



Postharvest Biology and Technology

Volume 81, July 2013, Pages 66-72

Essential oil vapours suppress the development of anthracnose and enhance defence related and antioxidant enzyme activities in avocado fruit

Author links open overlay panel Periyar Selvam Sellamuthu^a Dharini Sivakumar^a Puffy Soundy^a Lise Korsten^b
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Abstract

Anthracnose caused by *Colletotrichum gloeosporioides* is a major postharvest disease in avocados that causes significant losses during transportation and storage. Complete inhibition of the radial mycelia growth of *C. gloeosporioides in vitro* was observed with citronella or peppermint oils at 8 $\mu\text{L plate}^{-1}$ and thyme oil at 5 $\mu\text{L plate}^{-1}$. Thyme oil at 66.7 $\mu\text{L L}^{-1}$ significantly reduced anthracnose from 100% (untreated control) to 8.3% after 4 days, and to 13.9% after 6 days in artificially wounded and inoculated 'Fuerte' and 'Hass' fruit with *C. gloeosporioides*. GC/MS analysis revealed thymol (53.19% RA), menthol (41.62% RA) and citronellal (23.54% RA) as the dominant compounds in thyme, peppermint and citronella oils respectively. The activities of defence enzymes including chitinase, 1, 3- β -glucanase, phenylalanine ammonia-lyase and peroxidase were enhanced by thyme oil (66.7 $\mu\text{L L}^{-1}$) treatment and the level of total phenolics in thyme oil treated fruit was higher than that in untreated (control) fruit. In addition, the thyme oil (66.7 $\mu\text{L L}^{-1}$) treatment enhanced the antioxidant enzymes such as superoxide dismutase and catalase. These observations suggest that the effects of thyme oil on anthracnose in the avocado fruit are due to the elicitation of biochemical defence responses in the fruit and inducing the activities of antioxidant enzymes. Thus postharvest thyme oil treatment has positive effects on reducing anthracnose in avocados.