

Characterization of the Sex Pheromone of the Southern Masked Chafer *Cyclocephala*

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Objectives:

1. The main objective of the proposed research is to finish the chemical characterization of this beetle's sex pheromone. Once the chemical structure is established, the pheromone will be synthesized and tested for efficacy in both laboratory and field bioassays.

Start Date: 2000

Project Duration: 1 year

Total Funding: \$25,000

Masked chafers are one of the key pests of turfgrasses. White grubs, the larval stage of these beetles, feed and damage the root systems of turfgrasses. Adult females of the southern masked chafer (*Cyclocephala lurida*) use a potent sex pheromone to attract males.

The males of this beetle are attracted also to nonspecific male and female grubs, a very unusual phenomenon. Males are not only attracted, but also attempt to copulate with the grubs. In addition, a closely related species, *Cyclocephala borealis*, the northern masked chafer, appears to share a similar compound as its sex pheromone. Once this pheromone is characterized, it will be useful in the development of novel strategies to control this pest.

The identification of the pheromone remains a challenging task since the amount of pheromone present per grub is only about 1 to 5 millionths of a gram.



Scientists at Cornell University are identifying the chemical structure of a sex pheromone discovered at the University of Kentucky.



Masked chafers attracted to a sex pheromone discovered at University of Kentucky swarm Dr. Dan Potter.

Although the pheromone is very potent, the amount of pheromone present per grub is extremely minute. Chemical analysis of solvent extracts made from grubs showed that only about 1-5 nanograms of the pheromone could be obtained from each grub (a nanogram is a millionth of a milligram).

Since the pheromone is only a minute component among hundreds of other compounds, isolation and characterization of the pheromone is more difficult than searching for a needle in a haystack since we do not even know what the "needle" looks like. However, we have managed to obtain a significant amount of information about the structure of this pheromone.

By arduous liquid-chromatographic purification procedures, we have been able to obtain a sample of partially purified material which provided valuable preliminary analytical data about the

pheromone. However, this project will take the necessary steps to arrive at the complete chemical structure. A tremendous collection effort provided us about 7000 grubs. Using extracts made from these grubs, we have determined the molecular formula of the pheromone to be $C_{17}H_{26}O$. The compound belongs to a group of chemicals called aldehydes and bears a bicyclic ring structure.

Although the complete structure not yet established, we will continue our research until sufficient amount grubs are collected and the pheromone is isolated in sufficient quantities for more sophisticated analytical experiments.

Summary Points

- The molecule has been purified. However, the exact structure of the molecule has not been determined.
- The pheromone is active at extremely low levels (nanograms).
- Need 10,000 grubs to complete elucidation of the molecular structure.