



# Towards a Safer, Sustainable and Greener Rice Processing: Cutting-Edge Strategies

TRACING RICE AND VALORIZING SIDE STREAMS ALONG  
MEDITERRANEAN BLOCKCHAIN

28.10.2024



TRACE-RICE with Grant n° 1934 (call 2019, section 1 Agrofood) is part of the PRIMA Programme supported under Horizon 2020, the European Union's Framework Programme for Research and Innovation



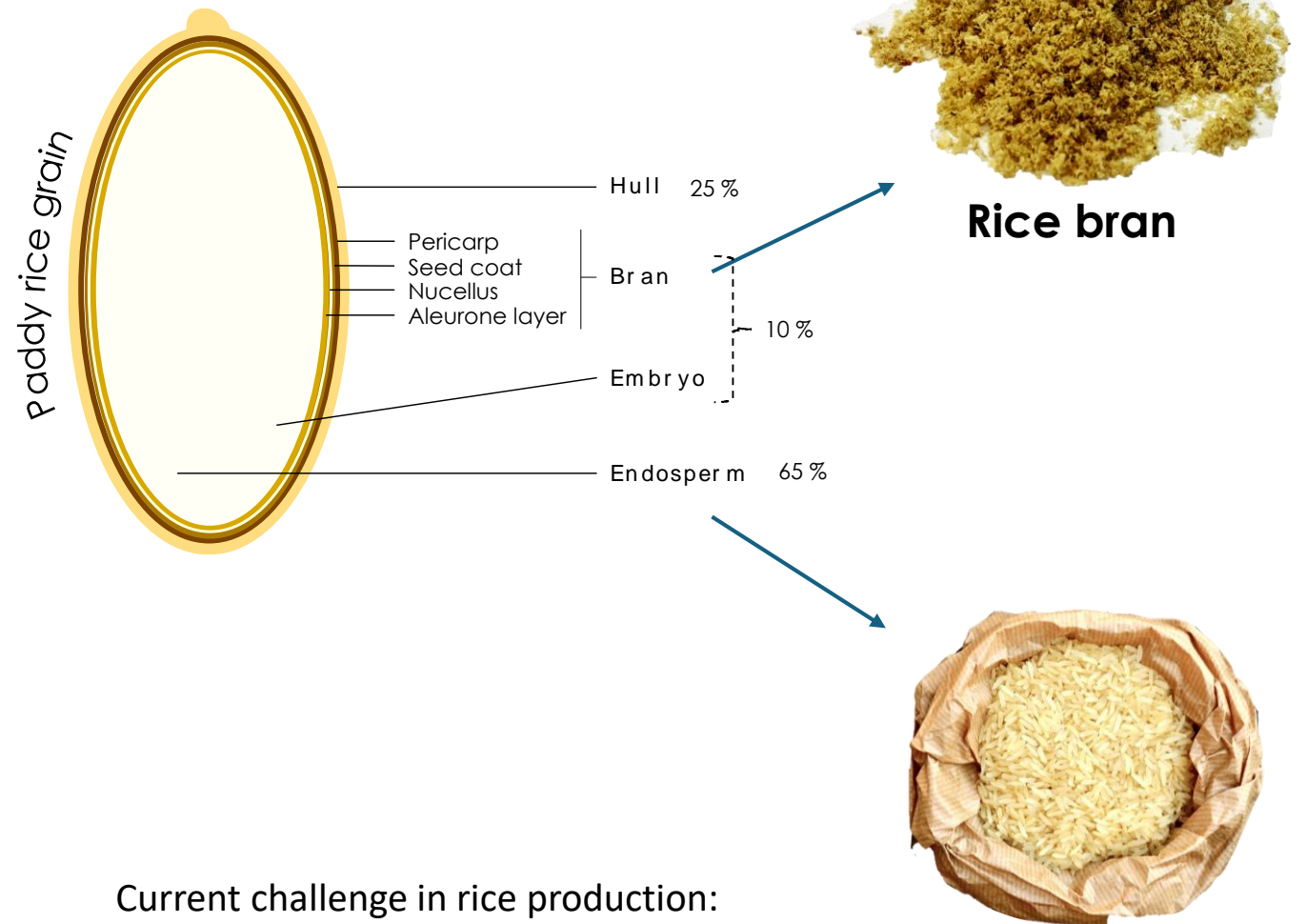
Instituto Nacional de  
Investigação Agrária e  
Veterinária, I.P.

