Title Effect of stabilizers on the shelf-life of *Penicillium frequentans* conidia and their efficacy as a biological agent against peach brown rot

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Abstract

Stabilizers were added to conidia of *Penicillium frequentans* at two different points of the production–formulation process to improve shelf-life of conidia stored at different temperatures. Effects were also tested on conidial germination and production. Germination of conidia without additives was 90.2%; sodium chloride, potassium chloride, triton TX100, dimethyl sulphoxide, peroxidase, 0.375% and 0.075% ascorbic acid, 7.5% and 3.75% sucrose, and 7.5% and 3.75% d-sorbitol reduced significantly ($P = 0.05$) conidial germination, while no effect was observed with glucose, lactose, maltose, sodium glutamate, glycerol, peptone, sodium alginate, carboximethylcellulose, Tween 80, and gelatine. Production of *P. frequentans* conidia in solid-state fermentation without additives was 1.07 conidia $\times 10^8$ g^{-1} of dry substrate. The highest tested doses of glucose, lactose, maltose, sodium glutamate, and glycerol enhanced production of *P. frequentans*, while the lowest tested doses of d-sorbitol and ascorbic acid reduced it. No significant effect was observed with sucrose, peptone, sodium alginate, carboximethylcellulose, gelatine and Tween 80. Conidial germinability after one year of storage at different temperatures was studied in some formulations. It was lower than 18% after 365 days of storage at room temperature in control samples (without any additive), being enhanced when 7.5% glucose, 7.5% glycerol, or 1.5% sodium alginate was added to the substrate in bags before fermentation; or when 7.5% glucose, 7.5% sodium glutamate, or 1.5% sodium alginate was added to conidia before drying. Germinability of conidia produced without any additive and stored at 4 °C was significantly higher (38%) than at room temperature, being enhanced when 7.5% glycerol or 1.5% sodium alginate was added to the substrate in bags before fermentation; and when 7.5% glucose, or 1.5% sodium alginate was added to conidia before drying. No effect was observed with the presence or absence of light or high vacuum. Four formulations of *P. frequentans* conidia reduced disease incidence by more than 55%. The relationship of the disease control with the viability of *P. frequentans* was discussed.