

Title Factors affecting the efficacy of 1-MCP applied to retard apple ripening
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Abstract

Experiments were carried out over a 4-year period (2000-03) to develop protocols for treating apples grown in the UK with SmartFresh™ (1-MCP). Fruit was stored in air and/or controlled atmosphere (CA) and assessed after a further 7 days at 20°C. Only the effects of 1-MCP on internal ethylene concentration (IEC), firmness and superficial scald are considered here. There was no consistent effect of dose rate (500 v 1000 nl L⁻¹ or 312 v 625 nl L⁻¹ of 1-MCP in store free space) on IEC, firmness or scald incidence of 'Cox' or 'Bramley' apples. On 'Cox' a 24 h treatment was more effective in reducing IEC and improving firmness than a 12 h treatment. A 5-day delay in application of SmartFresh™ increased IEC and reduced firmness in 'Cox' but had no effect on 'Gala' apples. IEC in 'Bramley' apples also tended to higher where treatment was delayed and fruit was softer. In general lower dose combined with shorter treatment time result in the highest IEC in 'Cox' and 'Bramley' and lower dose in combination with delayed treatment resulted in the highest IEC and lowest firmness in 'Cox'. The protocol subsequently decided universally for apple treatment was 625 nl L⁻¹ of 1-MCP (based on empty store volume) applied for 24 h with minimal delay between harvest and application. The greatest benefit from 1-MCP was derived from CA storage although worthwhile extensions in storage life were achieved in air storage. Differences in firmness between air and CA-stored 'Cox' apples increased with time in store due to the more rapid softening of air-stored fruit. Only 5/1 (kPaCO₂/O₂) storage gave complete control of scald in 1-MCP treated 'Bramley' apples stored for the longest period. Delaying establishment of CA conditions in 2002 from 10 to 28 days to avoid CO₂ injury in 'Bramley' did not affect IEC, scald incidence or firmness. However in 2003 there was an adverse effect of a 21-day delay on the firmness of fruit stored in 5/1 for 284 days but no effects on scald development. 'Fiesta', 'Jonagold', 'Idared' and 'Braeburn' treated with 1-MCP failed to soften during 90 days of CA storage. Despite a reduced IEC 'Meridian' apples treated with 1-MCP were not significantly firmer than untreated and 'Spartan' did not respond to 1-MCP either in terms of IEC or firmness. The significant orchard variability in IEC and quality of 'Bramley' treated with 1-MCP demonstrates the need to maximise storage potential through attention to pre-harvest factors.