# Introduction



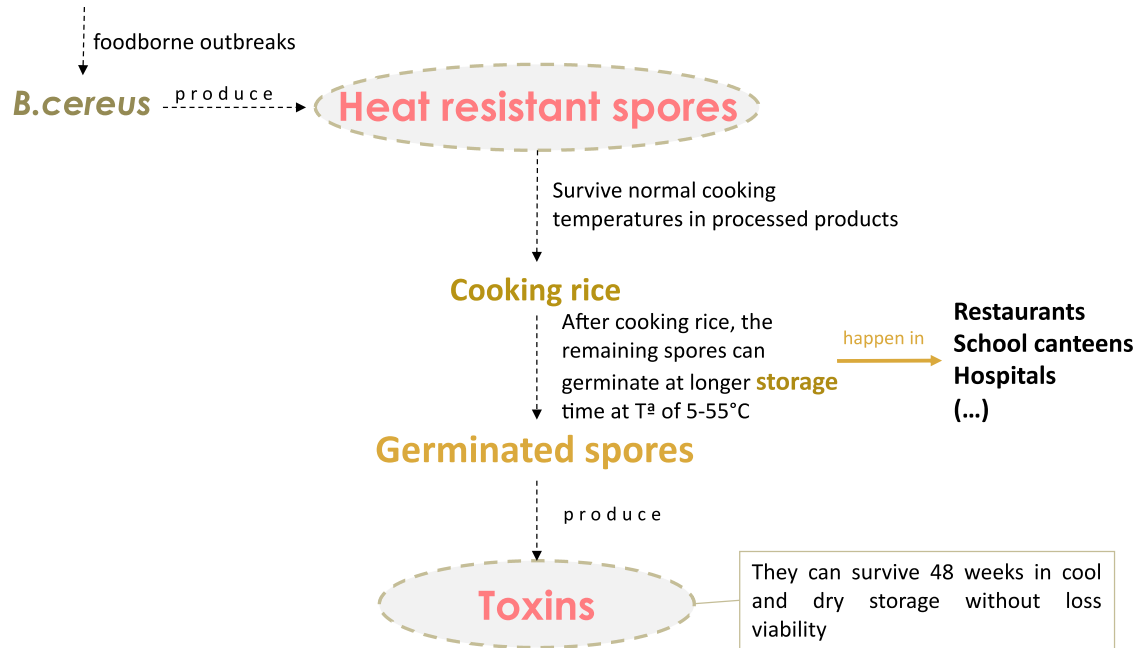
Sample 215

Importance of rice based products in the market



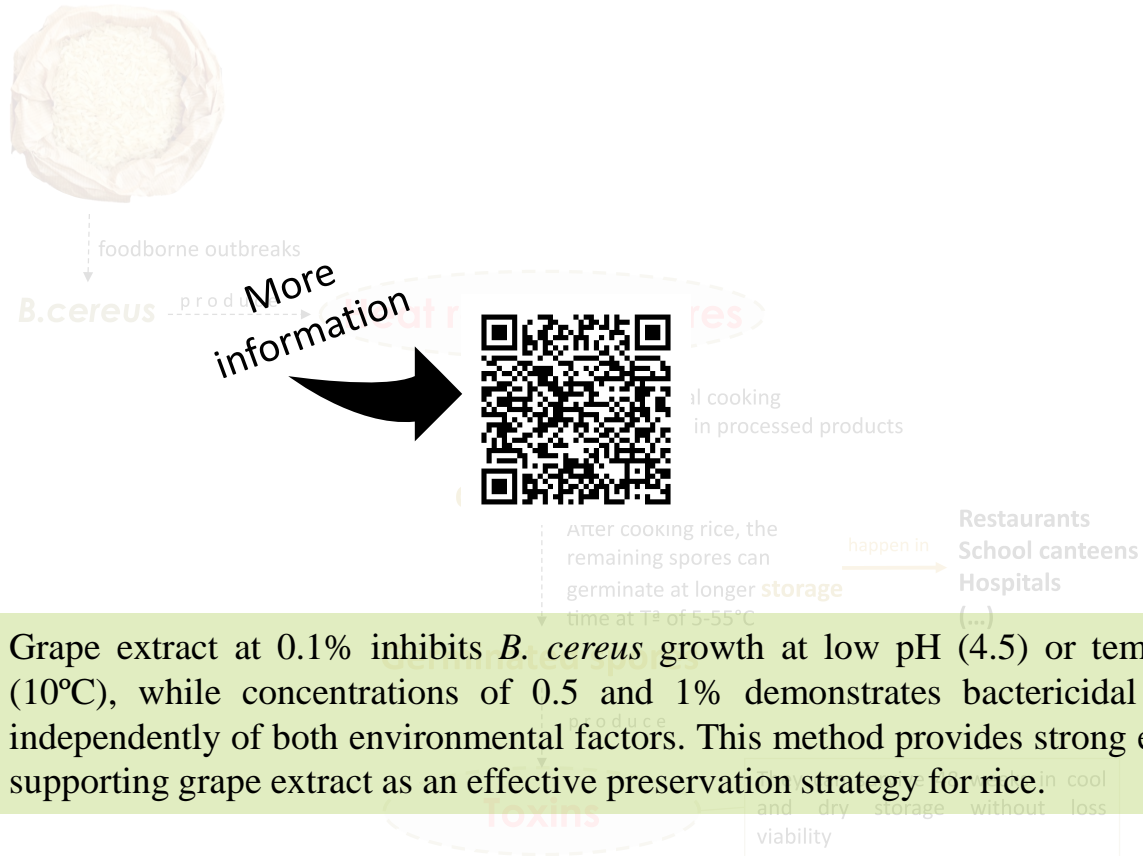
Current challenge in rice production:  
**Sustainability** (rice bran) and **safety** (*Bacillus cereus* spores in cooked rice)

# What's the food safety problem?



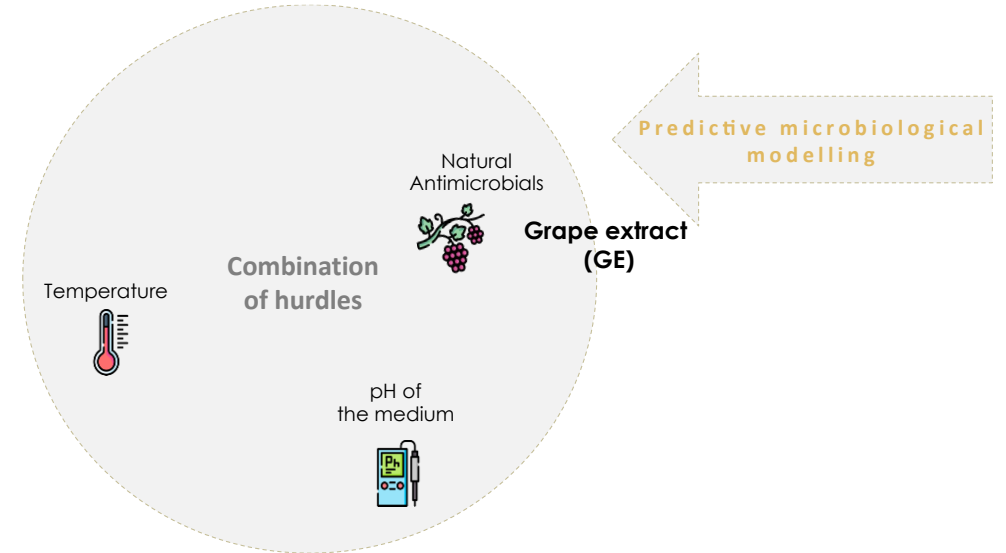
Grape extract at 0.1% inhibits *B. cereus* growth at low pH (4.5) or temperature (10°C), while concentrations of 0.5 and 1% demonstrates bactericidal activity independently of both environmental factors. This method provides strong evidence supporting grape extract as an effective preservation strategy for rice.

