A Bioassay Method to Evaluate Efficacy of Insecticides Against Asiatic Garden Beetle

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Introduction

- The Asiatic garden beetle (AGB), *Maladera formosae* (Coleoptera: Scarabaeidae) (Fig. 1) is a pest of corn planted in sandy soils in northern Indiana, southern Michigan, and northwest Ohio.
- Grubs feed on germinating corn seeds and roots of V-stage plants (Fig. 2).
- Currently-available soil insecticides and seed treatments have not worked well against AGB in commercial fields.
- Controlled field trials to optimize insecticides, or test new products are difficult to do because there is a narrow window in the spring to find infested fields before planting.

Fig. 1. AGB 3rd (top) and 2nd instar (bottom).

Fig. 2. An AGB grub actively feeding on corn plant during a bioassay.

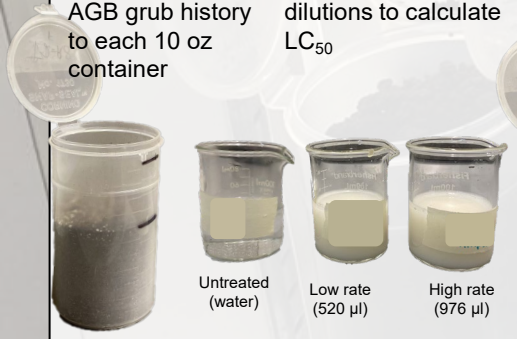
Objective

Develop a laboratory bioassay that approximates field conditions, to evaluate insecticides against Asiatic garden beetle grubs.

Materials and Methods

1) Add 6 oz of autoclaved, sieved soil from a field with known AGB grub history to each 10 oz container

2) Prepare pesticide concentrations based on labeled rate or in a range of serial dilutions to calculate LC_{50}



3) Apply 270 µl of each product in a straight 5 cm line

This volume approximates field conditions of:

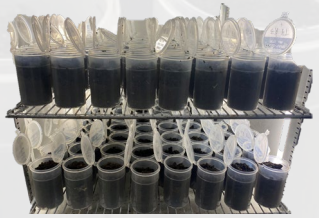
- seed population - 32K seeds/AC
- 6 gallons/AC
- 76 cm row width

4) Add one untreated, pregerminated corn seed on top of treatment

5) Add 4 oz of additional soil & one field-collected grub on top of soil

6) Place containers in a growth chamber up to 10 days:

- 25°C
- 60% RH
- 12:12 (L:D)
- soil moisture kept between 7 - 12%



7) Destructively sample containers to assess grub mortality

Live grub

Dead grub

Results

- Overall, we observed low grub mortality in the untreated containers (0 - 10%).
- Mortality in treated containers ranged from 0% to 100% depending on the treatment.
  - Moribund grubs (i.e., not actively moving/digging, discolored) were considered dead (Fig.3).
- The optimal duration of the bioassay ranged from 3 - 10 days after treatment (DAT), depending on the product tested, to achieve discriminating levels of mortality:
  - Organophosphates evaluated ~ 3 DAT
  - Neonicotinoids, pyrethroids, and diamides evaluated > 10 DAT

Fig. 3. Dead AGB (circled in yellow).

Discussion

With these methods we were able to:

1) calculate LC_{50} values

2) test pre-determined product rates for efficacy

- Information obtained through the bioassays can be used to make future management recommendations to farmers.

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