

**Title** Biological control for long term postharvest storage of *Cirtus* spp.  
**Author** Chung Sun Kim; Gung Pyo Lee; Sang Jo Kang; Young Hun Choi and Chang Hoo Lee  
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#### **Abstract**

It is necessary to develop new storage materials that are low cost, nontoxic, and environmentally friendly affinity for controlling filed bottleneck infection of *Citrus* spp. in Jeju. This study aimed to verify the efficiency anti-fungal bacteria and of natural active substances, and the development of treatment technology using new materials for long-term storage of mandarins. All of the *Bacillus* strains tested, GB-017, GB-0365, and GB-017+GB-0365 were antagonistic against *Penicillium* sp., *Fusarium* sp., and *Alternaria citri*. Visible effects of bacterial concentration occurred from  $6.3 \times 10^6$  cells/ml to  $6.3 \times 10^4$  cells/ml. The optimal concentrations of anti-fungal bacteria were determined to be 1/2 dilution of GB-0365, 1/10 dilution of GB-017, and 1/2 dilution of GB-0365+GB-0365 strains. White fungi were generated on the pericarp after 10 days from storage and most mandarins were decayed after 105 days in controls, while fungal occurrence was very low for 85-days on fruit treated with anti-fungal bacterial solutions. With the GB-0356 strain, a dipping treatment was more effective than tree spraying and dipping in preventing decay. The rate of decay on fruit sprayed on the tree was very low after 50 days compared with controls, and even less on dipped fruit. The effect of the a combination of natural active substance with anti-fungal bacteria on mandarin storage was examined by treating fruit with, 0, 1/20, 1/40, or 1/60 dilutions of the natural active substance. Rate of decay was decreased considerably in all dilution treatments with the 1/20 dilution effective on decay suppression after 90 days,; it had on affected on external fruit appearance.