AEROSOL DISTRIBUTION EFFECTS ON *TRIBOLIUM CONFUSUM* ADULTS

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Tribolium confusum Jacquelin du Val, the confused flour beetle, is a major pest species of milling facilities. *T. confusum* can exploit refuges were food material accumulates inside equipment and cracks and crevices throughout a building's structure. Historically milling facilities have treated *T. confusum* infestations with fumigants, but recently aerosol application of insecticides is becoming more widely adopted among milling professionals. However, the method of aerosol application by pesticide applicators and the complex structural features between milling facilities can impact the consistency of aerosol applications and its efficacy against *T. confusum.* Through a series of aerosol applications, we investigated how the location of aerosol application position impacts the spatial pattern in efficacy against *T. confusum* adults.

Aerosol application testing was conducted in collaboration with and industry cooperator using two different aerosol formulations, pyrethrin combined with either the insect growth regulator (IGR) pyriproxyfen or the IGR methoprene. Bioassay containers were placed throughout one floor of the Hal Ross Flour pilot scale flour mill at Kansas State University. Aerosol applications were released from one of three positions on the milling floor or a fourth application that consisted of one-third of the aerosol released from all three positions. Adult survival was assessed right after each application to quantify the number of adults that were knocked down by the aerosol, and again after 14 days to determine the number of adults that were alive, knocked down, or dead.

The aerosol release position had a significant effect on *T. confusum* adult knockdown regardless of aerosol formulation. Bioassay arenas farthest from aerosol application position, near walls, and underneath equipment, generally had lower initial adult knockdown and final mortality among both aerosol formulations, which was presumably due to a decrease in the amount of aerosol deposited on the concrete bioassay arenas. There was a difference in dispersal patterns between the two aerosols, and generally the pyrethrin + pyriproxyfen had higher adult mortality after 14 d compared to the pyrethrin + methoprene formulation. However, we did observed positive effects of multiple aerosol release points throughout a highly congested milling floor, regardless of aerosol formulation.

Our results demonstrate the vast variability aerosol applications present in the milling industry, and the challenges associated with aerosols applications. The effect of aerosols on *T. confusum* adults is dependent on aerosol formulation,

distance the aerosol particles must travel to reach various locations within a mill, and the effectiveness of the insecticide application at reaching fully or partially obstructed areas within a mill. By using pilot scale testing of aerosol release techniques, we can better understand the challenges associated with aerosol applications and to determine how to minimize variation among floor plan layouts and to maximize effectiveness. By rotating or moving the aerosol application position, potentially using supplemental air to reach tight corners or obstructed areas of the floor, it may be possible to maintain a more even coverage of the floor space can be achieved with better success.