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Bioavailability Enhancement of Ficus religiosa Extract by Solid Lipid Nanoparticles

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Abstract : Herbal drugs are well known for their mixed pharmacological activities with the benefit of no harmful side effects. The use of herbal drugs is limited because of their higher dose requirement, frequent drug administration, poor bioavailability of phytochemicals and delayed onset of action. Ficus religiosa, a potent anti-oxidant plant useful in the treatment of diabetes and cancer was selected for the study. Solid lipid nanoparticles (SLN) of Ficus religiosa extract was developed for the enhancement in oral bioavailability of stigmasterol and β-sitosterol-d-glucoside, principal components present in the extract. Hot homogenization followed by ultrasonication method was used to develop extract loaded SLN. Developed extract loaded SLN were characterized for particle size, PDI, zeta potential, entrapment efficiency, in vitro drug release and kinetics, fourier transform infra-red spectroscopy, differential scanning calorimetry, powder X-ray diffractrometry and stability studies. Entrapment efficiency of optimized extract loaded SLN was found to be 68.46 % (56.13 % of stigmasterol and 12.33 % of β-sitosteryl-d-glucoside, respectively). RP HPLC method development was done for simultaneous estimation of stigmasterol and β-sitosterol-d-glucoside in Ficus religiosa extract in rat plasma. Bioavailability studies were carried out for extract in suspension form and optimized extract loaded SLN. AUC of stigmasterol and β-sitosterol-d-glucoside were increased by 6.7-folds by 9.2-folds, respectively in rats treated with extract loaded SLN compared to extract suspension. Also, Cmax of stigmasterol and β-sitosterol-d-glucoside were increased by 4.3-folds by 3.9-folds, respectively in rats treated with extract loaded SLN compared to extract suspension. Mean residence times (MRT) for stigmasterol were found to be 12.3 ± 0.67 hours from extract and 7.4 ± 2.1 hours from SLN and for β-sitosterol-d-glucoside, 10.49 ± 2.9 hours from extract and 6.4 ± 0.3 hours from SLN. Hence, it was concluded that SLN enhanced the bioavailability and reduced the MRT of stigmasterol and β-sitosterol-d-glucoside in Ficus religiosa extract which in turn may lead to reduction in dose of Ficus religiosa extract, prolonged duration of action and also enhanced therapeutic efficacy.

Keywords : Ficus religiosa, phytosterolins, bioavailability, solid lipid nanoparticles, stigmasterol and β-sitosteryl-d-glucoside
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