

**Title** Preventive and curative activity of combined treatments of sodium carbonates and *Pantoea agglomerans* CPA-2 to control postharvest green mold of citrus fruit

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### Abstract

Preventive and curative activity of 2 min dips in 3% sodium carbonate (SC) or sodium bicarbonate (SBC) aqueous solutions heated to 40 °C, alone or followed by the application of  $2 \times 10^8$  CFU/mL of the biocontrol agent *Pantoea agglomerans* CPA-2 (BA), were simultaneously evaluated for the control of postharvest green mold, caused by *Penicillium digitatum*, in artificially inoculated Lanelate and Valencia oranges. Fresh cells of BA proliferated inside rind wounds and their survival was not adversely affected by the presence of residues of SC or SBC. Green mold incidence after 7 d of incubation at 20 °C in rind wounds treated after fungal inoculation (curative activity) was 15%, 40%, or 15% in oranges treated with SC, BA, or SC + BA and 5%, 45% or 0% in oranges treated with SBC, BA, or SBC + BA, respectively, while it was about 90% in untreated control fruit. Green mold incidence in rind wounds treated before inoculation or reinoculation with the pathogen (preventive activity in pre-existing wounds) was 10% and 2%, or 15% and 8%, respectively, in oranges treated with SC and SC + BA, and 3% and 5%, or 20% and 5%, respectively, in oranges treated with SBC and SBC + BA. Green mold incidence in wounds inoculated after treatment (preventive activity in new wounds) was 55% and 25%, and 60% and 40% in oranges treated with SC and SC + BA, or SBC and SBC + BA, respectively. Additionally, the duration of the protective effect of SBC, BA, and SBC + BA was assessed in Eureka lemons and Valencia oranges. In both species, all three treatments effectively protected pre-existing rind wounds during 7 d of storage at 10 °C. After 0, 1, and 2 d, but not after 4 or 7 d, the protective effect of SBC was significantly inferior to that of BA and SBC + BA. The integration of treatments is a promising approach to replace the use of conventional fungicides to control green mold in citrus packinghouses.