversity and their host plants pave the way to constructing butterfly park and maintaining host plants and butterfly diversity in College campus.

Keywords: biodiversity, butterflies, Papilionidae, Nymphalidae

Introduction
Biodiversity is defined as variety and variability of living organisms in the earth. It is classified as ecosystem diversity, genus diversity and species diversity. The varied organism is closely linked each other and staying within the atmosphere. If there is a disturbance within the linkage, the population of linked organism are going to be lesser or eradicated. Hence, the continual observation of environment and biodiversity is extremely important.
Butterflies are thought of as lovely creatures among insect diversity. Its conspicuousness competes with flower diversity in garden. Diversity of butterfly depends on the good environmental conditions. If there is a abrupt change in their environment, namely, temperature, humidity, light, and rainfall patterns, butterflies are highly responsive to the changing environment, thought of as helpful ecological indicators. Different butterfly species require suitable plant species for mating, breeding, and nectaring and are, thus diversification of plants are directly proportional to diversification of butterflies (Harsh *et al.*, 2014) [4]. Butterflies are also a good linker in food chain and food webs. Studying the relationship between butterfly and plants would helpful to conserve the floral and plant diversity**.**
Since butterflies are depending on plants, the destruction and deforestation due to urbanization affects the butterfly diversity (Rosin *et al*., 2012) [3]. Even a minor change in the surrounding ecosystem might affect numerous species especially they are going to become extinct. Extinction of single butterfly species leads to extinction of several other linked dependent species (Amrutha *et al*, 2020).
Butterflies have important values, such as the value of ecology (pollinator), nativity (endemism), maintaining food chain (conservation), study (education), culture, entertainment (aesthetics) and pollination provides more yield (economy) (Lestari *et al*., 2015) [7]. Hence, biodiversity of butterflies must be conserved from extinction and species diversity decline.
Studying biodiversity of butterflies is interesting in and around the area of hometown. Now a day, peoples are maintaining the garden the school, colleges, universities and holy places. It is very helpful to maintain the

butterfly diversity. Ayya Nadar Janaki Ammal College campus is having wonderful garden with medicinal plants with rich fauna and flora. Hence, the present study was taken to assess the diversity butterfly found in College campus.

Materials and Methods

Survey Spots

The survey was carried out with main focus on documentation of butterfly distribution across the Ayya Nadar Janaki Ammal College, Sivakasi, Tamil Nadu campus. This was done at different sites of the campus from January 2021 and February 2021. The records were taken from Site 1: Main block front, Site 2: West block, Site 3: Near Canteen, Site 4: Animal house, Site 5: East block, Site 6: A block, Site 7: Library, Site 8: Auditorium and Site 9: Computer block. The data were collected during 09 hr to 11 hr and from 14 hr to 16 hr on alternate days.

Identification of Butterfly Species

Identification of the butterflies observed directly in field with the help of manual. For identification, no collection and preservation of butterfly was done. Butterflies had been photographed from different angles in order to get good photograph to identify the species, key characters with colour patterns, wing span, Mode of fight, etc., Further identification was done with the help of field guide "Butterflies of Tamil Nadu" (Mohan Prasath and Satheesh, 2018) [15].

Relative Abundance

The difference between the total number of individual of all species and the total number of individual of the species Relative abundance of insects were calculated using the following formula (Michael, 1986)

$$\text{Relative abundance} = \frac{\text{Total number of individuals of the species}}{\text{Total number of individuals all species}} \times 100$$

Results

A study was undertaken to understand the biodiversity of butterflies in Ayya Nadar Janaki Ammal College campus, Sivakasi, Tamil Nadu during January'2021 and February' 2021. Totally 28 species of butterflies belonging to families Papilionidae, Pieridae, Nymphalidae and Lycaenidae had been noted (Fig. 1, 2, 3, 4 & 5; Table 1).

It become observed that family Nymphalidae become the maximum dominant (45 %) followed by family Lycaenidae (30 %), family Papilionidae and family Pieridae (8 %) (Fig. 6; Table 2). The study was carried out during two months (January and February). Most number of species and individuals were observed during January (25 species) than February (24 species) (Fig. 7; Table 3).

