EVALUATING STRUCTURAL FUMIGATION EFFICACY IN RICE MILLS

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The red flour beetle, *Tribolium castaneum* (Herbst) (Coleoptera: Tenebrionidae), is a major stored-product insect pest infesting rice mills. Historically methyl bromide has been the primary fumigant used to reduce populations within the mill structure. Sulfuryl fluoride (ProFume) has become more widely used as a fumigant in rice mills after methyl bromide phase out in accordance with the 1987 Montreal Protocol. However, there is limited information on red flour beetle populations in rice mills or the impact of sulfuryl fluoride on these populations. Long-term red flour beetle trapping data sets (2 – 6 yr) at seven rice mills were analyzed to assess the efficacy of sulfuryl fluoride fumigations (n = 24). Fumigation efficacy, measured as the percentage reduction in mean trap captures of adults, before and after treatment, was 66 ± 6% (mean ± SE). Lengths of time for captures to return to pre-fumigation levels (i.e., rebound rates) varied among fumigations. Beetle captures inside and outside the mills fluctuated seasonally, and inside and outside trap captures exhibited a significant positive relationship. Fumigations consistently led to reductions in beetle captures outside mills indicating interconnectedness of the populations. Mill interior temperatures were similar to outside temperatures and showed a strong seasonal pattern, with relatively cool interior temperatures during the winter. These data suggest that red flour beetle populations were not confined within the mills, but extended to include the surrounding landscape of rough rice storage and exterior grain spillage with movement among these areas linking subpopulations. Seasonal fluctuations in temperature appeared to have a strong influence on beetle captures, which in turn impacted the apparent efficacy of the fumigation treatments. These results were different in many ways from results obtained in wheat mills, and potential causes for these differences will be discussed.