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Physical characterization of 3D printed PVA capsules produced by fused deposition modelling

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Additive manufacturing, or 3D printing is gaining significant importance as an advanced technology in pharmaceutical drug production. Among different printing techniques, fused deposition modelling (FDM) received attention due to its layer-by-layer deposition process for the fabrication of hollow structures intended for oral drug delivery [1]. The aim of this work was to produce empty and water filled capsules using FDM with polyvinyl alcohol (PVA) at 30% and 60% infill densities, and to perform their physical characterization including visual assessment of appearance, mass, hardness, and dimensional measurements, immediately after printing and after 7 days of storage. All produced capsules were yellowish in colour, slightly transparent, and rectangular with rounded edges. The empty formulations with 60% and 30% infill (F60e and F30e) had similar mass values. All formulations had similar hardness immediately after printing. Formulations filled with 100 µl of water (F60 and F30) showed a significant reduction in hardness after 7 days of storage. The greatest increase in capsule height and width was observed after 7 days in the formulation with 30% infill filled with 100 µl of water (F30). Using FDM 3D printing, PVA capsules with different infill densities were successfully produced. Overall, the findings expand current knowledge on the physical properties of 3D-printed PVA capsules.

References

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