# What's the food safety problem?



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# What's the solution?



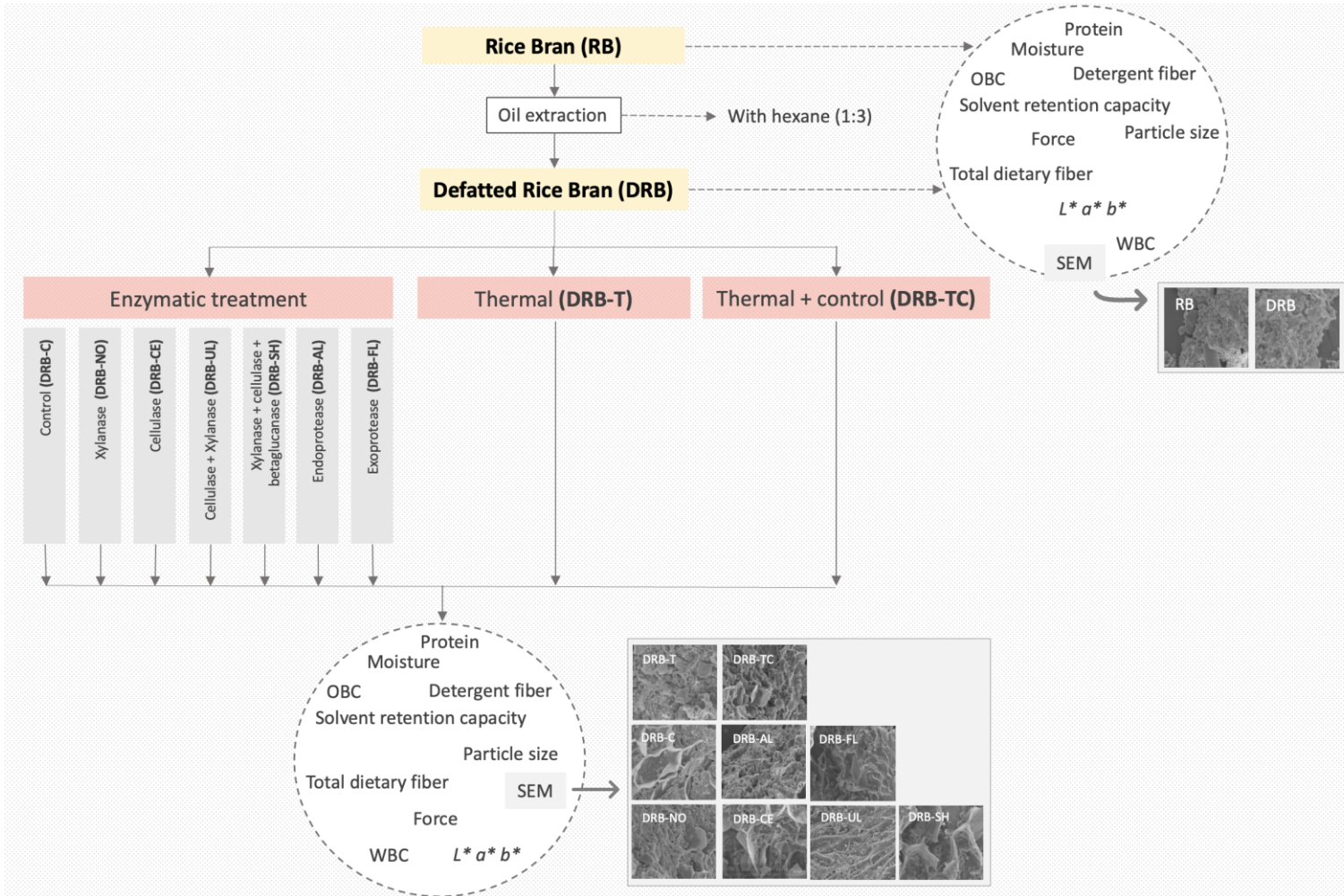
T <sup>a</sup>	pH	CA	0,1% GE	0,5% GE	1% GE
30°C	4,5	→	↘	↘	↘
	5.5	→	→	↘	↘
	6.5	→	→	↘	↘
20°C	4.5	→	→	↘	↘
	5.5	→	→	↘	↘
	6.5	→	→	↘	↘
10°C	4.5	→	↘	↘	↘
	5.5	→	↘	↘	↘
	6.5	→	→	↘	↘





