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Bio-efficiency of *Cinnamomum verum* loaded niosomes and its microbicidal and mosquito larvicidal activity against *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus* (Diptera: Culicidae)

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The emergence of mosquito vector borne diseases is considered as a perpetual problem globally in tropical countries. Outbreak of several diseases such as chikungunya, zika viral infection and dengue fever has created a massive threat towards living population. Frequent usage of synthetic insecticides like DDT eventually had its adverse harmful effects on humans as well on the environment. Since there are no perennial vaccines, prevention, treatment or drugs available for these pathogenic vectors, WHO is more concerned in eradicating their breeding sites effectively without any side effects on humans and environment by approaching plant derived natural eco-friendly bio-insecticides. The aim of this study is to investigate the larvicidal potential *Cinnamomum verum* essential oil (CEO) loaded niosomes were prepared using trans-membrane pH gradient method using cholesterol and surfactant variants of Span 20, 60 and 80 and treated against II to IV instar larvae of *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus*. The synthesized CEO loaded niosomes were characterized by zeta potential, particle size, Fourier Transform Infrared Spectroscopy (FT-IR), GC-MS and SEM analysis to evaluate charge, size, functional properties, composition of secondary metabolites and morphology. The Z-average size of the formed niosomes was 1870.84 nm and had good stability with zeta potential -85.3 meV. The entrapment efficiency of the CEO loaded niosomes was determined by UV-Visible Spectrophotometry. Evaluation of synthesized niosomes against gram-positive (*Bacillus subtilis*) and gram-negative (*Escherichia coli*) bacteria and fungi (*Aspergillus fumigatus* and *Candida albicans*) at various concentrations were assessed for its bio-potency. The larvicidal activity was evaluated at various concentrations for 24 h and LC50 and LC 90 values were calculated. The results exhibited that CEO loaded niosomes has greater efficiency against mosquito larvicidal property and also the results suggest that niosomes could be used in various applications of biotechnology and drug delivery systems with greater stability by altering the drug of interest.

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