

On the use of hot water treatment to control postharvest diseases of export grown banana fruit (*Musa* sp., Group AAA, subgroup Cavendish, 'Williams')

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Introduction

Quality problems in banana:

- Latex stains
- Mechanical damage
- Physiological
- Pests
- Molds and rots





Introduction

Crown rot is a limiting factor in banana fruit commercialization

The causal agents reported:

- Lasiodiplodia theobromae
- Colletotrichum musae
- Thielaviopsis paradoxa
- Fusarium sp. Complex

Colletotrichum musae is the most prevalent





Introduction

- International markets set stricter regulations of pesticide residues
- Make produce safer for human consumption
- Hot water treatment (HWT) is a viable physical treatment to replace fungicides
- Most studies with HWT were performed with bananas grown in small-scale farms, and with minor cultivars.



https://www.wpr.org/race-save-banana-extinction?qt-popularity=2



Objective

To evaluate the effectiveness of thermal treatments on banana fruit produced in commercial, non-organic, Cavendish banana plantations in Costa Rica for export purposes.



Experiment 1: Effect of hot water treatment on Crown Rot and Crown Mold control and in the general fruit response



Material and Methods









Immersion: 45 °C for 10, 15 and 20 min 50 °C for 5, 10, 15 and 20 min 55 °C for 1, 2, 3, 4, and 5 min Commercial Control (CC) water was applied to the Absolute Control (AC)



250 ppm ethylene / 24 h at 18 °C catalytic generator

Material and Methods

4-4.5 ripening stage evaluation





Variables evaluated:

- Incidence of Crown Rot and Mold
- Severity index of Crown Rot and Mold
- Electrolyte leakage rate
- Total soluble solids
- Pulp firmness
- Peel color (CIE*)
- Total phenolics







End of transport simulation





Results

Ripening stage 4-4.5







Scalded banana fruit 50 °C x 15 min and 50 °C x 20 min





General quality of the fruit

	End of transport simulation	4 to 4.5 ripening
Fruit firmness	P=0.3491	P=0.1953
Electrolyte leakage	P=0.1710	P=0.06
Total soluble solids	P=0.0260	P=0.09
L*	P=0.0171	P < 0.0001





55 °C x 1 min 50 °C x 3 min 50 °C x 1 min

Results





Experiment 2: Effect of hot water treatments on disease control in fruit inoculated with pathogens associated with Crown Rot



Material and Methods



ANGERS – FRANCE



250 ppm ethylene / 24 h at 18 °C catalytic generator

Material and Methods

4-4.5 ripening stage evaluation







End of transport simulation





Results

Ripening stage 4-4.5





Results





General quality of the fruit

- Electrolyte leakage, NS
- Total soluble solids, NS
- Pulp firmness, NS
- Skin color, NS
- Total phenols content was lower in fruit exposed to HWT compared to the Commercial Control (P=0.023)





Conclusions

- HWT between 50 and 55 °C for less than five-minute are <u>an alternative</u> to chemical treatments for crown rot and mold.
- Results suggest that HWT are less effective for mold control where there is a possibility of reinfection.
- Data suggest that HWT <u>directly affects pathogens</u>, reducing their growth, while the impact on fruit physiology is very low.



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