Dissolution improvement by solid dispersions composed of nifedipine, Eudragit® E and silica from rice husk

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Nifedipine is a practically water-insoluble drug used therapeutically as a calcium-channel blocker for systemic and coronary vasodilation. Poorly soluble drugs that undergo dissolution rate-limited gastrointestinal absorption generally show increased bioavailability when dissolution is improved by formulation techniques [1]. In solid dispersion system, a drug may exist as an amorphous form in polymeric carriers, and this may result in improved solubility and dissolution rate as compared with crystalline drug. Solid dispersion can be prepared by either fusion or solvent method [2].

In this study, the solid dispersion composed of nifedipine (NDP), Eudragit® E (EE) and silica from rice husk (SRH) was prepared by dissolving NDP and EE in methylene chloride, and SRH was dispersed in the solution. The solvent was then completely evaporated. The morphology of solid dispersion was observed by scanning electron microscopy (SEM). The physicochemical properties of solid dispersion, compared to physical mixtures, were analyzed using powder X-ray diffraction and differential scanning calorimetry. The dissolution of NDP from the prepared solid dispersion, compared to the NDP alone, was tested in simulated gastric fluid (SGF, pH 1.2) [3]. Fig. 1a and b show the SEM images of physical mixture and solid dispersion containing NDP, EE and SRH. It could be seen that, in the solid dispersion, SRH particles were dispersed in the solid dispersion of NDP and EE. The powder X-ray diffraction and differential scanning calorimetry results of the solid dispersion showed that the NDP was present in an amorphous form.
On the other hand, the diffraction patterns and thermograms of the physical mixtures revealed that to some extent the drug was present in a crystalline form. Fig. 1c demonstrated the dissolution profiles of solid dispersions with and without SRH and NDP alone. Dissolution of all solid dispersion formulations was improved compared to NDP alone. Solid dispersion of NDP and EE (without SRH) showed lower drug dissolution when compared to solid dispersion with SRH. These findings suggest that the preparation of solid dispersion composed of NDP, EE and SRH could be a promising strategy for improvement of dissolution of NDP.

REFERENCES

