

Biocompatible nutmeg oil-loaded nanoemulsion as phyto-repellent

ABSTRACT

Plant essential oils are widely used in perfumes and insect repellent products. However, due to the high volatility of the constituents in essential oils, their efficacy as a repellent product is less effective than that of synthetic compounds. Using a nanoemulsion as a carrier is one way to overcome this disadvantage of essential oils. Nutmeg oil-loaded nanoemulsion (NT) was prepared using a high speed homogenizer and sonicator with varying amounts of surfactant, glycerol, and distilled water. Using a phase diagram, different formulations were tested for their droplet size and insect repellent activity. The nanoemulsion containing 6.25% surfactant and 91.25% glycerol (NT 6) had the highest percentage of protection (87.81%) in terms of repellent activity among the formulations tested for the 8 h duration of the experiment. The droplet size of NT 6 was 217.4 nm, and its polydispersity index (PDI) was 0.248. The zeta potential value was -44.2 mV, and the viscosity was 2.49 Pa.s at pH 5.6. The in vitro release profile was 71.5%. When the cytotoxicity of NT 6 at 400 µg/mL was tested using the MTS assay, cell viability was 97.38%. Physical appearance and stability of the nanoemulsion improved with the addition of glycerol as a co-solvent. In summary, a nutmeg oil-loaded nanoemulsion was successfully formulated and its controlled release of the essential oil showed mosquito repellent activity, thus eliminating the disadvantages of essential oils.

Keyword: *Aedes aegypti*; In vitro release; Nanoemulsion; Nutmeg oil; Repellent activity