Valorization of plant beverage by-products with fungi to obtain mycoprotein

Camila Mendoza, Matteo Vitali, Juan Francisco García-Moreno, Antonio Cilla, Amparo Gamero and Mónica Gandía
Preventive Medicine and Public Health, Food Science, Toxicology and Forensic Medicine Department
Faculty of Pharmacy and Food Sciences, University of Valencia
Av. Vicent Andrés Estellés S/N 46100 Valencia, Spain
camenmar@alumni.uv.es

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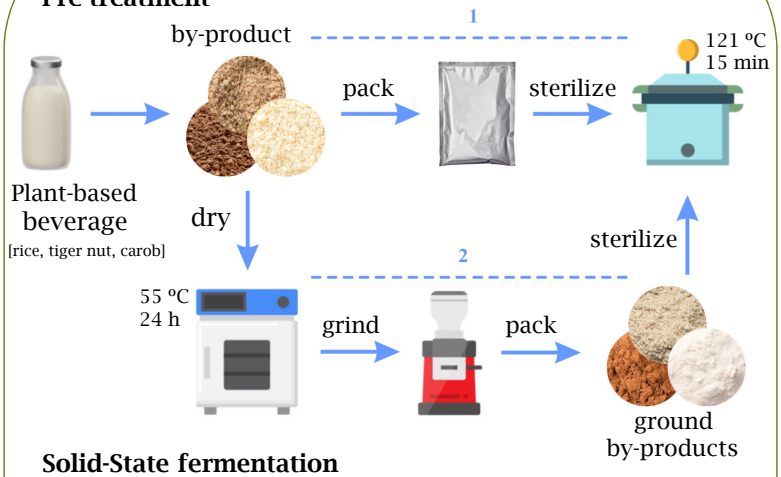
INTRODUCTION

The rapid population growth and the environmental impact of traditional protein sources highlight the need for sustainable alternatives [1]. Microbial protein, or mycoprotein, produced through fermentation using different substrates, offers a promising solution [2]. This study explores the potential of revalorizing solid by-products from the production of rice, tiger nut, and carob beverages as substrates for the growth of *Aspergillus oryzae* and *Fusarium venenatum* to produce mycoprotein. This approach not only addresses the growing demand for alternative protein sources but also contributes to waste reduction and resource optimization, aligning with the circular economy and the United Nations' Sustainable Development Goals (SDGs), particularly SDG 12.

METHOD

Pre-treatment



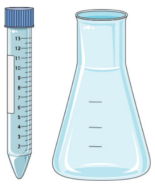
Solid-State fermentation

a. whole by-product

b. ground by-product + water

c. ground by-product + glucose 4% yeast extract 2%

Liquid-State fermentation

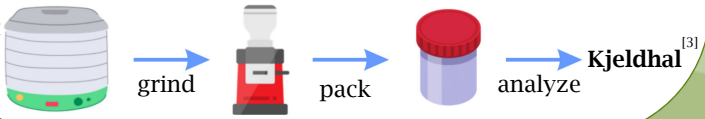


a. ground by-product + water in 1:4 ratio

b. ground by-product + water (1:7) + centrifuged

c. b. + glucose 20% yeast extract 10%

Sample drying and grinding



RESULTS & DISCUSSION

The results from the Solid-State yielded varied outcomes. For rice by-products, method **c** were the most effective, promoting strong fungal growth. Tiger nut and carob by-products, although not showing significant protein increases, supported fungal growth, especially in unground tiger nut samples. Nutrient adjustments may be needed to optimize protein synthesis.

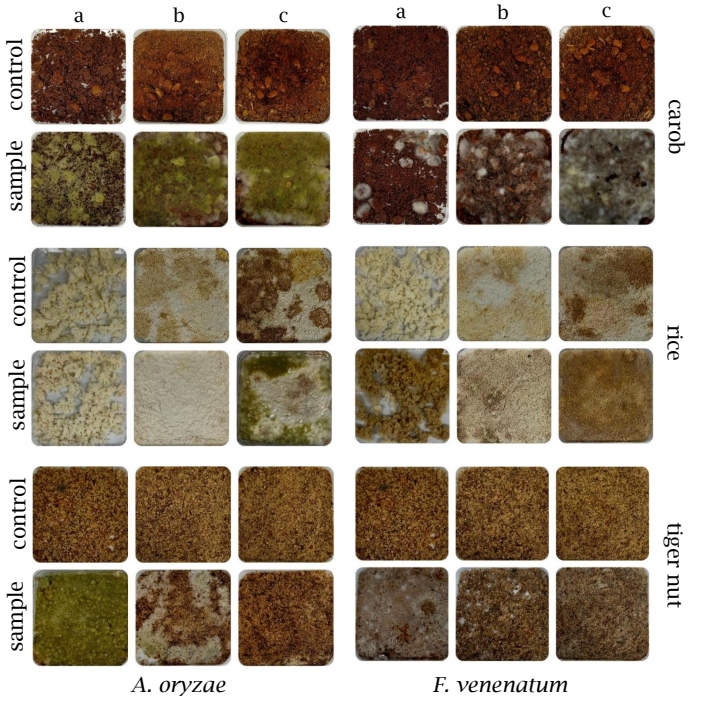


Figure 1. Growth of *A. oryzae* and *F. venenatum* in the by-products after 7 days of incubation at 24 ºC. (a) whole by-product, (b) ground by-product, (c) ground by-product supplemented with 4% glucose and 2% yeast extract.

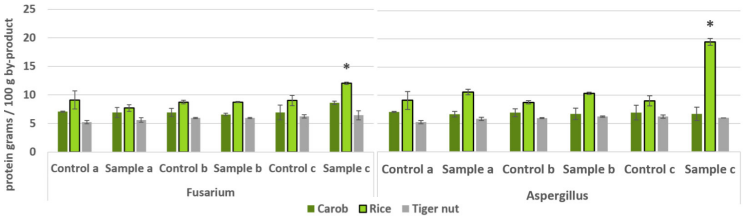


Figure 2. Mycoprotein production of *F. venenatum* and *A. oryzae* in the by-products. The symbol * indicates statistically significant differences.

The Liquid-State samples showed practically no fungal growth, probably due to the low nutritional content of the liquid by-products after a second extraction process.

CONCLUSIONS

- By-products of rice, tiger nut, and carob have significant potential as substrates for mycoprotein production.
- Substrate preparation and specific fungal preferences are key to optimizing fungal growth.
- Aqueous extracts for liquid fermentation did not support sufficient fungal growth or biomass production.
- Rice by-products, particularly with grinding and supplementation, significantly increased protein content with *F. venenatum* and *A. oryzae*.

References

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Acknowledgments

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