

Title Integration of biocontrol, hot water dip and potassium silicate for the control of *Penicillium digitatum* (Green mould) on citrus fruit

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Abstract

Synthetic fungicides have been widely used to control *Penicillium digitatum* Sacc., the causal agent of green mould of citrus. However, in many countries, postharvest fungicides are no longer effective, due to resistance. We have found some South African isolates of *P. digitatum* to be resistant to Imazalil®. Alternative measures to control the disease are necessary, such as biological control. Sixty yeast and 92 *Bacillus* isolates were screened for their antagonistic activity against *P. digitatum*. None of the yeasts or *Bacillus* isolates produced a curative action against *P. digitatum* on oranges. However, the yeast Isolate B13 (*Candida fermentati* (Saito) Bai comb. nov.) provided excellent preventative control of *P. digitatum*, superior to all the *Bacillus* isolates, if it was applied to citrus fruit prior to artificial inoculation by *P. digitatum*. Yeast Isolate B13 reduced *P. digitatum* incidence to 2%, compared with 12% after treatment with Imazalil® in commercial packhouse trials. Electron microscopy showed that yeast Isolate B13 inhibited conidial germination of *P. digitatum*. For control of *P. digitatum* pre-harvest, trees were treated with potassium silicate for a full season (monthly or two monthly, per tree, 5 l x 1000 mg (l⁻¹)). Regular potassium silicate treatments resulted in a significant reduction in the level of *P. digitatum* infection on both navel and Valencia oranges. For the control of latent infections of inoculated Valencia oranges, hot water treatment at 56°C for 1 min provided the best control of the pathogen. The integrated treatment of citrus fruit with (1) the application of potassium silicate fertilization pre-harvest; (2) a hot water dip (56°C x 1 min); (3) and application of the yeast Isolate B13, combined to provide excellent control of *P. digitatum* in applied packhouse trials.