Optimizing conditions for the development of 3D printed chocolates

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Background

- 3D food printing technology as an innovative approach to develop a attractive shape from chocolate
- Few studies on the printability of chocolates and their mixes
- Offering a fresh and innovative method of producing chocolate, could boost customer acceptance of goods containing chocolate

Methodology

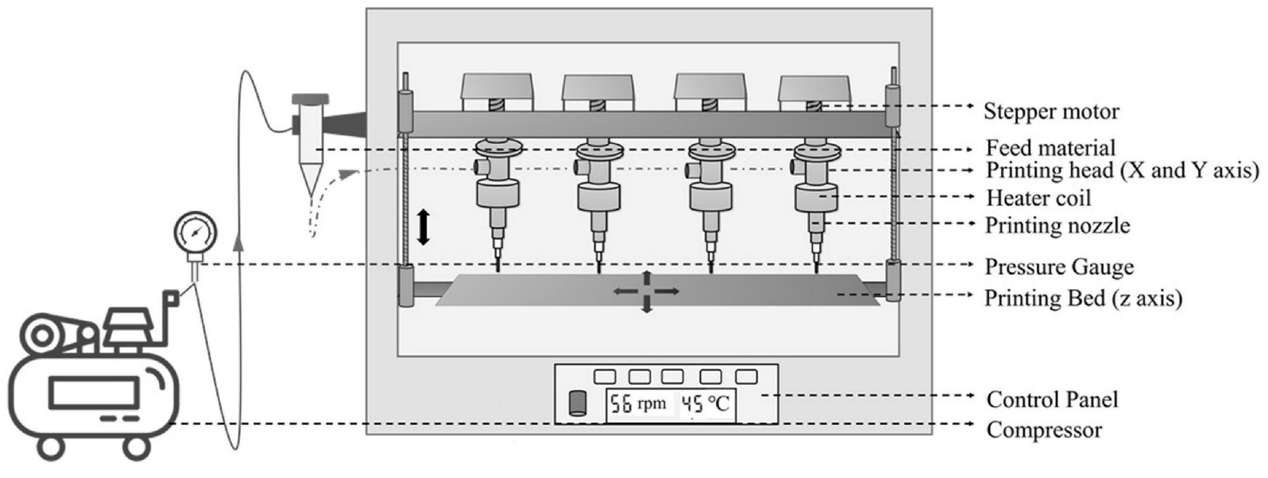
Technique: Hot extrusion 3D food printing

Compositions: Chocolate paste (CP), Chocolate gel (CG)

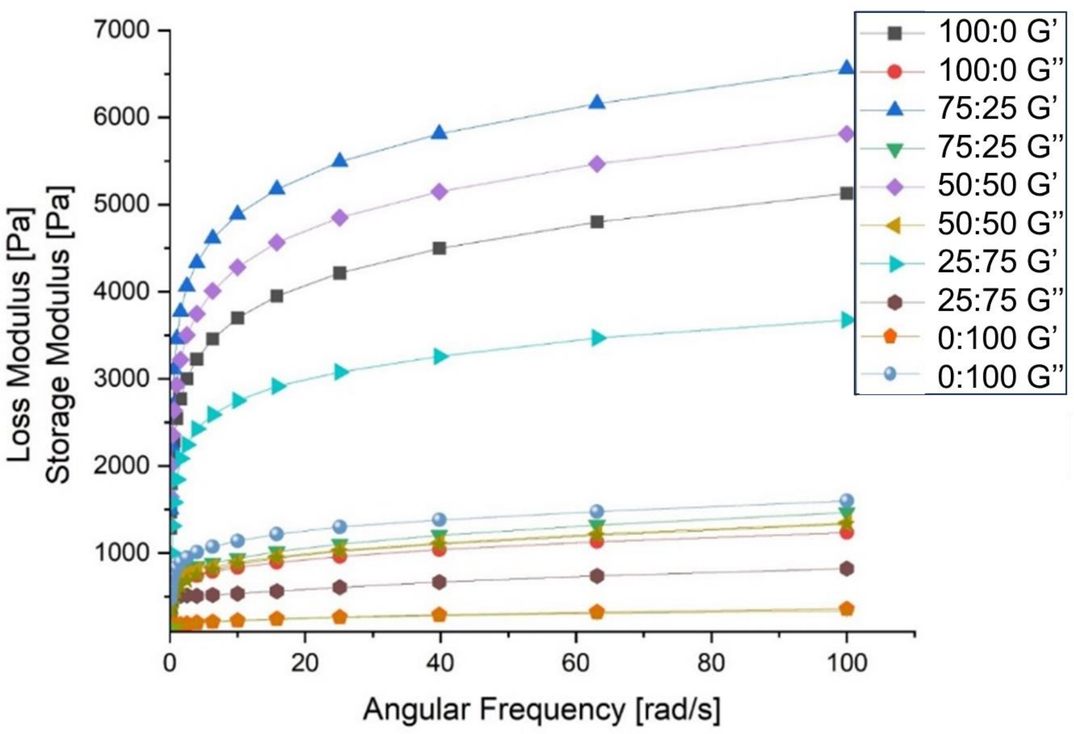
- CP: CG (%w/w :w/w) - 100:0, 75:25, 50:50, 25:75, 0:100

