

Title Differential ethylene sensitivity during abscission and degreening in citrus
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Abstract

Ethylene is a gaseous plant hormone that regulates many processes in plant growth and development. Knowledge of ethylene biosynthesis, perception and signal transduction has helped to better understand plants response to ethylene. Response to ethylene was affected by several factors such as cultivar, plant organ and stage of development. In this research, differential response to exogenous ethylene in citrus during abscission and degreening were explored. Expression of genes involved in ethylene biosynthesis and signaling pathways were analyzed to determine if transcriptional changes were correlated with differential ethylene response. Partial or full-length nucleotide sequences were obtained for 'Valencia', 'Fallglo' and 'Lee x Orlando' homologs of biosynthetic genes *CsACS1*, *CsACS2* and *CsACO*, receptor genes *CsERS1*, *CsETR1*, *CsETR2* and *CsETR3*, and signaling genes *CsCTR1*, *CsEIN2*, *CsEIL1* and *CsEIL2*.

When applying abscission agents to tree fruit to facilitate harvest, it is desirable to loosen fruit and not leaves or other organs, but mechanisms controlling leaf and fruit drop are not fully understood. Differential abscission response in leaf and fruit tissues was observed when 'Valencia' orange was treated with ethephon abscission agent (ethylene releasing agent) alone or in combination with 1-methylcyclopropene (1-MCP; ethylene perception inhibitor). When 1-MCP was combined with ethephon application, leaf abscission was greatly reduced whereas fruit loosening was little affected.

Diurnal fluctuation in ethylene biosynthetic and signaling gene expression levels were studied in 'Valencia'. Expression of genes fluctuated diurnally in at least one of the tissues tested (leaf blade, leaf abscission zone, fruit peel and fruit abscission zone). Changes in natural fluctuations were correlated with changes in sensitivity of mature fruit and leaves to abscission agent ethephon. Abscission agent was most effective when applied at 2 pm when expression levels of biosynthetic genes were actively increasing.

Apart from differential abscission response, two citrus types 'Fallglo' and 'Lee x Orlando' exhibit differential degreening response. When harvested fruit were exposed to ethylene, rate of color change was greater in 'Fallglo' than in 'Lee x Orlando'. Differential degreening was correlated with differences in peel maturity between the two types and seedling triple response assay indicated no differences in ethylene perception.