

Title Integrated control of crown rot of banana with *Candida oleophila* strain O, calciumchloride and modified atmosphere packaging

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Abstract

An integrated approach for biological control of crown rot of banana was studied. The efficacy of three control measures, applied alone or in various combinations, was evaluated under conditions highly conducive to the development of crown rot (artificial inoculation of *Colletotrichum musae* at 10^4 conidia/ml). The studied measures were: application of an antagonistic yeast (*Candida oleophila* strain O at $1 \cdot 10^7$ cfu/ml), treatment with 2% (w/v) calciumchloride, and modified atmosphere packaging of fruit (MAP) in non-perforated polyethylene bags. *C. oleophila* was able to grow under MAP, maintaining a large population ($7 \cdot 10^6$ to $7 \cdot 10^7$ cfu/g crown) throughout the 13 days of storage. Both treatment with the antagonistic yeast and storage under MAP, applied separately, reduced crown rot significantly (by 22% and 20%, respectively, as compared to untreated controls). The effect of the yeast was the same whether it was produced in Petri dishes or in a fermentor. Calciumchloride treatment alone had no effect on *C. musae*. The antagonistic yeast showed a 16% higher biocontrol activity (from 26% to 42%) when applied together with 2% (w/v) calciumchloride, and the presence of this adjuvant made it possible to achieve the same protective effect with a lower yeast concentration. The highest efficacy (53%) was achieved by the combination of the three alternatives means of control and a synergistic relation has been detected between the yeast, calciumchloride and MAP. Considering the severe conditions of screening, the consistency of the results obtained in this study indicates that the integrated strategy has great potential for control of crown rot of banana under commercial conditions.