PhD Project Advertisement

Project title: High moisture extrusion technology assisted by enzymatic protein-protein crosslinking approach to improve the texture quality of plant-based meat analogues and eliminate the need for additives

Project No: FBS2023-28-Khalil Ghawi-rb

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Project description:

This project involves an academic team from University of Reading, and Brunel University London, as well as THIS.CO (Plant Meat Ltd) as a partner from food industry.

Plant-based meat analogues are steadily shifting from niche to mainstream products as they offer a healthier and more environmentally sustainable solution which considers consumer preferences and behaviour. The structuring process is the most important step for meat analogues production because it is the foundation of meat-like texture formation, the structuring process aims to develop a fibrous structure.

A typical plant-based meat analogue contains, apart from protein in textured and non-textured form, a significant amount of flavourings & colouring agents, oil or fat, and binding agents. However, a long ingredient list with additives and binding agents may form barriers towards consuming such products.

The centre of interest has been given towards the development of meat analogues that simulate conventional meat in all its physical sensations (appearance, texture, taste, smell, etc.), on the other hand, there is an increasing demand by consumers for more sustainable ingredients, natural, clean label, and nutritious products.

Recently, modifying the plant protein structure by enzymatic crosslinking is gaining a lot of interest due to mild reaction conditions and the specificity of the enzymes. Exploring the effects of crosslinking catalysed by enzymes such as transglutaminase, will be useful in understanding the effects it has on gelling, emulsifying, foaming properties of the plant proteins.

Research objectives

In this project, we aim to develop a novel and chemical free protein-protein binding system (crosslinking enzymes) for plant-based meat products as a replacement of currently used commercial binders/additives.

1. Achieve in-depth understanding of the chemistry of different proteins (e.g. pea, soy, chickpea, faba), enzymes (crosslinkers), and how the texture of current meat-alternative products is developed using additives.
2. Screen the tested proteins, enzymes, and processing parameters, via a structured design of experiment methodology. Generate predictive models to achieve optimal performance (e.g. texture, brittleness, elasticity) of crosslinked protein matrix.
3. Understand how crosslinked protein matrix behaves in model plant-based meat formulae, and the impact of manufacturing process parameters (e.g. extrusion, high shear mixing, pasteurisation).
4. Conduct an extensive product validation program (in collaboration with industry partner), including large scale manufacture trials and sensory testing.

Training opportunities:

You will receive training on and use laboratory and pilot scale equipment available in University of Reading's Food Processing Centre which is one of the largest facilities of its kind in Europe. You will have a chance to visit the industry partner site where you will observe and take part in the full-scale production process.

THIS>CO will provide a three-month work placement (based in London). This will give you wider commercial awareness

and knowledge of how your research impacts the company's success; whilst equipping you with a host of complementary business skills beyond your research.

Student profile:

This project suits a student with a degree in food science, food technology, food processing, food engineering, or similar applied undergraduate discipline. Applicants from other background such as biological sciences degree, chemical engineering, biochemistry or a chemistry are encouraged to apply if they are motivated by this project.

Stipend (Salary):

FoodBioSystems DTP students receive an annual tax free stipend (salary) that is paid in instalments throughout the year. For 2022/23 this will be £17,668 and this will increase slightly each year at rate set by UKRI.

Equality Diversity and Inclusion:

The FoodBioSystems DTP is committed to equality, diversity and inclusion (EDI), to building a doctoral researcher(DR) and staff body that reflects the diversity of society, and to encourage applications from under-represented and disadvantaged groups. Our actions to promote diversity and inclusion are detailed on the FoodBioSystems DTP website.

In accordance with UKRI guidelines, our studentships are offered on a part time basis in addition to full time registration. The minimum registration is 50% FT and the studentship end date will be extended to reflect the part-time registration.

For up to date information on funding eligibility, studentship rates and part time registration, please visit the FoodBioSystems website.