Rice bran

# Rice bran: Enzymatic approach to add value



- Enzymatic treatments of bran increase soluble dietary fiber content and reduce particle size up to 50%.
- It enhances hydration properties and solvent retention capacity.

More information

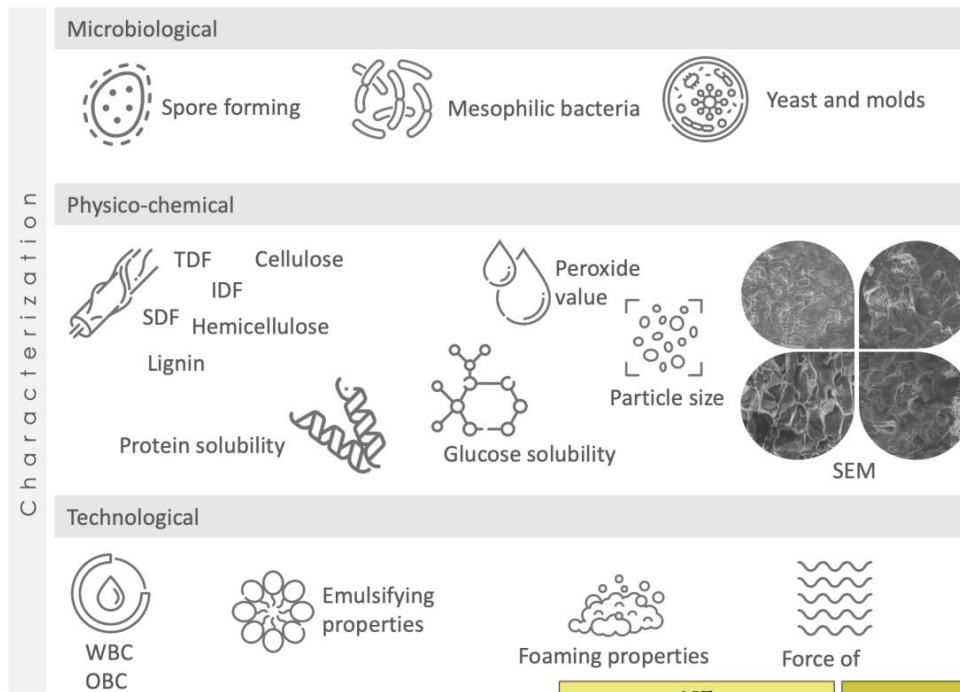
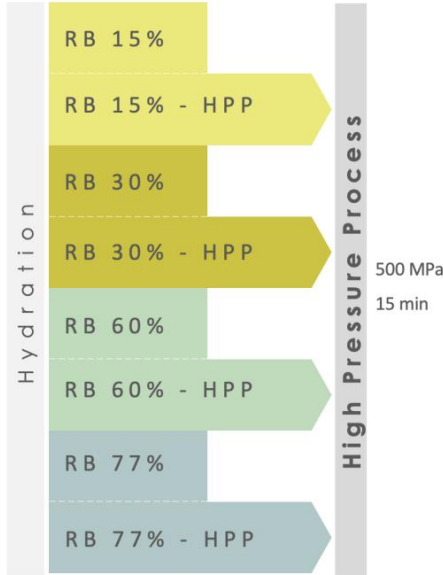


