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RESEARCH ARTICLE

In vitro antifungal efficacy of selected essential oils in controlling fungi associated with the stem-end rot disease of mango (cv. Karutha Colomban) fruits and characterisation of antifungal components

TD Kodituwakku[1], GCM Ekanayake[1], KP Abeywickrama[1*] and R Jayakody[2]
[1] *Department of Plant and Molecular Biology, Faculty of Science, University of Kelaniya, Kelaniya.*
[2] *Department of Botany, Faculty of Natural Sciences, The Open University of Sri Lanka, Nawala, Nugegoda.*

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Abstract: Karutha Colomban is one of the most delightful mango varieties popular among Sri Lankan consumers. A significant postharvest loss of mango takes place every season due to diseases including stem-end rot (SER), which is caused by a group of endophytic fungal pathogens. In this research, *in vitro* antifungal efficacy of different concentrations of essential oils of basil, clove, and cinnamon were evaluated for their ability to control SER causing fungal pathogens of mango (cv. Karutha Colomban) as bio-safe alternatives to conventional fungicides, by conducting liquid and disc volatilisation bioassays. Major bioactive compounds of the selected essential oils were identified by gas chromatography-mass spectroscopy (GC-MS). Basil and cinnamon bark oils (0.20 – 0.30 µL/mL) in liquid bioassay showed high efficacy against *Lasiodiplodia theobromae*, while basil and cinnamon leaf oils (0.40 – 0.60 µL/mL) successfully inhibited *Pestalotiopsis* sp. Cinnamon bark oil (0.60 µL/mL) was identified as the most effective oil against *Phomopsis* sp. According to disc volatilisation bioassay, vapour of cinnamon oils (0.20 – 0.40 µL/mL) was the most effective in controlling *L. theobromae*. *Pestalotiopsis* sp. was efficiently controlled by clove and cinnamon bark oil (0.20 – 0.60 µL/mL) vapour. In vapour phase, clove and cinnamon oils (0.40 µL/mL) were the most effective against *Phomopsis* sp. According to GC-MS characterisation, methyl chavicol was the most abundant antifungal component in basil oil while it was (E)-cinnamaldehyde in cinnamon bark oil. Moreover, eugenol displayed the highest abundance in clove and cinnamon leaf oils. Based on *in vitro* studies, it could be concluded that cinnamon bark oil in liquid and vapour phases demonstrated a higher antifungal efficacy among the tested essential oils in controlling fungal pathogens causing SER of mango.

Keywords: Antifungal, essential oils, GC-MS, mango, stem-end rot.

INTRODUCTION

Mango (*Mangifera indica* L.) is a popular fruit worldwide and it has become one of the most desirable fruits in international trade because of its delightful taste and high caloric value (Diedhiou *et al*., 2007). It bears important nutrients such as vitamins, minerals, polyphenolic and flavonoid antioxidant compounds as well as prebiotic dietary fiber (Kothalawala & Jayasinghe, 2017). Asia is recognised as the highest mango producing region, with a record 74.4 % of global production. Present extent under mango cultivation in Sri Lanka is about 3.1 million hectares (FAOSTAT, 2016). 'Karutha Colomban' is one of the most popular cultivars of mango among growers and consumers in Sri Lanka due to its orange flesh and delightful taste (Kothalawala & Jayasinghe, 2017).

However, the availability of high quality mango for the local and international consumers has been limited by its highly perishable nature and susceptibility to postharvest diseases, which lead to severe postharvest lossess (Bally *et al.,* 2009). Stem-end rot (SER) is considered as one of the most serious and frequently occurring postharvest and post-packaging diseases of mango (Tripathi & Shukla, 2009). SER is caused by a complex of fungi

* Corresponding author (kris@kln.ac.lk; https://orcid.org/0000-0001-6562-3151)