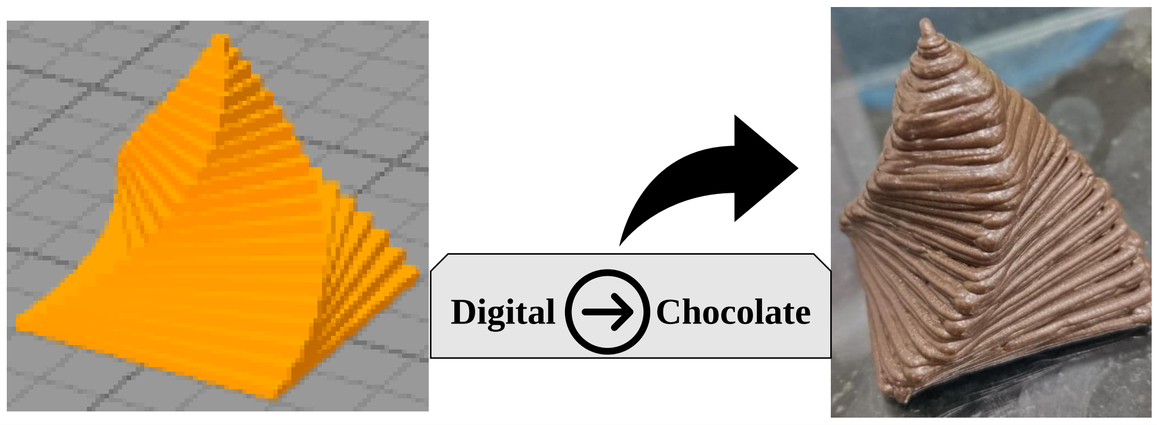
Conditions:

- Nozzle – 0.84 mm, 1.22 mm, 1.56 mm
- Extrusion motor speed – 120 rpm, 180 rpm, 240 rpm
- Printing speed – 600 mm/min, 800 mm/min, 1000 mm/min



Results





Yield stress (τ_y) (Pa)	80.43
Flow behavior index (n)	0.60
Deformation (%)	41-92
Recovery (%)	104-122
LVER (%)	0.05
Crystallinity (%)	75-80%

Conclusion

- High-precision constructs reached printing speeds ranging from 600 to 1000 mm/min, with a melt extrusion rate from 40 to 60℃, and the most efficient motor speed was 15–30%
- The findings of this study can be utilized in the process of 3D printing intricate items employing chocolate and other analogous food materials

References

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2. Mantihal, S., Prakash, S., Godoi, F. C., & Bhandari, B. (2017). Optimization of chocolate 3D printing by correlating thermal and flow properties with 3D structure modeling. Innovative Food Science & Emerging Technologies, 44, 21-29. https://doi.org/10.1016/j.ifset.2017.09.012