

Title Impact of low-level atmospheric ozone-enrichment on black spot and anthracnose rot of tomato fruit

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Abstract

Tomato fruit (*Lycopersicon esculentum* L.) were exposed to ozone concentrations between 0.005 (control) and 5.0 $\mu\text{mol mol}^{-1}$ up to 13 days at 13 °C, prior to, or following, inoculation by *Alternaria alternata* or *Colletotrichum coccodes* (causes of black spot and anthracnose, respectively). Low-level atmospheric ozone-enrichment resulted in a modest, but statistically significant, reduction in fungal lesion development; higher concentrations of the gas resulting in greater effects. This finding implies concentration-specific impacts on fungal lesion development. A fluorescent lesion assay revealed that the ozone-induced inhibition of visible lesion development was reflected in a similar reduction in fungal biomass below the fruit surface. Fungal spore production in vivo, was markedly reduced when fruit were stored in an ozone-enriched atmosphere. Higher concentrations/duration of exposure resulted in greater reduction in spore production, with considerable benefits resulting from exposure to low levels of ozone (i.e. below the 0.2 $\mu\text{mol mol}^{-1}$ European threshold used for the protection of human health). In vitro, effects of ozone on spore germination depended on concentration and duration of exposure. Studies performed on fungi exposed to ozone on Potato Dextrose Agar at 13 °C and 95% relative humidity revealed no major effects on the growth of mycelia, implying the observed suppression of pathogen development was due in part to ozone-induced changes in fruit-pathogen interactions.