SYNTHESIS OF AN AGRONANOCHEMICAL BASED ON CHITOSAN-HEXACONAZOLE NANOPARTICLE FOR BASAL STEM ROT DISEASE TREATMENT OF OIL PALM TREE

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Abstract - A pathogenic fungus, *Ganoderma boninense* (*G. boninense*) caused the basal stem rot disease of oil palm tree has resulted significant losses in upstream palm oil industry. Nanotechnology platforms enabled the fungicide active agent, hexaconazole to be encapsulated into the chitosan nanoparticles for the formation of a fungicide nanocarrier system and transported it to the target cells (*Ganoderma* fungus) more effectively. A series of chitosan nanoparticles loaded with fungicide, hexaconazole were prepared in increasing of sodium tripolyphosphate (TPP) concentrations; 2.5, 5, 10 and 20 mg/mL, labelled as CHEN2.5, CHEN5, CHEN10, and CHEN20, respectively. The resulting particle size of the synthesized nanoparticles revealed that the increasing of the TPP concentration gave smaller particles which follow the order; CHEN2.5 > CHEN5 > CHEN10 > CHEN20. In addition, *in vitro* fungicide release at pH 5.5 shows the release of the fungicide from the nanoparticles is of sustained manner with prolonged release time up to 86 h. Furthermore, the *in vitro* antifungal studies reveal that in comparison to the counterpart, non-embedded hexaconazole and bare hexaconazole, the synthesized nanoparticles gave better inhibition and lower EC_{50}. Parallel to effect of TPP to the particle size, the smaller the particle size leads to lower EC_{50} value, indicating higher antifungal activity against *G. boninense* which also follows the same order; CHEN2.5 > CHEN5 > CHEN10 > CHEN20. This study indicates that the size of the nanoparticles can be controlled, and plays a crucial role in inhibition of the *Ganoderma boninence*.

Keywords - Nanotechnology, Nanoparticles, Hexaconazole, Chitosan, Fungicide, Anti-Fungal, *Ganoderma boninance*, Basal Stem Rot, Oil Palm.