

Evidence of acidic Invertase as a control step of sucrose level during ripening of two diploid banana fruit

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Keywords: *Musa*, banana, sucrose, Cell wall Invertase, Sucrose Synthase, Sucrose Phosphate Synthase, ripening, quality, fruit

Abstract

We previously shown that diploid dessert cultivars accumulate more sucrose during ripening on plant than diploid cooking cultivars, and that Acid Invertase (AIV) might be in this case important by correlating the ratio sucrose / glucose + fructose of fruit (Fils-Lycaon et al. poster). To investigate the putative involved mechanisms, Sucrose Phosphate Synthase (SPS) and AIV, two enzymes involved in sucrose metabolism were studied in fruit of two diploid AA dessert (IDN110) and cooking (Sowmuk) bananas, during their development and postharvest ripening after acetylene treatment. From the green developmental to late ripening stages, SPS activity increased at comparable levels in both varieties from 107 to 222 $\mu\text{moles of sucrose}\cdot\text{h}^{-1}\cdot\text{g FW}^{-1}$ for Sowmuk and from 68 to 168 and then after 106 $\mu\text{moles of sucrose}\cdot\text{h}^{-1}\cdot\text{g FW}^{-1}$ for IDN110. Activity of AIV increased slowly in IDN110 fruit from 3 to 26 $\mu\text{moles of glucose}\cdot\text{h}^{-1}\cdot\text{g FW}^{-1}$, and drastically in Sowmuk from 4 to 207 and then after 174 $\mu\text{moles of glucose}\cdot\text{h}^{-1}\cdot\text{gFW}^{-1}$. At molecular level, the pattern of SPS and Cw-AIV mRNA accumulation was similar in both varieties during fruit development and ripening. SPS mRNA level increased transiently during the green developmental stage while that of Cw-AIV increased with ripening. Interestingly, at equivalent stages, the increase of Cw-AIV mRNA level was approximately 100-fold more in Sowmuk than in IDN110, which corroborates with the higher AIV activity measured for Sowmuk. As between the two varieties, no significant changes were observed for neutral invertase activity and for Susy gene expression and activity, our data strongly suggest that AIV activity constitutes a key step that controls the sucrose level during ripening of diploid banana fruit and that Cw-AIV gene contributes to this activity. Thus, Cw-AIV constitutes a target for the identification of molecular markers usable in breeding, and marker-assisted selection to improve quality traits of banana fruit.