In family Papilionidae, there are four species of butterflies (*Pachliopta bector*, *Papilio polytes*, *Papilio aristolocbiae* and *Belenois aurota*) had been identified. Among the four species, *Pachliopta bector* become the dominant species (34 individuals) followed by *Papilio aristolocbiae* (22 individuals), *Belenois aurota* (11 individuals) and *Papilio polytes* (9 individuals) were noted (Fig. 1; Table 1).

In family Pieridae, three species of butterflies (*Eurema blanda*, *Appias libythea* and *Delias eucharis*) were noted. Among the three species, *Eurema blanda* was the dominant species (20 individuals) followed by *Appias libythea* (12 individuals) and *Delias eucharis* (2 individuals) had been observed (Fig. 2; Table 1).

In family Nymphalidae, fourteen species *Acraea violae*, *Mycalesis visala*, *Ariadne ariadne*, *Melanitis leda*, *Euploea klugii*, *Danaus genutia*, *Danaus chrysippus*, *Hypolimnas bolina*, *Acraea violae*, *Tirumala septentrionis*, *Junonia almanac*, *Junonia iphita*, *Parantica aglea* and *Ypthima asterope* had been observed. Among the fourteen species, *Acraea violae* found to be higher (43 individuals) and, *Melanitis leda* and *Hypolimnas bolina* determined to be lower (1 individual) (Fig. 3 & 4; Table 1).

In family Lacaenidae, seven species *Curetis acuta*, *Freyeria putili*, *Castalins rosimon*, *Virachola Isocrates*, *Leptosia nina*, *Leptotes plinius* and *Zizina otis* had been noticed. Among the seven species, *Zizina otis* determined to be higher (36 individuals) and *Castalins rosimon* become determined to be lower (2 individuals) (Fig. 5; Table 1).

	*Pachliopta bector* (Crimson Rose) Family- Papilionidae		*Papilio polytes* (Common Mormon) Family- Papilionidae

	*Papilio aristolocbiae* (Common Rose) Family- Papilionidae		*Belenois aurota* (Pioneer) Family- Papilionidae

Fig 1: Butterflies (Family: Papilionidae) in A.N.J.A. College campus

	*Appias libythea* (Striped Albatross) Family- Pieridae)		*Delias eucharis* (Common Jezebel) Family – Pieridae
	*Eurema blanda* (Three spot Grass Yellow) Family- Pieridae		

Fig 2: Butterflies (Family: Pieridae) in A.N.J.A. College campus

	*Acraea violae* (Tawny Coster) Family- Nymphalidae		*Mycalesis visala* (Long-Brand Brown) Family- Nymphalidae
	*Ariadne ariadne* (Common Castor) Family- Nymphalidae		*Melanitis leda* (Common Evening Brown) Family- Nymphalidae
	*Euploea klugii* (Common Crow) Family- Nymphalidae		*Danaus genutia* (Striped Tiger) Family- Nymphalidae

	*Danaus chrysippus* (Plain Tiger) Family- Nymphalidae		*Hypolimnas bolina* (Great Eggfly) Family- Nymphalidae
	*Acraea violae* (Tawny Coster) Family- Nymphalidae		*Tirumala septentrionis* (Dark Blue Tiger) Family- Nymphalidae

Fig 3: Butterflies (Family: Nymphalidae) in A.N.J.A. College campus

	*Parantica aglea* (Glassy Tiger) Family-Nymphalidae		*Junonia almanac* (Peacock pansy) Family- Nymphalidae
	*Junonia iphita* (Chocolate Pansy) Family- Nymphalidae		*Ypthima asterope* (Common Three Ring) Family-Nymphalidae

Fig 4: Butterflies (Family: Nymphalidae) in A.N.J.A. College campus

	*Curetis acuta* (Angled Sunbeam) Family- Lycaenidae		*Freyeria putili* (Small Grass Jewl) Family- Lycaenidae
	*Castalins rosimon* (Common Pierrot) Family- Lycaenidae		*Virachola isocrates* (Guava Blue) Family- Lycaenidae

	*Leptosia nina* (Psyche) Family- Lycaenidae		*Leptotes plinius* (Zebra Blue) Family- Lycaenidae
	*Zizina otis* (Lesser Grass Blue) Family- Lycaenidae		

