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Abstract

Using 3D Printing Technology in Cookie Production †

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Abstract: Nowadays, 3D food printing, in other words, food layered manufacture, has gained more importance. The most common driving forces behind of using 3D technology in the food sector is designing complex external and internal food structure, customizability of sensorial and nutritional features and the relationship between the sustainability. In this regard, 3D printed cereal-based products, especially cookies are one of the most common food products.

According to studies in which have used 3D printing technology for cookie production, some food additives like hydrocolloids, in particular xanthan gum, could be used to increase mechanical strength in the post-processing steps as baking, frying, or steaming. However, the concentration of hydrocolloids is important due to influencing extrudability and also porosity which could bring about poor textural properties. On the other hand, it is possible to produce 3D printed cookies without hydrocolloids or stabilizers with modifying the cookie recipes by means of changing fat and flour type or concentration of sugar. Besides, applying the pre-heating process in cookie dough could enhance the resistance of deformation and could be implemented as 3D printing inks, which is giving better results in flours with lower starch content rather than higher starch content like tapioca. Moreover, 3D printed technology make also available fortifying cookies with some micro-algae like *Arthrospira platensis* and *Chlorella vulgaris*, culminate in enhancing printability and stability. Moreover, to obtain novel functional foods with high nutritional properties, pea protein, grape skin powder, jackfruit seed powder, and finger millet powder have also been used in 3D printed cookies. To sum up, 3D printing technology has great potential and is a promising solution for personalized cookies with complex shapes and textures by taking into consideration the contribution of ingredients and printing parameters to produce high quality end-products with higher repeatability and accuracy.

Keywords: 3D printing; cookie; fortification; sustainability

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