

Enhanced fungicidal efficacy on *Ganoderma boninense* by simultaneous co-delivery of hexaconazole and dazomet from their chitosan nanoparticles

ABSTRACT

The excessive use of fungicides may be of environmental and health concerns. Hence, to overcome this problem, chitosan as a controlled release matrix was used in this work to encapsulate the fungicide for the development of enhanced fungicide nanodelivery system. In this proposed study, dual-loaded fungicides (hexaconazole and dazomet) were simultaneously encapsulated into chitosan nanoparticles as an antifungal agent on *Ganoderma boninense* (*G. boninense*). In this work, we report the synthesis and characterization of the nanoparticles prepared using various concentrations of the crosslinking agent of sodium tripolyphosphate (TPP); 2.5, 5, 10, and 20 mg mL⁻¹, which resulted in the nanoparticles of CHDEN2.5, CHDEN5, CHDEN10, and CHDEN20, respectively. The effect of TPP on the synthesized nanoparticle size revealed that an increase of TPP resulted in smaller particles, which in turn play a crucial role in controlling *G. boninense* growth. CHDEN20 shows the highest antifungal efficacy with the lowest half-maximal effective concentration (EC₅₀) on *G. boninense*. The formulated nanocarrier system of fungicide aims to enhance the efficient delivery of the active ingredients to the target site, able to sustain in it for a longer time, and consequently improve the fungicide efficacy in combating the basal stem rot disease in oil palm.