

WORLD YEAST CONGRESS

May 14-15, 2018 | Montreal, Canada

Yeast species as biological control agents of fungal plant pathogens

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The use of yeast species represents a promising strategy as biocontrol agents. Different yeast species are able to prevent infection, decrease host tissue colonization, and reduce plant pathogen survival and sporulation with varying degrees of efficiency. Despite the known biological roles of yeasts in the environment, however, much remains to be discovered regarding its modes of action in distinct environments and their antagonistic behavior toward other organisms. The purpose of this study was to isolate and select yeasts from citrus leaves, flowers and fruits as well as from citrus growing soils and determine the adequate strains for post-harvest diseases biocontrol both in vitro and in vivo. Additionally, to evaluate the modes of action of yeasts isolates that previously shown to be effective in controlling sour rot (*Geotrichum citri-aurantii*), green mold (*Penicillium digitatum*) and blue mold (*P. italicum*) in citrus fruits and, finally, to purify and characterize the killer toxin produced by yeast isolates and, verify their antagonistic activity on pathogens that occur in citrus postharvest. The results obtained in this study showed that

the isolates ACBL-42 (*Sporobolomyces koalae*) and ACBL-77 (*Aureobasidium pullulans*), showed efficient control as a preventive and as well as curative measure for sour rot and were able to produce chitinase in the presence of the *G. citri-aurantii* cell wall. *A. pullulans* produced killer toxin against *Geotrichum*. *Saccharomyces cerevisiae* (ACB-K1) when applied as a preventive measure against *P. digitatum* promoted 73% healthy fruits. This yeast provided 100% disease control in 'Tahiti' acid lime fruits under refrigeration (10°C and 95%RH) when combined with a quarter dose of imazalil fungicide. Studies about modes of action of this yeast against *Geotrichum citri-aurantii* demonstrated that ACB-K1 produced hydrolytic enzymes (chitinases and β -1,3-glucanases), killer activity and inhibited conidial germination. The multiple modes of action (killer activity, production of chitinase and inhibition of conidial germination) presented by the *Candida stellimalicola* strains against *P. italicum* may explain why these yeasts provided control of blue mold in citrus fruits.

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