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Research Article

ANTS-PLANTS DIVERSITY IN RBVRR WOMENS COLLEGE WITH SPECIAL REFERENCE TO HOST PLANT INTERACTIONS

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ABSTRACT

Ants form the important constituents of ecosystem and compose major part of the animal biomass. They live in different habitats, feed on variety foods. Ants involve in performing many important roles in ecosystems including harvesting seeds, predating and scavenging organisms. The present study records diversity and distribution of ant fauna, ants identification and types with special reference to host plant interactions. The first level of study conducted on plants for their phytochemical analysis and next on ants includes their genera identification in four different locations in the campus they are: Location I-Botanical Garden; Location II-UG. Quadrangle; Location III-P.G. Block; Location IV-College Hostel. Ants were collected during different seasons by hand collecting; using baits as attractants, ground litter sampling, and pitfall traps Upton (1991).In our experimental evaluation, we collected and stored ants in isopropanol and ethanol at four concentrations (70, 85, 95, and 100%) over three time periods (24 h, 1 month, 6 months). The ants were identified using a magnifying glass, dissecting microscope and an identification guide for Bornean Ants. Ants Web; The analysis of these sites showed the presence of Seven genera among which the prevalence varied. A total of seven ant genera include *Monomorium, Pheidole, Bothroponera, Tetraponera, Camponotus, Oceophylla, and Lepisiota* were identified, among them five genera were predominant from subfamilies *Formicinae* and *Myrenicinae.*

Keywords: Ants, Ecosystem, Diversity, Identification, Genera.

INTODUCTION

The natural history of ant-plant associations has attracted the attention of biologists around the world frown early two centuries. During this time it became evident that ants and plants can affect each other's lives in diverse and complex ways. Although the suggestion of mutuality interactions between ants and plants is present in the classic works of naturalists such as (Belt, 1874; Delpino, 1875), and (Trelease, 1881), at that time the supporting evidence was based mostly on detailed anatomical and/or behavioral observation rather than experimental demonstration. Ants are predominant components of tropical ecosystems (Holldobler, 1994). It is thus not surprising that their interactions with other organisms have strong impacts on nutrient fluxes and thus on food webs. They also process large amount of organic matter and thus have a noticeable impact on the structure of plant communities (Farjibrener & Ghermandi, 2008). Ants and plants may also interact mutualistically. Ant–plant interactions have a structuring role in tropical arboreal communities through their impact on populations of other arthropods and thereby on food webs (Davidson, 1997; McKee Ryan *et al.,*, 2005). The diverse feeding behavior of tropical arboreal ants predispose them to be protective mutualisms of plants: they prey on many arthropod enemies of plants, they are attracted by energy-rich, solid or liquid food rewards offered by plants and they often live in symbiosis with other organisms, such as hemipteran trophobionts or bacteria that help them adapt to the nutritional imbalances that dependence on plant-produced rewards often entails (Davidson, 1997; McKeeRyan *et al.*, 2005; Russell, 2009).

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In particular, diets of tropical arboreal ants are often characterized by high C:N ratios, reflecting caloric richness relative to paucity of nitrogen and mineral nutrients (Davidson, 1997; Davidson *et al*., 2003)While provision of food rewards to ants imposes costs to plants, these are often outweighed by the benefits they confer. Thus, opportunistic interactions between ants and plants are often mutualistic, and have repeatedly given rise to specialized symbiotic mutualisms between so called myrmecophytes (also called ant-plants), which provide symbiotic ants with nesting cavities (specialized hollow structures, called domatia) in addition to food rewards, and specialist 'plant-ants' (Davidson *et al.,* 2003; McKeeRyan *et al.,* 2005)**.**

MATERIALS AND METHODS

Four locations were selected for the diversity of Ants with Plant Species of R.B.V.R.R.W.C.

a. Location I-Botanical Garden
b. Location II- Quadrangle
c. Location III-P. G.Block
d. Location IV-Hostel

