

# Formulation and Evaluation of Herbal Hand Sanitize

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**Abstract:** Hand hygiene remains the most crucial role for reducing transmission of infectious microorganisms. Alcohol-based hand sanitizers are widely recommended due to their rapid antimicrobial activity mediated through protein denaturation and lipid membrane disruption. However, frequent use high alcohol concentrations have been associated with disruption of the stratum corneum barrier and irritant dermatitis. Plant-derived antimicrobial agents, including phenolics, flavonoids, and essential oils, have ability of broad-spectrum antimicrobial activity via membrane permeabilization, enzyme inhibition, and oxidative stress mechanisms. This review critically synthesizes published literature on the formulation techniques, physicochemical considerations, antimicrobial evaluation methods, and stability assessment of herbal hand sanitizers. Hydroalcoholic gels, alcohol-free systems, essential oil-based formulations, and nano emulsion approaches are comparatively analysed based on pharmaceutical principles. Evaluation parameters including pH, viscosity, spread ability, antimicrobial activity, and accelerated stability testing are discussed in accordance with validated methodologies reported in formulation studies. Limitations identified include variability in phytochemical standardization, lack of uniform antimicrobial testing protocols, and insufficient long-term stability data. Based on this, herbal hand sanitizers suggest pharmaceutical potential when rationally formulated and systematically evaluated using validated analytical methods.

**Keywords:** Herbal hand sanitizer; Hydroalcoholic gel; Phytochemicals; Essential oils; Carbopol; Antimicrobial evaluation; Rheology; Stability studies; Pharmaceutical formulation; Dermal compatibility

