Sulfuryl fluoride fumigation to control brown marmorated stinkbug (Hempitera: Pentatomidae)

Adelaine E. Abrams, James C. Kawagoe, Adriana Najar-Rodriguez and Spencer S. Walse

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Abstract

Brown marmorated stinkbug (BMSB), *Halyomorpha halys* (Stål), is an insect pest of concern to certain countries that import vehicles and shipping containers from the USA. Adult BMSB contained in gas-permeable cages were fumigated with sulfuryl fluoride in laboratory-scale chambers at 10.0 ± 0.5 °C (x±2s), across a range of applied doses and treatment durations. Sulfuryl fluoride exposures, expressed as concentration (*C*) × time (*t*) products (*Ct*), were calculated, exposure-mortality regressions were modeled, and the relative contribution of *C* versus *t* toward treatment efficacy was evaluated relative to Haber's Rule, specifically $C^{z}t = \boldsymbol{\omega}$. The induction of diapause, to simulate overwintering physiology, resulted in an ~ 2-fold increase in tolerance of adults toward sulfuryl fluoride, and this effect is more pronounced as the fumigation duration is shortened from 12 h. Results of this study identify how the applied dose and/or treatment duration can be modulated (i.e., tuned) to ensure adequate toxicological efficacy toward adult BMSB following a sulfuryl fluoride fumigation at air temperature ≥ 10.0 ± 0.5 °C (x±2s). An assimilation of these technical results with labeling, environmental, and logistical considerations can be used to guide a fumigation schedule for operational implementation in the USA and beyond.