At Location I-Botanical Garden, total 19 plants were selected for the host plant interactions those are: 1. *Quisqualisindica,* 2. *Dracenafragrans,* 3. *Manilkara zapota,* 4. *Artabotyrs hexapetalus,* 5. *Jatropa rosea,* 6. *Magnolia champaka*, 7. *Tradescantia spathacea,* 8. *Hamelia patens,* 9. *Hibiscus rosasinensis,* 10. *Terminalia catappa,* 11. *Crossandra infundibuliformes*, 12. *Piper longum,* 13. *Punica grantum* 14. *Ellataria cardamom,* 15. *Costusigneus,* 16. *Psidiumguajana,* 17. *Musa paradiscica,* 18. *Allamandacathartica,* 19. *Mirabulusjalapa.*

At **Location II- Quadrangle, total 12 plants were selected for the host plant interactions those are:** 1. *Techomastans,* 2. *Ixora coccinia,* 3. *Ixorapudica,* 4. *Canna indica,* 5. *Neeriumindica,* 6. *Acalyphaindica,* 7. *Mirabulus jalapa,* 8. *Lycoris radiate,* 9. *Dracenafragrans,* 10. *Durantaerecta,* 11. *Jacomentia blue,* 12. *Hibiscus rosasinensis.*

At Location III-P.G. Block, total 9 plants were selected for the host plant interactions those are: 1. *Psidiumguajana,* 2. *Annona squamosa,* 3. *Punicagrantum,* 4. *Dracenafragrans,* 5. *Tradescantias-pathacea* 6. *Hibiscus rosasinensis,* 7. *Manilkarazapota,* 8. *Neeriumindica,* 9. *Durantaerecta.*

At Location IV-Hostel, total 10 plants were selected for the host plant interactions those are: 1. *Durantaerecta,* 2. *Acalyphaindica,* 3. *Annonasquamosal,* 4. *Punicagrantum,* 5. *Dracena-fragrans* 6. *Tradescantias-pathacea,* 7. *Neerium indica,* 8. *Balsaminaceae,* 9. *Barleriacristata,* 10. *Lycoris radiate.*

Extract Preparation: 10 gm of leaf powder was taken and added 50ml of ethyl alcohol stirred it constantly for 30 minutes and the solution was kept in room temperature for 24 hrs and then filtered with muslin cloth to remove fine particles. The filtered solution is again filtered with Whitman filter paper No.3 and then stored at 4ºC in a freezer for further use.

Preparation of solutions

Fehling's solution: Take a beaker and add equal mixture of equal volume of copper sulphate, sodium potassium tartarate and sodium hydroxide.

Wagner's Reagent: Add 2 gm of Iodine and 6 gm of potassium iodide and mix well in 100 ml of water.

Chemicals such as Wagner's reagent, Chloroform, 2% H_2SO_4, concentrated Sulphuric acid, 10 % lead acetate, Benedicts reagent, 0.1 % ferric chloride, Fehlings solution, dilute NaOH, 2 % HCL, 10% ammonia,10% HCL, distilled water, Ethyl alcohol are provided by the management of the college.

Phytochemical screening

Chemical tests are carried out on the ethyl alcohol crude extract of *Lawsonia* plant using standard procedure to identify the constituents.

Alkaloids: To identify the presence of alkaloids, 2 ml of extract and 2 ml of Wagner's reagent is added. Brownish precipitate indicates the presence of alkaloids.

Cardiac glycosides: To know the presence of cardiac glycosides, 2 ml of extract is dissolved with 2ml of chloroform following by adding concentrated Sulphuric acid carefully to form a layer. Deep reddish brown colour at the interface of steroid ring indicates the presence of cardiac glycosides.

Flavonoids: To indicate the presence of flavonoids, 2ml extract is treated with 2 ml of 10% lead acetate. Yellowish green colour indicates the presence of flavonoids.

Saponins: To test the presence of saponins, 2ml of extract is dissolved with 2 ml of benedicts reagent. Blue black ppt indicates the presence of saponins.

Tannins: To identify the presence of tanins, 2 ml of extract with 0.1% ferric chloride. Brownish green indicates the presence of tanins.

