

**Title** Biological control of postharvest diseases of fruits and vegetables by microbial antagonists: A review

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**Citation** Biological Control, Volume 50, Issue 3, September 2009, Pages 205-221

**Keywords** Bioagents; Biocontrol; Physical treatments; Postharvest decay; Salt additives

#### **Abstract**

Postharvest diseases cause considerable losses to harvested fruits and vegetables during transportation and storage. Synthetic fungicides are primarily used to control postharvest decay loss. However, the recent trend is shifting toward safer and more eco-friendly alternatives for the control of postharvest decays. Of various biological approaches, the use of antagonistic microorganisms is becoming popular throughout the world. Several postharvest diseases can now be controlled by microbial antagonists. Although the mechanism(s) by which microbial antagonists suppress the postharvest diseases is still unknown, competition for nutrients and space is most widely accepted mechanism of their action. In addition, production of antibiotics, direct parasitism, and possibly induced resistance in the harvested commodity are other modes of their actions by which they suppress the activity of postharvest pathogens in fruits and vegetables. Microbial antagonists are applied either before or after harvest, but postharvest applications are more effective than preharvest applications. Mixed cultures of the microbial antagonists appear to provide better control of postharvest diseases over individual cultures or strains. Similarly, the efficacy of the microbial antagonist(s) can be enhanced if they are used with low doses of fungicides, salt additives, and physical treatments like hot water dips, irradiation with ultraviolet light etc. At the international level, different microbial antagonists like *Debaryomyces hansenii* Lodder & Krejer-van Rij, *Cryptococcus laurentii* Kufferath & Skinner, *Bacillus subtilis* (Ehrenberg) Cohn, and *Trichoderma harzianum* Rifai, are being used. Biocontrol products like Aspire, BioSave, and Shemer etc., have also been developed and registered. Although the results of this technology are encouraging, we need to continue to explore potential uses on the commercial scale in different corners of the world.