Title The interaction of ethylene and carbohydrate status on the postharvest quality of non-rooted vegetative cuttings

Authors V.K. Rapaka, J.E. Faust

Citation ISHS Acta Horticulturae 755:75-80. 2007.

Keywords irradiance; 1-MCP; postharvest; stock plant; symptom

Abstract

Successful post-harvest shipment and propagation of non-rooted vegetative cuttings is dependent on the interaction of carbohydrate status and ethylene sensitivity. Carbohydrate status of the cutting is affected by the ambient irradiance delivered to the stock plants, the time of cutting harvest from the stock plant and the amount of respiration that occurs in the post-harvest environment. The combination of stock plants grown under relatively high irradiance (10-20 mol m^{-2} d^{-1}), afternoon harvest, and proper post-harvest temperature management result in cuttings with a relative high carbohydrate status. Ethylene production results from the wounding process that occurs during cutting harvest. For most species, ethylene production in the post-harvest environment increases as temperature increases, e.g., poinsettia cuttings stored in sealed packages at 20°C for two days accumulated 0.25 ppm of ethylene while cuttings stored at 10°C accumulated only 0.06 ppm. Plant sensitivity to this ethylene is dependent on the carbohydrate status of the cutting. Cuttings that possess a relatively high carbohydrate status are less sensitive to leaf senescence when exposed to ethylene. In contrast, cuttings with a low carbohydrate status are more sensitive to ethylene in the post-harvest environment. The most common symptoms include chlorosis and/or abscission of the most mature leaves. If the mature leaves exhibit only marginal chlorosis without rapid abscission, then the ethylene signal may result in improved rooting during propagation. Adventitious root formation was inhibited by application of the ethylene action inhibitor 1-MCP during the post-harvest environment, whereas it was promoted by exogenous ethylene when applied to cuttings with a higher carbohydrate status. These results suggest that a post-harvest ethylene signal promotes root regeneration when carbohydrate status is higher in the source leaves. Alternatively, when the carbohydrate status is low, rapid leaf abscission occurs and root formation is not promoted.