

Surface Moisture Induces Microcracks in the Cuticle of 'Golden Delicious' Apple

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Abstract:

Abstract. Formation of microcracks in the cuticular membrane (CM) of epidermal segments (ES) of apple [*Malus sylvestris* (L.) Mill. var. *domestica* (Borkh.) Mansf., 'Golden Delicious', 'Braeburn', 'Idared', 'Jonagold', and 'Topaz'; all grafted on 'Malling.9' rootstocks] fruit was studied after exposure of the surface of the ES to water. Potential strain of the CM on the ES was preserved by mounting a stainless steel washer on the fruit surface using an ethyl-cyanacrylate adhesive. Subsequently, ES were excised by tangentially cutting underneath the washer. The number of microcracks in the CM was established by light microscopy before and after a 48-h incubation period in deionized water. Within 48 h, the number of microcracks rapidly increased when the outer surface of ES of 'Golden Delicious' apple was exposed to water, but there was essentially no increase in microcracks when exposed to the ambient atmosphere. The occurrence of microcracks depended on the region of the fruit surface and increased from the rim of the pedicel cavity to the calyx. Increasing the relative humidity (greater than 75% relative humidity at 22.8°C) above the outer surface of the ES exponentially increased the number of microcracks. Water-induced microcracking was not limited to 'Golden Delicious', but also occurred in 'Braeburn', 'Jonagold', 'Topaz', and, to a markedly smaller extent, in 'Idared' apple. The mechanism of formation of microcracks in the CM of apple fruit and their role in fruit russetting are discussed.