Evaluation of potato starch gelling ingredients (native and modified by dry heating) and post-processing in the texture of 3D printed foods

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3D printing technology has recently been widely applied to fabricate food with complex shapes and textures. In addition, starch has shown the potential to prepare hydrogel inks for 3D-printed food production. This source offers advantages such as being available worldwide, relatively cheap, and having gelling properties. However, starch-based hydrogels present processing difficulties, mainly associated with their rheological properties. Some starch modification methods have been performed to overcome these difficulties, for example, the dry heating treatment (DHT), a simple, safe, physical, and "green" treatment. In addition, post-processing can strongly influence the dimensional accuracy and texture of the printed food. In this context, this work aimed to evaluate the performance of hydrogels (10% w/w) based on native or dry heating modified potato starch (4 h, 130 ºC) and the effect of post-processing on the performance of 3D printed food. The 3D printer (3D BioedPrinterV4-BioEdTech, Brazil) and the parameters used were: 15% filling percentage, ten layers, 100% extrusion flow rate, 10 mm/s of printing speed, and a cylinder with 20 mm of diameter. The post-processing evaluated were oven drying (45 ºC and 15% RH) and freeze-drying (-20 ºC). The printed food's weight, dimensions, and mechanical properties (TPA tests, TA Instrument TA.TX Plus, UK) were evaluated. The hydrogels based on modified starches showed lower hardness and higher adhesiveness than the native ones. Also, modified starch resulted in printed food with higher reproducibility. In addition, freeze-drying was able to preserve better the accuracy of printed food and to obtain 3D-printed food softer than that dried in the oven. Finally, this study was fundamental to showing how different gelling agents from the same starch source and how post-processing can affect the quality of printed food, including from a visual aspect to textural properties.