

Use of carvacrol and thymol in shellac coating to control stem-end rot on 'Ruby Red' grapefruit and maintain fruit quality during simulated storage and marketing

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Abstract

Diplodia stem-end rot (SER) caused by *Lasiodiplodia theobromae* is often the most important postharvest disease of fresh citrus fruit in warm and humid regions such as Florida. This disease is exacerbated by commercial degreening practices used to improve peel color of early season fruit. Essential oils are aromatic oily liquids obtained from plant organs that have been used to control plant diseases. This study screened nine compounds from essential oils against *L. theobromae* mycelial growth *in vitro* and only carvacrol and thymol exhibited strong inhibitory efficiency, with half maximal effective concentration to reduce mycelial growth of 0.045 and 0.037 mg mL⁻¹, respectively, in amended PDA medium. Carvacrol and thymol were then incorporated in a commercial shellac coating and applied on 'Ruby Red' grapefruit inoculated with *L. theobromae* to determine their activities against Diplodia SER *in vivo*. Fruit were artificially inoculated with *L. theobromae* 12 h before coating application or immediately after coating application and incubated at 29 °C with 90% relative humidity (RH) for 48 h. When fruit were inoculated before treatment, shellac containing 10 mg mL⁻¹ carvacrol or thymol inhibited lesion development by 59% or 37%, respectively, compared to shellac alone. When fruit were inoculated after treatment, coating fruit with shellac containing 1 mg mL⁻¹ carvacrol or thymol inhibited lesion development by 43% or 24%, respectively, compared to shellac alone. This study also found that incorporating carvacrol or thymol into shellac coating inhibited fruit decay from natural infections and chilling injury compared to shellac alone, while not negatively impacting fruit weight loss, peel color, total soluble solids, or titratable acidity. The results suggest that shellac coatings containing carvacrol or thymol may provide a viable option for Diplodia SER control and quality maintenance on citrus fruit.