

PhD: Food science

Title: Solid State Fermentations for the Enhancement of Bioaccessibility of Alternative Ingredients: Experimentation with Edible Mycelial Fungi

Supervisor: Dr Chiara Nitride

Objectives of the research project and interdisciplinary collaborations:

The greenhouse gas emissions associated with animal protein production is driving the evaluation of environmentally sustainable proteinaceous ingredients. The objective of the project is to evaluate the solid-state fermentation of mycelial fungi grown on alternative ingredients to obtain a semi-prepared product with enhanced nutrient bioaccessibility, potential bioactivity, and reduced content of anti-nutrients and allergens. Mycelial fungi *Pleurotus*, *Shiitake* and *Lion's Mane* will be evaluated. The growth substrate will be prepared by including alternative protein sources such as leaves and by-products of the food industry, like spent oilseed cakes, which represent a valid source of nutrients with known low bioaccessibility. The fermentation will be set up in collaboration with Prof. Cinzia Pezzella (CHIM 11) from the Department of Chemical Sciences. The compositional evolution of the fermented product will be evaluated using qualitative-quantitative methodologies, with particular attention to allergens/antinutrients degradation and/or the generation of bioactive peptides. The characterization will be supported by in vitro bioactivity and allergenicity assays. The semi-finished product obtained from fermentation will be used to produce a model food in collaboration with Prof. Pasquale Ferranti (AGR 15) and it will be used for digestibility studies.

Innovation and originality of the project in relation to the state of the art:

The project aims to develop foods that include 'new' ingredients in their formulation for the food industry. Minor legumes, leaves such as *moringa oleifera*, and by-products are used as alternative protein sources to animal products due to their nutritional benefits and reduced environmental impact. The study aims to use mycelial fungi, such as 'Lion's Mane,' on recalcitrant substrates. The nutritional improvement of the semi-finished product will allow to understand at the molecular level the added value of solid-state fermentation. The fermented ingredient meets the demands of a market segment that favors a flexitarian-vegan diet, reducing animal product consumption, and seeks accessible, user-friendly daily food choices. The project's results may also apply to developing a high biological value food model that companies can produce on a large scale. This will result in the development of safe and easily absorbed high-quality foods.

Grant availability:

GIANT LEAPS (EU-22042 GIANT LEAPS (BO-62-101-003))

Collaborations with foreign institutions:

The project will benefit from the collaboration with the University of Surrey, with prof. Clare Mills, who has a long experience in the molecular characterization of food allergens. The collaboration will allow us to access a bank of sera of allergic subjects for in vitro cross-allergenicity studies.