Differential expression of copper/ zinc superoxide dismutase in pear/quince combinations during early stages of development

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Abstract:

Superoxide dismutase (SOD, EC 1.15.1.1) is one of the most important antioxidant enzymes and constitutes the first level of defence against superoxide radicals in plants. SOD catalyzes the dismutation of O2– to H2O2 and O2. SOD enzymes fall into three distinct families that are classified according to metal cofactors. The most abundant SODs in plants are the CuZnSODs which are found mainly in the cytosol and in the chloroplasts providing enhanced tolerance to oxidative stress. In grafted plants, it is reported that oxidative stress could trigger cell and tissue degradation processes in incompatible grafts. The aim of this study was to evaluate the gene expression of different genes encoding CuZnSOD (CSD1, CSD2, CSD3) and cytosolic SOD activity in callus unions with different graft response from pear cvs. ‘Conference’ (Co) and ‘William’ (Wi) and the quince rootstock clone ‘Ba29’ during three weeks after union. CuZnSOD mRNA transcripts were detected in all combinations throughout the graft union development However, the mRNA expression patterns varied with the kind of combination examined. CSD1 and CSD2 transcript levels showed significant differences between ‘Co/Co’ and ‘Co/BA29’ at 10 and 21 DAG, respectively. Likewise, it was observed a 4-fold increase in CSD3 gene expression in the homograft ‘Wi/Wi’ at 21 DAG compared to the heterograft ‘Wi/Ba29’. Furthermore, there was a higher SOD activity in the compatible cultivar (Co) than in the incompatible cultivar (Wi) from 1 day after wounding onwards. These results will be discussed in terms of wound/healing repair mechanisms and oxidative stress associated to grafted plants during graft union development.

Keywords:

cytosolic SOD
in vitro callus unions
oxidative stress
real-time PCR
wounding mechanisms

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