Biochemical and phenotypic characterization of sweet cherry (*Prunus avium* L.) cultivars with induced surface pitting

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Postharvest Biology and Technology, Volume 175, May 2021, 111494

Abstract

One important physiological disorder in sweet cherry (*Prunus avium* L.) is surface pitting. This disorder involves irregular depressions on the fruit surface and occurs during harvest, but it develops during cold storage. The aim of this research was to understand the phenotypic characteristics and biochemical responses, referring to the metabolomic profile and the composition and disassembly of the cell wall, that underlie the susceptibility to pitting. The study was carried out using cultivars with contrasting pitting behaviors, such as Bing (resistant) and Sweetheart (sensitive), during ripening and postharvest storage. Induced pitting did not have a negative impact on quality parameters except visual quality in sweet cherries during cold storage, and firmness was not a key parameter that explained the susceptibility to pitting. The mechanical stress to induce pitting triggered a significant decline in pectin methylesterase (PME) activity on day 14 of storage for the Sweetheart cultivar. Intensified labeling for methylated homogalacturonan immunostaining of pitted mesocarp cells in Bing was observed. Xyloglucan showed more abundant labeling in pitted samples, which was more pronounced in Sweetheart fruit than Bing cherries. The metabolomic screening showed a higher content of organic acids and amino acids in the Sweetheart cultivar, while the Bing cultivar had higher contents of sorbitol and arabinitol. Proline and 2-oxoglutaric acid emerged as metabolites altered in response to mechanical stress in both cultivars. Furthermore, pitted Bing fruit elicits anthocyanin overexpression. The metabolomic analysis suggests that susceptibility to pitting could depend on the metabolic differences of each cultivar because the induced pitting did not greatly disrupt the studied metabolic responses.