Behavioral Studies of the Southern and Tawny Mole Cricket

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Goals:

- Isolate and determine the activity of sex, aggregation and alarm pheromones of the tawny mole cricket.
- Improve our understanding of environmental conditions that affect tawny mole cricket and southern mole cricket behavior.
- Compare the activity of healty mole crickets to crickets infected with microbial control agents.

Tawny and southern mole crickets were collected in North Carolina and transported to the New York State Agricultural Experiment Station, Geneva, New York for laboratory analysis. It was noted that when disturbed, both mole cricket species discharged an oily, highly odorous substance from their abdomen. Discharges were collected for biological and chemical assays in our laboratory.

A small discharge sample from each cricket species was prepared for analysis through the use of gas chromatography (GC). Although there appeared to be basic similarities in the discharges from the two species, as indicated by overlapping peaks in parts of the GC detection strip charts, there were also clear differences in the tawny and southern mole crickets discharges (Figure 1a and 1b), indicating unique compound constituents in the discharges for these two species. We are currently working in concert with electro-antennogram analysis to determine which peaks are bioactive and therefore should be analyzed further.

The purpose of this procedure was to determine whether the volatiles emitted from the crude discharges of the tawny and southern mole crickets caused a neurological response from the ablated antenna of either mole cricket species. The antenna of either cricket was attached through a saline-electrode system to an oscilloscope chart recorder; volatiles were then puffed over the antenna. There was no measurable response from the southern mole cricket antenna (a predator of TMC) suggesting that they cannot detect discharge volatiles from either species through sensory organs in their antenna. However, tawny mole cricket antenna reacted positively to volatiles from either species discharges. Each time volatiles were puf-

fed over tawny mole cricket's antenna, the antenna discharged a pulse on the oscillascope, indicating the sensory organs on the antenna were sensing compounds from both species. Tawny mole crickets are prey for the southern mole cricket, suggesting that these discharges may serve as alarm and warning pheromones for the tawny mole cricket.

Tawny mole cricket discharge was collected on absorbent cotton and placed in soil arenas along with several tawny nymphs. Radiographic analysis showed a clear avoidance of tawny mole cricket to areas near the cotton with the alarm discharge, further suggesting the biological activity of the discharge.

Studies were begun using radiographic technology (x-rays) to visualize the movement and feeding patterns of both TMC and SMC in the soil matrix. Through the placement of a small lead tag on each cricket, tunnel construction and cricket movement in the tunnel could be monitored over time. These studies indicate: a) TMC produce a characteristic 'Y' shaped tunnel that allows two escape routes to the surface, and a long tunnel into the soil profile that most likely aides in thermal and water regulation; b) each TMC builds its own tunnel system that it maintain over time; c) as TMC grow, their burrows widen and extend further into the soil profile, suggesting a possible cause for the difficulty in bringing older crickets to the surface through soap flushes and baits; and d) SMC appear to create less extensive burrows than do TMC.