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Fabrication of optimized Diclofenac potassium micro-particles using response surface methodology

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Aims: This study was conducted to prepare modified release Diclofenac potassium loaded ethyl cellulose microparticles.

Methods: 13 trail formulations were studied to form an optimized formulation. Non-solvent addition coacervation method was used for the preparation. Response Surface Methodology (RSM) was applied for modified release formulation optimization. Solid state study was conducted for optimized formulation both qualitatively and quantitatively.

Results: As the polymer concentration (X1) and stirring speed (X2) increases Entrapment efficiency (Y3) also increases. Stirring speed (X2) has great effect over particles size (Y4). As polymer concentration (X1) and stirring speed (X2) increases compressibility index (CI:Y5) also increases. Optimized formulation was selected from 30 predicted values. Polymer concentration (X1) for optimized formulation was 1.96gm and stirring speed was 602rpm. Characterization study of modified formulation of Diclofenac potassium were given as; %DR after 1st hour (Y1) was 29.793%, % DR after 7th hr (Y2), E.E(Y3) was 94.511%, particle size was 343.70µm and CI (Y5) was 13.46%. *In vitro* dissolution study showed sustained release for 12 hrs. Kinetic study showed high R2 values for zero order (0.9318) and Higuchi model (0.9962). Both qualitative and quantitative analysis proved the stability of optimized microparticles.

Conclusion: SEM showed that particles of optimized formulation were nearly spherical, light yellowish in color, and having porous and rough surface entrapping drug crystals. Fourier transform spectrophotometry showed that drug is stable in polymer and having no interactions, X-rays powder diffraction (XRD) showed decrease in crystallinity of Diclofenac Potassium in optimized formulation and differential scanning calorimetry (DSC) proved the thermal stability of formulation.

Biography

Dr. Barkat Ali Khan: Was born on 20 September 1982 in, Bannu, Khyber Pakhtunkhwa, Pakistan. He completed his B. Pharm. in 2005 from Gomal University D.I Khan, M. Phil. And PhD (Pharmaceutics) in 2010 and 2013 respectively from the Islamia University of Bahawalpur under the supervision of renowned professor Dr. Navid Akhtar. He is serving as a Lecturer in the department of Pharmaceutics at faculty of Pharmacy, Gomal University D.I Khan, Pakistan, since January 2012. He also served the school of pharmacy, Kampala international university Uganda; east Africa for one year. He has more than 100 publications in national and international journals. His research interest is in the area of cosmetics, skin preparations, novel drug delivery systems such as nanoparticles, microparticles and liposomes and their design, preparation optimization and evaluation. He is the chief editor of journal of pharmaceutical and cosmetics sciences. He is serving as Editorial Board Member and reviewer for many reputed journals. He received scholarship for his master and PhD studies from the higher education commission (HEC) of Pakistan. He was granted travel expenses to present his research papers at Thailand and Turkey by HEC.

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