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**Disease control methods for post-harvest quality
improvement of banana (*Musa acuminata*) and
papaya (*Carica papaya*).**

by

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ABSTRACT

The post-harvest loss of banana in Sri Lanka is about 20% of its total production. This is mainly due to poor post-harvest handling and post-harvest diseases. Anthracnose and crown rot are the most common post-harvest diseases of banana. In Sri Lankan fruit industry, anthracnose (*Colletotrichum musae*) and crown rot disease are caused by *Fusarium proliferatum*, *Lasiodiplodia theobromae* and *Colletotrichum musae*. The novel trend is using the eco-friendly treatment methods to control post harvest diseases instead of using systemic fungicides which are harmful to human health. Most of researches reported that volatile compounds from various plants can evaporate easily and inhibit fungal pathogens without leaving residues on fruit surface. *Ocimum basilicum* oil (0.16% v/v) controlled banana and papaya fruit pathogens and 1% (w/v) in liquid bioassay also controlled the growth of *Fusarium proliferatum*, *Lasiodiplodia theobromae* and *Colletotrichum musae*. However, calcium chloride or calcium oxide *in vitro* did not control the growth of banana fruit pathogens during the liquid bio assay.

A combination of basil oil treatment and/or and Modified Atmosphere Packaging (MAP) with cold storage were tested on Embul banana fruits for minimizing post-harvest diseases and lengthening storage life. During *in vivo* bioassays Embul banana fruits were washed with 1% alum (w/v) solution and sprayed with *Ocimum basilicum* oil (0.16% and 0.20% v/v) on three maturity levels (80, 85 and 90 day mature) of banana. According to the findings of 3 experiments of different maturity levels of Embul banana, physico-chemical (Peel colour, percentage weight loss, total soluble solids, titratable acidity), organoleptic (flavour, taste, odour and overall acceptability) and pathological (Crown

rot disease and Anthracnose) properties were best in 85 day mature level of Embul banana. The effect of vacuum treatment was evaluated on treated banana fruits. The essential oil treatment in combination with MAP and vacuum packing in cold storage (12-14°C) controlled the crown rot and anthracnose pathogens, facilitating the storage of Embul banana up to 32 days without any effect on physico-chemical properties only with slight differences of organoleptic properties (odour and taste) compared to the control. When the fungicidal effect of calcium compounds were tested on banana in MAP under cold storage, Ca(OH)₂ controlled banana fruit pathogens, however, with less visual quality due to residue calcium deposited on fruit surface.

Surface rot (*Rhizopus Stolonifer*), anthracnose (*Colletotrichum gloeosporioides*) and stem-end-rot and internal mold due to *Lasiodiplodia theobromae* and *Phomopsis caricae-papayae* affect quality of papaya fruits. During the *in vivo* study of papaya, two varieties of papaya fruits (Rathna and Red Lady) were harvested at 25% yellow stage and the efficacy of 1% alum (w/v) and an emulsion of basil oil (0.16% and 0.20% v/v) were tested on papaya fruits. When each fruit was individually enclosed in styrofoam net sleeves and stored in plastic crates and stored at 12-14°C and 85-90% relative humidity, extended storage life was extended up to 14 days with minimal disease. Alum (1% w/v) washed and 0.16% (v/v) basil oil sprayed papaya fruits effectively controlled surface rot, stem-end rot and *Phomopsis* rot with no effect to the physico-chemical properties and with less effect to the organoleptic properties (taste and overall acceptability). The Visual Quality Rating (VQR) was high (11-13), shriveling was low with no “green island” on fruits and with low disease severity, which was statically similar to data obtained with bavistin (a commercial fungicide) treatment (disease severity index=2, slightly diseased,

Green Islands formation=2, few number of incidence and shriveling index= 1, no shriveling). Gas chromatography data of the extract of essential oil treated Red Lady papaya peel obtained during residue analysis, indicated the absence of major components of basil oil after storage period of 14 days due to the volatile nature of oil.

According to the data of the present study, treating banana fruits at 85 day maturity level with alum (1% w/v) and basil oil (0.16% v/v) in combination with MAP or vacuum packaging could be used as an eco-friendly integrated method to extend the storage life of fruits up to 32 days under cold storage. Alum and subsequent essential oil treatment supported by styrofoam net sleeve cushioning could be commercially recommended as a safe and effective method to control post harvest diseases of papaya, retain visual quality and lengthen the storage life up to 14 days under cold storage. These integrated treatment strategies of banana and papaya could be adopted for sea shipment and temperature-regulated supermarket storage.