Fig 5: Butterflies (Family: Lycaenidae) in A.N.J.A. College campus

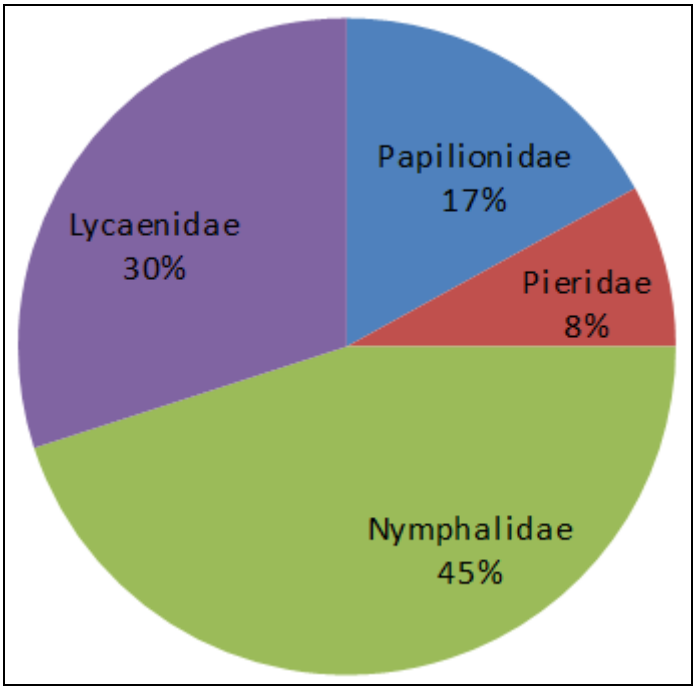

Fig 6: Relative abundance of butterflies families recorded in the study area

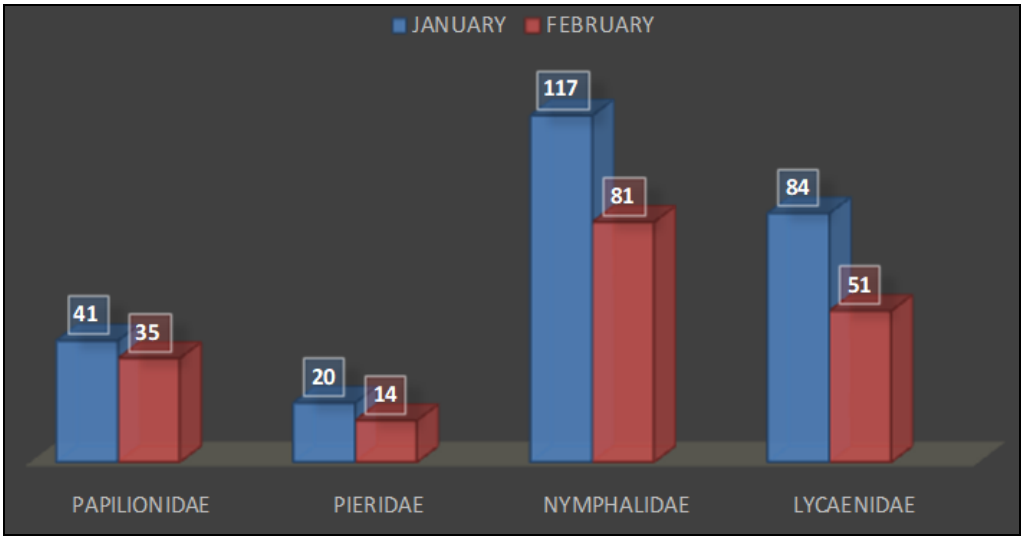

Fig 7: Monthly variations butterfly species recorded in the study area (A.N.J.A.College campus) during the study period (January-February 2021).

