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**Formulation and Evaluation of Alcohol Based Poly-herbal Hand Sanitizer
with Potential Antibacterial Activity**

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Background: *Azadirachta indica* (neem), *Curcuma longa* (turmeric) and *Citrus aurantium* (bitter orange) plants are known to have well known antimicrobial activity due to the presence of various phytochemicals. Poly-herbal hand sanitizers consist of natural plant extracts are vital in controlling the spread of microbes and in preventing the development of infectious diseases.

Objectives: To evaluate the phytochemical constituents of plant extracts and formulate the alcohol based poly herbal hand sanitizers with potential antimicrobial activity using neem leaves, rhizomes of turmeric and bitter orange peels.

Methodology: Aqueous ethanolic (80%) extracts of the plants were obtained by steeping method and subjected to phytochemical screening test and total phenolic content (TPC) and total flavonoid content (TFC) were determined by Folin-Ciocalteu assay and by Aluminium Chloride Colorimetric method respectively. The alcohol based poly herbal hand sanitizers (F₁, F₂, F₃, F₄ and F₅) were formulated by incorporating freeze dried powders of 80% aqueous ethanolic extracts to the base of the hand sanitizers. F₁-F₅ formulations were tested for stability parameters and in vitro antibacterial activity by using agar well diffusion method against *Staphylococcus aureus*, *Escherichia coli* and *Pseudomonas aeruginosa* compared to positive control (commercial product) and the negative control (base).

Results: The phytochemical screening of all three extracts revealed the presence of carbohydrates, phenolics, saponins and flavonoids TPC and TFC values of turmeric is significantly higher than other plant extracts (3928.497±343.0241mg GAE/100g DW and 1657.711±138.281 mg CAE/100g of DW of the rhizomes. F₅ herbal hand sanitizer is stable (colour, phase separation, odour, pH) for 1 month of period. Prominent zone of inhibition (mm) was observed in F₅ formulation (*S. aureus* 23.6±0.6, *E.coli* 15.6±0.6, *P. aeruginosa* 10.3±0.6) compared to the commercial product (*S. aureus* 0±0, *E.coli* 0±0, *P. aeruginosa* 0±0).

Conclusions: Selected plants are rich in polyphenols and flavonoids and formulated hand sanitizers have significant antibacterial activity compared to commercial product tested against all the tested microorganisms.

Keywords: *Hand sanitizer, Antibacterial activity, Azadirachta indica, Curcuma longa, Citrus aurantium*