

## EVALUATING IMPACT OF STRUCTURAL FUMIGATION ON PEST POPULATIONS

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For grain and grain-based products, stored-product insect infestation pressure begins at harvest and continues through the processing of grain into processed commodities and the distribution and storage of these products. Insects are difficult to manage in food processing and storage facilities because they can occur in areas that are difficult to access, such as in the equipment and structure of the building, and move from these sources into the food product. As a result, there has been a reliance on fumigant pesticides that can penetrate into hidden structural refugia and into packaged or bulk stored foods.

Methyl bromide has been the most widely used fumigant for post-harvest structural treatments; however, methyl bromide, is a Class I ozone depleting substance and its use is being phased out under the 1987 Montreal Protocol to protect the stratospheric ozone layer. A critical use exemption (CUE) nominations process has been established to meet the needs of users lacking available technically or economically feasible alternatives. In the United States, CUE's have been allowed for structural fumigation of rice mills, pet food manufacturing facilities, and flour mills.

Potential alternatives to methyl bromide for structural fumigation are available for the management of insect infestations of food facilities, including other fumigants, such as phosphine and sulfuryl fluoride (ProFume™), and heat treatments. Effective IPM programs are another approach that could reduce the need to resort to structural fumigations; these programs include more efficient monitoring programs, management tactics that reduce the buildup of pest populations to the point where a structural treatment is needed, and better tools to predict when and if structural treatments are needed. There is a need for evaluation of these alternatives under real world conditions and for finding ways to make alternatives more efficacious and cost effective.

Limited information on field efficacy of methyl bromide compared to alternatives has been a major factor hampering the adoption of alternatives. This knowledge gap has fueled a considerable amount of new research done at multiple research institutions on monitoring pest

populations and their response to structural treatments in commercial facilities. This will provide the foundation with which it may be possible to move away from the use of methyl bromide.

A major challenge in evaluating treatment efficacy in commercial facilities has been that it is difficult to replicate trials given the variation among sites and the specific conditions when fumigations are performed (e.g., building structure, surrounding environment, season, pest population levels, concurrent management tactics). Two ways of dealing with this problem are to evaluate a large number of fumigations from different facilities or to have long term datasets from individual facilities. In this presentation, I will focus on the second approach and evaluate the impact of repeated fumigations in two flour mills that are geographically close to each other and for which we have 5 to 6 years of insect trapping data available. Specifically, the temporal and spatial variation in the impact of fumigations on red flour beetle, *Tribolium castaneum*, populations will be assessed; including reduction in trap captures and rebound rates on a whole mill, individual floor, and individual trap basis. By holding building structure constant, the potential influence of other factors on efficacy, including time of year and pest population levels, can be evaluated.