

Harnessing oregano nanoemulsion: A novel solution to combat curvularia-induced fruit rot and preserve mango quality

Abstract

Mango is a significant global fruit crop, producing over 1,000 million tonnes annually. However, postharvest losses due to pathogenic fungal infections are considerable, exacerbated by the continuous use of synthetic fungicides, which pose risks of fungal resistance and environmental harm. This study assessed the effectiveness of *Origanum vulgare*-based nanoemulsion against mango postharvest diseases and quality preservation. Results indicate that the *O. vulgare* nanoemulsion (Ore-S1-15) exhibited optimal properties, including small droplet size, low polydispersity, and stable pH. FTIR analysis identified key functional groups, while GC-MS results revealed prominent components with isopropyl myristate being the major constituent at 42.41%, followed by isopropyl palmitate (25.53%), oleic acid (4.57%), diethyl phthalate (3.84%), estagole (2.09%), 2-(phenylmethylene)-octanal (1.17%), cyclopentane acetic acid (0.85%), benzoic acid (0.34%), and coumarin (0.26%) as minor constituents. In vitro test of the Ore-S1-15 nanoemulsion against *Curvularia* sp. demonstrated significant antifungal activity, with $79.51 \pm 0.95\%$ conidia inhibition. Additionally, in vivo test showed a reduction in disease incidence on wounded mangoes. The Ore-S1-15 nanoemulsion enhanced quality parameters by delaying colour changes, reducing weight loss and steadily maintaining the total soluble solids. Thus, Ore-S1-15 nanoemulsion emerges as a promising and eco-friendly alternative to synthetic fungicides for controlling mango postharvest diseases and increasing shelf life while preserving quality.

Keywords

Curvularia sp; Fruit quality; Fruit rot disease; Mango; Nanoemulsion; Oregano essential oil