# Rice bran: High pressure process (HPP) approach to add value and increase microbial safety

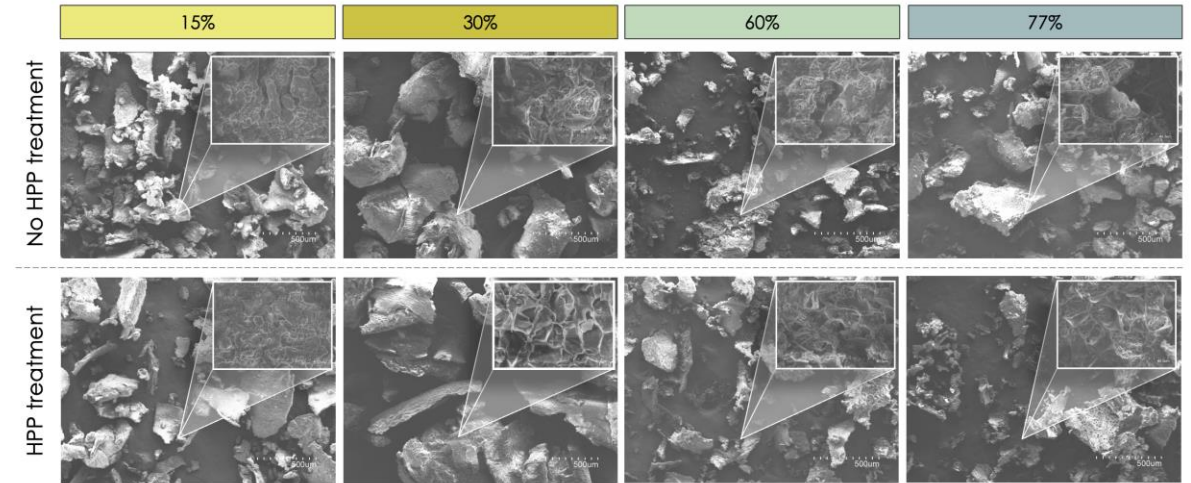


Rice bran

Rice Bran  
RB



- At low hydration levels HPP can change microstructure, increases SDF content, reduces peroxide value, and enhances foam capacity and stability.
- Higher moisture content increases protein solubility, reduces particle size, and improves WBC and OBC.

