

Preparation and Characterization of Solid Lipid Nanoparticles Loaded with Ceylon *Citronella* Oil as a Potent System for Slow-releasing Mosquito Repellent

C. M. Lokuge^{1,2}, H. I. C. De Silva¹, H. D. Weeratunge², G.A.S. Premakumara³

¹*Department of Chemistry, Faculty of Science, University of Colombo, Sri Lanka*

²*Industrial Technology Institute, Sri Lanka*

³*Department of Basic Science and Social Science, Faculty of Nursing, University of Colombo, Sri Lanka*

Ceylon *Citronella* oil (CCO) is known to possess mosquito-repellent activity. The effective use of CCO is limited by its hydrophobic and high volatility profile. This research study focused on developing solid lipid nanoparticles (SLNs) loaded with CCO as a slow-releasing delivery system. CCO was extracted from Ceylon citronella by steam distillation. The chemical composition of CCO was analyzed by GC-MS and GC-FID, and physicochemical properties were determined at 25 °C. CCO was incorporated into SLNs by high shear homogenization and ultrasound technique using stearic acid as the solid lipid and span 80 and Tween 20 as surfactants. Varying CCO and surfactant amounts, different formulations were prepared and encapsulation efficiency (EE%) was investigated by measuring absorbance at 230 nm using geraniol as the index. Particle size was investigated by dynamic light scattering. The stability of CCO-SLNs was determined at 4 °C, 25 °C, and 45 °C for 4 weeks by calculating the EE%. The evaporation release percentage was determined at 35 °C. The percentage of extracted CCO was (0.4%), and geraniol (18.8%), camphene (13.8%) and D-limonene (10.6%) were found as major compounds. Relative density, refractive index and optical rotation were 0.9345, 1.4872, and 16.2950°, respectively. CCO-SLNs composed of 0.3 wt. % CCO, 0.4 wt.% of stearic acid, and 0.8 wt.% of tween 20 and span 80 showed the highest EE% of 68.96±2.32. The average particle size of CCO-SLNs was 172.9 ± 4.85 nm with a polydispersity index of 0.541±0.043 and 59.7±4.0 mV zeta potential value. After 4 weeks, minimum deviation in EE% was shown in CCO-SLNs stored at 4 °C and 25 °C. CCO-SLNs exhibit a slower release rate over 24 h with less than 50% of release percentage within the first 4 h compared to CCO emulsion. The results conclude that CCO-SLNs are suitable for use as a slow-releasing agent in mosquito-repellent formulations.

Keywords: *Ceylon Citronella Oil, Mosquito-Repellent, Solid Lipid Nanoparticles*