

**Title** Differential expressions of *PR1* and chitinase genes in harvested bananas during ripening, and in response to ethephon, benzothiadiazole and methyl jasmonate

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### Abstract

Ripening of banana (*Musa acuminata* L.) fruit is concomitant with weakening of disease resistance. The aim of this research was to determine the patterns of expression of *PR1* and chitinase genes during banana ripening. Northern blots show that the *MaPR1* did not have expression in peel of young growing banana fruit, nor in harvested bananas until the onset of ripening. The chitinase gene (*MaChit*) had constitutive expression in bananas during development and after harvest. *MaChit* expression increased with time after harvest and reached the highest level at the onset of ripening when *MaPR1* transcripts began to give detectable signals. Infection of the banana pathogen *Colletotrichum musae* did not induce *MaPR1* but increased *MaChit* expression. The ethylene producer ethephon immediately induced *MaPR1*, but benzothiadiazole (BTH) and methyl jasmonate (MeJA), when applied alone, did not. The combination of ethephon and BTH or MeJA treatment increased intensity of *PR1* signals 12 h after treatment compared with ethephon alone, and in the combination treatments, the inoculation-related lesions were significantly ( $P < 0.05$ ) smaller. In bananas treated with ethephon alone, the levels of *MaPR1* and *MaChit* transcripts decreased in distal uninfected areas, but in a combination treatment, it did not decrease. The triple combination of ethephon, BTH and diphenylene iodonium (DPI) reduced *MaPR1* and *MaChit* expression compared with a double combination of ethephon and BTH, whereas when MeJA replaced BTH in the triple treatment, the expression of the two genes increased compared with the double treatment. This research suggests that *MaPR1* could be involved in defense mechanisms of ripe bananas, while *MaChit* could more be involved in banana resistance to disease before ripening. The results also suggest that BTH and MeJA-induced systemic defense in banana fruit is ethylene-dependent, and H<sub>2</sub>O<sub>2</sub> might be necessary in BTH-induced SAR, but not in MeJA-induced systemic resistance. In the banana industry, *MaPR1* could be used as a molecular indicator for monitoring banana ripening.