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DIVERSITY OF HYMENOPTERA AT AGRI BIODIVERSITY PARK, HYDERABAD

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ABSTRACT

The diversity and abundance of Hymenoptera at the Agri-biodiversity Park of Professor Jayashankar Telangana State Agricultural University, Hyderabad was studied from September 2019 to January 2020. Five collection methods (pitfall trap, yellow pan trap, manual collection, light trap and yellow sticky trap) were used and 6,773 individuals under 26 families were collected. The most abundant family was *Formicidae* (29.29%) followed by *Platygastridae* (8.15%) and *Braconidae* (7.59%). Yellow pan trap recorded the maximum number of individuals (2,734) as well as the maximum number of families (25). The Shannon-Weiner diversity Index, Margalef's species richness index and Pielou's evenness index of the study area were 2.628, 2.834 and 0.807, respectively.

Key words: Hymenoptera, Shannon-Weiner diversity, Margalef's species richness, Pielou's evenness, abundance, insect collection methods, Formicidae, Platygastridae, Braconidae, yellow pan trap

The order Hymenoptera, consisting of ants, bees, wasps and sawflies, is one of the most diverse groups among insects. Except a very few phytophagous members which may cause damage to crop plants, it includes efficient pollinators, parasitoids and predators of other crop pests and is considered as the most beneficial insect order. There are about 1, 20,000 species known worldwide and the Indian fauna is represented by about 10,000 species (8.33% of world fauna) under 65 families (Alfred et al., 1998). Professor Jayashankar Telangana State Agricultural University (PJTSAU), Rajendranagar, Hyderabad, is the first Agricultural University in India to initiate the establishment of Agri-biodiversity Park (ABP) in August 2008, in 60 ha area covered with jungle, scrub, hillocks, boulders, undulated rocky terrain with sloppy lands and diverse vegetation, such as herbs, shrubs, creepers, trees and grass species, and half of it is occupied by a pond (Khan and Krishna, 2017). The existing flora of this habitat includes tree species like *Tectona grandis*, *Butea monosperma, Syzygium cumini*, *Ficus* spp., *Pongamia pinnata, Madhuca longifolia*, *Albizia lebbeck*, *Senna/Cassia* spp., *Dalbergia sissoo*, *Vachellia nilotica*, *Tamarindus indica*, *Annona reticulata*, *Azadirachta indica* and *Prosopis juliflora* besides a diverse species of shrubs, herbs and grasses. There was no earlier documentation of the Hymenopteran fauna from this habitat, hence keeping in view the ecological importance of this order the present investigation was taken up.

The sampling of hymenopterans was carried out from September 2019 to January 2020 at the Agri-biodiversity Park of PJTSAU, Rajendranagar, Hyderabad, which is at 17°18' N, 78°24' E and 559 masl. The collection was carried out at weekly intervals using five different sampling methods: (i) pitfall traps (N=50), (ii) yellow pan traps (N=30), (iii) light traps (N=5), (iv) yellow sticky traps (N=30) and (v) manual collection. The traps (except light traps) were inspected after 24 hours of installation in weekly intervals and trapped insects were collected and preserved in containers with 70% alcohol. Manual collection was done every week by 3 hours (9 am-12 noon) of random active sweepings at different points covering the whole area with a sweep net. Light traps fitted with collecting bottles (containing 50% alcohol) were operated in evening hours (6 to 9 pm) to collect nocturnal insects. Hard bodied insects were dry preserved by pinning in insect boxes. Shannon-Wiener diversity index, Margalef's species richness index and Pielou's evenness index were computed by using the software, PAST (Paleontological Statistics Tool) version 3.25. The relative abundance (RA) of each hymenopteran family was also calculated by the formula, Relative abundance (%) = ni × 100/ N (where,

N: the total number of individuals in all families and ni: the number of individuals in Ith family).

A total of 6,773 number of hymenopteran individuals under 26 families were collected during the study period. The number of individuals collected in each family is represented in Table 1. The maximum number of hymenopteran individuals were trapped through yellow pan trap (2734) followed by pitfall trap (2078), light trap (898) and yellow sticky trap (766), while the minimum number of individuals were recorded in manual collection method (297). As far as the number of families is concerned, the maximum number of families were recorded by yellow pan trap (25 families) followed by light trap (16 families), manual collection (15 families), pitfall trap (13 families) and yellow sticky trap (6 families) (Fig. 1). This indicates that the yellow pan trap is an efficient method for trapping hymenopterans. Devigne and Biseau (2014) also found yellow pan traps as an effective method for sampling hymenopterans. Anbalagan et al. (2015) conducted a similar survey in North-eastern district of Tamil Nadu and collected a total of 4,994 individuals under 37 families of hymenopterans. Thakkar and Parikh (2018) reported 20 families of hymenopterans from a study in Gujarat. Bishnoi and Dang (2019) recorded 5 families of non-parasitic hymenopterans from Kota, Rajasthan. Aland et al., (2010) recorded 17 families of hymenopterans from Kolhapur district of Maharashtra. Taye et al. (2017) reported 6 families of larval parasitoids, 5 families of predators and 5 families of egg parasitoids of the order Hymenoptera from Assam

