

Title Patterns of enzymatic activity of cell wall-modifying enzymes during growth and ripening of apples

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Abstract

Fruit softening is thought to result from extensive cell wall modifications that occur during ripening. These modifications are the result, at least in part, of the activity of members of cell wall-modifying enzymes from the same families involved in the cell wall loosening which promote tissue extension and growth. In this work, the activities of a set of pectolytic and non-pectolytic cell wall-modifying enzymes, namely polygalacturonase (PG; endo- and exo-acting), pectin methylesterase (PME), pectate lyase (PL), β -galactosidase (β -Gal), α -L-arabinofuranosidase (AFase), endo-1,4- β -glucanase (EGase), xyloglucan endotransglycosylase (XET) and expansin, were monitored during growth and ripening of 'Mondial Gala' apple (*Malus × domestica* Borkh.) fruit. After optimisation of protein extraction protocols and standard activity assays, activity could be detected in all the assays, except for endo-PG. The overall results suggest that fruit growth and ripening are possibly coordinated by members of the same families of cell wall-modifying enzymes, although different isoforms may be involved in distinct developmental processes. Based on the trend of total activity measured in vitro using equal amounts of protein per developmental stage, the role of EGase seems to be more prominent during growth than during ripening, and XET activity is most important only after the fruit stopped growing and is maintained throughout ripening. β -Gal and AFase activities increased after harvest as the fruit became over-ripe. On the other hand, exo-PG, PL and expansin activities increase from that in unripe fruit to fruit at harvest but are maintained at similar levels thereafter, throughout the over-ripe stages. The patterns of activity observed are discussed in relation to published information about ripening of apples and to results reported using other species.