

Abstract

We investigated the role of β -galactosidase (EC 3.2.1.23; β -Gal) in 'La France' pear (*Pyrus communis* L.) fruit growth and softening at both biochemical and molecular levels. Northern hybridization was carried out using probes prepared from Japanese pear β -galactosidase (*PpGAL*) cDNA clones, designated *PpGAL1*, *PpGAL2*, *PpGAL3*, *PpGAL4*, *PpGAL5*, *PpGAL6* and *PpGAL7*. β -Galactosidase activity and accumulation of the transcripts hybridizing with the *PpGAL* genes were investigated during fruit growth and in relation to fruit softening and in response to propylene and 1-methylcyclopropene (1-MCP) treatments during postharvest ripening. β -Galactosidase activity was highest in very young fruit, decreased to low levels in later stages of fruit expansion and then increased during postharvest ripening. The increase in β -Gal activity during fruit ripening paralleled the decrease in fruit firmness. Transcripts hybridizing with *PpGAL1* and *PpGAL4* were not detected during fruit growth but were detected in the ripening fruit. On the contrary, the abundance of transcripts hybridizing with *PpGAL2*, *PpGAL3*, *PpGAL5*, *PpGAL6* and *PpGAL7* was highest in the early stages of fruit development, decreased towards fruit maturity and except for *PpGAL2* were detected in the ripening fruit, albeit at low levels. Propylene treatment resulted in increased ethylene production, decreased fruit firmness and increased β -Gal activity. Besides, propylene stimulated the accumulation of transcripts hybridizing with *PpGAL1* and *PpGAL4* and suppressed the accumulation of transcripts hybridizing with *PpGAL6* and *PpGAL7* and had no effect on transcripts hybridizing with *PpGAL2*, *PpGAL3* and *PpGAL5*. The converse was true for fruit treated with 1-MCP, although the inhibition of the accumulation of transcripts hybridizing with *PpGAL1* and *PpGAL4* by 1-MCP was not complete. These results indicate that *PpGAL1* and *PpGAL4* play a crucial role in 'La France' pear fruit softening and the increase in their expression at the onset of fruit ripening is in part due to up-regulation by ethylene. The decrease in transcripts hybridizing with *PpGAL6* and *PpGAL7* in ripe fruit may in part be due to down-regulation by ethylene whereas that of transcripts hybridizing with *PpGAL2*, *PpGAL3* and *PpGAL5* may be due to another mechanism(s) unrelated to ethylene action. The divergent members of the β -Gal gene family in 'La France' pear fruit, therefore, have differential developmental and hormonal regulation characteristics.