Terpenoids (Salkowski test): To know the presence of terpenoids, 2 ml of extract is dissolved with 2ml of chloroform and concentrated sulphuric acid carefully to form a layer. A reddish brown colour indicates the presence of terpenoids.

Anthraquinones: 1ml of extract is boiled with 10% HCL for few minutes in a water bath. It is filtered and allowed to cool. Equal volume of $CHCL_3$ is added to the filtrate few drops of 10% Ammonia is added to the mixture and heat. Formation of rose pink colour indicates the presence of anthraquinones.

Reducing sugars: The extract was shaken with distilled water and filtered. The filtrate was boiled with Fehlings solution A and B for few minutes an orange red ppt indicates the presence of reducing sugars.

Glycosides: To test the presence of glycosides, the extract was hydrolysed with HCL solution and neutralized with NAOH solution. A few drops of Fehlings solution A and B are added, red ppt indicates the presence ogglycosides.

Phlobatanins: To identify the presence of phlobatanins, the extract is dissolved in distilled water and filtered. The filterate is boiled with 2% HCL solution. Red ppt shows the presence of Phlobatanins

Collection of Ants

In order to sample ants from four locations in the college campus we used various methods for Sample collection and identification. We used both direct sampling and baiting of ants. Direct sampling allowed estimation of the number of ant species per unit area. Direct sampling in each stratum (leaf litter, soil, and tree) lasted 10-15 min. Leaf litter was separated into coarse and fine litter and ants were taken from the fine litter in the tray. For the soil strata, ants were collected directly from the ground with forceps. Sampling on trees was combined with baiting, using sugar bait to attract the ants (Bestelmeyer, 2000). Sugar water were put in a plastic plate with a diameter of 20 cm with 4 bait containers with a diameter of 2 cm. Sugar water was absorbed into a foam that was placed in the container. Baits were installed for one hour. Ant sampling was done during morning times during sunny weather in different seasons. All specimens were stored in 70% ethanol and were identified to generic level by using magnifying glass, a dissecting microscope and an identification guide for Bornean Ants (Hashimoto *et al.*, 2005).

RESULTS

All the plants contain Anthraquinones, Flavanoids, Alkaloids, Terpenoids, Saponins, Caediac glycosides, Glycosides, Reducing sugars which attract the ants more.

Ant diversity in the campus with special reference to host plant interactions of R.B.V.R.R. Women's College, Hyderabad has been analyzed in this study. During this study a total of 7 genera sampled specimens were captured and were recorded in the study area (Table 1). Few ant genera as *Camponotus* and *Lepisiota* of *Formicinae, Monomorium* of *Myrmecinae* are mostly found everywhere. Some genera such as *Oecophylla* of *Myrmecinae* abundance are average, Tetraponera *of Psudo Myrmecinae, Bothroponera* of *Ponerinae* are less prevalent (rare).

Figures 1 and 2 shows the detailed distribution of diversity of ants. To date, no research has been conducted on the diversity of ants.

Table 1. Range of ants abundance in the four locations of the campus.

Identified Genera in the Campus	Range of Ants Abundance			
	Location1 Botanical Garden	Location2 U.G.Quadrangle	Locations3 P.G. Block	Location4 College Hostel
Camponotus	*H	*H	*H	*H
Lepisiota	*H	*H	*H	*H
Oecophylla	*H	M	M	M
Pheidole	M	*H	L	L
Monomorium	*H	*H	*H	*H
Tetraponera	M	L	L	L
Bothroponera	L	L	L	L

*H-High Range; M-Medium Range; L-Low Range.

