Title Postharvest non-destructive determination of fruits: a model on fruit maturity assay via biosensor based on colorimetric change of gold nanoparticles

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Abstract

A new approach for non-destructive fruit maturity determination using *Ananas comosus* (pineapple) as a model had been established. The assay was based on expression patterns of the putative hexose transporter gene (*AcMST*1) in crown leaves during the course of physiological maturity that could be employed as a marker for fruit maturity. Determination of *AcMST*1 cDNA was initially designed using isothermal cDNA amplification with DNA signal detection via biosensor based on a colorimetric platform with 20 nm gold colloid nanoparticles. In the immature fruit, the *AcMST*1 gene was expressed which allowed target DNA amplification to occur. DNA signal detection in a later step was based on plasmon phenomena of gold nanoparticles. The presence of target DNA caused gold colloid nanoparticles to remain unaggregated, resulting with no colour change (still ruby red). However, in the mature fruit, the expression of the *AcMST*1 gene was terminated resulting in no target cDNA amplification. Upon reaction with gold colloid nanoparticles, particle aggregation resulted in a plasmonic change of the colloid solution from ruby red to dark purple, visible with the naked eye. All processes from RNA extraction to cDNA signal detection could be completed within 70 min without the need for a thermocycler as normally employed during RT-PCR. The developed assay demonstrated the integration of a novel DNA biosensor approach for a non-destructive determination of fruit quality.