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Developing Tasty and Nutritious Sustainable Foods Using Note by Note Cooking and 3D Food Printing

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Developing Tasty and Nutritious Sustainable Foods Using Note by Note Cooking and 3D Food Printing

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Background

- Molecular Gastronomy (MG) is a sub-discipline of Food Science and Note by Note (NbN) Cooking is an application of MG. In this type of cooking traditional foods are not used to make dishes but pure compounds or mixtures of pure compounds (This, 2014; Burke and Danaher, 2016).
- Note by Note (NbN) cooking and 3D food printing individually and in combination allow for the creation of customized foods.
- The shape of the 3D printed food can be designed as required by using shapes, or scanning in photographs or images (Procusini Company, 2022)
- Protein ingredients can be exchanged for another protein, and concentrations of proteins can be increased or decreased as required.

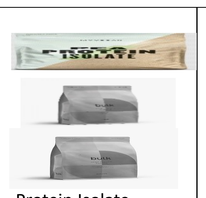
Objective

To develop a NbN recipe that can be 3D printed and customized to match the dietary requirements of consumers while at the same time minimizing waste.

Methodology

Ingredients

Corn Flour



Protein Isolate

Cellulose Dietary Fiber

Caster sugar

Common salt

Olive oil

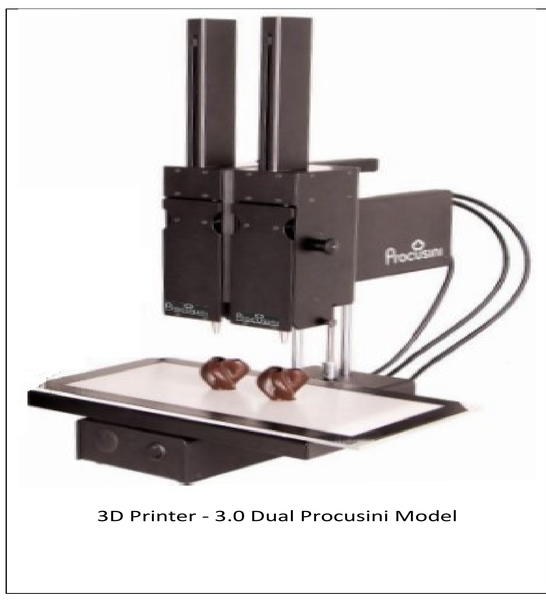
Berthome flavor

Conq flavor

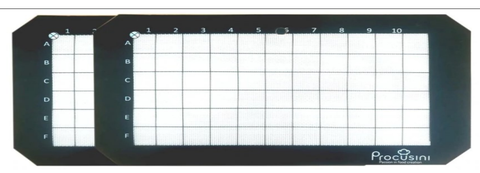
Onium flavor


Red colorant

Equipment



3D Printer - 3.0 Dual Procusini Model



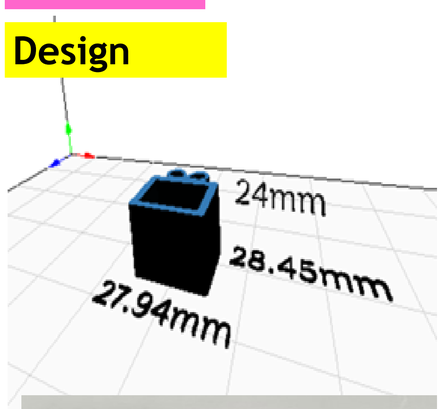
Silicone mat


Plastic syringe


Plastic tips

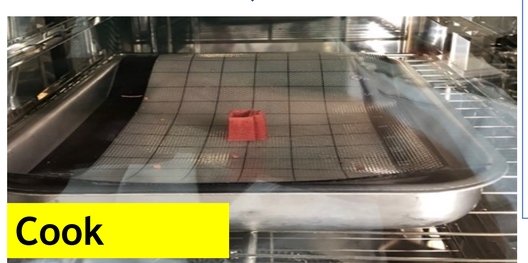
Process

Design



Print

Cook



Ready to eat

Results and Discussion

After a number of trials, to optimize the texture, a prototype savoury NbN recipe was developed which included cornflour, olive oil, sugar, salt, water, plant protein-rich ingredients i.e. either soya, hemp or pea-protein and dietary fibre, flavours and colours.

Table 1: Note by Note recipes for a 3D Printed lobster (soya or hemp protein) and a gift box (pea protein). Ingredients are expressed as a percentage of the total wet weight.

