Title Evaluation of the biofungicides effects of lactic acid bacteria against *Penicillium digitatum*

Author Gerez CL, Carbajo MS, Pollán G, de Valdez GF, and Leal GT

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Abstract

The citrus industry in Tucumán has placed Argentina among the main lemon producers in the world. Lemons are sensible to infections caused by fungi, mainly *Penicillium digitatum* Sacc., which is responsible for severe economic losses worldwide. Currently, this postharvest disease is controlled for chemical fungicides. The use of these fungicides is restricted because its negative effects on environment, health and the development of fungicide resistance. World trends are moving toward the reduction of pesticide use, thus; several physical and biological treatments have been evaluated. In previous studies, eight lactic acid bacteria (LAB) were able to inhibit the growth of *P. digitatum* strains isolated from decayed lemon. The aim of this work was to characterize the antifungal effect of LAB and to evaluate its biofungicide effectiveness by the response surface methodology. The antifungal activity of LAB was not changed after either heating (100°C, 20 min.) or treatment with Proteinase K, while it was removed after neutralization indicating the acidic nature of the metabolites involved in antifungal activity. Lactic (LA), acetic (AC) phenyllactic (PLA) acids were related to the antifungal effect of the LAB cultures. In order to estimate a combination of organic acids with best activity, antifungal activity of these organic acids alongside propionic acid (PR) was evaluated by response surface methodology. The maximum antifungal activity (15%) was achieved with the mixture of LA, AC, PR and PLA in concentrations of 511.1 52.5, 3.5 and 0.8 mM, respectively. The activity of this mixture was comparable with concentrations of imazalil, guazatine and Serenade® (commercial biofungicide), as high as 100 ppm, 100 ppm and 6.0 ppm, respectively. The results show the potential use of antifungal LAB and /or a biofungicide mixture as a novel biocontrol strategy of postharvest diseases as contribution to maintain the quality, and shelf life of citrus fruit as well as alternative of chemical fungicide uses.