Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 5 [2] January 2016: 28-33

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804

ORIGINAL ARTICLE **OPEN ACCESS**

Comparison of Ant (Hymenoptera: Formicidae) Diversity in Different Habitats of Machad Region of Thrissur

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ABSTRACT
We studied the Formicidae diversity of Machad region of Thrissur. Five different habitats paddy, banana, rubber, coconut, vegetables garden (pea, ladies finger and brinjal) were selected. 25 species of Formicidae belonging to four subfamilies (Formicinae, Myrmicinae and Ponerinae) were collected. The distribution of species in the different subfamilies showed a dominance of Formicinae with 4 genus (15 species) followed by Myrmicinae with 5 genera (6 species), Ponerinae with 2 genera (3 species) and Pseudomyrmecinae with least species (1 species). The genus Camponotus (Mayr) was the most abundant genera with 12 species. Findings of this preliminary study indicated that much more detailed study should be conducted to investigate the diversity of ants of Macha region of Thrissur.
Keywords: *Formicidae, Diversity, Camponotus, Dominance.*

Received 14.11.2015 Revised 21.12.2015 Accepted 27.12. 2015

INTRODUCTION

Ants are one of the most diverse group of insects with approximately 13,152 species [1]. They thrive in most ecosystems, and may form 15-25% of the terrestrial animal biomass [2]. Ants are important components of ecosystems not only because they constitute a great part of the animal biomass but also because they act as ecosystem engineers. Ant biodiversity is incredibly high and these organisms are highly responsive to human impact, which obviously reduces its richness. Most species of ants are omnivorous and they have very broad feeding habits. The greatest usefulness of ants lies in their power to hasten the decomposition of organic substances. In many part of the earth the ants are regarded as useful allies in destroying the insect pests of plantations. Ants occupy a unique position among all insects on account on their dominance. This can be seen in their higher degree of variability as exhibited in the great number of the species and varieties.

The first estimate of ant species richness and diversity of Indian forest provides the details of ant species diversity in some selected localities of Western Ghats in Southern India [3]. Fourteen species of ants were recorded Alagar hills Madurai, Tamilnadu [4]. A comparative study on the arboreal ant species richness in primary forest, secondary forest and pasture habitat of a tropical montane landscape records 21 species [5]. The relationships between biodiversity and predation, links between agriculture and conservation, patterns and mechanisms for ant diversity loss with agricultural intensification, importance of ants as control agents of pests and fungal diseases, and whether ant diversity may influence the functional role of ants as predators are addressed [6]. Abiotic factors such as litter temperature, humidity, litter depth, rainfall and slope of the terrain were found to influence abundance and elevational distribution of litter ants [7]. The loss of some ant species from small habitat fragment may have widespread effect in ecosystems because of their functional role as keystone mutualists [8].

The objective of this study was to provide the habitat of the species including plant association if any, to study the diversity of ants in Machad and to understand the role of ant diversity in soil functioning.

MATERIALS AND METHODS

The study was conducted in Machad, which is situated in Thrissur the Kerala state. (Latitude 10° 37' 42.9708", longitude 76° 14' 47.6226"). Ants were collected from the five different habitat between October 2014 to June 2015.

Sampling was carried out in five different ecosystems i.e, paddy, banana, rubber, coconut, vegetables garden (pea, ladies finger and brinjal). Different collection techniques i.e., all-out search method, hand collection, brush method, Baiting (oil baiting), pit fall trap, sweep netting was used to collect ants.
Genus level identification was carried out using the keys of [9]. A detailed taxonomic study was carried out based on the various keys [9, 10]. Species identification was carried out under Leica S8APO Stereo zoom microscope and with the help of the keys of Bingham [11] and other relevant literature.
Multi-focused montage images were produced using Leica S8APO Stereo microscope. Field photography was done using canon. Finally for both montage and non-montage images, unnecessary parts (unfocused appendage), surrounding or covering target objects were erased and cleaned up. The backgrounds, colour balance, contrast and sharpness were adjusted using Adobe photoshop CS3.

