

**Title** Expression of *ACO1*, *ERS1* and *ERF1* genes in harvested bananas in relation to heat-induced defense against *Colletotrichum musae*

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### Abstract

The aim of this study was to investigate the connection between heat-induced ethylene signal changes and enhanced disease resistance. Heat enhanced ripening and elevated *MaACO1* expression in naturally ripened bananas (NRB), while it delayed ripening and reduced *MaACO1* expression in the ethephon-treated bananas (ETB). However, in both cases, heat reduced lesion sizes infected by *Colletotrichum musae*. This indicates that heat-induced disease resistance in bananas was independent of ripening rate. The expression of *MaERS1* gene was inhibited by heat treatment in both NRB and ETB, implying that heat as a physical signal could be sensed by banana fruits through the inhibition of ethylene receptor gene expression. The intensity of *MaERF1* transcript signals was elevated in heated bananas, suggesting that the enhanced accumulation of *MaERF1* transcript following heat treatment could play an important role in activation of the defense system. In ETB, inhibition of JA biosynthesis by application of IBU down-regulated the expression of *MaERF* and significantly weakened disease resistance, suggesting involvement of endogenous JA in induction of the gene expression, which was reconfirmed by the fact that exposure to exogenous MeJA following the combination of heat plus IBU treatment restored part of the gene expression. On the other hand, in NRB, application of IBU elevated level of *MaERF1* expression at 24 h and enhanced disease resistance, suggesting that, when banana was not exposed to ethephon, the expression of *MaERF1* gene was not JA dependent, which was verified by the fact that MeJA application did not enhance *MaERF1* gene expression. In conclusion, heat-induced disease resistance in harvested bananas could involve down-regulation of *MaERS1* expression and up-regulation of *MaERF1* expression and JA pathway could be involved in heat activation of the defense system in bananas exposed to ethephon.