

Studies on the 'tree factor' and its role in regulating induction of ethylene in persimmon (*Diospyros kaki* Thunb.) Fruit

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Abstract

Reports of 'tree factors' indicated that some climacteric fruits on a tree receive inhibitors of ripening or ethylene biosynthesis from leaves of the parent plants. In our study, the existence of 'tree factor' or 'tree ethylene-inhibitory factor' in persimmon was investigated, and different effects of the 'tree factor' were determined at a variety of developmental stages. Infiltration of a crude leaf extract (extracted in ethanol and dissolved in phosphate buffer), three leaf-extract fractions of different polarities (hexane, ethyl acetate, and aqueous fractions) and four plant hormones (ABA, GA3, IAA and zeatin) into young persimmon fruit flesh was conducted, and none of them inhibited endogenous ethylene production in flesh from detached fruit, thus the leaf extracts contained none of the expected 'tree factors'. Alternatively, we determined the effects of 3-(3,4-dichlorophenyl)-1,1-dimethylurea (DCMU; a specific photosynthesis inhibitor) and defoliation treatments on photosynthetic rate, transpiration rate, sap flow, fruit drop, and ethylene evolution. DCMU treatment, which prevented photosynthate transport but allowed water flow, promoted fruit drop by 67% 10 days after treatment. The defoliation treatment, which prevented photosynthate and water transport, significantly hastened fruit drop. On average, fruit drop occurred 2 days earlier in the defoliation treatment than in the DCMU treatment. Overall, our results suggested that the transport of photosynthates, or both photosynthates and water, to fruit inhibits fruit drop by preventing induction of ethylene synthesis in young persimmon fruit. The finding of the candidates for 'tree factors' is expected to have important implications for the improvement of postharvest fruit quality and storability.