

## Abstract

Strawberry fruit, western flower thrips and two-spotted spider mites were exposed to a range of ethyl formate (EF) concentrations from 0.8 to 2.4%. Ethyl formate treatments included both single and multiple applications of EF, the multiple applications having a venting period between each application. Additionally, target pests were exposed to EF and elevated levels of CO<sub>2</sub> from 5 to 95 kPa, balance air to total 101 kPa. Exposure to EF resulted in significant mortality for western flower thrips; however, complete control was achieved only in the treatments with the highest cumulative exposures, multiple applications of 0.8% or 2.4% EF. Two-spotted spider mites were less susceptible to EF with the most effective treatment, 2.4% EF, resulting in 66% mortality. Low levels of CO<sub>2</sub> (5 kPa or 10 kPa) combined with 1.3% EF significantly increased two-spotted spider mite mortality, however, levels of CO<sub>2</sub>  $\geq 20$  kPa significantly decreased mite mortality compared to treatments with EF in air. There was no significant difference in mortality for western flower thrips exposed to 0.8% EF in the presence of CO<sub>2</sub> at 5, 10, 20, and 40 kPa when compared to 0.8% EF in air. Treatment with 0.3% EF with  $\geq 40$  kPa CO<sub>2</sub> resulted in significantly decreased western flower thrips mortality compared with that of 0.3% EF in air. However, for 0.8% EF, western flower thrips mortality only declined in an atmosphere of  $\geq 80$  kPa CO<sub>2</sub>. There was no significant difference in strawberry condition between treated and untreated fruit, however increased levels of acetaldehyde, ethanol, ethyl acetate and EF were detected in fruit exposed to EF. In two separate experiments, strawberry fruit showed calyx damage in fruit exposed to concentrations of 0.8% or 1.6% EF, respectively.