World Academy of Science, Engineering and Technology
International Journal of Pharmacological and Pharmaceutical Sciences
Vol:12, No:01, 2018

Experimental Design for Formulation Optimization of Nanoparticle of Cilnidipine

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Abstract : Cilnidipine is practically insoluble in water which results in its insufficient oral bioavailability. The purpose of the present investigation was to formulate cilnidipine nanoparticles by nanoprecipitation method to increase the aqueous solubility and dissolution rate and hence bioavailability by utilizing various experimental statistical design modules. Experimental design were used to investigate specific effects of independent variables during preparation cilnidipine nanoparticles and corresponding responses in optimizing the formulation. Plackett Burman design for independent variables was successfully employed for optimization of nanoparticles of cilnidipine. The influence of independent variables studied were drug concentration, solvent to antisolvent ratio, polymer concentration, stabilizer concentration and stirring speed. The dependent variables namely average particle size, polydispersity index, zeta potential value and saturation solubility of the formulated nanoparticles of cilnidipine. The experiments were carried out according to 13 runs involving 5 independent variables (higher and lower levels) employing Plackett-Burman design. The cilnidipine nanoparticles were characterized by average particle size, polydispersity index value, zeta potential value and saturation solubility and it results were 149 nm, 0.314, 43.24 and 0.0379 mg/ml, respectively. The experimental results were good correlated with predicted data analysed by Plackett-Burman statistical method.

Keywords : dissolution enhancement, nanoparticles, Plackett-Burman design, nanoprecipitation
Conference Title : ICPRD 2018 : International Conference on Pharmaceutical Research and Development
Conference Location : Paris, France
Conference Dates : January 25-26, 2018