Abstract:

Three-dimensional (3D) printing technology has emerged as a promising alternative to traditional manufacturing processes, particularly for the production of small batches intended for pre-clinical studies or personalized dosing. Despite significant advancements in the field over the past decade. there remains a notable gap in research regarding the printing of scored tablets to enhance the accuracy and precision of functionally scored tablets. The primary objective of this study was to explore the utilization of 3D printing technology for the manufacture of scored tablets, utilizing paracetamol as a model drug. The printing process employed polyvinyl alcohol (PVA) filaments, while paracetamol-loaded filaments were prepared using the solvent impregnation method. Fused deposition modelling (FDM)-based 3D printer was selected for printing scored tablets of target dimensions of 12.5mm at three infill density values (0, 50 and 100%). The scored tables with different infill density were successfully printed. Subsequently, the 3D printed tablets were evaluated for physical and mechanical properties including drug content, weight variation and breaking force, friability and were within acceptable range as defined by the international standards stated in the British Pharmacopoeia. Also, X-ray powder diffraction and differential scanning calorimetry were used to identify the physical form of the drug in the printed tablets, which suggest the drug is present in the amorphous form. In addition, Thermogravimetric analysis results shows no evidence of drug degradation at the printing temperature. European Pharmacopeial standards for the accuracy of subdivision for scored tablets were assessed. The evolution of the scored tablet indicated that the weight uniformity of the scored tablets remained consistent before and after splitting across all infill densities, with no observed weight loss upon