The combined effects of Carboxymethyl chitosan and *Cryptococcus laurentii* treatment on postharvest blue mold caused by *Penicillium italicum* in grapefruit fruit

Fang Wang, Jia Deng, Junying Jiao, Yanyuan Lu, Lei Yang and Zhengjun Shi

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Abstract

The blue mold caused by *Penicillium italicum* in grapefruit fruit was controlled by the antifungal activities of Carboxymethyl chitosan (CMCS) alone and combined with *Cryptococcus laurentii* treatments in this study. According to the study results spore germination of *P. italicum* can be inhibited by both CMSC and *C. laurentii* treatment. Moreover, the growth of *C. laurentii* can be maintained by low CMCS concentration in vitro. The blue mold in grapefruit fruit inoculated with *P. italicum* was decreased in all treatments compared with the control fruit. The combination of CMSC and *C. laurentii* treatment resulted in a significantly synergistic effects in smallest lesion diameter and decay incidence. The defense enzyme activities, such as phenylalanine ammonia-lyase, polyphenol oxidase, peroxidase and antifungal compounds like total phenolic related to disease resistance can be induced by combined treatment. Furthermore, the commercial quality parameters of the CMCS combined with *C. laurentii* treatment which were measured by ascorbic acid, titratable acidity, weight loss and total soluble solid, were better than those treated with treatments alone. According to the results, the combination of CMSC and *C. laurentii* treatment can maintain fruit quality and control postharvest decay more effectively than single treatment, and can be commercially used in grapefruit fruit.