OBSERVATION AND RESULTS

The study focused on the diversity of Formicidae in different habitats of Machad region. Six different sites (Banana, Rubber, Brinjal, Pea, Ladies finger and Coconut) were selected. During the present study a total of a total of 25 species of Formicidae belonging to four subfamilies (Formicinae, Myrmicinae and Ponerinae) were collected from six different sites of Machad (They were provided in table 1).
Numbers of species collected from each garden were represented in Table 1. The detailed representations of the species were listed in Table: 2. Separate collection list of species from each sites were listed (Table 3-8).

Table 1: Number of species collected from selected sites

Sites	Number of subfamily	Number of Genus	Number of Species
Banana	3	8	9
Rubber	4	5	10
Brinjal	2	3	3
Pea	2	4	5
Ladies finger	2	2	2
Coconut	3	8	14

Table: 2 List of identified species

SL.No	Subfamily	Species
1	Formicinae	*Camponotus augusticollis* (Jerdon)
2	Formicinae	*Camponotus compressus*(Fabricius)
3	Formicinae	*Camponotus mendax* (Forel)
4	Formicinae	*Camponotus mitis* (Smith)
5	Formicinae	*Camponotus parius* (Emery)
6	Formicinae	*Camponotus variegatus somnificus* (Forel)
7	Formicinae	*Camponotus* sp.1
8	Formicinae	*Camponotus* sp.2
9	Formicinae	*Camponotus* sp.3
10	Formicinae	*Camponotus* sp.4
11	Formicinae	*Camponotus* sp.5
12	Formicinae	*Camponotus* sp.6
13	Formicinae	*Anoplolepis gracilipes* (Smith)
14	Formicinae	*Oecophylla smaragdina* (Fabricius)
15	Formicinae	*Paratrechina longicornis* Latreille
16	Myrmicinae	*Pheidologeton diversus*(Jerdon)
17	Myrmicinae	*Pheidologeton affinis* (Jerdon)
18	Myrmicinae	*Pheidole sharpi* (Forel)
19	Myrmicinae	*Crematogaster* sp.
20	Myrmicinae	*Myrmicaria brunnea* (Saunders)
21	Myrmicinae	*Solenopsis geminata* (Fabricius)
22	Pseudomyrmecinae	*Tetraponera allaborans* (Walker)
23	Ponerinae	*Odontomachus haematodus* (Linnaeus)
24	Ponerinae	*Diacamma ceylonese* (Emery)
25	Ponerinae	*Diacamma scalpratum*(Smith)

Table: 3 List of identified specimens from Banana		
SL.No	**Subfamily**	**Species**
1	Formicinae	*Camponotus mendax*(Forel)
2	Formicinae	*Camponotus augusticollis*(Jerdon)
3	Formicinae	*Anoplolepis gracilipes*(Smith)
4	Formicinae	*Oecophylla smaragdina* (Fabricius)
5	Formicinae	*Paratrechina longicornis*Latreille
6	Myrmicinae	*Solenopsis geminata* (Fabricius)
7	Myrmicinae	*Myrmicaria brunnea*(Saunders)
8	Myrmicinae	*Crematogaster* sp.
9	Ponerinae	*Odontomachus haematodus* (Linnaeus)

Table: 4 List of identified specimens from Rubber		
SL.No	**Subfamily**	**Species**
1	Formicinae	*Camponotus augusticollis*(Jerdon)
2	Formicinae	*Camponotus variegates somnificus*(Forel)
3	Formicinae	*Camponotus*sp.1
4	Formicinae	*Camponotus*sp.2
5	Formicinae	*Camponotus*sp.3
6	Formicinae	*Camponotus*sp.4
7	Myrmicinae	*Myrmicaria brunnea* (Saunders)
8	Pseudomyrmecinae	*Tetraponera allaborans*(Walker)
9	Ponerinae	*Odontomachus haematodus* (Linnaeus)
10	Ponerinae	*Diacamma ceylonese* (Emery)

Table: 5 List of identified specimens from Brinjal		
SL.No	**Subfamily**	**Species**
1	Myrmicinae	*Myrmicaria brunnea* (Saunders)
2	Formicinae	*Oecophylla smaragdina* (Fabricius)
3	Formicinae	*Camponotus* sp.1

