

Title Cloning and expression analysis of phenylalanine ammonia-lyase in relation to chilling tolerance in harvested banana fruit

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Abstract

Bananas are highly susceptible to chilling injury (CI) and phenylalanine ammonia-lyase (PAL), as a key enzyme involved in plant phenylpropanoid metabolism, has been associated with low temperature stress in plant tissues. However, little is known about the role of PAL (including PAL activity, gene and protein expression) in postharvest chilling tolerance of banana fruit. Two partial cDNAs sequences (*MaPAL1* and *MaPAL2*) with about 760 bp were cloned from banana pulp by RT-PCR. Western and northern hybridizations were used to investigate expression of PAL protein and *PAL* genes in fruit stored for 10 days at 7 °C (chilling temperature) and then transferred to 22 °C (room temperature). The effects of propylene (a functional ethylene analog) on their expression in relation to CI were also examined. Northern and western blot analyses revealed that mRNA transcripts of *MaPAL1* and *MaPAL2* and PAL protein levels in banana fruit during storage increased, reaching a peak at about day 8, and finally decreased at chilling temperature. Prior to low temperature storage, pretreatment with propylene could alleviate CI and enhance PAL activity, protein amount and mRNA transcripts of *MaPAL1* and *MaPAL2*. Moreover, changes in PAL activity, protein amount and accumulation of *MaPAL1* and *MaPAL2* exhibited almost the same patterns. The results suggest that the induction of PAL in banana fruit during low temperature storage is regulated at transcriptional and translational levels, and is related to reduction in CI symptoms.