Abstract

EVALUATION OF COMBINING SULFURYL FLUORIDE, PROPYLENE OXIDE & CO_2 FOR STORED PRODUCT INSECT CONTROL

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DFA has spent the past 13 years conducting research to find alternatives to MB with promising results. Two effective fumigates, sulfuryl fluoride (SF) and propylene oxide (PPO) were employed. ProFume™ gas fumigant (99.8% sulfuryl fluoride or SF) is now registered for use on many stored products and other commodities. This study combined these two fumigates along with CO_2. The three year CSREES funded research was titled, "Efficacy with the Combination of Sulfuryl Fluoride and Propylene Oxide as Replacement for Methyl Bromide Fumigation of Stored Food Products." In this work, the fumigant mixture was compared to SF and PPO alone.

The study evaluated the costs, lethal dosages as LD_{50} and LD_{95}, vacuum and the addition of adding commodities to the fumigations.

The first part of the study, all fumigation conditions were the same: NAP, 26.7 ^{0}C and 24 hours. Post-embryonic stages require a higher CT product when fumigated with PPO. Past data showed RFB larvae fumigated with PPO had an LD_{95} using 606 mg·h/l SF is just the opposite requiring higher CT product for the eggs, LD_{95} 966 mg·h/l,10% CO_2 was the most effective. Without CO_2, combining the two fumigants together showed a LD_{95} of 432 on RFB eggs and a LD_{95} of 353 on RFB larvae. Adding 10% CO_2 reduces the

dosages by about two-thirds of the fumigants used alone. The CO_2 along with the synergy of the blend reduces cost, lowers environmental emission and provides greater safety.

The second and third part of the study involved vacuum, low temperature, and commodity work. RFB and WB eggs were the most difficult stage to kill followed by larvae, pupae and then adults. IMM larvae were the most difficult stage to kill followed by pupae, eggs and then adults. Red flour beetle (RFB) required the highest concentration of the mixture for LD_{50} and LD_{95}. Therefore, RFB was used as the standard for vacuum, low temperature and commodities work. Vacuum treatments required about one third the fumigant compared to NAP fumigations. This blend used lower dosages compared to MB, PH_3, SF and PPO used alone for similar mortality.

This mixture may prove to be a successful replacement for MB for stored products protection.