Table: 6 List of identified specimens from Pea		
SL.No	**Subfamily**	**Species**
1	Formicinae	*Camponotus parius* (Emery)
2	Formicinae	*Camponotus compressus* (Fabricius)
3	Formicinae	*Anoplolepis gracilipes* (Smith)
4	Myrmicinae	*Myrmicaria brunnea* (Saunders)
5	Myrmicinae	*Pheidole sharpi*(Forel)

Table: 7 List of identified specimens from Ladies finger		
SL.No	**Subfamily**	**Species**
1	Myrmicinae	*Crematogaster* sp.
2	Formicinae	*Camponotus augusticollis* (Jerdon)

Table: 8 List of identified specimens from Coconut		
SL.No	**Subfamily**	**Species**
1	Formicinae	*Oecophylla smaragdina* (Fabricius)
2	Formicinae	*Camponotus parius* (Emery)
3	Formicinae	*Camponotus compressus* (Fabricius)
4	Formicinae	*Camponotus mendax* (Forel)
5	Formicinae	*Camponotus mitis* (Smith)
6	Formicinae	*Camponotus* sp.5
7	Formicinae	*Camponotus* sp.6
8	Formicinae	*Anoplolepis gracilipes* (Smith)
9	Formicinae	*Paratrechina longicornis* Latreille
10	Myrmicinae	*Pheidologeton diversus* (Jerdon)
11	Myrmicinae	*Pheidologeton affinis* (Jerdon)
12	Myrmicinae	*Pheidole sharpi* Forel
13	Myrmicinae	*Myrmicaria brunnea* (Saunders)
14	Ponerinae	*Diacamma scalpratum* (Smith)

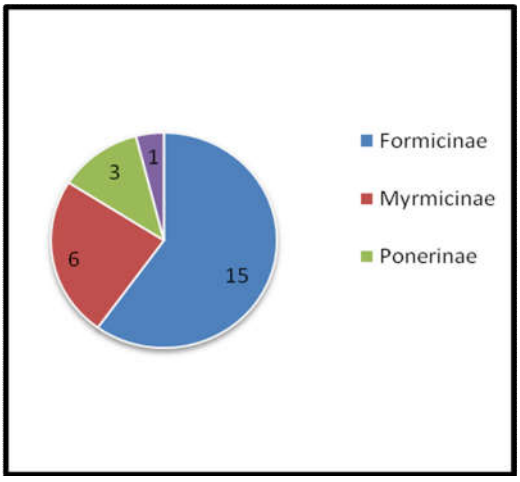
DISCUSSION

Ants play an important role within the terrestrial ecosystems because they have numerous interactions with different plant species, including seed dispersers, leaf- and seed- predators, and in some cases, as pollinators [11, 12]

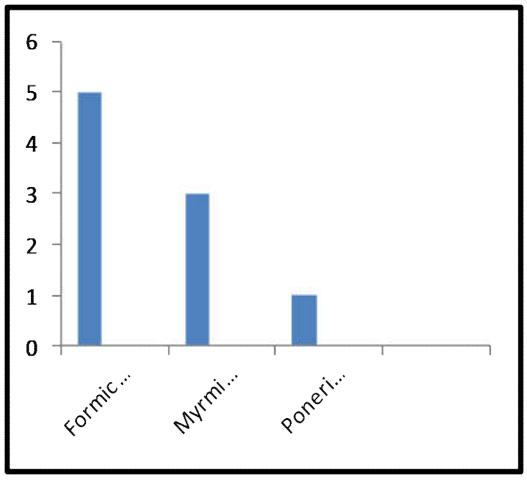
In the present study area total 25 ant species with 12 genera from four subfamilies were reported (Graph: 1). The distribution of species in the different subfamilies showed a dominance of Formicinae with 4 genus (15 species- *Camponotus augusticollis* (Jerdon), *Camponotus compressus* (Fabricius), *Camponotus mendax* (Forel), *Camponotus mitis* (Smith), *Camponotus parius* (Emery), *Camponotus variegatus somnificus* (Forel), *Camponotus* sp.1, *Camponotus* sp.2, *Camponotus* sp.3, *Camponotus* sp.4, *Camponotus* sp.5, *Camponotus* sp.6, *Anoplolepis gracilipes* (Smith), *Oecophylla smaragdina* (Fabricius) and *Paratrechina longicornis* (Latreille) followed by Myrmicinae with 5 genera (6 species- *Pheidologeton diversus* (Jerdon), *Pheidologeton affinis* (Jerdon), *Pheidole sharpi* (Forel), *Crematogaster* sp., *Myrmicaria brunnea* (Saunders) and *Solenopsis geminata* (Fabricius)), Ponerinae with 2 genera (3 species- *Odontomachus haematodus* (Linnaeus), *Diacamma ceylonese* (Emery) and *Diacamma scalpratum* (Smith)) and Pseudomyrmecinae with least species (*Tetraponera allaborans* (Walker)). The genus *Camponotus* (Mayr) was the most abundant genera with 12 species. The genus *Pheidologeton* (Mayr) and *Diacamma* (Jerdon) occupies equal distribution.

