

Title Differential effects of abscisic acid and ethylene on the fruit maturation of *Litchi chinensis* Sonn.

Author Huicong Wang, Huibai Huang and Xuming Huang

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Abstract

Two litchi cultivars, a well-coloured 'Nuomici' and a poorly coloured 'Feizixiao', were used to investigate changes in endogenous abscisic acid (ABA) concentration and ethylene production during fruit maturation and to test the effects of exogenous growth regulators on litchi fruit maturation. Abscisic acid concentration in both the aril and pericarp increased with fruit maturation. Transfusion of ABA into the fruit 3 weeks before harvest accelerated, whereas transfusion of 6-benzyl aminopurine (6-BA) retarded sugar accumulation and pigmentation. The effect of 6-BA was assumed to link with the resultant decrease in ABA. In contrast, 1-aminocyclopropane-1-carboxylic acid (ACC) concentration and ACC oxidase (ACO) activities in the aril remained relatively constant during sugar accumulation. Transfusion of aminooxyacetic acid (AOA) significantly decreased ACC concentration but had no effect on sugar accumulation in the aril. These results suggested that endogenous ABA, but not ethylene, was critical for the sugar accumulation. However, the roles of ABA and ethylene in pericarp pigmentation were rather complicated. Application of exogenous ABA promoted anthocyanin synthesis significantly, but had very little effect on chlorophyll degradation. Ethylene production in litchi fruit decreased with development, but a transient increase of endogenous ethylene production was detected just around the colour break in 'Nuomici'. Enhanced ACO activity in the pericarp was detected during pigmentation. Ethrel at 400 mg l^{-1} showed no effect on pericarp coloration, but accelerated chlorophyll degradation and anthocyanin synthesis at a much higher concentration (800 mg l^{-1}). Fruit dipped in ABA solution alone yielded no effect on chlorophyll degradation, but the combined use of ABA and Ethrel at 400 mg l^{-1} enhanced both chlorophyll degradation and anthocyanin synthesis. These results indicated the possible synergistic action of ethylene and ABA during litchi fruit colouration. ABA is suggested to play a more crucial role in anthocyanin synthesis, while ethylene is more important in chlorophyll degradation. ABA can increase the sensitivity of pericarp tissue to ethylene.