Abstract

Watermelon (*Citrullus lanatus Thunb*. Matsum and Nakai) fruits were held in 50 μl l^{-1} ethylene at 20 °C following an 18-h exposure to 5 μl l^{-1} 1-methylcyclopropene (1-MCP) to investigate the involvement of ethylene perception in the regulation of placental tissue water-soaking through phospholipase-mediated phospholipid (PL) degradation. Water-soaking was accompanied by increase in phospholipases C (PLC, EC 3.1.4.3) and D (PLD, EC 3.1.4.4), and lipoxygenase (LOX, EC 1.13.11.12) activities, decreases in phosphatidylcholine (PC) and phosphatidylinositol (PI), and increases in phosphatidic acid (PA). These changes were evident within 2 days of ethylene exposure, coincident with accelerated softening, increased electrolyte leakage and extractable juice, and appearance of water-soaking. Air-stored fruits did not exhibit water-soaking, and the activities of lipid-degrading enzymes and PL levels remained constant throughout the 8-day storage period. Treatment of fruit with 5 μl l^{-1} 1-MCP prior to ethylene exposure reduced ethylene-induced increases in the activities of lipid-degrading enzymes, and PL degradation, and completely prevented water-soaking and the attendant increases in electrolyte leakage and extractable juice. The results demonstrated that water-soaking in watermelon fruit requires competent ethylene responsiveness and is associated with ethylene-inducible PL degradation. This represents the first report wherein 1-MCP imparts to a fully ripe fruit complete protection against deleterious effects of exogenous ethylene. Watermelon fruit maintained under simulated commercial storage conditions (up to 3 weeks at 13 °C) without exposure to exogenously provided ethylene also benefited significantly from prior exposure to 1-MCP.