Assessing the Effect of Essential Oil Nanoemulsions against Tomato Gray Mold using Multispectral Imaging

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Abstract

Gray mold, caused by the fungus *Botrytis cinerea*, is a major pre-and post-harvest disease that affects all aboveground parts of tomato and many other economically important crops. The main control strategy to manage gray mold is through the use of synthetic fungicides. However, *B. cinerea* has a high ability to develop resistance to fungicides, and fungicides pose environmental hazards and health risks to off-target organisms. The use of nanoemulsions encapsulating hydrophobic plant essential oils to improve water dispersibility is a promising strategy to ameliorate gray mold without the application of harmful fungicides. This study evaluates the potential of cinnamon essential oil nanoemulsion (EONE) to suppress gray mold in hydroponically-grown tomatoes. The root system of four-week-old tomatoes were dosed with different concentrations of EONE before the leaves were inoculated with *B. cinerea*. The effect of EONE on the plant's photosynthetic capacity and ability to suppress necrotic lesion development were measured using Plant Explorer Pro+ and LeafSpec imagers. Multispectral data showed significant differences in Fv/Fm, chlorophyll content, and NDVI values between inoculated and uninoculated leaves. In addition, EONE-treated plants showed up to 45% reduction in gray mold lesions compared to the non-treated control. Future experiments will evaluate the efficacy of foliar-application of EONEs to suppress tomato root diseases, and investigate potential mechanisms using RNA-seq and microbiome analyses. Results of the study could be useful in further development of EONEs as an effective management tool against different diseases and could be adapted to evaluate other nanocarrier formulations for disease control.

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