FIELD DEMONSTRATION TRIAL WITH PYRETHRIN AEROSOLS: KNOCKDOWN AND RECOVERY OF CONFUSED FLOUR BEETLES

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Synergized pyrethrin aerosols are used by the food industry to control insect pests inside mills and processing plants. Although there are several systems and formulations on the market, all are usually activated by a timing device and set to deliver a dosage based on the cubic foot space of the facility. A typical mill contains machinery and equipment that block the free flow of aerosol fogs and could offer potential harborages for insect pests. The purpose of this demonstration trial was to determine the coverage and efficacy of several systems that were in operation at a General Mills plant in Des Moines, Iowa.

Three systems were in operation, a Turbicide Gold system (4% pyrethrins) in the mill, a CT-511 system (0.05% pyrethrins) in the mix packing area and the mill warehouse, and a ULD BP 300 system (3% pyrethrins) in the small pack-large pack bulk warehouse. The confused flour beetle, Tribolium confusum (DuVal) was used as the test insect species because it would not crawl upward or fly. Twenty aluminum dishes containing 10 1-2 week-old adults were placed at selected locations throughout the mill, 25 dishes of 10 adults were placed in the mix packing area, and 15 dishes of ten adults were placed in the small pack-large pack area.

The systems were activated at approximately 4:30 PM. All dishes were collected at 6:00 AM the next morning and the beetles in each dish were transferred to a clean Petri dish lined with filter paper. Beetles were classified as live (running freely in the dish), knocked down (on their backs but able to move) or dead + moribund (no visual movement). The Petri dishes were taken to the US Grain Marketing Research Center in Manhattan, KS, and held at laboratory conditions (approximately 72° F) along with two dishes containing 10 unexposed confused flour beetles for 14 days. After 2 days there was considerable recovery in many dishes, therefore all individuals considered dead + moribund at the collection site were assumed to be knocked down. The beetles were then classified as live (running freely in the dish), knocked down (able to respond to agitation or prodding) or dead + moribund (no movement after being prodded or shaken). Additional assessments of condition were made after 5, 7, 10, and 14 days. Even with this system, several individuals classified as dead + moribund on a particular date were either knocked down or live on subsequent dates.

All beetles treated with the Turbicide Gold system were knocked down upon removal from the exposure sites and some appeared to be dead, however many had recovered from knockdown after 5 days. Recovery gradually increased during the holding period and by the conclusion of the test at least 9 of 10 beetles

in each dish were alive and moving freely.

Similar patterns of recovery were observed for beetles exposed to the CT-511 system. All beetles were knocked down upon removal from the exposure environment with the exception of dish # 28, however after 2 days all individuals in dishes 28, 34-37, 40, and 60 had recovered. At the conclusion of the test recovery was complete in nearly all dishes, with the exception of dishes #23 and 31.

With the exception of dishes # 44-47, at least half of the beetles exposed to the ULD BP 300 system were classified as dead after 5 days. At the conclusion of the test mortality was 100% in 7 dishes and 90% in 2 dishes, while mortality in the remaining 6 dishes ranged from 0 to 60 %.

This demonstration trial shows the difficulty of controlling insect pests inside flour mills which contain machinery and structures which block the movement of aerosol fog particles. It was not a specific test of application systems because the internal characteristics of the three areas containing the respective systems may differ, therefore results could be different if the systems were switched for new trials. Additional replications would be necessary to draw conclusions regarding the insecticidal efficacy of the various systems. When and if new pyrethroid aerosols are registered for use in mill environments, they could be evaluated using the procedures and methods described in this study. Additional treatment regimes such as multiple applications could also be tested.