Ingredients	Recipe 1 Soya protein lobster	Recipe 2 Hemp protein lobster	Recipe 3 Pea protein gift box
Cornflour	28.6	28.6	23.8
Soya protein isolate	12.1		
Hemp protein		12.1	
Pea Protein			12.5
Dietary fiber			6.8
Olive oil	6.0	6.0	5.6
Caster Sugar	0.87	0.87	0.78
Salt	0.43	0.43	0.59
Conq flavour			0.06
Berthome flavouur			0.08
Onium flavor			0.04
Red colorant			0.10
Water	51.9	51.9	49.6
Total	100.0%	100.0%	100.0%

The three resulting mixes were printed either in a lobster shape (soya and hemp) or a cube shape (pea protein). During cooking of each sample there was loss of volume, due to water evaporation, but not of shape. The colour of each sample darkened and the texture became crisp.

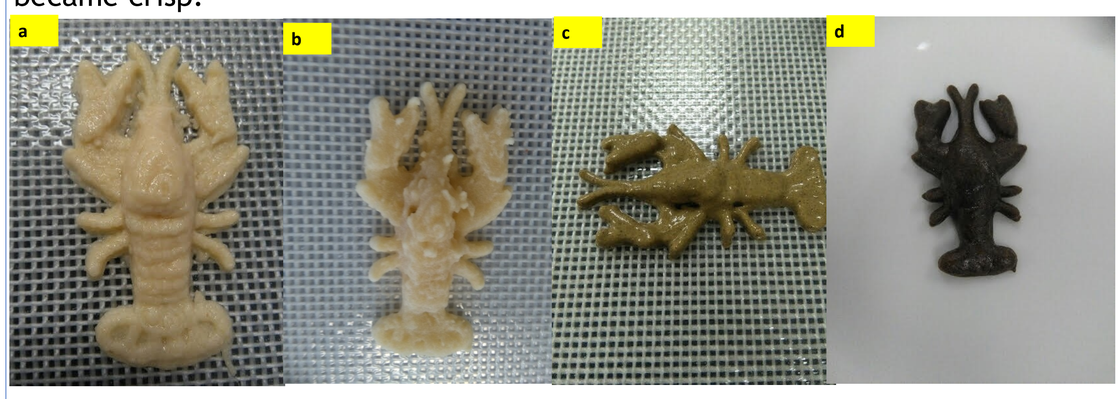


Figure 1: The 3D printed soya lobster (a) before cooking and (b) after cooking and the 3D printed hemp lobster (c) before cooking and (d) after cooking.

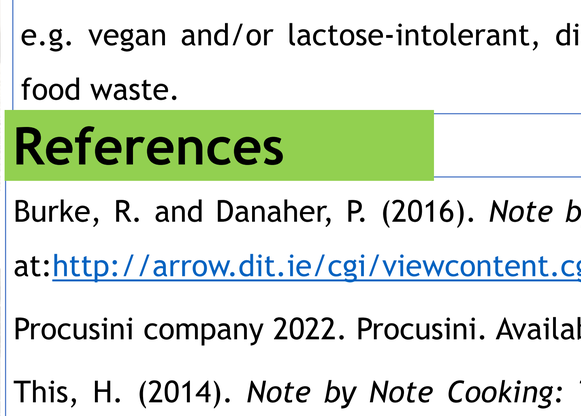


Figure 2: The 3D printed pea protein gift box (a) before cooking and (b) after cooking.

The final protein contents for the cooked soya lobster was 17.5%, 9.7% for the hemp and 12.9% for the pea protein.

Conclusions

The recipes are prototypes and can be produced in various shapes, colours, flavours (including odours) and textures. The customized foods can be served to diners or developed as food products and allow for an expansion in creativity and innovation which addresses the dietary and sustainability requirements of a growing number of consumers e.g. vegan and/or lactose-intolerant, dietary needs of sports athletes and reduction of food waste.

References

Burke, R. and Danaher, P. (2016). *Note by Note: A New Revolution in Cooking*. Available at:http://arrow.dit.ie/cgi/viewcontent.cgi?article=1060&context=dgs

Procusini company 2022. Procusini. Available at: https://procusini.com/en/collections/all

This, H. (2014). *Note by Note Cooking: The Future of Food*. Translated from French by Malcolm DeBevoise. Columbia University Press: New York.