

Determination of *in vitro* sun protection factor of extract of neem leaves and neem oil

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Neem (*Azadirachta indica*) is one of the most versatile medicinally and cosmetically valuable plants having a wide spectrum of biological activities such as antimicrobial, anti-inflammatory, antioxidant, antipyretic, hypoglycemic, gastro-protective and diuretic. Neem plants are abundant in the dry zone of Sri Lanka and are exposed to relatively high levels of UV-B (Ultra Violet) radiation. Therefore, neem plants may contain phytochemicals with sunscreen potential. *In vitro* sun protection factor (SPF) of neem has not been yet investigated in Sri Lanka. The aim of this study was to determine *in vitro* SPF of methanol extract of neem leaves and neem oil. Fresh neem leaves were collected from a taxonomically identified, matured plant in Horana area, Kaluthara district, Western Province of Sri Lanka (GPS 6°46'34.4"N 80°00'41.5"E). Thoroughly cleaned, air dried and small pieces were macerated for 4 days in distilled methanol. The filtrate was evaporated to dryness and subjected to preliminary phytochemical analysis after re-dissolving the crude in methanol. The concentration series of 2.0 mg mL⁻¹, 1.0 mg mL⁻¹, 0.5 mg mL⁻¹, 0.25 mg mL⁻¹, and 0.05 mg mL⁻¹ were prepared for the crude solid product using distilled methanol. Neem oil was purchased from the market and 0.1 % v/v solution was prepared. A commercial sunscreen cream (*Dermatone*® - Labeled SPF 35) was dissolved in methanol to obtain a solution of 2.0 mg mL⁻¹. Absorbance of UV radiation by each concentration of leaf extract, oil and *Dermatone*® were determined in triplicate, using a UV-visible spectrophotometer from 290 to 320 nm, at 5 nm intervals taking methanol as the blank. The mean absorbance data were taken. The SPF values for each concentration of neem and *Dermatone*® were then calculated using the Mansur equation. Data were analyzed using IBM SPSS Statistics 21.0. Linear regression analysis was performed to evaluate dose-dependencies. Phytochemical screening of methanol extract of neem leaves showed the presence of alkaloids, flavonoids, tannins, phenols, saponins, terpenes and polyphenols. The mean SPF of neem leaves with respect to the concentrations 2.0 mg mL⁻¹, 1.0 mg mL⁻¹, 0.5 mg mL⁻¹, 0.25 mg mL⁻¹, and 0.05 mg mL⁻¹ were 40.1, 37.5, 20.9, 11.1 and 3.1 respectively. The mean SPF of neem oil and *Dermatone*® were 6.3 and 34.4 respectively. The *in vitro* SPF of neem leaves was dose dependent ($r^2 = 0.815$, $p < 0.05$). Since extracts of neem leaves and oil were found to be having good sunscreen activity, these cost effective and easily available botanicals could be incorporated into herbal sunscreen formulations.

Keywords: *Azadirachta indica*, Neem leaves, Neem oil, Sun Protection Factor