Red Flour Beetle Response to Traps with Prior Captures

Colton Smith[1] and Jim Campbell[2]
[1]Department of Park management and conservation, College of Agriculture, Kansas State University
[2]USDA ARS and Department of Entomology, College of Agriculture, Kansas State University

Abstract

The red flour beetle (*Tribolium castaneum*) is a major pest of food facilities such as flour mills and is often monitored using pitfall type traps with a food oil and pheromone attractant. Previous research had indicated that prior captures of beetles could increase beetle behavior captures in a trap. Here we used a more realistic bioassay to evaluate how the number of beetles previously captured include beetle captures in traps. Results showed no significant impact of prior captures on the number of red flour beetles captured in a trap. There were some trends suggested in the results that warrant further study to investigate, perhaps by focusing on individual beetle behavior at traps rather then using groups of beetles.

Purpose

- The red flour beetle (*Tribolium castaneum*) is a major pest of facilities where grain is processed and stored, such as flour mills (Campbell et al. 2010).
- A critical part of pest management is monitoring for abundance using traps with pheromone and kairomone attractants.
- Insect response to traps can be impacted by a range of external and internal factors (Campbell, 2012)
- A previous study showed that prior captures in a trap may be increased if beetles of the same species had been previously captured.
- Here we evaluated if the number of beetles previously captured in a trap influences the response of red flour beetles under more realistic conditions.

Questions, Hypotheses, and Predictions

Question: Does prior captures in a trap influence subsequent captures of red flour beetles?

Hypothesis: (1) Red flour beetle will prefer traps that have already captured beetles. (2) Level of capture will increase with the number of beetles that had previously been captured.

Study System

•Red flour beetle (*Tribolium castaneum*) adults were used in this study. This is the stage and actively moves around inside food facilities and is most likely to be captured in traps.
•Dome traps (Trece Inc.) are widely used to monitor red flour beetles and are a pitfall type of trap that has a grain-based food oil in the bottom and typically also has a pheromone lure (although lure was not used in this study). These traps typically have a cover, but this was not used in this study so that we could count the beetles captured without disturbance.


Dome traps with food oil used for the experiment

Methods and Experimental Design

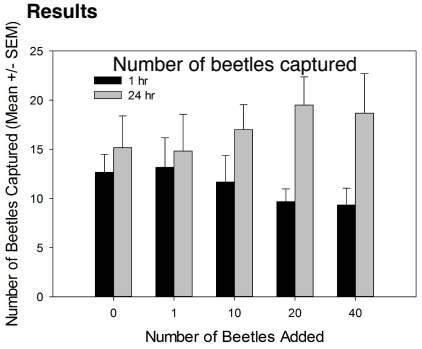
Equipment
•Dome Traps (with food oil but no pheromone) with 0, 1, 10, 20, and 40 beetles added immediately before the start of the test. Placed without the cap or dome of the trap
•Six of each type were performed, in two blocks of three replicates each.

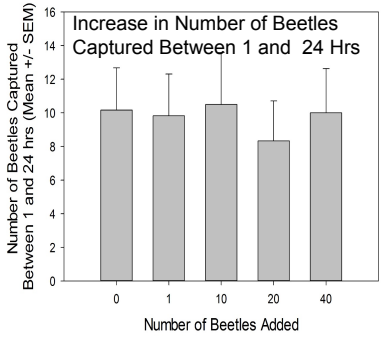
Arena:
•Large square box (45.7 x 66 x 8.9 cm) with a lid.
•Each box had one Dome trap and one square of cardboard, each midway from the center of the box. Cardboard served as a refugia for the beetles.
•Boxes were placed on the floor in a grid pattern switching the cardboard and traps randomly, of a walk-in environmental chamber set at 25ºC, 60% relative humidity, and lights on.

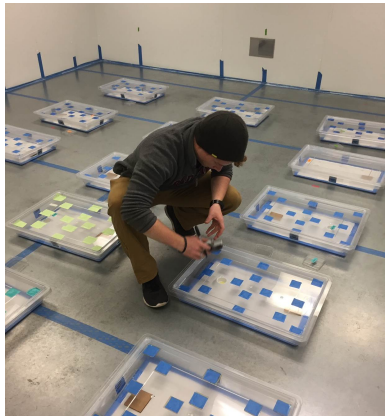
Experiment:
•Forty red flour beetle adults released in center of boxes.
•After 1 hour a picture was taken of each trap so as to not affect the environment and the total number of beetles in the trap counted, and an adjusted count determined by subtracting the initial number seeded in the trap.
•After 24 hours, number of beetles in trap were counted again and the number in the cardboard and in the arena counted finishing that test.

Results

- There was no significant difference in the captures of red flour beetles in the traps among the different numbers of prior captured beetles at either 1 hour (ANOVA: F= 0.619, P= 0.65) or at 24 hours (ANOVA: F= 0.102, P= 0.981).
- There was also no difference in the increase in captures between 1 hour and 24 hours (ANOVA: F=0.102, P=0.981).
- There was a suggestion of a trend upward in captures after 24 hours and for slightly higher captures at 0 and 1 beetles after 1 hour that might be worth further investigation.







Conclusions

The data showed that there was no significant increase or decrease in red flour beetle captures in relation to the number of beetles previously captured in a trap.

Future Directions

- Could evaluate individual insect responses rather than using groups of beetles, since the addition of beetles to the traps in the first hour may have also impacted response
- Included 1-hour observation which had not been done previously, but even shorter times may be needed to detect early response since had high capture levels even at 1 hour.

References

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Acknowledgements

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