

**Title** Effects of cinnamon extract, chitosan coating, hot water treatment and their combinations on crown rot disease and quality of banana fruit

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#### **Abstract**

The antifungal activities of cinnamon extract (CE), piper extract (PE) and garlic extract (GE) were evaluated on banana crown rot fungi (*Colletotrichum musae*, *Fusarium* spp. and *Lasioidiplodia theobromae*) *in vitro*. The assay was conducted with extracts of CE, PE and GE with concentrations of 0, 0.1, 0.5, 1.0, 5.0, 10.0 and 0.75 g L<sup>-1</sup> of carbendazim (CBZ) on potato dextrose agar at room temperature. CE completely inhibited conidial germination and mycelial growth of all fungi at 5.0 g L<sup>-1</sup>. PE totally suppressed mycelial growth of all fungi at 5.0 g L<sup>-1</sup> and conidial germination at 10.0 g L<sup>-1</sup> except for *Fusarium* spp. GE had no significant effects but low concentrations (0.1 and 0.5 g L<sup>-1</sup>) enhanced germ tube elongation of the three fungi. The ED<sub>50</sub> values were higher for mycelial growth than for conidia except for *Fusarium* spp. Combined treatments were investigated on crown rot development in banana fruit (*Musa* AAA group 'Kluai Hom thong'). Treatments included 5.0 g L<sup>-1</sup> CE, 1% (w/v) chitosan solution, hot water treatment (HWT, 45 °C for 20 min), CE plus chitosan, CE plus HWT and 0.75 g L<sup>-1</sup> of CBZ, applied before and after inoculation of the fruit. Crown rot development was assessed during storage at 13 °C for 7 weeks. Disease development was least (25%) on CE treated fruit after inoculation compared to CBZ but was higher when CE was applied before inoculation. Chitosan significantly delayed ripening as in terms of peel color, firmness, soluble solids and disease severity. CE showed no negative effects on quality of fruit. CE plus HWT caused unacceptable peel browning.