

Title Sensitivity of fruit species to ethyl formate fumigation under quarantine concentrations

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Citation Abstracts of 7th International Postharvest Symposium 2012 (IPS2012). 25-29 June, 2012. Putra World Trade Centre (PWTC), Kuala Lumpur, Malaysia. 238 pages.

Keywords Methyl bromide alternative; quarantine treatment; phytotoxicity

Abstract

Ethyl formate is a volatile compound which occurs naturally in a variety of products and is recognized as safe (GRAS) by the USA Food and Drug Administration (FDA). High concentrations have shown insecticidal properties and it is used as a GRAS fumigant of dried food. Ethyl formate is under investigation as an alternative to replace methyl bromide for quarantine fruit fumigation. However, ethyl formate can induce phytotoxicity in the fruit, limiting its potential use in the future. Concentrations and exposure times of ethyl formate were evaluated in several fruit species: *Vaccinium corymbosum* L. cv. 'Liberty', *Prunus persica* L. cv. 'Sweet September', *Fragaria x ananassa* cv. 'Albi3n', *Rubus idaeus* L. cv. 'Heritage', *Prunus salicina* Lindl. cv. 'Angelino', *Vitis vinifera* L. cv. 'Redglobe'. Critical concentration values were determined to avoid phytotoxicity symptoms. Concentrations of ethyl formate gas (0, 1, 2, 3.5 %) were generated from its liquid stage at atmospheric pressure into an 11-litre container. Two exposure times one hour and two hours (1h and 2h) - were evaluated. The highest concentration of ethyl formate (3.5%) induced slip skin on blueberries cv 'Liberty' during the 2h exposure period; sunken areas were observed in peaches cv. 'Sweet September' at 2% during a 1h exposure period; and strawberry cv. 'Albi3n' and red raspberry cv. 'Heritage' were very sensitive to the compound. In the former, ethyl formate induced brown discoloration in the sepals and all concentrations resulted in tissue breakdown. In red raspberry, tissue breakdown and bleaching were the main symptoms during a 2h exposure time even with a 1 % concentration of ethyl formate. Plum cv. 'Angelino' and table grape cv. 'Redglobe' did not show visible damage at any of the concentrations. Therefore, the highest, safe concentrations should be: 2% for 2h's for blueberries; 1 % for 2h's for peaches; and 3.5% for 2h's for plums and table grapes. Further work is needed to verify if the safe concentrations determined here have the necessary effectiveness for use in quarantine insect control.