Table 1: Total number of butterfly species identified in A.N.J.A. College Campus

S.No.		January'2021	February'2021	Total
	Family: Papilionidae			
1.	*Pachliopta bector*	16	18	34
2.	*Papilio polytes*	6	3	9
3.	*Papilio aristolocbiae*	13	9	22
4.	*Belenois aurota*	6	5	11
	Family: Pieridae			
5.	*Appias libythea*	8	4	12
6.	*Delias eucharis*	-	2	2
7.	*Eurema blanda*	12	8	20
	Family: Nymphalidae			
8.	*Acraea violae*	23	20	43
9.	*Mycalesis visala*	2	-	2
10.	*Ariadne ariadne*	4	1	5
11.	*Melanitis leda*	1	-	1
12.	*Euploea klugii*	25	15	35
13.	*Danaus genutia*	10	6	16
14.	*Danaus chrysippus*	18	10	28
15.	*Hypolimnas bolina*	1	-	1
16.	*Acraea violae*	15	7	22
17.	*Tirumala septentrionis*	-	2	2
18.	*Junonia almanac*	4	-	4
19.	*Junonia iphita*	6	8	14
20.	*Parantica aglea*	1	3	4
21.	*Ypthima asterope*	7	9	16
	Family: Lycaenidae			
22.	*Curetis acuta*	10	12	22
23.	*Freyeria putili*	15	7	22
24.	*Castalins rosimon*	-	2	2
25.	*Virachola isocrates*	8	4	12
26.	*Leptosia nina*	13	3	16
27.	*Leptotes plinius*	16	9	25
28.	*Zizina otis*	22	14	36

Table 2: Relative abundance of butterfly families recorded in the butterfly species of study area (A.N.J.A.College campus) during the study period (January-February 2021).

S.No	Family	Number of species	Total no of individuals	Relative abundance (%) Density X=∑fx/n
1.	Papilionidae	4	76	17
2.	Pieridae	3	34	8
3.	Nymphalidae	14	198	45
4.	Lycaenidae	7	135	30
		28	443	100

Table 3: Monthly variations in relative abundance of butterfly species recorded in the study area (A.N.J.A.College campus) during the study period (January –February 2021)

S.No.		1	2	3	4
Family		Papilionidae	Pieridae	Nymphalidae	Lycaenidae
Total no of individuals	January	41	20	117	84
	February	35	14	81	51
Total no of species		4	3	14	7

Discussion

The present study was undertaken to take a look at the butterfly diversity in Ayya Nadar Janaki Ammal College campus in order to measure the butterfly diversity richness. Mostly educational institutions like Schools, Colleges, Universities and Research Institutes are having good infrastructure with water facilities along with maintaining the garden with rare and decorative plants. Further the disturbance through public in College campus is low and maximum of the establishments are some distance from town or villages. It can also additionally inspire the biodiversity richness in College campuses. The study area, Ayya Nadar Janaki Ammal College is having full of vegetation and Eco-park. Studying butterfly diversity in College Campus would useful

to evaluate the wealth of the Ecosystem in College. It is pronounced that butterfly prefers the region with appropriate plant diversity for pleasurable it wants suitable host and nectar plants. The butterfly diversity is well correlated with plant diversity (Thangjam *et al*., 2018) [17].

Butterflies are located everywhere in the world. There are about 20,000 species of butterflies all over the world are reported. Butterflies vary from small to large sized, brightly coloured and have a conspicuous, fluttering flight. Butterflies are grouped into 5 families - Papilionidae, Pieridae, Nymphalidae, Lycaenidae and Hesperiidae (Mohan Prasath and Satheesh, 2018) [15]. In the present study, totally 28 species belonging to Papilionidae (4 species), Pieridae (3 species), Nymphalidae (14 species) and Lycaenidae (7 species). It is reported that the family Nymphalidae is most predominant and successful family in tropical areas because of the species of family Nymphalidae are polyphagous and active fliers. Hence this family species are capable to search the host plants in extended area (Eswaran and Pramod, 2005; Krishnakumar *et al*., 2007; Saha, 2017) [1, 2, 12]. Further, abundance of Nymphalidae is correlated to the presence of flowers belonging to plant families such as Fabaceae, Rutaceae, Euphorbiaceae, Compositae and Rubiaceae (Kumar *et al*., 2019) [19]. Above statements convincingly proved that diversity of butterfly depends on the diversity of plants. Since, study area is having rich plant diversity with herbs, shrubs and trees, it acts as a host and providing the nectar.

