

Optimized preparation of tea tree oil complexation and their antifungal activity against *Botrytis cinerea*

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Abstract

Tea tree oil (TTO) inclusion complexes were prepared by co-precipitation with β -cyclodextrin (β -CD). After the complexation protocol was optimized using response surface methodology, the physicochemical and anti-fungal properties of the TTO- β -CD inclusion complex were investigated. The optimal complexation time (4 h), temperature (62 °C), and β -CD/TTO mass ratio (7), provided a TTO complexation efficiency of 87.47 %. Fourier transform infrared spectroscopy showed that the spectra of TTO complexations and β -CD are quite similar, suggesting that TTO molecules enter β -CD cavities during the formation of inclusion complexes. Scanning electron micrographs revealed that particles of TTO- β -CD complexes are smoother and smaller than the amorphous structures of β -CD. Thermogravimetric analysis demonstrated that the thermal stability of TTO is enhanced after complexation with β -CD, which reduces TTO volatility and oxidation. Complexed TTO inhibit mycelial growth of *B. cinerea* in a dose-dependent manner *in vitro*. In cherry tomato fruit, complexed TTO can control artificially-induced *B. cinerea* infection and extend shelf life. It was concluded that TTO complexation might be benefit for the commercial application of TTO to control the postharvest grey mold of fruits.