Evaluation of Thyme Oil Vapor for Control of Postharvest Gray Mold on Blueberry

YURU CHANG*, ALI SARKHOSH, AND JEFFREY K. BRECHT
Horticultural Sciences Department, University of Florida, Gainesville, FL 32611

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Gray mold caused by Botrytis cinerea is a major postharvest disease of blueberry (Vaccinium spp.). It is a necrotrophic fungus that favors moist, humid, and warm environmental conditions between 65 to 75 °F (18.3 to 23.9 °C). It has fluffy mycelium and gray-tan spore masses on brown stalks (Fig. 1). The increasing need to control pathogens in organic fruits promotes the search for safe and effective antimicrobials from natural sources. Essential oils (EOs) are natural, complex, volatile aromatic, hydrophobic, oily liquids synthesized in aromatic plants as secondary metabolites (Bassolé and Juliani 2012). They have broad-spectrum anti-bacterial, anti-fungal, and anti-viral functions. Thymol is the most abundant compound; the major active component of thyme oil (TO). The objectives of this in vivo study were to determine the effects of TO on postharvest gray mold control and to explore the side effects of TO postharvest application.

Inoculated and uninoculated southern highbush blueberries cv. Suziblue were exposed to TO vapor at 0 mL, 0.05 mL, 0.1 mL, 0.25 mL, and 0.5 mL per 500 mL mason jar with 25 berries per jar and four replications per treatment. B. cinerea was isolated from infected blueberry fruit and maintained on an acidified potato dextrose agar (APDA) at 71.6 °F (22 °C). Spore suspensions of B. cinerea were prepared by wiping the surface of a culture dish, and spore concentration adjusted to 1×10⁵ CFU/mL with sterile DI water using a hemocytometer. Each fruit was sprayed with 20 μL of spore suspension using an airbrush for inoculation. Blueberries were incubated for 24 h at room temperature to establish the pathogen then TO was added to jars and the fruit incubated for 24 h at room temperature. All blueberry fruit were stored in jars in a 41 °F (5 °C) and 95% relative humidity (RH) cold room for 7 d and then moved to clamshells at room temperature (75 °F/24 °C and 50% RH) for another 3 d. The number of decayed fruit was recorded daily after moving to room temperature. Fruit color and firmness were measured at the end of the experiments. The TO vapor effectively inhibited the growth of gray mold, but also reduced fruit firmness and caused significant color change (a*, b*, and C* values) expressed as a darker, more purplish hue. The highest TO concentration (0.5 mL per 500 mL mason jar) completely eliminated decay development for at least 3 d at room temperature in inoculated and uninoculated groups. Thyme oil vapor may potentially provide a new and effective strategy for controlling postharvest gray mold disease in blueberry fruit.

Further research in sensory evaluation is needed to determine consumer acceptability due to the strong influence of TO on organoleptic properties.

Literature Cited

*Corresponding author. Email: changyuru@ufl.edu