SULFURYL FLUORIDE AS A QUARANTINE TREATMENT FOR KHAPRA BEETLE, *TROGODERMA GRANARIUM*

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Abstract

Khapra beetle, *Trogoderma granarium* is a serious pest of stored products throughout the world, particularly in hot and dry regions. The larvae of *T. granarium* attack a wide range of dry food products of plant or animal origin. They can undergo a dormancy or quiescence, hide secretively in small cracks and cervices and survive without food for several years, making them difficult to control. In the United States, khapra beetle is considered a quarantine species and great efforts are made to prevent its introduction and establishment. In recent years interceptions of *T. granarium* have risen dramatically as a result of increased trade and improved sampling and detection efforts. When khapra beetle populations are detected in port environs or elsewhere efficacious treatments are needed to eradicate populations before they are able to establish and spread. Current recommendations for khapra beetle control rely heavily on treatment with fumigation with methyl bromide (MeBr). Although MeBr is still be available for quarantine and pre-shipment (QPS) treatment its continued use is not guaranteed, so there is a need to evaluate new alternative fumigants.

Sulfuryl fluoride (SF), a broad-spectrum fumigant, is considered one of the important alternatives to methyl bromide for postharvest commodity treatment. The objectives of this work were to evaluate the efficacy of SF against all *T. granarium* life stages to establish quarantine level treatments. Small scale experiments were conducted in 10 L glass jars in an environmental chamber at 20 and 30˚C. Different life stages (eggs, larvae including quiescent/diapausing, puape, or adults) of *T. granarium* were kept in a small plastic cups/vials within the 10 L jar and exposed to SF for 4 or 20 hours. Headspace SF was measured via micro GC at 30 minute intervals. Eggs and larvae were provided with ~1.3 g of food whereas no food was provided for the pupae and adults. Adult mortality was evaluated 2 d after the exposure whereas egg, larval, and pupal mortality was evaluated after 7-21 d. The results from the these studies show that all life stages except eggs are controlled with 64 and 48 mgL^{-1} rates at 20 and 30˚C temperatures, respectively exposed for 4 hours. The dormant larvae from field population of *T. granarium* are more tolerant than lab population specifically in low temperatures (20˚C). However, susceptibility to SF was similar between diapausing and non-diapausing larvae of *T. granarium* when they were exposed to

higher temperatures. The eggs were by far the most tolerant stage and require longer exposure times of 20 h at 30˚C with CTs product dosages above 2000 $h*mgL^{-1}$ to achieve quarantine level control.

Key words: fumigation, quarantine species, khapra beetle, Dermestids