

Abstract

Three-Dimensional Printing—Spicing Up Gluten-Free Diets! [†]

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[†] Presented at the Annual Scientific Meeting of the Nutrition Society of New Zealand 2022, Wellington, New Zealand, 1–2 December 2022.

Abstract: Coeliac disease, presenting in about 1.4% of the world's population, is an auto-immune disorder triggered by the gluten protein found in wheat, barley, rye and other grains, which can result in damage to the gastro-intestinal tract villi, leading to malnourishment, loss of bone density, and more serious consequences. A common complaint of people with coeliac disease is the lack of gluten-free products with high nutritional value and unique sensory qualities, especially regarding the textural aspects. The aim of this work was to use 3D printing to create nutritious, tasty gluten-free foods. Our hypothesis was that the layer-by-layer alignment of protein filaments and air gaps in a 3D-printed object would result in a modified protein network and that the effects on aspects of sensory perception, such as texture and taste, would ultimately be due to this. The products were created with chickpea flour and lupin flour in combination with pea protein isolates. These ingredients were used because they are gluten-free and readily available and provide a good taste and texture. There were significant differences between the 3D-printed and non-3D-printed objects. The longer the bars were cooked for, the lower the moisture content was, and there was greater moisture loss in the 3D-printed objects. In the sensory analysis, the traditionally cooked bars were perceived as softer and more beany than the 3D-printed bars with a similar moisture content. The 3D-printed objects were perceived as more crumbly than the traditionally cooked bars. More work is needed to improve the sensory attributes of the 3D-printed bars. Additionally, we will need to determine whether we can apply 3D-printing-based knowledge to the current commercial processing methods, such as extrusion.



Citation: Wallace, A.; Agarwal, D.; Kim, E.; Wadamori, Y.; Feng, L.; Hedderley, D.; Morgenstern, M.P. Three-Dimensional Printing—Spicing Up Gluten-Free Diets! *Med. Sci. Forum* **2023**, *18*, 5. <https://doi.org/10.3390/msf2023018005>

Academic Editors: Claire Smith, Sally Mackay, Shabnam Jalili-Moghaddan and Michelle Gibbs

Published: 7 March 2023



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Keywords: gluten-free; 3D printing; sensory

Author Contributions: Conceptualization, D.A.; methodology, A.W., D.A. and E.K.; validation, A.W., D.A. and E.K.; formal analysis, A.W., D.A., E.K., D.H. and M.P.M.; investigation, D.A.; data curation, A.W., Y.W. and L.F.; writing—original draft preparation, D.A.; writing—review and editing, A.W., D.A., E.K., D.H. and M.P.M.; visualization, D.A. All authors have read and agreed to the published version of the manuscript.

Funding: The New Zealand Institute for Plant and Food Research Limited's Blue Skies Programme supported this project, funded by the New Zealand Ministry of Business, Innovation and Employment (MBIE) Strategic Science Investment Fund (SSIF).

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: All panelists received written information about the study before giving their informed consent. The protocols for preparing samples and performing the sensory evaluation were accepted by the Food Safety Committee of the New Zealand Institute for Plant and Food Research Limited.

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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