Development of an Efficient Transdermal Drug Delivery System Based on a Novel Biopolymer Matrix

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Transdermal Drug Delivery Systems can be defined as a capacitor that can hold and can release a discrete dosage of a therapeutic drug that will deliver drugs through the skin and it has taken a higher consideration in the present due to its control drug-releasing mechanism. However, there are some major downsides in sustaining a controlled and slow release rate of the drug to the structural circulation. Hence developing a novel polymer matrix to enhance the biocompatibility, controlled and continuous drug-releasing became a key objective. Therefore, as a solution a transdermal drug delivery system has developed using a horse gram and corn starch based novel biopolymer which contains Diclofenac Sodium as a model drug. This novel biopolymer films were obtained with a different particle size of horse gram (<63 µm, <125 µm, <150 µm) and horse gram/corn starch ratio (25%, 50%, 100% w/w). Surface morphology, functional group analysis, water vapor transmission rate, transparency, folding endurance, and moisture content were used in characterizing the novel drug loaded biopolymer. UV–visible spectroscopy was used to analyse the releasing kinetics of the drug loaded polymer. 8.97 x 10^{-3} g m^{-2} h^{-1} value of WVTR rate was observed for composition 1(100 %<63 µm Horse gram). Percentage moisture absorbance was maximum in composition 3(25 % <63 µm Horse gram) (25.78%) and percentage moisture loss was maximum composition 2(50 % <63 µm Horse gram) (18.82%). A dialysis tube test with a pH 7.44 buffer solution indicated that the bio polymer matrix with particle size is less than 63µm and contains 100% horse gram shows significantly higher releasing kinetics than the other formulations. Diclofenac Sodium release models from the polymer matrix demonstrate two diffusions, approaching a first order and Fickian controlled-diffusion model for 8 h. Hence this new biodegradable polymer matrix shows significant potential as a delivery platform in the cosmetics and pharmaceutical industries.

Keywords: Controlled release, Drug delivery, Release kinetics, Biopolymer, Diclofenac sodium