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Control of postharvest green mold of orange by essential and fixed oils

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The potential of using essential oils (extracted from *Pogostemon cablin, Mentha arvensis, Cymbopogon citratus, Ocimum basilicum* var. Maria Bonita, *Rosmarinus officinalis, Lippia sidoides, Zingiber officinale, Citrus aurantifolia, Piper aduncum* and *Ocimum basilicum*) and fixed oils (extracted from *Allium sativum, Copaifera langsdorffii, Eucalyptus* spp. *Azadirachta indica*) to control of *Penicillium digitatum* on citrus fruits was evaluated *in vivo* and *in vivo*. Oranges of cultivar Pera were wounded with a sterile puncher in two opposite points in the fruit equatorial region, reaching the albedo. Wounds were then inoculated with 20 µL of a spore suspension (10^5 spores mL^{-1}) of the pathogen. Inoculated fruits were then submerged for 1 min in oil suspensions with several concentrations (1, 10, 100, 1000, 10,000 or 100,000 µL L^{-1}). The fruit treatments in oil submersion were performed 24 h prior inoculation, immediately after inoculation or 24 h later. Afterwards, all fruits were incubated at 25 ± 2 ºC and 85-90 % relative humidity and the disease progress was evaluated by measuring the lesions diameter six days after incubation. The effect of oils in prevent spore germination was evaluated by microscopy and mycelial growth inhibition was tested in PDA medium. In all studies, sterile water and the fungicide Tecto® were used as control and standard treatment, respectively. The oils at 10,000 and 100,000 µL L^{-1} controlled green mold and inhibited spores germination and mycelial growth in similar levels as compared to the fungicide treatment. No significant differences were observed between the oil applications in different time points, 24 h prior or after and simultaneously to the pathogen inoculation. Treatment with oil in concentrations higher than 10,000 µL L^{-1} caused rind damage and changed fruits flavour, which makes its implementation impractical in high concentrations.