Out of the different habitat/ plantation surveyed the coconut plantation was the most species diverse region (14 species, Graph: 7), followed by Rubber (10 species, Graph: 3), Banana (9 species, Graph: 2), Pea (5 species, Graph: 5), Brinjal (3 species, Graph: 4) and ladies Finger (2 species, Graph: 6). A comparison between the number of species present in each habitat is represented in Graph 8.

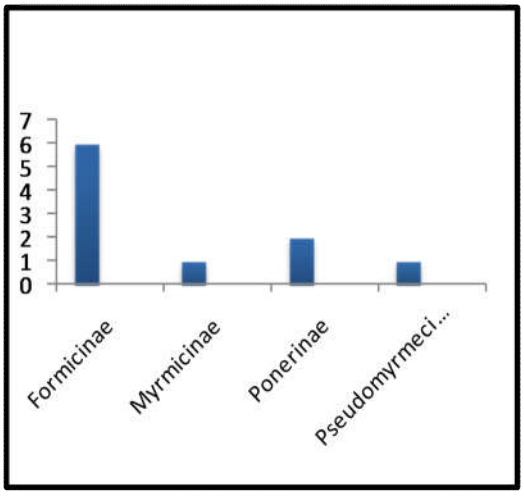
Graph: 1 Representation of Species in Each Subfamily of Family Formicidae



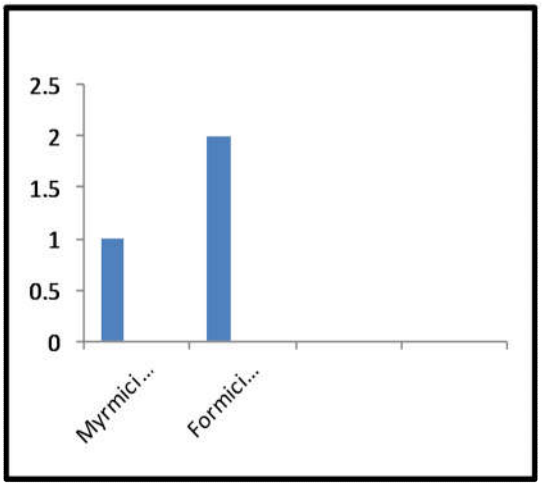
Graph 2 – Representation of Genus of Family Formicidae in Banana Plantation



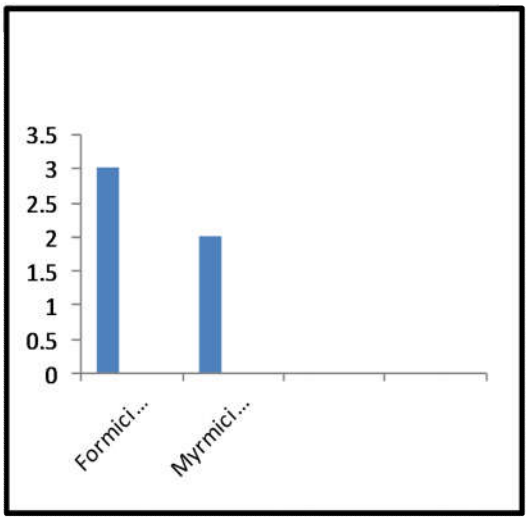
Graph 3 – Representation of Genus of Family Formicidae in Rubber Plantation



