**Title** Salicylic acid enhances biocontrol efficacy of the antagonist *Cryptococcus laurentii* in apple fruit

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**Abstract**

Biological control and induced resistance are two of the promising approaches to the control of postharvest diseases. This study was conducted to evaluate the efficacy of salicylic acid (SA) alone or in combination with an antagonistic yeast, *Cryptococcus laurentii*, in controlling the blue mold disease caused by *Penicillium expansum* on apple fruit wounds. SA alone significantly inhibited the spore germination of *P. expansum in vitro* when its concentration was increased to 1000 $\mu g\ ml^{-1}$, but it was not effective in controlling the disease *in vivo*. Simultaneous application of SA and *C. laurentii* to the wounds on the apple fruit surface showed that SA could improve the efficacy of *C. laurentii* against *P. expansum* in a concentration-dependent manner, being most effective at 10 $\mu g\ ml^{-1}$ but less effective at a higher or lower concentrations. Besides reducing the blue mold incidence in the local wound sites, the combination of *C. laurentii* with SA at 10 $\mu g\ ml^{-1}$ also had a synergistic effect on the induction of fruit resistance to the disease, which might be associated with a rapid increase in peroxidase, phenylalanineamonialyase and lipoxygenase activities. In addition, SA at 100 $\mu g\ ml^{-1}$ or above showed an adverse effect on the growth of *C. laurentii in vitro* and *in vivo*, whereas it had no effect when its concentration was decreased to 10 $\mu g\ ml^{-1}$ or lower. This suggested that SA could enhance the biological activity of *C. laurentii* in apple fruit by inducing resistance to pathogens based on the antagonistic activity of *C. laurentii*.