

Title Cell wall modifications during fruit ripening: when a fruit is not the fruit
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Abstract

Textural changes that lead to softening of fruits are accompanied by loss of neutral sugars, solubilisation and depolymerisation of the polysaccharides of the cell wall, and rearrangements of their associations, as the result of the combined action of several cell wall-modifying enzymes, acting in both pectic and hemicellulosic fractions. Recent studies on the structure of the plant cell wall have disclosed a large number and type of biochemical linkages between the components. Such linkages are potential targets for enzymatic action and draw attention to the putative involvement of several members of enzymes able to act and modify its structure in a developmental and coordinated way. Extensive work on fruit ripening has been done using tomato (*Solanum lycopersicum* [*Lycopersicon esculentum* Mill.]) as a plant model and the information concerning fruits other than model species is fragmented and incomplete. However, recent data from the literature had disclosed that differences exist between fruits, and even between cultivars of the same fruit species. These differences exist in the type and extent of the modification of the polysaccharides of the cell wall and in the expression and regulation of cell wall-modifying enzymes. In addition, genetic manipulation of cell wall-modifying genes re-opened the discussion about the real effect of these enzymes in the cell wall and their role in fruit softening. Moreover, the function of each enzyme has been proposed based on its homology with other annotated sequences, but, in most cases, confirmation of activity *in planta* and substrate specificity remains to be investigated. This aspect and recognized limitations of the *in vitro* enzymatic activity assays also need to be considered when discussing their role. This paper provides a critical review on the current knowledge concerning these differences and emphasises the need of using other species and more accurate methodologies to investigate general mechanisms and fruit specificities of softening among different fleshy fruits.