Synthesis and Field Evaluation of the Sex Pheromone from the Tenlined June Beetle

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PROJECT SUMMARY

Objectives:

- Identification and synthesis of the sex pheromone of the Tenlined June beetle (TLJB), *Pollyphyla sobrinia* (in the scarab beetle family).
- Develop formulations for detection, monitoring, and risk assessment.
- Explore the use of sex pheromones for mass trapping and/or mating disruption.
- Reverse chemical engineering approach for the development of scarab beetle attractants.

Background:

Sex pheromones and other semiochemicals are invaluable tools in insect control programs. These chemicals can be employed in integrated pest management (IPM) programs for monitoring established populations to optimize insecticide sprays, as well as for detection and survey programs for exotic species.

To implement an effective IPM approach, it is critical to know which pest species are present (detection), and whether or not their population densities warrant control (monitoring and risk assessment). Often the cornerstone of successful IPM programs is the identification and synthesis of sex pheromones of insect pests.

Pheromones are used in lures in traps to detect the presence or frequency of a pest species. Sex pheromones are also used for direct control of insect populations in mass trapping, mating disruption, and attract and kill.

Tenlined June beetle (TLJB) is a localized soil pest for almonds that lives as larvae (grubs) for 2-4 years below ground eating tree roots. The grub feeding can severely damage trees, even death. During the summer the adults emerge from the soil and use pheromones to find mates. Currently the only available control tool is soil fumigation.

Discussion:

Elucidation of the chemical structure of the sex pheromone from the TLJB has been challenging because of its novelty; the small amounts of pheromone produced; the limited number of beetles available to extract the pheromone; and the chemical instability of the pheromone structure.

Using gas chromatography and the beetle antennae as the sensing element (the so-called GC-EAD, or– Gas Chromotography-Electroantennographic Detection) and gas chromatography-mass spectrometry, limited structural information has been gathered. Based on the available information tentative structures of the pheromone have been mapped.

In addition, the protein that transports this pheromone in the beetle's antennae has been expressed, allowing additional structural features to be assessed based on test compounds' affinity to the pheromone carrier protein. In the near future several putative compounds will be synthesized and their efficacy assessed as a TLJB sex pheromone.

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