EXPRESSION OF MADS GENES IN HARVESTED BANANAS FRUIT IN RELATION TO FINGER DROP PROCESS

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Finger drop is a banana physiological disorder, mainly expressed during ripening, and causing a dislodgment of fruit from the crown (Fig. 1).

Ripening fruit is a complex process during which quality traits are set up. It is upstream regulated by MADS-box (MADS: MCM1-AGAMOUS-DEFICIENS-SRF) transcription factor [1, 2, 3].

Conventional breeding and marker assisted selection is an efficient way to improve quality trait of complex species such as banana. Thus, getting major or ripening candidate gene(s) putatively involved quality trait is an essential step in the prospect of identification of molecular marker throughout candidate gene approach.

In this prospect, we examined here changes in MADS gene expression in relationship with finger drop, in order to identify major genes associated with the upstream regulatory basis of this physiological disorder.
Materials and Methods

- Experimental setting

3 Harvest stages of Cavendish banana (AAA)
im mature green (mMG)
Early MG (eMG)
Late MG (LMG)

Ripening induction
ACE treatment
1000ppm/20°C/24h

Sampling
4 postharvest ripening stages

Fruit sample was used for (i) finger drop measurement as described [4, Fig. 2A] and (ii) gene expression analysis throughout qPCR analysis, comparatively at CZ and DZ as described [5Fig. 2B and 2C].

Fig. 2: Measurement of pedicel rupture force to estimate banana finger drop (A). Peel tissue of green (B) and ripe (C) fruit used for qPCR experiments are indicated as DZ (drop zone) and CZ (control zone).
Results

Fig. 3:
A: Ethylene sensitivity level of iMG, eMG, lMG banana fruit taken 5 days after ripening induction by different concentration of acetylene
B: Evolution of finger drop during postharvest ripening of iMG, eMG, lMG induced by acetylene treatment (10^3 ppm/20°C/24h).

Fig. 4: Expression changes of a set of banana MADS Box genes comparatively in control (CZ) and drop zone (DZ) during postharvested ripening of iMG (A, B, C), eMG (D, E, F), lMG (G, H, I) fruit.
Conclusions

1. Contrary to δMG fruit, εMG and δMG fruit were both able to ripen and, their ethylene sensitivity and ripening rate were increased since δMG fruit to δMG.

2. Despite these differences, εMG and δMG were displayed a similar finger drop pattern and rate.

3. In contrast to that of MaMADS2, MaMADS3 and 4 mRNA accumulation was correlated with ethylene fruit sensitivity, thus corroborating their transcriptional regulation by ethylene in peel tissue [3].

4. The increase of MaMADS3 mRNA level was comparable in both CZ and DZ of δMG fruit. This gene may, probably involved in the overall ripening process common to CZ and DZ.

5. MaMADS2 and MaMADS4 genes expression were enhanced by finger drop in εMG and δMG fruit, respectively. They may trigger specifically the finger drop process in a sequential manner, MaMADS2 acting earlier and MaMADS4 later.
References

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