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Improving biopharmaceutical properties of diacerein using crystal engineering approach

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Manipulating the biopharmaceutical properties of poorly water soluble drug molecule seems to be the need of the hour in pharmaceutical industry nowdays. The phenomenon of multi-component crystalline adducts such as salts, co-crystal, eutectics, solid solutions etc., has attracted interest from majority of crystal engineering and pharmaceutical researchers in the past decade to improve the said properties of drug molecule. In context to this, the present research work was aimed to prepare cocrystal of diacerein (DIA) with improved biopharmaceutical properties. Temperature-composition phase diagrams of diacerein and coformers were constructed using DSC (Differential scanning calorimetry) thermograms obtained for mixtures prepared by liquid assisted grinding. Apart from characteristic V shaped binary phase diagram, no noticeable changes in the FT-IR (Fourier-transform infrared spectroscopy) and PXRD (Powder X-ray Diffraction) spectra further confirmed eutectic formation of diacerein with fumaric acid-FMA (1:2) and 2,4-dihydroxy benzoic acid-DHA (1:3). As adhesive forces established by complimentary functional groups on diacerein and coformers were unable to overcome the stress due to size shape mismatch of component molecules, explains the formation of eutectics. Kinetic solubility in 0.1 N HCl (pH 1.2), acetate buffer (pH 4.5), and phosphate buffer (pH 6.8) was conducted, it revealed that eutectics showed higher solubility than their physical mixtures vis-a-vis parent drug in all three medias. *In-vitro* dissolution and bioavalability profiles of prepared eutecics were improved as compared with pure diacerein. Additionally, the study demostrated that flow properties and tabletability of eutectics were enhanced as compared to DIA alone. Thus produced eutectics of DIA-FMA and DIA-DHA systems having fast dissolving capabilities, improved tabletibility and enhanced *in-vivo* performance make them more favourable candidates for better dosage form development.

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