3D food printing as a promising tool for food fabrication: 3D printing of chocolate

## ABSTRACT

The optimisation of printing dark chocolate was investigated, which included 3D printer modification. The modification comprises development of custom printer bed an inbuilt water recirculation system with a slow flow rate of 6.3 mL/s to avoid vibration. Additionally, a fan was attached to enhance the solidification of chocolate. It was found that 32°C was the optimal condition of chocolate melting and this temperature was applied in the printing process. The addition of the support structure on the mechanical properties of chocolate such as cross and parallel support structures printed in a hexagonal shape was also investigated. Findings indicated that the cross support increased the stability and strength (57.5±4.8 N) of chocolate more than the chocolate printed with parallel support (50.5±2.7 N) and without any support structure (12.6±6.1 N). Different infill structures (infill pattern and percentage) can contribute to the textural modification of 3D printed chocolate. The appearance of the 3DP construction was vital as this modality can influence the acceptability of the product. Sensory analysis was conducted among 30 semi -trained panellists. Most participants favoured the appearance of sample 3DP100%\_IP (1.33) to those of samples 3DP25%\_IP (2.00) and 3DP50%\_IP (2.67). On the textural perspectives, consumers indicated their potential preferences on chocolate printed with 25% infill percentage. Similar results from consumer paired-preference test were obtained. These results suggested that consumer realised the potential of 3D printing for textural modification.