Fumigation Impact on Stored Product Insects in a Grain Processing Facility

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Introduction

Stored product insect pests reduce the quality of stored grain and processed grain products around the world. Over 12 billion bushels of corn and wheat are grown in the U.S. each year, with a value of over 25 billion dollars. Post harvest losses attributed to insects are estimated at 5 to 10%, or 1.25 to 2.5 billion dollars. Losses to processed grain products are difficult to quantify but are undoubtedly greater because these products are more valuable yet have a lower pest tolerance than raw commodities. Insect management is important not only to maintain consumer confidence, but also because federal laws regulate insect presence in processing facilities and insect fragments in processed goods. Fumigation is the primary tool used to manage these insect infestations.

Materials and Methods

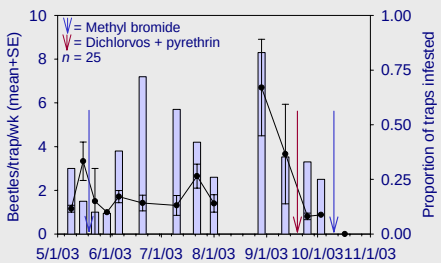
Pitfall Trap

Sticky Trap

- Beetles in a grain processing facility and attached warehouse were monitored from February through October 2003
- Pheromone baited sticky traps and pheromone/food oil baited pitfall traps were placed throughout each building.
- Ten additional sticky traps were placed around the outside periphery of the property to monitor changes in outside populations.
- Traps were serviced every 1 to 3 weeks and pheromones were changed every 6 to 8 weeks.
- A professional fumigation company fumigated the mill and fogged the warehouse in May and again in October
- In July, management sealed all cracks in the pavement outside the warehouse and follow up with outside perimeter insecticide applications on a weekly basis for 3 weeks
- The entire facility (mill and warehouse) was fogged with dichlorvos + pyrethrin in September
- Flour beetle (red flour beetle and longheaded flour beetle) and warehouse beetle captures were quantified in two ways: mean number (± SE) of captures per week in traps containing at least one insect, and proportion of the traps that contained at least one insect over the monitoring period
- The mill is a tightly sealed structure containing a great deal of large milling equipment while the warehouse is a corrugated metal building with lots of open space and greater potential for insect entry from the outside

Results and Discussion

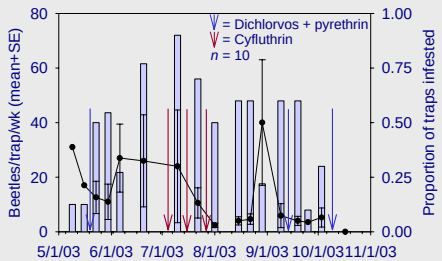
Warehouse Beetles in Mill



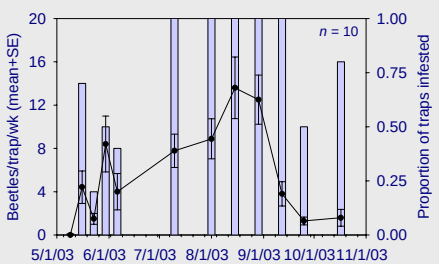
- Methyl bromide application always resulted in decreased insect captures
- Efficacy of dichlorvos + pyrethrin fogging is inconclusive
- Timing of applications was based on the calendar rather than pest activity

- Dichlorvos + pyrethrin treatment had negligible impact
- Cyfluthrin application and sealing resulted in both decreased captures and the proportion of traps infested
- Exclusion may be an important part of warehouse beetle management

Warehouse Beetles in Warehouse



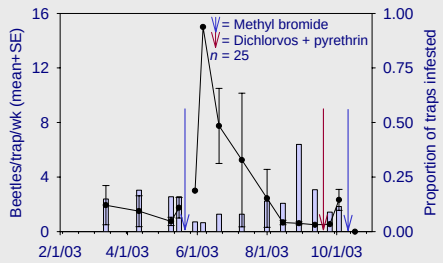
Warehouse Beetle Outside Captures



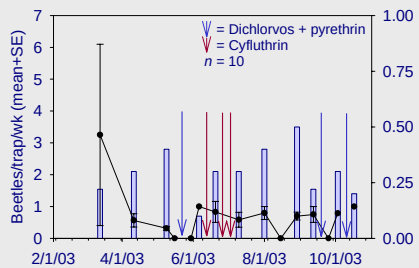
- Insect captures started in May and increased to a maximum in August
- Number of captures seem to coincide with outside temperature
- A large outdoor population may be a potential indoor infestation threat
- A drop in outdoor populations may explain the success of late fumigations

- Methyl bromide decreased the proportion of infested traps by >50%
- Dichlorvos + pyrethrin application had no effect on flour beetle captures
- The method of reporting illustrates how one trap with many captures can be depicted without greatly biasing the rest of the traps

Flour Beetles in Mill



Flour Beetles in Warehouse



- Large initial spike was eliminated with targeted sanitation
- Dichlorvos + pyrethrin application yielded mixed results
- Cyfluthrin application had no effect on number of insects captured
- Flour beetle populations may not be immigrating from outside

Summary

- Fumigation with methyl bromide did a good job reducing the number of both flour beetles and warehouse beetles in the mill
- Dichlorvos + pyrethrin fogging had inconclusive or no measurable results in either the mill or the warehouse
- Pavement sealing and cyfluthrin application around the warehouse appeared to decrease warehouse beetle captures indicating that they may be immigrating into the warehouse from outside populations
- Sealing and cyfluthrin application around the warehouse had no measurable impact on flour beetle populations indicating less immigration into the facility
- Several large spikes in insect captures could be attributed to simple procedures such as doors left open or poor sanitation in localized areas
- Fumigation and fogging need to be carefully evaluated based on the proper timing and whether the expected reduction in insect infestation justifies the high cost and disruption