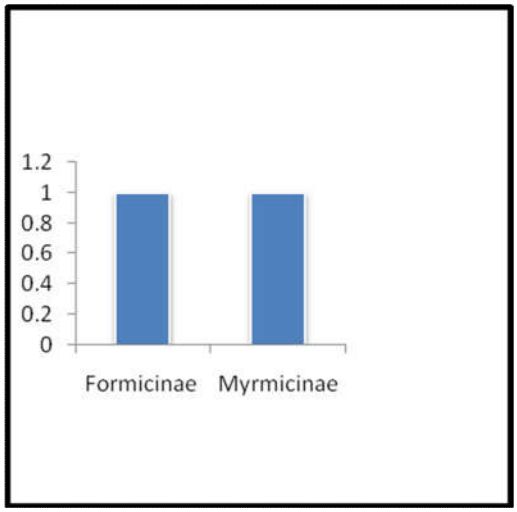
Graph 4 – Representation of Genus of Family Formicidae in Brinjal Garden



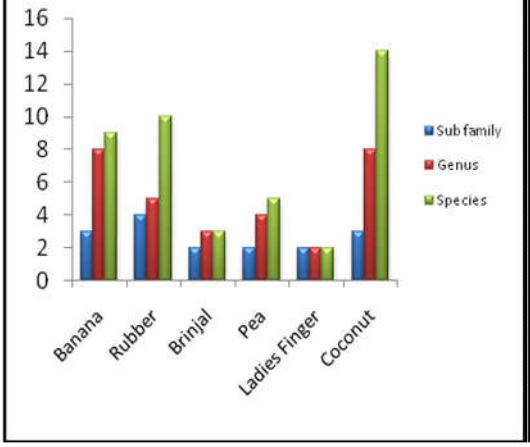
Graph 5 – Representation of Genus of Family Formicidae in Pea Garden



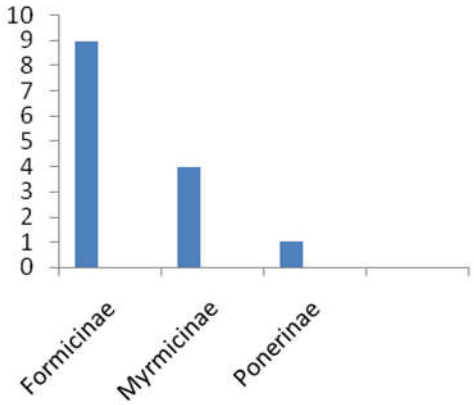
Graph 6 – Representation of Genus of Family Formicidae in Ladies Finger Garden



Graph 8 – Comparison of Diversity of Family Formicidae in Machad Region



Graph 7 – Representation of Genus of Family Formicidae in Coconut Plantation



CONCLUSION

Ants are important components of ecosystems; their biodiversity is incredibly high and these organisms are highly responsive to human impact, which obviously reduces its richness [14]. In ant communities, heterogeneity and resource availability have been reported as important processes to maintain species richness [15, 16]. Low diversity of ants was observed in annual crops.

Out of the six habitats studied, the genus *Camponotus* (Mayr) was the most diverse group in the. A total of 12 genus under three subfamilies were collected. Of the four subfamilies reported, Formicinae was the most diverse with 15 species; subfamily Myrmicinae with six species. The subfamily Pseudomyrmecinae was the lease diverse group. Three species were collected under the subfamily Ponerinae. From the present study it can be concluded that diversity of ants is different in these six habitats in terms of species diversity. The numbers of certain ant species in certain habitat were considerably increased because they get ideal conditions over their as nesting sites, food availability, open grounds for foraging etc. Detailed studies of disturbed habitats are needed according to extent species abundance, composition, physicochemical properties of soil, climatic factors, exotic flora and fauna.

ACKNOWLEDGEMENT

We wish to extend our gratitude to Dr. Sister. Jincy Maria, Principal, Vimala College Thrissur, Dr. Kezia Kuruvila, Head of the Department of Zoology, Vimala College, Thrissur and all other teachers of the Department of Zoology for their concern and encouragement.

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CITATION OF THIS ARTICLE

Nayana P, Presty J, Baaby Job & P. Lakshmi Devi M· Comparison of Ant (Hymenoptera: Formicidae) Diversity in Different Habitats of Machad Region of Thrissur. Bull. Env. Pharmacol. Life Sci., Vol 5 [2] January 2016: 28-33