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Polymeric behavior evaluation of PVP K30-poloxamer binary carrier for solid dispersed nisoldipine by experimental design (Article)

Kyaw Oo, M., Mandal, U.K., Chatterjee, B.

Department of Pharmaceutical Technology, Kulliyah of Pharmacy, International Islamic University Malaysia, Kuantan, Malaysia

Abstract

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Context: High melting point polymeric carrier without plasticizer is unacceptable for solid dispersion (SD) by melting method. Combined polymer-plasticizer carrier significantly affects drug solubility and tableting property of SD. Objective: To evaluate and optimize the combined effect of a binary carrier consisting PVP K30 and poloxamer 188, on nisoldipine solubility and tensile strength of amorphous SD compact (SD_{compact}) by experimental design. Materials and methods: SD of nisoldipine (SD_{nisol}) was prepared by melt mixing with different PVP K30 and poloxamer amount. A 3² factorial design was employed using nisoldipine solubility and tensile strength of SD_{compact} as response variables. Statistical optimization by design expert software, and SD_{nisol} characterization using ATR FTIR, DSC and microscopy were done. Results: PVP K30-poloxamer, at a ratio of 3.73:6.63, was selected as the optimized combination of binary polymeric carrier resulting nisoldipine solubility of 115 µg/mL and tensile strength of 1.19 N/m². Discussion: PVP K30 had significant positive effect on both responses. Increase in poloxamer concentration after a certain level decreased nisoldipine solubility and tensile strength of SD_{compact}. Conclusion: An optimized PVP K30-poloxamer binary composition for SD carrier was developed. Tensile strength of SD_{compact} can be considered as a response for experimental design to optimize SD. © 2015 Informa UK Limited, trading as Taylor & Francis Group.

Author keywords

Factorial design, nisoldipine, solid dispersion, solubility

Indexed keywords

EMTREE drug terms:

nisoldipine, poloxamer, povidone, antihypertensive agent, drug carrier, excipient, nisoldipine, plasticizer, poloxamer, povidone, tablet

EMTREE medical terms:

Article, concentration (parameters), differential scanning calorimetry, dispersion, drug delivery system, drug solubility, evaluation study, experimental design, factorial design, infrared spectroscopy, melting point, microscopy, miscibility, physical chemistry, polymerization, priority journal, response surface method, response variable, tensile strength, chemistry, medicinal chemistry, solubility, tablet

MeSH:

Antihypertensive Agents, Calorimetry, Differential Scanning, Chemistry, Pharmaceutical, Drug Carriers, Excipients, Nisoldipine, Plasticizers, Poloxamer, Povidone, Solubility, Spectroscopy, Fourier Transform Infrared, Tablets, Tensile Strength

Chemicals and CAS Registry Numbers:

nisoldipine, 63675-72-9; poloxamer, 9003-11-6; povidone, 9003-39-8;

Antihypertensive Agents; Drug Carriers; Excipients; Nisoldipine; Plasticizers; Poloxamer; Povidone; Tablets

Manufacturers:

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