Intercalation of Acarbose into Sodium Montmorillonite for Sustained Release Formulation

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Among the numerous antidiabetic drugs, acarbose is the most extensively used digestive enzyme inhibitor for the treatment of Type-II diabetes. A simple and rapid UV-Vis spectroscopy method reported in the literature was modified and successfully implemented for the determination of acarbose in aqueous media. The method is based on the formation of a green-colored complex of acarbose with alkaline potassium permanganate. Concentration (in the range of 10-50 ppm) is proportional to the visible light absorbance at 426 nm wavelength, therefore, the above parameters were selected for the quantitative determination of acarbose in aqueous solution. The Beer–Lambert law is obeyed in the above-mentioned range with a coefficient of determination (r^2) value of 0.9826. The acarbose concentration in commercial tablets was determined using this method and the recovery was 99.65 % for 40 ppm solution. Short biological half-life and more side effects of acarbose have been recurring problems, owing to its low bioavailability and low patient tolerance, respectively. The controlled release of a therapeutic agent to patients is gaining prodigious importance during the recent time and clay minerals play a major role in modulating drug delivery. The present work is focused on the intercalation of acarbose into montmorillonite (MMT) as a controlled release drug carrier. MMT is an aluminosilicate clay composed of tetrahedral layers of silica stacked between octahedral layers of alumina with negatively charged surfaces. Due to its high cation exchange capacity and large specific surface area, MMT is extensively used in the formulation of various pharmaceutical products. In this study, acarbose was successfully incorporated into MMT by stirring MMT in a 100 ppm acarbose solution and showed 22.4% intercalation at pH 6. Acarbose intercalated MMT was characterized by X-ray diffraction and Fourier transformed infrared and the presence of N-H stretching peak at 1632 cm^{-1} and increase of d-spacing confirmed the successful intercalation of acarbose into the interlayers of MMT. The releasing properties of the synthesized acarbose-MMT composite would be investigated in the future.

Keywords: Acarbose, Montmorillonite, Intercalation, Drug delivery, Characterization