

Combined impact of peppermint oil and lime oil on Mangosteen (*Garcinia Mangostana*) fruit ripening and mold growth using closed system

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Abstract

Mangosteen (*Garcinia mangostana*) is a climacteric fruit and thus, there is need for intervention on its postharvest preservation to delay ripening, reduce spoilage and microbial infestation, and possibly enhance its availability all year round. This study was aimed at determining the best application ratio of the combination of peppermint oil (PO) and lime oil (LO) essential oils (EOs) in slowing down ripening and extending the shelf-life of mangosteen in a closed storage system. Furthermore, the mechanism by which PO and LO inhibit mold and decay on the surface of mangosteen was investigated. Forty microliters of PO and LO at ratios 1:0, 0:1, 1:1, 2:1, and 1:3, respectively, were applied to the fruit in a 1 L storage box and stored at 25 ± 2 °C, 75 ± 5 % RH for 9 days. The ability of the EOs to suppress mold and decay, and their effects on ripening stage were measured. Also, the quality parameters of the fruit pericarp (peel) and aril (pulp) after treating with EOs were evaluated. Results showed that ratio 1:3 of PO and LO had 20 % mold and decay appearance after 9 d, compared with the control (untreated sample) which had 80%. Mangosteen treated with this ratio of EOs attained only stage 4 (red color) of ripening, while the fruit in the control group were completely ripened at the end of storage, reaching stage 6 (dark purple). In addition, the fruit firmness, color (calyx, pericarp, and aril), titratable acidity, pH, total soluble solids, and total phenolic content were maintained with this ratio when compared with the control and other ratios. The potential mode of action of PO and LO was revealed by scanning electron microscopy and gas chromatography - mass spectrometry analysis where main components of these EOs such as menthol, menthone and limonene were released into the treated fruit, with possible interaction with other components for improved antifungal activity. The application of PO and LO at this ratio (1:3) could be formulated as a fungicide on mangosteen for enhanced antifungal activity, improved shelf-life quality, and consumer acceptability of mangosteen fruit.