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Ant-mealybug interactions in pineapple cropping systems in Reunion Island

Introduction

In Reunion Island, pineapple cultivation is largely impacted by the **Wilt virus complex**, transmitted by mealybugs of the ***Dysmicoccus brevipes*** (Hemiptera) species. However, other species such as **ants** (Hymenoptera) are involved in this complex pathosystem. Ants usually **nurture** and **protect** the mealybugs from predators[1], while the latter provide **honeydew** to the ants.

→ Which ant species are present and tend on mealybugs in pineapple cropping systems in Reunion Island ?

→ How can sugar provisioning impact the mutualism between ants and mealybugs ?

Wilt symptoms

Ant & mealybug communities in pineapple cropping systems

Pineapple plants were collected from **10 plots** in the south of the island, for a total of **144 plants** sampled. The plants were dissected to count the **number of mealybugs** and **ants** per species.

Table 1: Occurrence and abundance of species collected on plants

Species	Occurrence (/144 plants)	Abundance (Total)
Dysmicoccus brevipes (Cockerell)	84	4976
Brachymyrmex cordemoyi* (Forel)	53	352
Solenopsis geminata* (Fabricius)	50	4643
Pheidole megacephala* (Fabricius)	24	601
Tetramorium bicarinatum (Nylander)	9	71
Tapinoma melanocephalum (Fabricius)	6	240
Hypoponera punctatissima (Roger)	4	5
Technomyrmex spp. (Mayr)	4	5
Nylanderia bourbonica (Forel)	4	237
Technomyrmex difficilis (Forel)	4	236
Paratrechina longicornis (Latreille)	3	22
Technomyrmex albipes (Fr. Smith)	3	3
Hypoponera eduardi (Forel)	3	7
Strumigenys rogeri (Emery)	1	2

*** Observation(s) of interactions with *D. brevipes***

We used a negative binomial generalized linear **mixed model** to analyse the effect of the 3 more frequent **ants abundances** on ***D. brevipes* abundance**. The plot effect was considered as a random effect.

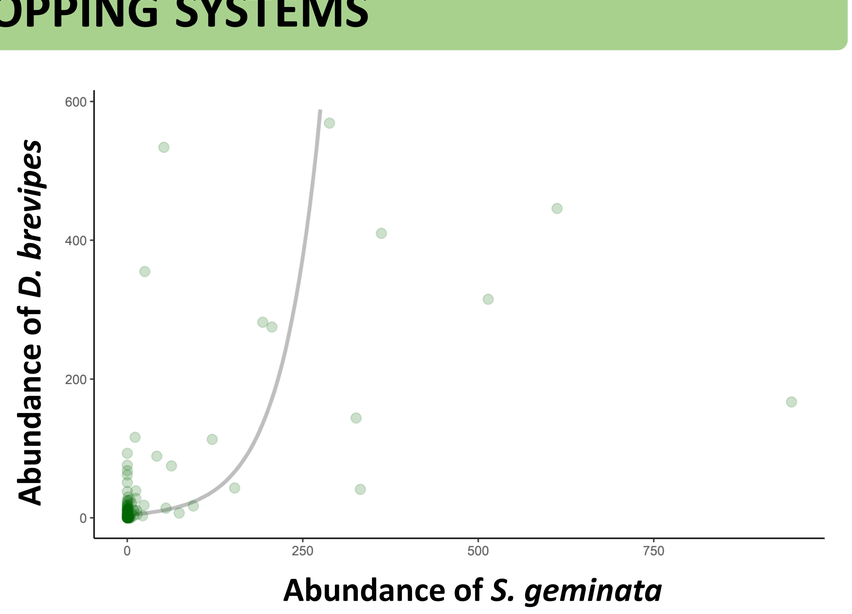
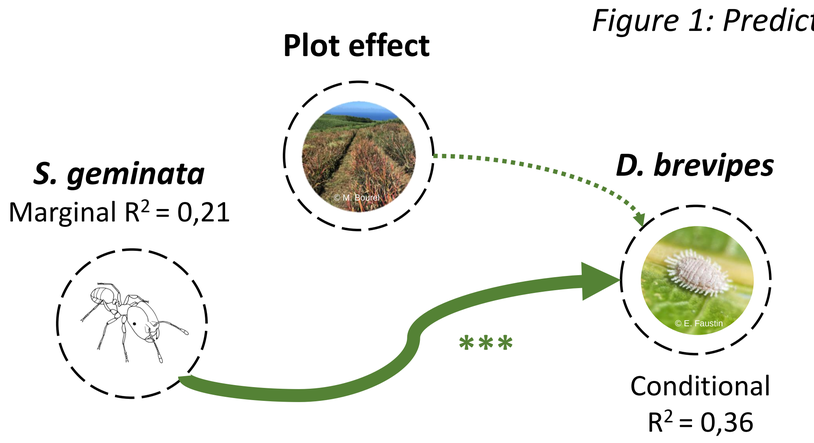


Figure 1: Prediction plot of the model



Only the abundance of ***S. geminata*** was **positively** correlated with the abundance **of *D. brevipes*** in our plants.

Ant dominance

We used an i**magery approach** to facilitate the detection of ant species and study their **dominance** on a honey bait.

