

Title Application of *Pantoea agglomerans* CPA-2 in combination with heated sodium bicarbonate solutions to control the major postharvest diseases affecting citrus fruit at several Mediterranean locations

Author Rosario Torres, Carla Nunes, José María García, Maribel Abadías, Inmaculada Viñas, Teresa Manso, Manuel Olmo and Josep Usall

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Abstract

We determined the potential of using a formulated product based on *Pantoea agglomerans* CPA-2, either alone or in combination with heated sodium bicarbonate (SBC) solutions, to control the major postharvest diseases affecting citrus crops in the Mediterranean region. Treatments applied either individually or in combination were tested in semi-commercial and commercial trials carried out with oranges and mandarins from the Algarve, Andalusia and Catalonia. Firstly, several formulations of the biocontrol agents were tested in laboratory trials; one of them, a freeze-dried formulation of *P. agglomerans* strain CPA-2 called FD10-3, was chosen for combined with SBC. This formulation, applied at 2×10^8 cfu ml⁻¹ and the SBC treatment, applied at 3% 50°C for 20–40 s, demonstrated that it was possible to reduce decay development in laboratory trials. Semi-commercial applications of FD10-3 and 3% SBC solution at 50°C for 40 s showed excellent control of decay in unwounded mandarins and oranges artificially inoculated with both *Penicillium digitatum* and *P. italicum*. No rind injuries or residues attributable to hot water or SBC were observed on treated fruits. Combined treatment provided better control than the two treatments applied separately. Commercial trials demonstrated an important reduction in natural decay with the treatment of SBC 3% at 50°C for 40 s. Furthermore, bacterial-product formulation treatment significantly reduced the percentage of infected fruit and in some cases this reduction was equal to chemical treatments. Even so, no improvement in efficacy was observed with the combination of FD10-3 and SBC in the commercial test. We also assessed the ability of FD10-3 to grow at the wound site in oranges, whether alone or in the presence of SBC, and also its compatibility with standard citrus packinghouse practices.