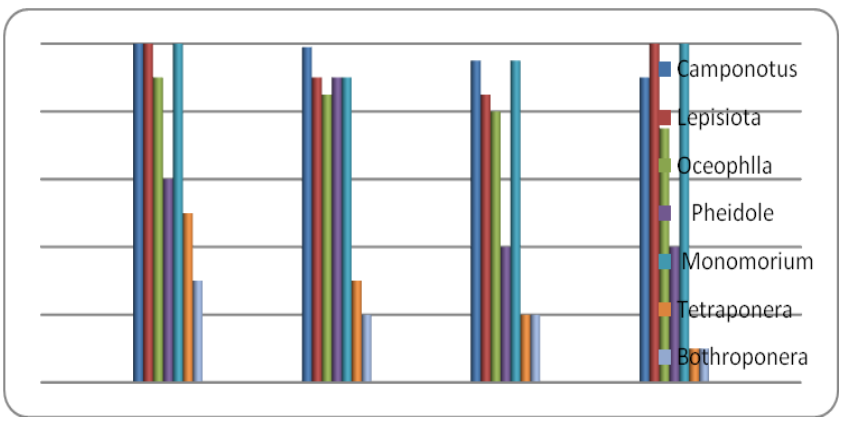

Figure 1. Diversity of ants representing genera with subfamily.

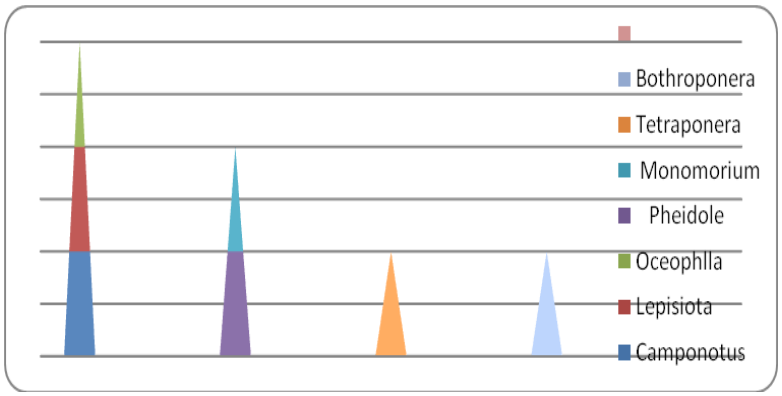

Figure 2. The ants diversity representing the genera in four locations.

DISCUSSION

R.B.V.R.R. Women's college campus is about 60 years old the campus area has undergone several modifications in the form of floral cultivations extension of permanent structures, which has become more rapid in the past few years. Campus is located near the edge busy road with high rate of vehicular traffic this imminently has increased air pollution around compared to years past, also noise of vehicles and vibration of the vehicular movement has raised to a disturbing level. On the campus gardening has been done each year as a regular process leading to digging, change of soil, replacement of soil, additional manuring, burning of litter, change of plants and grass that has resulted change of topological profile of ant 's ecosystem in this campus.

It seems none of the factors related to air or soil pollution has affected existence of the ants and their abundance in the campus as these could be collected. A total of 4 subfamilies and 7 genera were collected and identified. The Formicinae were the most abundant in the study area. The genus *Camponotus* of subclass *Formecinae* was frequently occurs everywhere. The *Camponotus* had the greatest individual numbers. These ants are called as carpenter ants because of their "Nesting behaviours" (Gupta *et al.*, 2011). *Monomorium* of subclass *Myrmecinae* and *Lepisiota* of *Formicinae* is also found everywhere. Ponerinae subfamily was more specific about its niche and food habits (Ramachandra & Bharath, 2012) Only one genus *Tetraponera* representing Pseudomyrmicinae has been recorded. *Bothroponera* is also specific.

Ants exhibit a greater resistance to pollutants in comparison to other invertebrates (Le Masne *et al.*, 1972; Mahalakshmi & Channaveerappa, 2016) even to industrial pollutants (Patel *et al.*,, 2016) . With all the atrocities on the habitat of ants in college campus these have showed continued existence and have persisted through the years and generations. The average diversity of the ants documented during this study may be because of adequate nesting sites and availability of food as well foraging. The average diversity of ants in this area is showed that this area is good habitat for ants.

CONCLUSION

The present investigation on diversity of ants with special reference to host plant interactions in the R.B.V.R.R. Women's College Campus, Hyderabad clearly shows the richness of ants' fauna in the city. We have recorded 7 genera of ants belonging to 4 subfamilies. The present study will yield valuable information of ant availability in the region. Finally, with the tremendous efforts to understand ant biology over the past decades, ant species are expected to be discovered.

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