Title Fruit softening during ripening - causes and regulation

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Abstract

Fleshy fruits have evolved repeatedly in several plant clades, including five times in Rosaceae. Different tissues have become the fleshy edible portion including the mesocarp, accessory tissues, aril, and flower tissue. Hence, ripening physiology may differ significantly between different species. Temporal and spatial differences exist between species in ethylene production and respiration rates and softening related changes. Papaya ripening illustrates some of the differences that can occur between species. Papaya has unique ripening variants in which skin and flesh color development is separated from respiratory rise and ethylene production, and softening. One variant softens to the edible stage in six days versus 11 days for the commercial varieties and another that does not begin to soften until 14 days from mature green stage and reaches the edible soft stage at 21 days. These papaya variants contrast sharply with the profound disruption shown by the tomato single gene ripening mutants. We have also purified a fruit ripening associated endoxylanase that is 32.5 kDa and coded for as a 64.96-kDa protein. The protein contains a secretory sequence, carbohydrate binding domain and the endoxylanase catalytic domain. Endoxylanase expression data from the ripening variants supports the possibility that it has a role in papaya mesocarp softening during ripening. The results suggest that different fruit may use different combinations of cell wall hydrolases to cause ripening related fruit softening. Tomato can be a model in that it can provide research direction. In a different fruit the results from tomato need to be confirmed at the gene expression, physiology and functional level.