Roles of laccase and cultivar-specific phenolic composition in scald-like disorder development in pears

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Abstract

'Starkrimson' pears are prone to develop scald-like disorders after cold storage. In contrast, 'Conference' pears are less susceptible to scald-like disorders. In the present study, the scald morphology and underlying mechanism related to scald formation in 'Starkrimson' fruit and 'Conference' fruit were investigated. The scald-like symptoms in the two pear varieties were different from typical superficial scald in pears. In 'Starkrimson' fruit, the scald morphology was similar to soft scald symptoms, and the scald disorder could be inhibited by 1-MCP treatment but not triggered by oxidation of α-farnesene. In 'Conference' fruit, the occurrence of scald-like symptoms was accompanied by fruit senescence. To elucidate the scald formation mechanism in the two cultivars, scald incidence, membrane integrity, PPO activities, laccase activities and phenolic compositions were evaluated in peel tissue of 'Starkrimson' and 'Conference'. The cell membrane integrity related parameters including malondialdehyde (MDA) contents and relative leakage rates (RLR) gradually increased accompanying scald development in both cultivars. However, higher level of MDA contents and RLR but less scald symptom was observed in 'Conference' than those in 'Starkrimson'. The enzymatic browning during scald development was further confirmed to be catalyzed by laccases but not PPO. Laccase activity and the expression pattern of *PcTT10* (the typical enzymatic browning related laccase) were highly associated with scald development. Moreover, the native phenolic compounds in 'Starkrimson' could cause more severe enzymatic browning than that in 'Conference'. Taken together, our results indicated although cell membrane integrity and laccase participated in scald formation in pear fruit, variable phenolic composition in different pear cultivars may contribute to their different susceptibility to scald.