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LARVICIDAL MICROEMULSION OF PEPPERMINT ESSENTIAL OIL TO Aedes aegypti CONTROL

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Aedes aegypti is the primary vector for diseases such as dengue, Zika, and chikungunya, which present significant public health challenges in various regions worldwide. The increasing resistance of mosquitoes to insecticides, along with the associated risks of their use, underscores the urgent need for safer and more effective alternatives for mosquito control. Essential oils (EOs) are emerging as promising natural solutions, particularly as larvicides. Microemulsions (MEs) are colloidal systems that are highly stable, cost-effective to produce, and easy to apply. They enhance the penetration and dispersion of biocidal active ingredients, thereby improving their effectiveness in complex environments. The objective of this study was to develop a ME based on peppermint (*Mentha piperita* L.) essential oil to complement existing *A. aegypti* control strategies. The EO was purchased commercially, and its chemical composition was analyzed using gas chromatography-mass spectrometry (GC-MS). The ME was prepared using surfactants under agitation with an Ultra-Turrax mixer, characterized physicochemically, and evaluated for stability. The larvicidal activity against *A. aegypti* was determined following WHO guidelines, and the data was processed using R software. GC-MS analysis identified menthol (57.14%) and menthone (17.53%) as the major compounds in the oil, which is consistent with previous literature. The ME containing 10% EO demonstrated 4 months stability, with a droplet size of 11.41±0.56 nm, charge of -8.35±3.24 and PdI of 0.17±0.06. In the larvicidal assay, the EO exhibited an LC_{50} of 172.27 ± 6.54 µg/mL. Additionally, the ME (10% EO) resulted in the death of 100% of mosquito larvae within 24 hours. The potential of the ME to inhibit egg hatching will be evaluated soon. These promising findings position MEs as an innovative, eco-friendly, and highly effective option for combating *A. aegypti*, significantly reducing environmental impact while enhancing public health efforts.

Keywords: *Dengue, larvicidal, monoterpenes, diterpenes.*