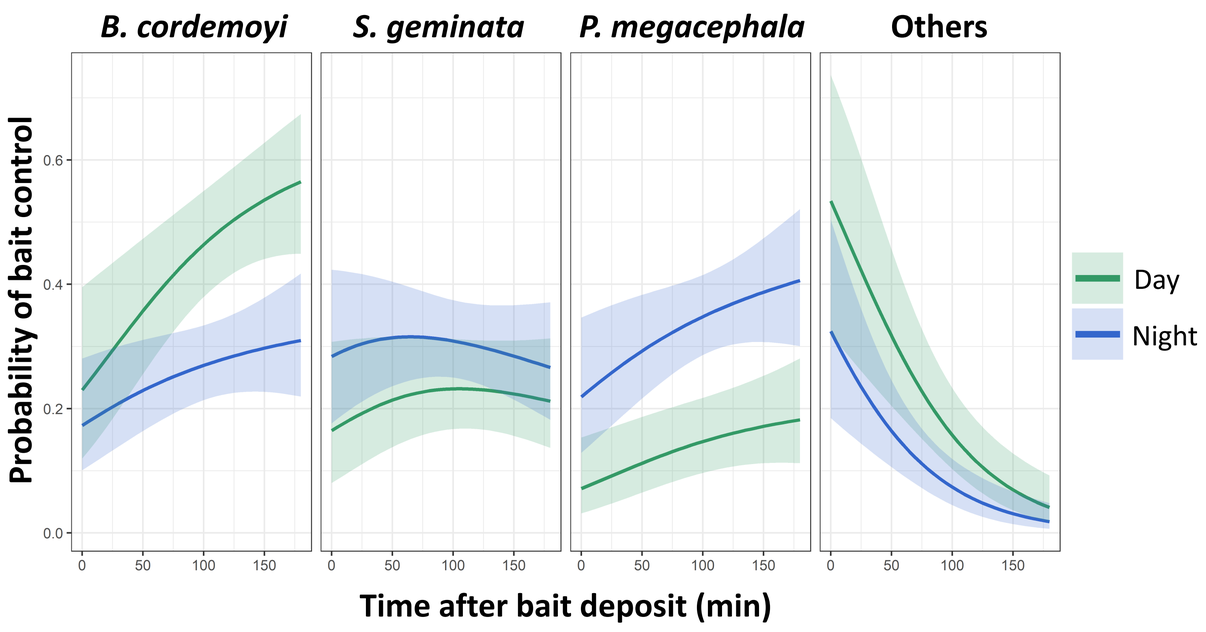


Figure 2: Probability of bait control after deposition of the bait

A **multinomial analysis** was performed in order to analyse the effect of (i) the **time** after deposition of the bait and (ii) the **Day/Night** effect on the relative **probability of control** of the bait. Both had **a significant influence** on the **probabilities of bait control.** The effects **differed** depending on the **species**.

Sugar provisioning

Colonies of ***P. megacephala*** and ***D. brevipes*** were captured and maintained in a climatic chamber (Temperature = 22°C, Relative Humidity = 64%). We tested the **effect** of adding a **sugary resource** on the **tending** of **mealybugs** by ants in terms of simple and prolonged contacts.

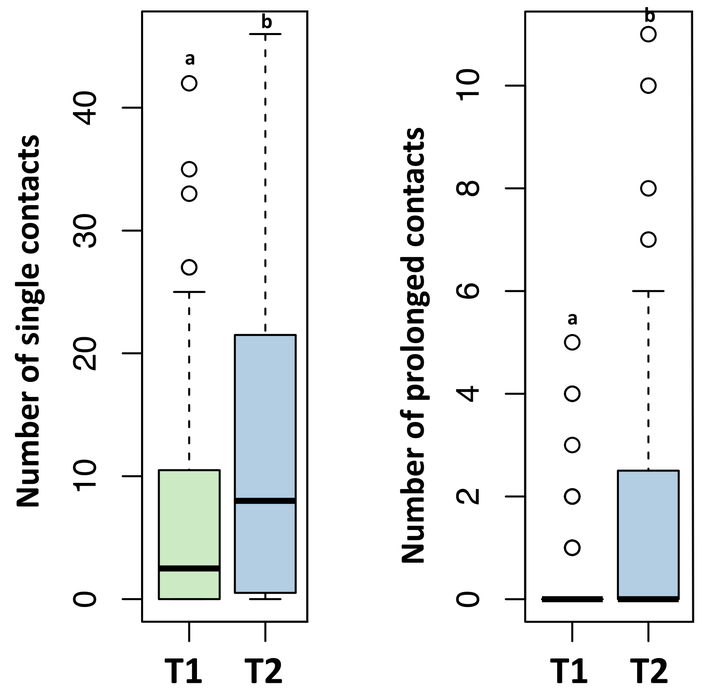


Figure 3: Effect of a sugary resource on ant tending

Ants **tended** mealybugs significantly **less** when provided with a **sugary resource**, in both simple and prolonged contacts.

Conclusion & Perspectives

In Reunion Island, **3 ant species** were found to be **dominant** and **involved** in the mutualism with mealybugs.

Sugar providing appears to be an effective lever for **reducing** the **attractiveness** of mealybugs to *P. megacephala*. Future studies, especially on ***S. geminata,*** need to be carried out to clarify the **long term** effects of this alternative resource on mealybug attendance in the lab and **in the field**.

S. geminata worker

[1]Offenberg, J. (2001). Balancing between mutualism and exploitation: The symbiotic interaction between Lasius ants and aphids. Behavioral Ecology and Sociobiology, 49(4), 304–310. https://doi.org/10.1007/s002650000303

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