EFFICACY OF PROPYLENE OXIDE IN COMBINATION WITH CARBON DIOXIDE AGAINST EGGS OF STORED-PRODUCT INSECT PESTS

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Abstract.

Sulfuryl fluoride (SF) is considered an important postharvest alternative to methyl bromide and is increasingly used in the United States to guarantee pest-free security and food safety of agricultural products. The California-based dried fruit and nut industries have transitioned to using sulfuryl fluoride (SF) where rapid disinfestation of insect pests is required. However, species specific ovicidal deficiencies of SF are evident and several key California pests are not adequately controlled by dose and exposure requirements listed on the current SF label. Therefore, this work was conducted in the context of overcoming ovicidal deficiencies of SF. Dose response relationships of propylene oxide (PPO) in combination with carbon dioxide (PPO:CO_2 – 8:92) against eggs of four stored-product insect species, namely, *Carpophilus hemipterus* (L.), *Tribolium castaneum* (Herbst), *Plodia interpunctella* (Hübner), and *Amyelois transitella* (Walker) were established as an initial step in formulating a blend of SF-PPO to meet disinfestation requirements. Fumigations were conducted at normal atmospheric pressure and 25°C for 24 h. Species tested responded differently to PPO. Mortality tests for *C. hemipterus*, *T. castaneum*, *P. interpunctella*, and *A. transitella* resulted in LD_{99} values (concentration x time) of 414.8, 348.6, 133.1, and 95.3 $mghl^{-1}$, respectively. At LD_{50}, dose values were 193.4, 174.8, 51.2, and 47.4 $mghl^{-1}$, respectively. Therefore, tolerance of the tested species in decreasing order was *C. hemipterus* > *T. castaneum* > *A. transitella* > *P. interpunctella.* The goals of future research will be obtaining toxicity data of SF on post-embryonic life stages of key pests of dried fruits and nuts, absorbance of PPO by different commodities, and evaluating a blend of SF-PPO to meet commodity-specific disinfestation requirements.