Title Use of volatile plant compounds as postharvest biofumigants to control fruit decay

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Abstract

Some volatile compounds naturally occurring in plant products commonly used in the human diet were evaluated as fruit postharvest biofumigants against *Penicillium expansum*, *Monilinia laxa*, *Phlyctema vagabunda* and *Botrytis cinerea*. The most consistent fungicidal activity was found with some isothiocyanates (allyl-isothiocyanate, 4-methyltiobutyl-isothiocyanate and butenyl-isothiocyanate), followed by *trans*-2-hexenal, carvacrol, citral and *trans*-cinnamaldehyde; other compounds such as hexanal, (-)-carvone, *p*-anisaldehyde, eugenol and 2-nonanone gave progressively lower inhibition. The *in vitro* activity of the volatiles was not always confirmed *in vivo*. Among the isothiocyanates tested, allyl-isothiocyanate provided the best control of brown rot in peaches and nectarines (80-100% efficacy, with 0.04 mg l^{-1}) without negative effects on fruits. Allyl-isothiocyanate (0.7 mg l^{-1}) also produced a significant reduction of blue mould infection on pears (over the 50%), although some phytotoxicity symptoms appeared on fruit skin after cold storage. *Trans*-2-hexenal significantly reduced *P. expansum*, *M. laxa* and *B. cinerea* infections in pome fruits, stone fruits and soft fruits (grapes and strawberries), respectively, whereas it failed to control *P. vagabunda* rot on apples. The results with *trans*-2-hexenal (12.5 μl^{-1}) on 'Golden Delicious' apples were particularly interesting, where the compound greatly reduced blue mould (98% efficacy) and fruit patulin content, without any detrimental effects on fruit. In contrast, *trans*-2-hexenal caused phytotoxic symptoms in apricots, nectarines, peaches, strawberries and 'Abate Fetel' pears, and offflavours in plums, 'Conference' and 'Bartlett' pears, 'Royal Gala' apples and 'Italia' grapes. Carvacrol, citral or *trans*-cinnamaldehyde had little positive effect or failed to control the decays.