

# STUDY OF THE IMPACT OF EDIBLE MUSHROOM BIOMASS OBTAINED FROM BY-PRODUCTS UPCYCLING ON THE HUMAN INTESTINAL MICROBIOTA.

Cima, André; Bierhalz Voss, Glenise; Salsinha, Ana Sofia; Sousa, Ana Sofia; Gómez-García, Ricardo; Pintado, Manuela

Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Diogo Botelho 1327, 4169-005 Porto, Portugal

## Introduction

The production of related by-products has increased due to the increase in mushroom consumption in recent years. Given their nutritional composition, mushrooms present a novel opportunity to incorporate dietary fiber into one's diet, thereby providing potential benefits for probiotic health. This research attempted to evaluate the potential prebiotic impact of mushroom biomass derived from by-products by using a simulated model of human feces fermentation. To achieve this, nutritional characteristics of by-products from two types of mushrooms, *Pleurotus ostreatus* and *Pleurotus eryngii* (obtained through different extraction procedures - M1 and M2), were assessed. Particular emphasis was placed on analyzing the fiber, structural carbohydrates, and glucans content of the components, as these are recognized substrates for microbiota microorganisms and are known for their prebiotic properties.

## Objectives

- 🎯 Biochemical characterization.
- 🎯 Assessing the potential prebiotic effects of biomasses derived from *Pleurotus ostreatus* by-products following *in vitro* gastrointestinal digestion on human gut microbiota, utilizing a human fecal fermentation model.
- 🎯 Determine the influence of the primary non-digested fraction on major gut microbial groups, incorporating metabolic indicators such as short chain fatty acids (SCFAs).

## Methods

### Extraction methods:

**M1** - hot extraction 90 ° C, 1 h, 500 rpm

**M2** - extraction at room temperature and the resulting residue was further extracted with hot water 90 ° C, 1 h, 500 rpm

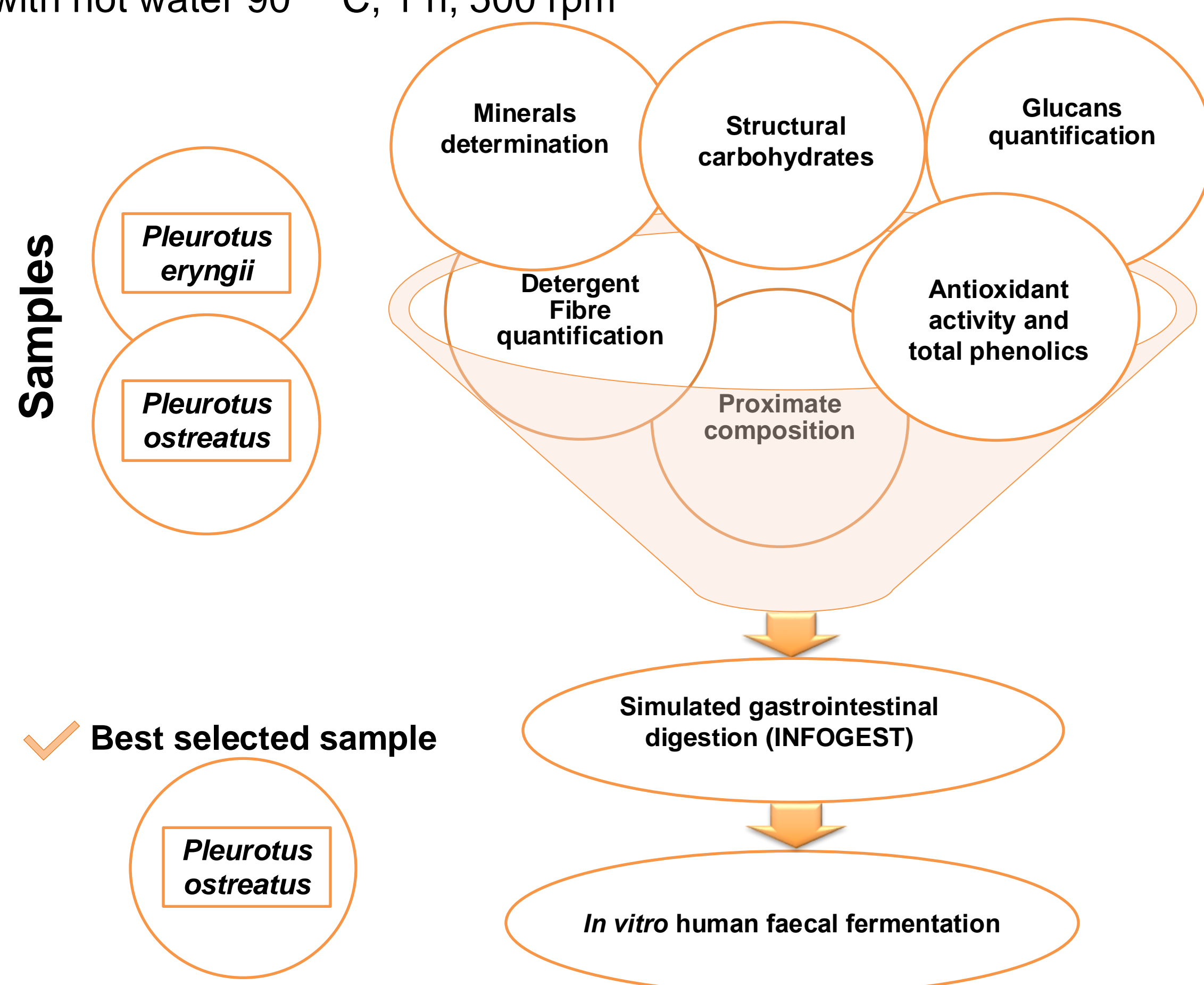


Figure 1. Simplified diagram of the process.

