Abstract

High CO_2 can inhibit ethylene production of various fruit. A high level of CO_2 (20 kPa) was applied to tomato fruit (*Lycopersicon esculentum* Mill. cv Aromata) at 18 °C for 5 days. To investigate the primary action site of CO_2, we used tomato fruit at a ripening stage where feedback regulation of ethylene production was of limited importance. Feedback reactions were further prevented by a treatment with 1-methylcyclopropene (1-MCP) before exposure to high CO_2. Tomatoes with and without 1-MCP pre-treatment were exposed to 0 or 20 kPa CO_2. Ethylene production, 1-aminocyclopropane-1-carboxylate (ACC) content and ACC oxidase mRNA abundance were measured after 1, 2 and 5 days exposure to 0 or 20 kPa CO_2. High CO_2-affected *LE-ACO1*, *LE-ACO3* and *LE-ACO4* transcripts differently. Several observations show that high CO_2 did not affect the ethylene receptor: (1) CO_2 had a much earlier and much stronger inhibitory effect on ethylene production than 1-MCP; (2) CO_2 prevented while 1-MCP stimulated ACC accumulation; (3) CO_2 prevented the 1-MCP induced decrease of *LE-ACO1* abundance, and inhibited the 1-MCP induced decrease of *LE-ACO3* abundance. Inhibition of ethylene production together with prevention of ACC accumulation by CO_2, both in fruit with and without 1-MCP pre-treatment, points to inhibition at a site before the conversion of ACC to ethylene.