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Design, Optimization, and Evaluation of Moxifloxacin Nanosuspension

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Abstract: *The present study aimed to develop, optimize, and evaluate a Moxifloxacin nanosuspension to enhance its solubility, stability, and controlled release profile. A preformulation study was conducted, assessing organoleptic properties, melting point, solubility, UV absorption characteristics, and drug-excipient compatibility via FTIR, confirming the purity and suitability of Moxifloxacin for nanosuspension formulation. The nanosuspension was prepared by the solvent diffusion method using ethanol as the organic phase and an aqueous phase containing Pluronic, Polysorbate 80, and Benzalkonium chloride as stabilizers. Various formulations (F1–F9) were prepared and evaluated for pH, viscosity, drug content, particle size, polydispersity index (PDI), and zeta potential. All formulations displayed acceptable pH (6.82–6.90) and viscosity (14.8–16.4 cP), with drug content ranging from 93.5% to 99.5%, indicating high encapsulation efficiency. F7 was identified as the optimized formulation due to its highest drug content (99.5%) and balanced physicochemical properties. In vitro drug release studies demonstrated a sustained release pattern, suggesting prolonged drug availability. Stability studies conducted under ICH conditions over three months confirmed the formulation's stability without significant changes in critical quality attributes. Overall, the developed nanosuspension exhibits promising potential for improved therapeutic delivery of Moxifloxacin, suitable for topical or systemic administration.*

Keywords: *Moxifloxacin, nanosuspension, solvent diffusion, controlled release, particle size, zeta potential, in vitro release, stability study*

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