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An Over View of Symbiotic Relationship between *Myrmecophytes & Pseudomyrmex Ferrugineus*

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Summary

*Pseudomyrmex*sp-*Myrmecophytes* symbioses involve plants that provide hollow structures specialized for housing antsand often food to ants. In return, the inhabiting ants protect plants against herbivores and sometimes provide them with nutrients. Food and protection are the most important 'currencies 'exchanged between partners and them drive the nature and evolution of the relationships.

Introduction

*Pseudomyrmex*and *Myrmecophytes* have a long evolutionary relationship. The oldest unambiguously identified fossil of ants(Hymenoptera; Formicidae) dates to *c*. 100 million year ago. From the early to late Cretaceous era, plant communities also experienced dramatic changes: flowering plants (angiosperms) diversified and rapidly radiated, displacing ferns and gymnosperms as ecological dominants in most ecosystems. The diversification and rise to dominance of angiosperms probably triggered the diversification of ant, as it did that of many other groups of insects, such as beetles and sap-feeding hemipterans. The rise of angiosperms may have provided new niches for ants (*Pseudomyrmex sp*) through at least two processes: an increase in prey availability as a result of the increase in diversity and abundance of herbivorous insects; and a shift in diet in some ant lineages from the ancestral state of carnivory to a diet based largely on plant-derived resources.

Myrmecophytes are the plants that have a mutualistic relationship with ants. There are more than 100 species of *Myrmecophytes* are present in the world. The best known *Myrmecophytes* (Ant-Plant) is Acacia tree. Interactions between ants and plants provide numerous examples of mutualism ranging from opportunistic and facultative interactions,including protection against herbivores and seed dispersal (by ants attracted to seed-associated food bodies called elaiosomes; to obligate interactions (more intimate

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interactions) such as ant–plant symbioses. Ant gardens are aggregates of epiphytes assembled by ants.

***Myrmecophytes* traits on ant symbiosis:**

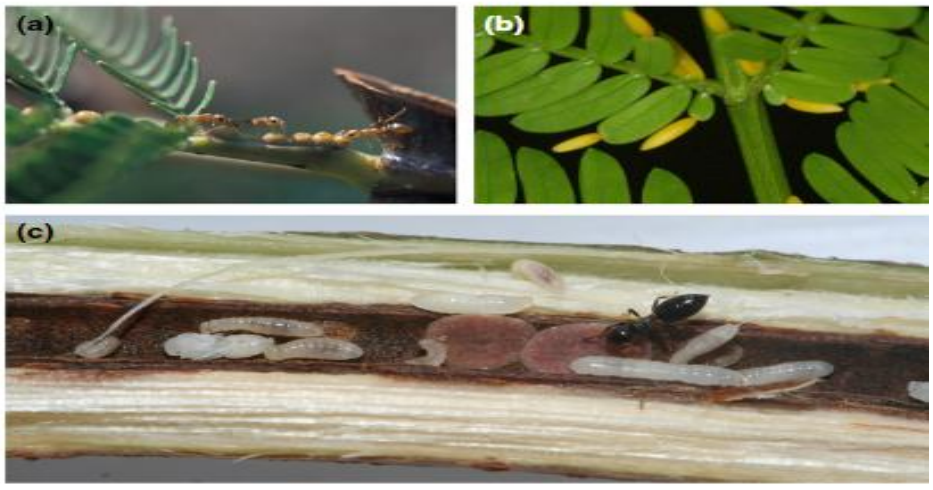
1) Food

The leaves of *Myrmecophytes* contain Extra floral nectarines (EPN) that are not involved in pollination. They are generally located on vegetative plant tissues and offer food rich in carbohydrates. The tips of the leaves contain sacs filled with valuable nutrients, which adult ants eat and feed to their larvae. Ants have become dependent on for survival.

Myrmecophytes has whitish bead-like Pearl bodies/food bodies (nutrient-rich food bodies). They are rich in lipids and proteins. It functions as ant food. A rough estimation suggests that 90 genera in 34 families of angiosperms have pearl bodies, a third of which have been confirmed to be harvested by ants. Many *myrmecophyte*-associated ants also tend hemipteran trophobionts that provide honeydew.

2) Shelter

Myrmecophytes have special structural adaptations, called domatia(hollow thorns, petioles, stems, rhizomes, or tubers, or modified leaves), that provide ants with shelter. Domatia is the enlarged thorns on *myrmecophyte* trees that ants excavate and use for shelter. Ants live inside of the thorns of trees. When *myrmecophyte* trees develop the thorns, the centers of the thorns are a soft green structure. The ants consume the soft centers and then live within the hollowed-out sections of the thorns, only coming out to feed on nectar from the leaves and protect the tree from other creatures.



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(a) Extrafloral nectaries on leaves of *Acacia collinsii*) feeding workers of *Pseudomyrmexsp*. (b) Tips of the leaflets of myrmecophytic Neotropical Acacia species, here *Acacia allenii*, are modified to nutritious food bodies (in Acacia named 'Beltian bodies') which are fed to the larvae. (c) The obligate plant-ant *Cladomyrma petalaeis* one of the numerous plant ant species that rear hemipterans for food within domatia of the host plant. Photos:MartinHeil(a), Veronika Mayer (b), Rumsaıs Blatrix (from material provided by UlrichMaschwitz) (c).

Pseudomyrmex sp traits on plant symbiosis

1) Protection

When herbivory attack the plants, the ants, 'in return', defend with their stinging behavior. The ants give off a chemical signal when plant-eaters approach that alerts the other ants to join in and attack. Without the ants, *Myrmecophytes* trees would get eaten by everything from grasshoppers to small rodents like mice. Ant also defend their host againstpathogensand encroaching vegetation and in several cases provide nitrogen, and probably other nutrients, to the plants by depositing debris in cavities that serve as waste chambers

*Pseudomyrmex*ant colony on *Myrmecophytes*

*Pseudomyrmex*feed on pest of *Myrmecophytes*

*Pseudomyrmex*ant colony on *Myrmecophytes*

Myrmecophytes ants also consume an w around the tree. It reduces the competition for resources, like water and sunlight, with other plants in the area.

References

Mayer, V.E., Frederickson, M.E., McKey, D. and Blatrix, R. (2014), Current issues in the evolutionary ecology of ant–plant symbioses. New Phytol, 202:749-746.