Antifungal activity and possible mechanisms of submicron chitosan dispersions against *Alteraria alternata*

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Postharvest Biology and Technology, Volume 161, March 2020, 110883

Abstract

Submicron chitosan dispersions (SCD) are effective in controlling postharvest decay. The antifungal activity of SCD against *A. alternata* both *in vivo* and *in vitro* was evaluated, and possible inhibition mechanisms were explored. Results indicated that SCD markedly inhibited the growth of the pathogenic mycelium in medium, with minimum inhibitory concentration and minimum fungicidal concentration of 0.313 g L^{-1} and 1.250 g L^{-1}, respectively. The inhibition of spore germination was correlated with SCD dosage when above the concentration of 0.625 g L^{-1}. The decay of black spot rot in jujube fruit was significantly decreased by using SCD at both 0.313 g L^{-1} and 1.250 g L^{-1}. The antifungal effect of SCD involved an intracellular mode of action *via* penetration into pathogenic cells instead of accumulating on or combining with cell walls, cell membranes, or septa. The cell membrane permeability was altered by ion exchange or loss of cytoplasmic contents followed by leakage of cellular components, such as proteins and nucleic acids, leading to cell structure breakdown. Given the above, SCD would be a promising alternative control of postharvest diseases of fruit caused by *A. alternata,* and the value of this approach would be directly attributed to the penetration of pathogenic fungal cells. This effect is due to the dispersion's small size, increased membrane permeability of fungal cells, and subsequent loss of cytoplasmic contents from the fungal hyphae.