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Bioefficiency of Cinnamomum verum Loaded Niosomes and Its Microbicidal and Mosquito Larvicidal Activity against Aedes aegypti, Anopheles stephensi and Culex quinquefasciatus

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Abstract : Emergences of mosquito vector-borne diseases are considered as a perpetual problem globally in tropical countries. The outbreak of several diseases such as chikungunya, zika virus infection and dengue fever has created a massive threat towards the living population. Frequent usage of synthetic insecticides like Dichloro Diphenyl Trichloroethane (DDT) eventually had its adverse harmful effects on humans as well as 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 potency of Cinnamomum verum essential oil (CEO) loaded niosomes. Cholesterol and surfactant variants of Span 20, 60 and 80 were used in synthesizing CEO loaded niosomes using Transmembrane pH gradient method. 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, the 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. The bio-potency of CEO loaded niosomes was treated and assessed against gram-positive (Bacillus subtilis) and gram-negative (Escherichia coli) bacteria and fungi (Aspergillus fumigatus and Candida albicans) at various concentrations. The larvicidal activity was evaluated against II to IV instar larvae of Aedes aegypti, Anopheles stephensi and Culex quinquefasciatus at various concentrations for 24 h. The mortality rate of LC_{50} and LC_{90} values were calculated. The results exhibited that CEO loaded niosomes have greater efficiency against mosquito larvicidal activity. 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.

Keywords : Cinnamomum verum, niosomes, entrapment efficiency, bactericidal and fungicidal, mosquito larvicidal activity
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