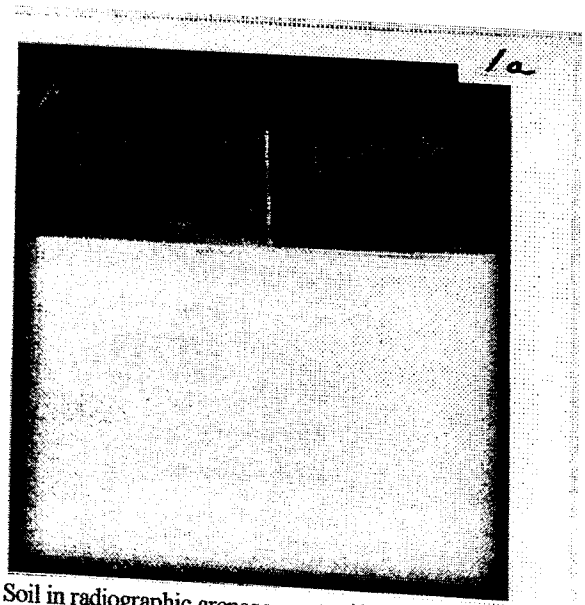
Behavioral Studies of the Southern and Tawny Mole Cricket

Dr. Rick L. Brandenburg
North Carolina State University

Dr. Michael G. Villani
NY State Agricultural Experiment Station
Geneva, NY

Goals:

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



Soil in radiographic arenas was stratified with the lower section of the arenas containing a more fine textured soil. Tawny mole crickets altered their highly stereotypic tunneling behavior (a "Y" shape with extended tunnel down to the bottom of the profile) to a truncated "Y" with deflection at the interface of the two soils.

Previous studies funded by the USGA suggested the possible existence of a sex attractant in tawny mole crickets. This information has not been published in the scientific literature to date. To explore this possibility, tawny mole cricket adults and nymphs were collected in North Carolina and transported to the NYSAES, Geneva, New York for laboratory analysis.

At the present time, air-borne samples are collected from isolated virgin male, virgin female, mated male and mated female tawny mole crickets. These various samples are being used to determine if specific compounds are being released into the air that cause attraction in crickets of the opposite sex.

If active crude pheromones are detected through behavioral and electroantennagram assays, then active fractionation and synthesis will proceed through the winter and spring of 1996. Field testing is anticipated in North Carolina during the fall of 1996.

The biological activity of alarm pheromone in southern mole cricket is under evaluation. It was noted in the first year progress report 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. There were also clear differences in the Southern and tawny mole cricket discharges. This could indicate the existence of unique compound constituents in the discharges for

these two species.

During the second year, radiographic bioassays were conducted that indicated that tawny mole crickets would avoid southern mole cricket discharge incorporated into soil. Radiographic studies also determined that when two highly predacious southern mole crickets were placed in large soil arenas, the crickets would space themselves in the arenas to allow no contact between them. This further suggests a chemically mediated alarm or identification pheromone that reduces chance encounters in complex soil systems, thereby reducing aggression between conspecific predators. Continued research will focus on the isolation and identification of these compounds.

The effect of the soil environment on mole cricket behavior also is under investigation. Extensive studies outlined in the previous progress report detailed the typical foraging behavior of tawny mole crickets and host-finding behavior of the southern mole cricket. We suggested that the "Y" shaped burrow of the tawny mole cricket aided in predation avoidance and water and temperature regulation.

Studies in 1995 focused on the impact of soil stratification and compaction on mole cricket construction. These studies indicated that soil texture and stratification can significantly modify tunnel construction, thereby affecting on the ability of these mole crickets to escape adverse environmental conditions. These studies will be continued and expanded during 1996.

The impact of biological and chemical control agents on mole cricket behavior is being evaluated. Field studies conducted during 1995 by Dr. Brandenburg suggested that biological and chemical insecticides may alter the behavior of mole crickets, thereby affecting the performance of these agents in the field. Preliminary radiographic assays with one synthetic insecticide suggests that tawny mole crickets can sense and avoid high concentrations of the product in the soil. This behavior may ultimately reduce the overall effectiveness of the insecticide.

Radiographic experimental designs, where crickets could not escape the insecticide, suggested a decline in burrow construction and maintenance. Although interesting, this work must be expanded and verified in 1996. Additional studies on the effects of fungal pathogens and entomogenous nematodes are in progress and will be continued during 1996.

Soil in radiographic arenas was stratified, with the lower section of the arenas containing a more fine textured soil. In this particular arena, an insecticide was incorporated into the upper left-hand quadrant of the arena. The radiograph indicates that the crickets are avoiding the soil containing the insecticide and will burrow into the fine textured soil if the proper stimuli are provided.