

The Role of Calcium Homeostasis in Bitter Pit Symptom Development in Apple Fruit

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Abstract

Bitter pit is a calcium deficiency associated physiological disorder of apple fruits. Calcium application by foliar spray in early season can reduce bitter pit incidence, but cannot eliminate the problem usually. The function of calcium in plant is determined by its location in sub-cell environment, and affected by the antagonism of other cations or precipitation with organic acids. In comparison with healthy fruits, lower Ca/(Mg+K) ratio and higher oxalic acid and citric acid concentration were found in fruits with bitter pit. Pitted fruit had higher cell membrane permeability, higher polyphenol peroxidase activity and more insoluble calcium accumulation in outer cortical tissue than non-pitted tissue or sound fruits. There is a greater degree of pectin deesterification in cortical tissue of pitted fruit compared with non-pitted fruit, therefore, higher fraction of calcium in fruit were bound in insoluble pectin in cell wall. It indicates that the distribution and effectiveness of calcium in cell is related with bitter pit symptom development.

Key words: plasma membrane permeability, oxalic acid, pectin.

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