Similarly, Kumar *et al.* (2017) [11] reported that Nymphalidae become the maximum foremost in campus of Manonmaniam Sundaranar University, Tamil Nadu. Kurve *et al*. (2013) [5] observed the butterfly diversity in Kongunadu College of Arts and Science campus, G. N. mills, Coimbatore and reported 12 species of butterfly in College campus dominated with Nymphalidae family. Elanchezhyan *et al*. (2017) reported 43 genera and 60 species of five families in Agricultural College campus, Killikulam and observed predominantly Nymphalidae with 325 individuals. Rathika *et al*. (2018) [16] also reported that presence of 35 species of butterflies belonging to 29 genera, five families and 29 subfamilies with predominant family Nymphalidae in Holy Cross College Campus, Nagercoil. Jaya Durga and Rajan (2018) [14] observed the biodiversity of butterflies in two selected habitats of Srivilliputtur i.e. nearby area of College Campus and reported that Nymphalidae was most dominant and Acraeidae was less dominant among 51 species of butterflies. Alleppa and Shrivastava (2016) [8] reported that total of 45 species, belonging to five families and noted the predominance of family Nymphalidae at Bhilai Mahila Mahavidyalaya College Campus. Panda *et al*. (2016) [9] reported that 53 species of butterflies of five different families with abundant family Nymphalidae followed by Pieridae at Fakir Mohan University campus, Balasore, Odisha. These evidences convincingly proved that Nymphalidae is foremost among butterfly families in most of the places with rich plant diversity.

In contrast, Dabhadkar and Prajapati (2020) [20] reported that 40 species of butterflies of 29 genera and five families and noted that Pieridae was the most dominant family followed by Nymphalidae at M. N. College Campus, Visnagar, Mehsana District, Gujarat. In Nymphalidae, the more number of *Acraea violae*, *Euploea klugii*, *Danaus genutia*, *Danaus chrysippus*, *Acraea violae*, *Junonia iphita* and *Ypthima asterope* was noted in College campus. It is reported that the Nymphalidae are the largest family of butterflies with about 6,000 species distributed throughout the world. There are 521 species in India of which 95 species found in Tamil Nadu (Mohan Prasath and Satheesh, 2018) [15] [15].

In the present study, 4 species belonging to family Papilionidae were identified. It is reported that swallowtail butterflies are 550 species worldwide and present in tropical region. In India, 107 species were recorded and 19 species are found in Tamil Nadu (Mohan Prasath and Satheesh, 2018) [15]. In family Pieridae, three species were identified. It is reported that 109 species of Pieridae in India and 32/33 in Tamil Nadu (Mohan Prasath and Satheesh, 2018) [15]. In Lycaenidae, seven species were identified. It is reported that Lycaenidae is the second largest family of butterflies with over 6000 species worldwide. There are 443 species in India and Tamil Nadu has 96 species (Mohan Prasath and Satheesh, 2018) [15]. In the present study, four families of butterflies except Hesperiidae were identified in the study area. It is an agreement of Dev *et al*. (2020), reported only one species butterfly belonging to Hesperiidae in Gogate Jogalekar college campus Ratnagiri, Maharashtra and stated that it may due to insufficient host plants to support the butterflies of Hesperiidae. Gupta (2018) reported only 4 families of buuerflies except family Hesperiidae at Campus area of Amolokchand Mahavidyalaya Yavatmal, Maharashtra.

It is reported that butterfly diversity varies from season to season. The changing climatic conditions such as summer, relative humidity and more rainfall affect the butterfly diversity (Nair *et al*., 2014). In India, March-April and October are suitable months for survival of butterflies. Butterflies development is closely related to the evolution of flowering plants since adult butterflies and caterpillars feed on food plants (Mohan Prasath and Satheesh, 2018) [15]. In the present study, 28 species of butterflies were identified during January and February (two months survey). The data may be extending if the survey was undertaken to other months. In College campus, there is a chance for increasing tendency of biodiversity of butterfly in remaining months. This study concludes that extensive study of butterflies and their native host plants and studying their interaction would helpful to maintain the butterfly garden and conserving butterfly diversity.

Acknowledgement

The authors would like to thank the Management and the Principal, Ayya Nadar Janaki Ammal College (Autonomous), Sivakasi for providing facilities to carry out this research work and for their encouragement.

