

Title Propylene oxide as a potential alternative to methyl bromide.
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Abstract

The relative effectiveness of propylene oxide (PPO) alone and in combination with vacuum (100 mm Hg) or 92% CO₂ against all the life stages of *Tribolium castaneum* during short exposure times was evaluated. Sorption of PPO by wheat, cacao bean and maize at initial concentration of 82 mg/litre for a 4-h exposure was determined. The tests were carried out in desiccators at 30 deg C and 70% relative humidity. Exposures to vacuum or 92% CO₂ alone, and an untreated control, were conducted in each test. The order of tolerance of the life stages to PPO was pupae > larvae > adults > eggs; these stages required a concentration of 147, 84, 55 and 30 mg/litre, respectively, to achieve LD99 for a 4-h exposure. PPO in combination with 100-mm Hg vacuum or 92% CO₂ produced a significant decrease in the LD99 of the larvae, pupae and adults (6.2- to 7.1-fold) compared with exposure to PPO alone. A negligible mortality of all life stages except eggs was observed when these stages were exposed to 92% CO₂ or vacuum(100 mm Hg) alone for 4 h. The results suggest that vacuum and CO₂ have a synergistic effect on the insects when they are exposed to PPO. Sorption of PPO by wheat, cacao bean and maize after a 4-h exposure time varied between 57 and 79% of the initial concentration. This study suggests that combination of PPO with CO₂ or vacuum could be a potential alternative to methyl bromide.