

Title Studies of the “Tree Factor” and its role in the maturation and ripening of ‘Gala’ and ‘Fuji’ apples

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Abstract

The difference in ethylene production between attached and detached apple (*Malus domestica* Borkh) fruit is hypothesized to be modulated by a putative inhibitor termed the “tree factor”. This inhibitor is thought to affect System 2 ethylene production. Preharvest treatments, including girdling plus defoliation and detachment, were applied to ‘Gala’ and ‘Fuji’ trees and fruit during fruit maturation. Internal ethylene concentration (IEC) and other commercially-used maturity indices were used to follow the effects of these treatments over 3 years. Two distinct patterns of maturation and ripening behavior were observed. ‘Gala’ apples demonstrated the expected “tree factor”. Attached fruit produced less ethylene than detached fruit or fruit harvested from girdled and defoliated limbs. ‘Fuji’ ripening was confounded by cold weather in one season. ‘Fuji’ also did not display the expected “tree factor” in this study. Starch degradation was enhanced in both cultivars by detachment or by girdling and defoliation. The effect of the treatment on fruit softening was cultivar-dependent. ‘Gala’ fruit softened rapidly during maturation regardless of treatment but the softening of detached, and girdled plus defoliated ‘Fuji’ fruit was delayed. The IEC of harvested ‘Gala’ apples was higher than that of attached apples, perhaps a result of stress responses associated with detachment. The strength of the “tree factor” was found to decline as fruit maturity progressed and tended to be more obvious in ‘Gala’ that has a shorter growing season and matures during hot weather.