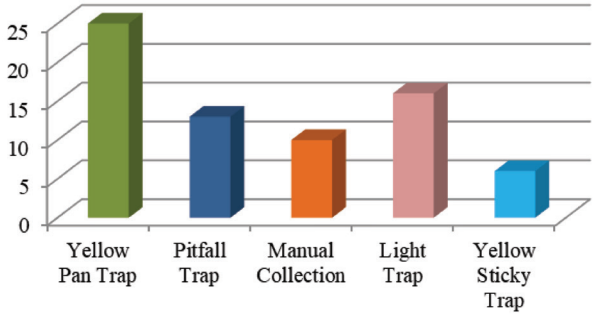

Fig. 1. Number of hymenopteran families recorded in different collection methods

Table 1. Methods of collection of hymenoptera and relative abundance of families

S. No.	Families	Methods of collection	No. of individuals	Relative abundance (%)
1	Agaonidae	LT	13	0.19
2	Apidae	YPT, PT, MC, LT	318	4.70
3	Braconidae	YPT, PT, LT, YST	514	7.59
4	Chalcididae	YPT, PT, LT, YST	225	3.32
5	Chrysididae	YPT, MC	45	0.66
6	Crabronidae	YPT	129	1.90
7	Diapriidae	YPT, PT, LT, YST	425	6.27
8	Encyrtidae	YPT, LT	82	1.21
9	Eulophidae	YPT, LT	196	2.89
10	Eupelmidae	YPT, LT	64	0.94
11	Eurytomidae	YPT, LT	109	1.61
12	Evaniidae	YPT, PT, YST	189	2.79
13	Figitidae	YPT	4	0.06
14	Formicidae	YPT, PT, MC, LT, YST	1984	29.29
15	Ichneumonidae	YPT, PT, MC, LT, YST	424	6.26
16	Megachilidae	YPT, MC	64	0.94
17	Mutillidae	YPT, PT, MC	201	2.97
18	Mymaridae	YPT, PT, LT	90	1.33
19	Platygastridae	YPT, PT, LT	552	8.15
20	Pompilidae	YPT, PT, MC	485	7.16
21	Scoliidae	YPT, MC	90	1.33
22	Sphecidae	YPT, PT, MC, LT	186	2.75
23	Tiphiidae	YPT	16	0.24
24	Torymidae	YPT, PT, LT	202	2.98
25	Trichogrammatidae	YPT, LT	34	0.50
26	Vespidae	YPT, MC	132	1.95
	Total		6739	

(LT- Light Trap; MC- Manual Collection method; PT- Pitfall Trap; YPT- Yellow Pan Trap; YST- Yellow Sticky Trap)

Agricultural University Campus, Jorhat. Harinath et al. (2014) reported 6 species of bees, 4 species of ants and one wasp species from Lankamalleswara reserve forest in the Eastern Ghats of Southern Andhra Pradesh.

Among the 26 recorded families of Hymenoptera, highest abundance was recorded for the family Formicidae (RA = 29.29%) followed by Platygastridae (RA = 8.15%) and Braconidae (RA = 7.59%). Families like Figitidae, Agaonidae and Tiphiidae were least abundant with RA of 0.06%, 0.19% and 0.24%, respectively (Fig. 3). Families like Formicidae, Platygastridae, Braconidae, Pompilidae, Diapriidae and Ichneumonidae were highly abundant (RA > 5%). Families like Apidae, Chalcididae, Torymidae, Mutillidae, Eulophidae, Evaniidae, Sphecidae, Vespidae, Crabronidae, Eurytomidae, Mymaridae, Scoliidae and Encyrtidae were moderately abundant (RA = 1-5%), while families like Megachilidae, Eupelmidae, Chrysididae, Trichogrammatidae, Tiphiidae, Agaonidae and Figitidae were less abundant (RA < 1%). The present results are in match with the findings of Aland et al. (2010) and Thakkar and Parikh (2018) who also reported Formicidae as the most abundant family among hymenopterans. The Shannon-Weiner diversity, Margalef's species richness and Pielou's evenness indices for the hymenopteran fauna of the study area were 2.628, 2.834 and 0.807, respectively, indicating their good diversity and richness in the study area.

The hymenopterans collected in the present study include 13 parasitoid wasp families (Platygastridae, Braconidae, Diapriidae, Ichneumonidae, Chalcididae, Torymidae, Eulophidae, Evaniidae, Eurytomidae, Mymaridae, Encyrtidae, Eupelmidae, Trichogrammatidae). Besides this, family Scoliidae and Tiphiidae are known to be parasitic on larvae of scarab beetles. Family Chrysididae and Mutillidae are parasites on other social hymenoptearns. Among the parasitic families, Platygastridae and Braconidae were most abundant. The predatory families recorded are: Vespidae, Sphecidae, Crabronidae and Pompilidae. Ants (family Formicidae) are important soil tillers and also have some members which are predators and scavengers. The important pollinator families recorded are: Apidae and Megachilidae. All other wasp families and parasitod families are also flower visitors in their adult stage and aid in pollination. Family Agaonidae, commonly called fig wasps, are also important pollinators of fig plants. Some members of the parasitic families: Eulophidae and Eurytomidae are also known to have phytophagous larval stages but are not much notorious. So, all the families recorded from the study area are either pollinators, parasitoids, predators, or soil tillers and are thus playing an important role in balancing the ecosystem. The present study provides preliminary information on the hymenopteran fauna of the study area. Such conserved areas without much human interference and free from pesticides should be encouraged which will provide a suitable habitat for breeding of these beneficial arthropods and will also be helpful to take up biodiversity and conservation studies.

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