

Title Effects of low oxygen and MCP, applied singly or together, on apple fruit ripening
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Abstract

Hypoxia induces numerous biological changes in plant tissues. In fruit ripening, the most important impact of low oxygen is to delay the onset of the ethylene climacteric for considerable periods. In the past three years we have studied the effects of 1 - 1.52 kPa O₂ and 1 ppm 1-methyl-cyclopropene (MCP), applied singly or together, on apple fruit ripening at 1 and 6.5°C. The effects of the treatments on the timing of the rise in ethylene evolution differ with the treatment. At 6.5°C the onset of the climacteric occurred after 15, 60 and 96 days in controls, 1.52 kPa oxygen, and MCP, respectively, while the combined application of MCP and low oxygen delayed the onset of the rise in ethylene evolution for 190 days, the duration of the experiment. The inhibition of ethylene biosynthesis was accompanied by a strong suppression of the accumulation of transcripts of ACC synthase (ACS1) and ERS1, a putative ethylene receptor. The expression of these genes was critically dependent on ethylene evolution and both of their promoters were found to contain ethylene-response elements. As expected, low oxygen induced the expression of alcohol dehydrogenase (ADH), an anoxic protein. MCP applied singly did not appear to enhance ADH expression. Nor did it inhibit it when it was applied together with low oxygen.