

Abstract

Postharvest treatment with 1-methylcyclopropene (1-MCP), the novel gaseous inhibitor of ethylene action, delays ripening and maintains apple quality during storage. Unfortunately, 1-MCP has also been shown to increase the incidence of certain storage disorders in apples using small-scale scientific trails. However, there has been little investigation on these negative effects of 1-MCP at a commercial level, using common industry practices and commercial storage facilities. The objective of this study was to determine the effects of commercial 1-MCP treatment on the incidence of disorders and storability of 'Empire' apples in controlled atmosphere (CA). 'Empire' apples were commercially harvested from 21 orchards in southwest Ontario and delivered to two storage operations. Apples from 15 orchards were drenched with diphenylamine (DPA) upon arrival at storage operation A, while fruit from the other six orchards were not drenched at storage operation B. Half of the fruit from each orchard were placed into commercial CA rooms for 1-MCP treatment. Rooms at storage A and B were treated within 4 days of harvest with $\sim 0.8 \mu\text{L L}^{-1}$ and $\sim 0.7 \mu\text{L L}^{-1}$ 1-MCP for 24 hours at 1.1 and 1.4 °C, respectively. Non-treated control fruit (held in comparable rooms at similar temperatures) were then returned to the treated storage rooms and CA conditions were established. As a quick efficacy test, some apples were evaluated after 14 days at ~ 22 °C following treatment. 1-MCP treated fruit had close to zero or lower internal ethylene than non-treated fruit and had firmness values similar to those at harvest. Soluble solids concentration was not affected by 1-MCP at this time or during storage. After 3 1/2 to 9 months of CA storage, apples treated with 1-MCP continued to have less internal ethylene and greater firmness than non-treated fruit. However, the largest differences were observed in apples that were of optimum maturity at harvest ($< 1 \mu\text{L L}^{-1}$ internal ethylene concentration). Apples that were not drenched with DPA and held at storage B developed some external CO₂ injury during CA storage, whereas those drenched and held at storage A did not exhibit any symptoms of CO₂ injury. Fruit treated with 1-MCP had higher incidence of CO₂ injury than non-treated fruit. Apples held at storage A developed some internal browning after 9 months of CA storage, but 1-MCP had no effect on the incidence.