Title Hydrogen peroxide induction in citrus fruit by antagonistic yeasts used for postharvest biocontrol: a new mechanism of action?

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Abstract

There is evidence that some biocontrol agents transiently induce ROS production in host plants, triggering local or systemic pathogen resistance. An oxidative response is triggered in a host plant by a microbe by either recognition of microbe-associated molecular patterns (MAMPs) or by specific, effector-triggered mechanisms. The ability of postharvest biocontrol agents to induce defence-related, oxidative responses in fruits, has not been investigated. Using laser-scanning-confocal microscopy, we showed that the antagonist yeast, *Metschnikowia fructicola* induces a rapid increase in H_2O_2 in host tissue when applied to citrus fruit wounds. By 18 hours after inoculation, the level of H_2O_2 around inoculated wounds increased by 3-fold compared to levels in controls. H_2O_2 levels in yeast-inoculated fruit were still significantly ($P < 0.01$) greater than controls 66 h post-inoculation. At this time, living yeast cells were detected in fruit wounds, indicating the ability of *M. fructicola* to tolerate high levels of ROS, which has been suggested to be an intrinsic characteristic of effective yeast antagonists. This data, together with our earlier observations of the importance of H_2O_2 production by flavedo tissue in citrus fruit resistance to postharvest pathogens, indicate that the ability of antagonist yeasts to induce an oxidative response in host tissue could be an important aspect of biocontrol activity. Whether the induction of an oxidative response in citrus fruit by yeast is due to an MAMP response or a more complex interaction involving specific yeast effectors needs to be determined.