## Results

- 🎯 **M2** extraction process produced a flour that included higher content of structural carbohydrates and fiber than the other methods
- 🎯 **Fiber content:**  
*P. ostreatus*: 36.39 – 41.01 g/100 g DW  
*P. eryngii*: 35.19 – 39.69 g/100 g DW.
- 🎯 **β-glucans content:**  
*P. ostreatus*: 50.92 – 52.29 g/100 g DW  
*P. eryngii*: 41.96 – 43.64 g/100 g DW.

## Results

- 🎯 The ratio of *Firmicutes* to *Bacteroidetes* ratio remained stable over time, hovering close to one, indicating a favorable indication of flours prebiotic potential.

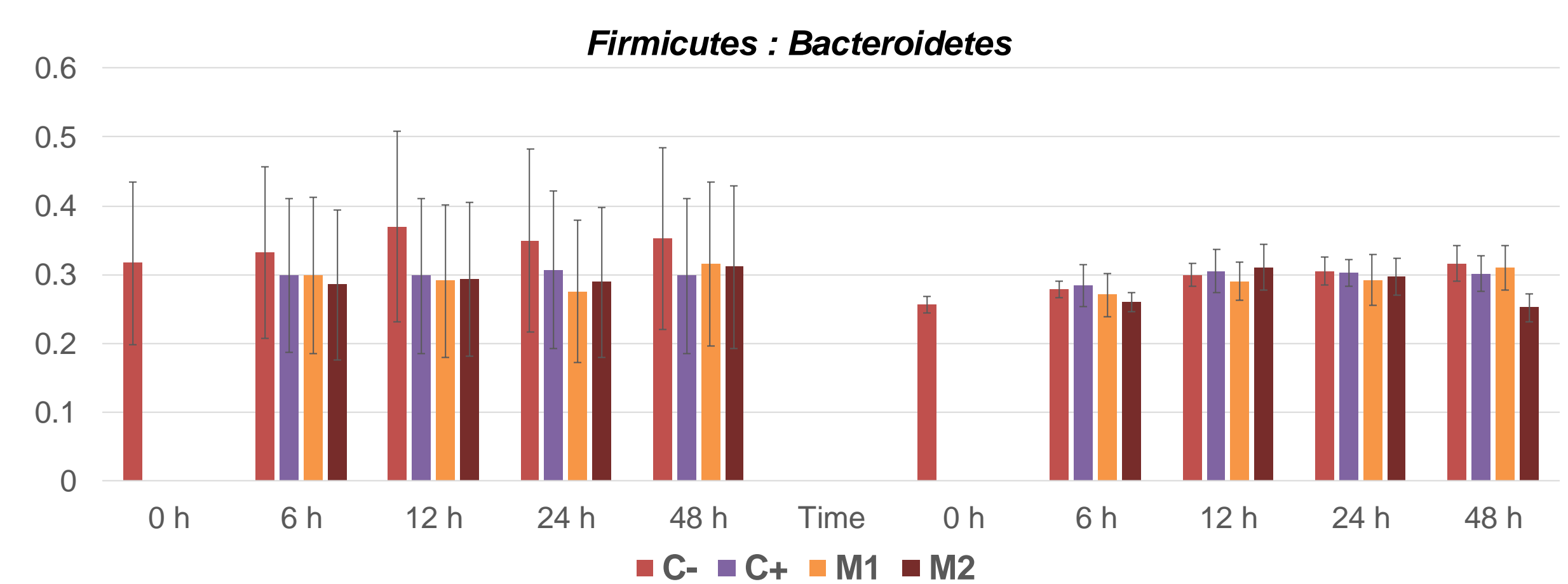


Figure 2. Firmicutes: Bacteroidetes comparison values evaluation during fermentation with human feces.

- 🎯 The production of SCFAs (acetate, butyrate, and propionate), lactic acid, and succinic acid revealed a positive modulation of the microbiota metabolism.



Figure 3. Concentrations of short-chain fatty acids (SCFAs) and succinic and lactic acid produced after 0, 6, 12, 24 and 48 hours *in vitro* fecal fermentation of negative control, positive control and samples (M1 and M2). The results are the means of five different donors.

## Conclusion

It is conceivable to suggest that the spectrum of bioactive properties linked with *P. ostreatus* biomasses could be broadened due to the potential prebiotic activity observed on the human gut microbiota, notwithstanding the absence of direct correlation between bacterial community results and metabolite production. Furthermore, it's critical to emphasize that the circular economy method of valorizing mushroom by-products - which aims for zero waste - made it possible to generate aqueous extracts and to valorize the byproducts biomasses as useful prebiotic ingredients.

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