Behavioral Studies of the Southern and Tawny Mole Cricket

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Goals:

- *Improve our understanding of tawny mole cricket and southern mole cricket behavior especially as affected by environmental conditions through radiographic studies.*
- *Isolate and determine the activity of sex, aggregation and alarm pheromones of the tawny and Southern mole crickets.*
- *Determine the behavior of tawny mole crickets in the presence of microbial and chemical insecticides.*
- *Initiate field studies to better understand tawny and southern mole cricket behavior as suggested by laboratory studies.*

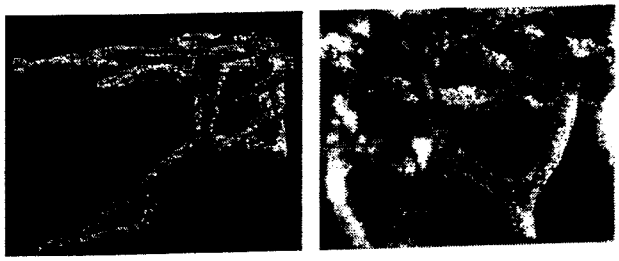

Figure 6. Examples of the use of wax castings to capture the burrowing pattern of mole crickets in large soil arenas.

The goal of this project is to develop a more effective and ecologically sound management strategy for both the tawny and southern mole cricket. The specific objectives of this proposal are to apply this new knowledge by: 1) documenting the site preference, dispersal, predation, avoidance behavior, and visible turf damage resulting from intra- and interspecific interactions between individuals in the field and through the use of radiographs, wax castings, and baits in the laboratory and in the field; 2) isolating and characterizing the biologically active compounds that may modify cricket behavior in the laboratory and in the field.

The field project at North Carolina State University has allowed us, in concert with the laboratory at Cornell University, to define factors that limit our management capabilities and identify conditions most conducive to effective mole cricket control.

Radiographic studies of mole cricket tunneling have documented stereotypic behavior of southern and tawny mole crickets. We have determined that soil physical properties, the presence of other crickets (of the same or different species), the presence of biological or chemical insecticides, and the presence of fluids from other crickets can alter this behavior. This information may help explain the variability observed when attempting to manage crickets in the field.

The use of radiography chambers that are essentially two-dimensional provides valuable insight into the subterranean activity of mole crickets. However, the actual three-dimensional components of the

mole cricket's behavior are not well documented. The use of larger chambers to hold soil and preparation of a wax-based material to create casts of the tunneling structure has proven quite successful. Wax castings provide examples of the burrowing pattern of mole crickets in large soil arenas. Ordinary canning wax was heated and poured down cricket tunnels to create permanent wax castings of these tunnels. The castings allow us to view and analyze the cricket soil-burrowing behavior in response to a variety of control agents and soil conditions.

These casts document, not only the typical Y-shaped structure of the tunnel, but the development of an extensive network of tunnels useful for feeding and escape. They not only confirm radiograph findings, but allow further exploration of cricket behavior. Additionally these arenas are of a sufficient size to determine surface activity and turfgrass damage that is indicative of field damage

The use of this technique in the field during the summer and fall of 1997 has further documented the accuracy and validity of the laboratory radiographs. Field validation of tawny mole cricket tunneling behavior was conducted by creating wax castings of mole cricket tunnels on a golf course driving range that permitted complete excavation of castings. Wax castings in field tunnels and subsequent excavation of these castings have documented the Y-shaped tunnels observed in the radiographs. The consistency of these tunnels lends credibility, not only to the laboratory studies, but also to the theory that tunnel construction plays a significant role in mole cricket ecology and avoidance of control strategies.

A Masters student initiated studies on ovipositional preference, dispersal of nymphs, and the impact of the southern mole cricket on distribution on tawny mole cricket and subsequent damage during 1997. These studies have involved intensive sampling of mole crickets (both southern and tawny) over a wide range of soil types, soil textures, soil compaction, soil drainage and moisture characteristics. Data collected include ovipositional preference, nymph abundance and development, and turf damage. These data will help define high-risk areas and help target control strategies more effectively. The modification mole cricket behavior and insecticide activity using irrigation practices was inconclusive.

Studies on the impact of soil moisture on egg laying indicate the timing and intensity of oviposition can be significantly affected. This affects not only the likelihood that a mole cricket infestation will occur in a specific location, but also affects the timing of egg laying and ultimate egg hatch. Moreover, this favorable response to higher soil moisture may well serve as a risk indices for high-risk areas and thus aid in target monitoring and control strategies. Continued research on mole cricket development, as related to soil temperature and acoustic sound trap catches, add further support to previously developed population curves.