Formulation and Evaluation of Microsponge Loaded Hydrogel for Topical Delivery

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Abstract

The present study was undertaken with an objective to control the delivery of drug when applied topically. Microsponge of Oxiconazole nitrate was prepared by quasi emulsion solvent diffusion method. A 3^2 full factorial design was applied to investigate combined effect of two independent formulation variables (factors) as amount of polymer and polyvinyl alcohol and dependent variables (responses) as loading efficiency and particle size. All the microsponge formulations were evaluated for production yield, loading efficiency, particle size, drug content, Scanning Electron Microscopy (SEM) and FTIR spectroscopic studies. Hydrogel was prepared using carbopol 940 P and evaluated for diffusion studies, viscosity and *in vitro* drug release. Based on the loading efficiency and particle size the microsponge containing 500 mg ethyl cellulose and 0.5 % w/v of PVA was found to be promising and for hydrogel preparation 1.5 % w/v of carbopol 940 P was selected based on viscosity measurement. The drug release kinetics followed Higuchi model indicting that the drug was released by diffusion controlled mechanism. The drug was released up to 12 h in a controlled manner. Stability testing (40^0 C/75 % RH for 1 month) and skin irritation studies on the final formulation were carried out and the results were found

satisfactory. The validation of the generated mathematical model for each response was done by preparing three extra design check point batches and closeness of actual and predicted results validated the design. The microsponge loaded hydrogel was compared with commercial Oxiconazole nitrate cream for antimicrobial activity and the results were found to be comparable. In conclusion, the microsponge loaded hydrogel was successfully prepared to control the drug release topically and to minimize the drawbacks associated with the commercial cream.