



Evaluation of the effect of nanoemulsion formulation of *Myrtus communis* essential oil against date palm white scale insect *Parlatoria blanchardi*

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Abstract

The date palm white scale insect (PWS) is a serious pest that causes damage to date palm trees by feeding on the plant sap. Formulating plant-derived active ingredients into nanoemulsions can provide effective pest management options. In this study, a low-energy approach was used to formulate a water-in-oil (W/O) nanoemulsion of *Myrtus communis* L. essential oil. The primary objective was to evaluate the efficacy of a nanoemulsion pesticide against *Parlatoria blanchardi* (Targioni Tozzetti, 1892). Additionally, the study investigated the spreading capacities of the essential oil nanoformulations. The study consisted of creating three phase diagrams using methyl ester and paraffin oil as the oil phases. These oils were then combined with water and three nonionic surfactants: Tensiofix EW70, Tensiofix 96 DB10, and Termul 3540. After the phase diagram was established, three points were selected from each phase. These selected points were then mixed with 25% essential oil of *M. communis*. After conducting the stability tests, three formulations with nanoparticle sizes ranging from 28.89 to 54.65 nm exhibited excellent physical properties and demonstrated strong stability under centrifugation and storage conditions. Among these nanoformulations, FN2 (paraffin oil and DB10 surfactant) achieved the highest toxicity against *P. blanchardi*, and the largest droplet spreading area. It was followed by FN5 (methyl ester and Termul 3540 surfactant) and FN8 (methyl ester and EW70 surfactant). Based on these results, the *M. communis* essential oil nanoformulations have the potential to serve as environmentally friendly insecticides.

Keywords: Nano-pesticide, Insecticidal efficiency, Emulsion stability, Wetting performance, Eco-friendly formulation

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