

Title Characterization and expression of β -1,3-glucanase genes in jujube fruit induced by the microbial biocontrol agent *Cryptococcus laurentii*

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Abstract

Two β -1,3-glucanase genes were cloned from jujube (*Ziziphus jujuba* Mill) fruit and designated *Glu-1* and *Glu-2* (GenBank accession numbers DQ012940 and DQ093571), respectively. The expression of *Glu-1* and *Glu-2* in jujube fruit in response to wounding and microbial biocontrol agent was evaluated by semi-quantitative reverse-transcription polymerase chain reaction analysis. Wounding and treatment with *Cryptococcus laurentii* stimulated an increase in β -1,3-glucanase (EC 3.2.1.39) activity in jujube fruit. Analysis of gene expression proved that *Glu-1* was highly induced both by wounding and *C. laurentii*, whereas *Glu-2* was broadly not responsive to the yeast. The expression of *Glu-1* was noticeably enhanced with increased concentrations of *C. laurentii*, suggesting that *Glu-1* may play a role in defense responses to fungal pathogens. The results hold true at the levels of gene activation and enzyme accumulation in jujube fruit treated by both stimuli, resulting in a significant decrease in disease incidence and lesion diameter, thus providing evidence that changes in β -1,3-glucanase activity are related to expression of the genes. Taken together, these findings suggest the possible use of β -1,3-glucanase activity as a biochemical marker for screening jujube fruit against fungal pathogens, and also provide a mechanistic framework for the functions of β -1,3-glucanase in defense responses.