THE EFFECTS OF *PSEUDOMYRMEX FLAVICORNIS* AND *P. SPINICOLA* MULLS ON THE AGGRESSIVE BEHAVIOR OF *P. FLAVICORNIS*

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Abstract. Acacia ants use chemical cues to recognize colony members and to stimulate aggressive responses. We hypothesized that changing the chemical signal carried by an intruding *Pseudomyrmex spinicola* on a tree occupied by *P. flavicornis* would change the *P. flavicornis* response. To test this hypothesis, we applied *P. flavicornis* and *P. spinicola* mulls to the intruding *P. spinicola* individuals. Our results were inconclusive, but the subject warrants further investigation.

INTRODUCTION

The relationship between acacia trees and *Pseudomyrmex* ants is a classic example of an animal-plant mutualism. The ants fiercely defend their trees against intruders. Previous studies confirm the use of alarm pheromones and their role in heightening acacia ant defense response (Balser et al. 1992, Broughton et al. 1994). Furthermore, chemical cues play a role in all aspects of intracolony ant communication (Wilson 1975). However, the specific chemical cues ants use to distinguish invaders have not been fully analyzed.

We examined the role of recognition chemicals in eliciting *P. flavicornis* (common black acacia ant) aggressive response. We hypothesized that treating *P. spinicola* (common red acacia ant) individuals with *P. flavicornis* mull would decrease the aggressive response of the *P. flavicornis* colony. This was based on the premise that the *P. flavicornis* mull would chemically disguise the *P. spinicola* individuals. In contrast, we hypothesized that *P. spinicola* individuals treated with conspecific mull would elicit an increased aggressive response from the *P. flavicornis* colony. This was based on the premise that the *P. spinicola* mull would enhance the chemical "name-tag" of the alien *P. spinicola* individuals.

METHODS

Our study took place on 8 January 1995 at Palo Verde National Wildlife Refuge, Costa Rica. The study site was located 100m from the bird observation tower of the OTS biological station. *P. flavicornis* and *P. spinicola* individuals were collected from nearby *Acacia cornigera*. Using a mortar and pestle, we ground individuals of each species in water to make two monospecific mulls.

We marked 18 *P. spinicola* with Liquid Paper TM. and subjected each marked ant to one of three treatments: (1) control - *P.spinicola* with no mull applied, (2) *P.spinicola* with a drop of conspecific mull, and (3) *P.spinicola* with a drop of *P.flavicornis* mull. We placed treated ants, one at a time from each of the three treatments, on a branch of an acacia occupied by *P. flavicornis* and watched for an encounter or an aggressive response. We defined an encounter as the touching of the two ants and an aggressive response as fighting behavior. After three minutes we terminated each trial and removed the *P.spinicola*. We repeated this entire experiment on six branches, two branches on each of three individual *A. cornigera*.

TABLE 1. *P. flavicornis* response to *P. spinicola* with the following treatments: 1) no mull, 2) *P. spinicola* mull, 3) *P. flavicornis* mull.

Treatment	Encounter	No Encounter	Aggressive Response	No Aggressive Response
No mull	1	3	1	3
P.spinicola mull	2	4	1	5
P.flavicornis mull	1	5	1	5

RESULTS

One of the four control individuals elicited both an encounter and an aggressive response (Table 1). Two of the control *P. spinocola* are not represented in the data because they fell off the tree during their respective trials. The host *P.flavicornis* encountered and attacked one of the *P.spinicola* with *P. spinicola* mull.

In a replicate of the same treatment, the *P.flavicornis* repeatedly contacted the *P.spinicola*, but did not respond aggressively. Finally, the host *P.flavicornis* both encountered and attacked one of the *P.spinicola* treated with *P. flavicornis* mull.

Aggressive interactions (when they occurred) typically began immediately after the encounter and continued to the end of the trial period. Most of the experimental *P.spinicola* moved little and remained unnoticed by the host *P.flavicornis*.

DISCUSSION

Because of difficulties with the manipulations, and of because of small sample sizes, we were unable to draw any firm conclusions about the effects of mulls on behavioral responses.

The low frequency of behavioral response in all treatments may have been due to the extreme wind and sun exposure of the three subject trees. Ants tended to remain inside the protective bullhorns under very sunny or very windy conditions. Additionally, more than three minutes may be required after introduction for aggressive responses in *P. flavicornis*.

Although we were unable to statistically analyze the data, we noted a tendency for a greater proportion of encounters in the *P.spinicola*-mull treatments and a smaller proportion of encounters in the *P. flavicornis*-mull treatments, when compared with the no-mull control (Table 1). These patterns were consistent with our hypothesis. Thus, we feel this topic warrants further research. Useful modifications would include: using a much larger sample size, conducting pilot tests to determine how much time should be allowed for a response, performing the experiments under less extreme weather conditions, preparing mulls with precise quantities of ants and water to control pheromonal concentrations, and using *P. flavicornis* ant treatments.

LITERATURE CITED

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