References

1. Eswaran R, Pramod P. Structure of butterfly community of Anaikatty hills, Western Ghats. Zoos' Print Journal,2005:20(8):1939-1942.
2. Krishnakumar N, Kumaraguru A, Thiyagesan K, Asokan S. Diversity of papilonid butterflies in the Indira Gandhi wildlife sanctuary, Western Ghats, Southern India. Tigerpaper,2007:35(1):1-8.
3. Rosin ZM, Myczko L, Skórka P, Lenda M, Moroń D, Sparks TH *et al*. Butterfly responses to environmental factors in fragmented calcareous grasslands. Journal of Insect Conservation,2012:16(3):321-329.
4. Harsh S. Butterfly diversity of Indian institute of forest management, Bhopal, Madhya Pradesh, India. Journal of Insects, 2014.
5. Kurve P, Shenai D, Joshi A, Pejaver M. Recent study on butterfly diversity at Jnandweepa, VPM campus, Thane, Maharashtra. In National Conference on Biodiversity: Status and Challenges in Conservation-'FAVEO, 2013, 116-120.
6. Nair AV, Mitra P, Bandyopadhyay SA. Studies on the diversity and abundance of butterfly (Lepidoptera: Rhopalocera) fauna in and around Sarojini Naidu College campus, Kolkata, West Bengal, India. Journal of Entomology and Zoology Studies,2014:87(6):1321-1338.
7. Lestari DF, Putri RDA, Ridwan M, Purwaningsih AD. Butterfly diversity (insecta: Lepidoptera) in Alas Bromo Forest Tourism, North Lawu BKPH, Karanganyar, Central Tengah SS(in Indonesian). Prom. Sem. Nas. Masy. Biovid. Indon,2015:1(6):1284-1288
8. Alleppa R, Shrivastava S. The butterfly diversity in Bhilai Mahila Mahavidyalaya College Campus. Open Science Journal,2016:1(2):1-9.
9. Panda B, Behera B, Pardia SP. Butterfly diversity in Fakir Mohan University campus, Balasore, Odisha, India, 2016.
10. Elanchezhyan K, Samraj JM, Reuolin SJ. Butterfly diversity at the agricultural college campus, Killikulam, Tami Nadu, India. Journal of Entomology and Zoology Studies,2017:5(5):1389-1400.
11. Kumar P, Ramarajan S, Murugesan AG. Diversity of butterflies in relation to climatic factors in environmental centre campus of Manonmaniam Sundaranar University, Tamil Nadu India. Journal of Entomology and Zoology Studies,2017:5(2):1125-1134.
12. Saha SK. Diversity of butterflies (Order: Lepidoptera) in West Bengal State University Campus, West Bengal, India. International Journal of Zoology Studies,2017:2(5):150-156.
13. Gupta S. Study of Butterfly Diversity from Campus area of Amolokchand Mahavidyalaya Yavatmal, Maharashtra, India. Int. J. Life Sci,2018:6(1):279-281.
14. Jaya Durga S, Rajan MK. Biodiversity of Butterflies in Two Selected Habitats of Srivilliputtur Taluk, Virudhunagar District, International Journal for Research in Applied Science & Engineering,2018:6:562-567.
15. Mohan Prasath P. Satheesh N. Butterfly of Tamil Nadu, Tamil Nadu Forest Department, Tiruchirappalli, 2018.
16. Rathika M, Yadav H, Vashistha N, Kumar P, Maurya KK. Crystal growth, structure and Z-scan studies of novel diisopropylammonium nicotinate crystal. Journal of Molecular Structure,2018:1206:127759.
17. Thangjam R, Kadam V, Hemochandra LD, Ramalaxmi V, Krishna G, Patnaik L. Studies on the diversity and abundance of butterfly in and around CUTM, Paralakhemundi campus, Odisha (India). Journal of Entomology and Zoology Studies,2018:6:2484-2491.
18. Amrutha T, Ananya P, Rajeshkumar S. Preliminary Report on Butterfly Diversity in Kallar Horticulture Farm, Western Ghats, Tamil Nadu, India,2019:9(1):874-909.
19. Kumar UR, Rathod V. Pai KNJ, Shastri N. Study of butterfly diversity in college of forestry campus, Sirsi, Uttara Kannada. Journal of Plant Ecology,2019:4(4):259-267.
20. Dabhadkar S, Prajapati R. A Study of Butterfly Species Diversity in MN College Campus, Visnagar, Mehsana District, Gujarat, India. International Journal of Research in Engineering, Science and Management,2020:3(12):98-104.
21. Dev MR, Raut KR, Mukadam MD. A report on butterfly diversity of Gogate Jogalekar college campus Ratnagiri, Maharashtra, 2020.