Title Managing the postharvest physiology of unrooted cuttings to enhance shipping and postharvest quality

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Abstract

United States ornamental plant producers imported approximately $61 million worth of unrooted cuttings in 2006. The top three greenhouse crops zonal geraniums, poinsettias and New Guinea impatiens had a $330 million wholesale value and were produced from approximately 138 million cuttings. To investigate possible areas for improvement in cutting production and shipping modified atmosphere (MA) storage of unrooted cuttings, the use of 1-methylcyclopropene (1-MCP) use as an ethylene inhibitor of unrooted cuttings, and ethephon, [(2-chloroethyl) phosphoric acid] use in stock plant management were studied.

Modified atmosphere storage of impatiens, geranium and poinsettia cuttings showed that cuttings held in 1%:20% oxygen:carbon dioxide generated higher ethylene concentrations than any other treatment including atmospheric control. Cuttings stored in 10:10, 10:5, 5:10, 5:5 generated less ethylene compared to atmospheric control. Cuttings stored in 10:5 performed best during propagation, with less leaf yellowing than other treatments. Application of 700 $\mu L \cdot L^{-1}$ 1-MCP prevented ethylene damage to begonia, portulaca and lantana. 700 $\cdot \mu L \cdot L^{-1}$ 1-MCP application to poinsettia, impatiens, zonal geranium ivy geranium, and petunia cuttings caused significant ethylene biosynthesis. 1-MCP application reduced zonal geranium root numbers and delayed adventitious root formation of angelonia, calibrachoa, impatiens, portulaca, sutera and verbena, though 1-MCP rooting effects were overcome by subsequent immediate exposure to ethylene. Ethylene evolution from cuttings harvested from ethephon treated stock plants is suspected to cause leaf abscission of unrooted cuttings during shipping. Impatiens cuttings harvested 24 hours after treatment with 0,250,500 or 1000 mg L^{-1} ethephon produced 0.07, 1.3, 1.7 or 5.8 $mg \cdot L^{-1} \cdot g^{-1}$ ethylene in the first 24 hours of storage at 20°C, respectively. Cuttings harvested 24 hours after treatment with 500 $mg \cdot L^{-1}$ ethephon stored at 10, 15, 20, and 25°C for 24 hours produced 0.37, 0.81, 2.03 and 3.55 $mg \cdot L^{-1} g^{-1}$ ethylene. Ethephon treatment effects were measurable on harvested cuttings up to 3 weeks post application.