

RARE

DISSERTATION



IMPROVEMENT OF THE POST-HARVEST STORAGE LIFE OF BANANA
(EMBUL - *Musa acuminata*, AAB) AND (CAVENDISH - *Musa acuminata*,
AAA) USING NOVEL CROWN ROT DISEASE CONTROL STRATEGIES

Submitted by

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(FGS/01/PhD/01/2016/01)

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A thesis submitted to the Faculty of Graduate Studies, University of Kelaniya

in fulfillment of the requirements for the degree of

Doctor of Philosophy in Botany



December 2016

ABSTRACT

Crown rot disease is a major postharvest diseases in Embul and Cavendish banana causing severe postharvest loss. Use of fungicides is still the major way of controlling crown rot disease. Due to the hazardous effects of fungicides, use of eco-friendly methods of controlling disease are being investigated throughout the world. In this study, efficacy of Potassium aluminium sulphate (alum) + *Ocimum basilicum* (basil) oil spray treatment in combination with modified atmosphere packaging (MAP) and alum + vacuum packaging (VP) was investigated in extending the shelf life of Embul and Cavendish banana at 12-14 °C.

Embul or Cavendish banana fruits were washed with 1% alum (w/v) and sprayed with 0.4% *Ocimum basilicum* (basil) oil and packed in Low Density Polyethylene (LDPE) bags and stored in a cold room at 12-14 °C. In-package gases were analysed every seven days up to 28 days of storage. Physicochemical, sensory and nutritional properties and crown rot disease severity as well as residues of treated banana peel were determined in ripening induced fruits. Test marketing trials were conducted in fruit outlets in Dambulla and Kiribathgoda, Sri Lanka where treatments were provided to consumers and staff to obtain feedback on the quality of treated banana.

At the end of 28 days of storage, O₂ in all packages remained between 2.7 - 4.0% while CO₂ level varied 3.9 - 4.3% in Embul banana whereas 5.0% - 5.4% of O₂% and 5.1% - 5.6% of CO₂% remained in Cavendish banana. Crown rot disease was controlled effectively using alum + 0.4% basil oil and shelf life of Embul and Cavendish banana was extended up to 28 days. Most of the physicochemical, sensory properties of alum + basil oil treated banana were not significantly different compared to control (distilled water treated) whereas nutritional properties of treated samples showed no significant changes compared to control. Treated samples scored higher for peel colour and taste over control samples, by staff and consumers of fruit outlets. Insignificant amount of residues persisted in treated banana.

Effect of vacuum packaging in combination with cold storage at 12-14 °C was evaluated on Embul and Cavendish banana. Embul banana or Cavendish banana fruits were washed with 1% alum (w/v) and packed in LDPE bags and vacuum treatment was applied by removing air using a vacuum cleaner. Physicochemical, sensory, nutritional and pathological properties and in-package gases were analyzed up to one month. At the end of 28 days of storage, O₂ level remained between 3.3 - 4.4% while CO₂ level varied 3.9 - 4.0% in Embul banana whereas 5.6 - 5.8% of O₂% and 5.0 - 5.1% of CO₂% remained in Cavendish banana. Crown rot disease was controlled to a fair extent in both varieties of banana. Most of the physicochemical, sensory and nutritional properties were not affected by the alum + vacuum packaging treatment. Customers and staff of fruit outlets preferred the alum treated banana over the control samples.

According to the results of the present study, crown rot disease of Embul and Cavendish banana could be controlled significantly using the integrated treatment of 1% alum + 0.4% basil oil combined with modified atmosphere packaging and optimum temperature of 12-14 °C. Test marketing trials further revealed the efficacy of basil oil in controlling crown rot of Embul and Cavendish banana and provided details on the consumer preference and palatability of treated banana samples. Further, alum combined with vacuum packaging was also effective in controlling crown rot disease in Embul and Cavendish banana and lengthening the storage life. Therefore, this eco-friendly treatment methods could be adopted in packing operations of the banana industry on a commercial scale.

Keywords: Cavendish, Embul, Crown rot disease, Basil oil, Alum