A COMPARISON OF SULFURYL FLUORIDE WITH METHLY BROMIDE ON STORED PRODUCT INSECTS DURING SIMULATED EMPTY MILL FUMIGATIONS

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DFA has spent the past 11 years doing research to find alternatives to MB and have had promising results with many of the alternatives tested. One of the more promising is ProFume™ gas fumigant (99.8% sulfuryl fluoride, or SF) which is now registered for use on many stored products. Like MB, SF adheres to the principles of "CT product" for efficacy, and CT products are most important in fumigating where sorption is a factor created by commodity. The CT products required for efficiency are also greatly influenced by half loss times (gas leaks).

Empty grain mills are routinely fumigated in order to disinfest the mills from potential insect populations that are harbored in grain residues (flours) found along the floor edges. Traditionally, this has been done with MB as the fumigate. In recent years we have conducted research that shows that SF is very effective for this same purpose and is now registered by EPA for this use. In this study, we developed fumigation tests to determine efficacy of several store product insects when subjected to average field conditions for half loss times in commercial settings and when sorption from remaining flour residues were also factored in.

In this work we studied efficacy of ProFume vs. MB, under two temperatures (15.6 & 20^{o}C) looking at Indian meal moth (IMM), *Plodia interpunctella,* warehouse beetle (WB) *Trogoderma variabile* pupae; and red flour beetle (RFB) *Tribolium castaneum* larvae. Treatments were done under simulated empty grain mill conditions, which included a small amount of residual flour around the edges of the floor of the chamber to simulate leftover grain millings. The insects were all contained in stainless steel, 150 mesh wire cages 2 cm (diameter) x 7 cm long with a neoprene stopper. Cages with the insects were filled and buried 2.5 cm below the surface of a 5-cm depth of flour. Fumigation tests where conducted in 28.4 laboratory fumigation chambers housed in temperature control walk-in boxes. To contain the flour residue and insect cages, we used cardboard cartons that fit the chamber dimensions. To further simulate a typical grain mill fumigation, we used a 10 hour half loss time (HLT) in a 24 hour fumigation i.e., in the first 10 hours of exposure 50% of the fumigant was lost after dosing with MB or SF; in the next 10 hours 50% of remaining concentration was lost; and in the last 4 hours about 50% of the balance concentration was lost, creating a total loss of about 80% of the fumigant. Throughout the duration of the exposure

sorption was taking place. Sorption varies considerably depending on the type of commodity and the quantity. The dosages (CT product) were comparable to those used for a commercial fumigation of empty, grain mills.

Our results show that considerable sorption by the flour residue; occurred: about 78% sorption with MB and about 20% sorption with SF. With the combination of sorption and gas loss, CT products accumulated slowly and terminal gas concentrations were low. Efficacy results will be discussed during presentation.