

The present study was aimed to characterize polyethylene glycol (PEG) based nanocapsules loaded with clove oil (*Syzygium aromaticum*) and to investigate their insecticidal potential against *Sitophilus oryzae* and *Tribolium castaneum*. Nanocapsules were synthesized by the melt dispersion method. The 10% PEG-CIO NPs formed the most stable nanocapsules with 200.30 nm size, 0.25 PDI, and 90.03% encapsulation efficiency. Scanning electron microscopy image of optimal formulation showed slightly irregularly shaped nanocapsules in a good dispersion. Major phytochemicals identified in GC-MS analyses of clove oil were eugenol, phenol and caryophyllene but post-encapsulation analysis only showed the presence of eugenol as a major component of nanoformulations. Contact toxicity bioassay revealed that clove essential oil nanocapsules showed 100% mortality after 7 days of exposure against *Sitophilus oryzae* and *Tribolium castaneum* whereas pure oil showed 100% mortality only after 24 hours of exposure. The residual contact toxicity results showed that toxicity of pure oil was reduced after 4 weeks of exposure and showed 61.67 % and 58.36 % mortality while clove essential oil nanocapsules showed 95.67 % and 93.33% mortality against *Sitophilus oryzae* and *Tribolium castaneum* respectively. The LC50 values for nanocapsules were 2260.89 and 10498 mg/kg against *Sitophilus oryzae* and *Tribolium castaneum*. The results of this study suggested that PEG-based nanocapsules prevent the oil from evaporation and rapid degradation while allowing a persistent and slow release suggesting that PEG nanocapsules loaded with clove essential oil are feasible to be used as bioinsecticide against store-product pests for a long time period