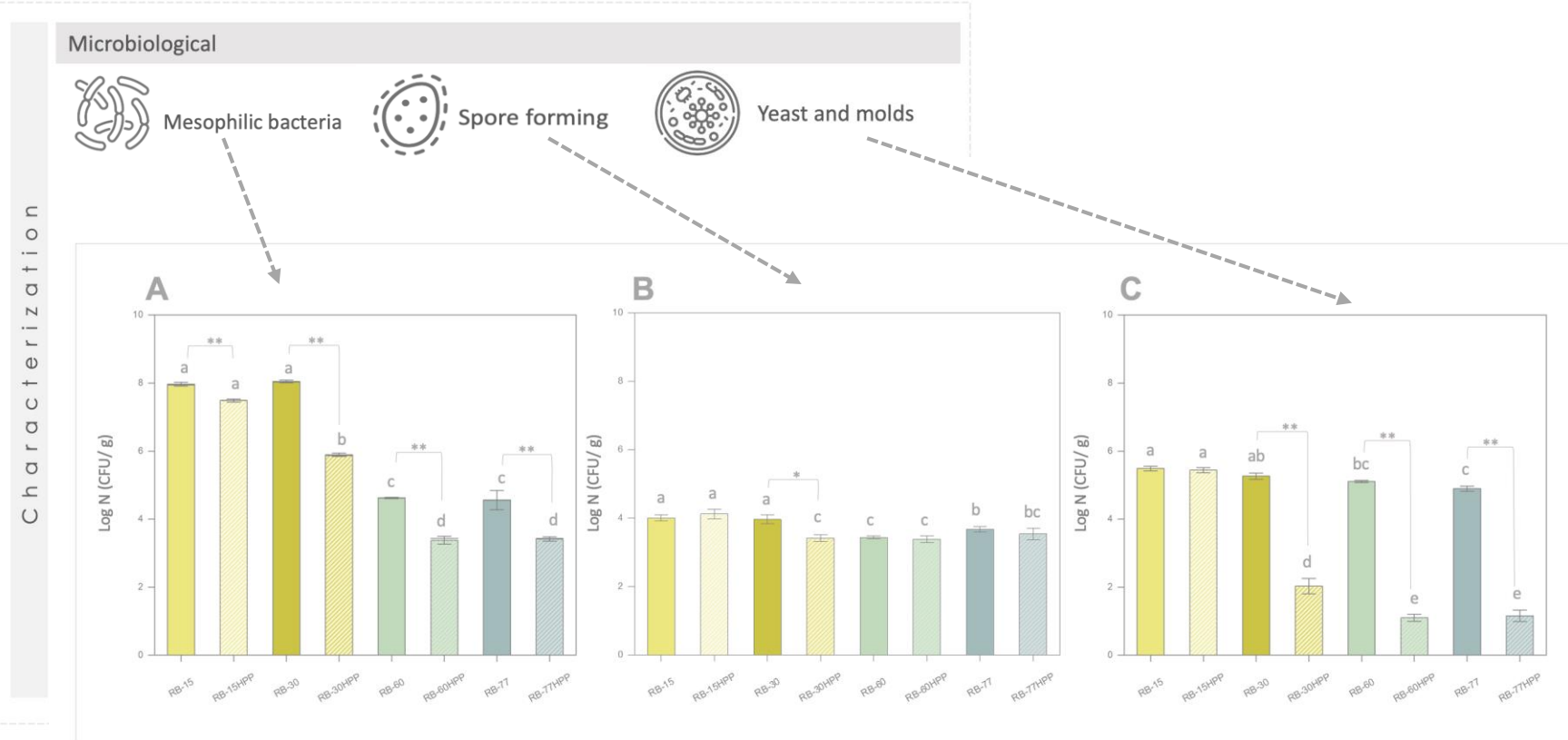
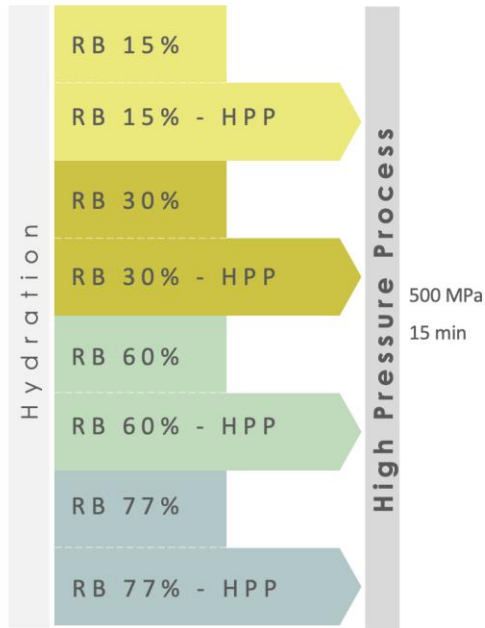


# Rice bran: High pressure process (HPP) approach to add value and increase microbial safety



Rice bran

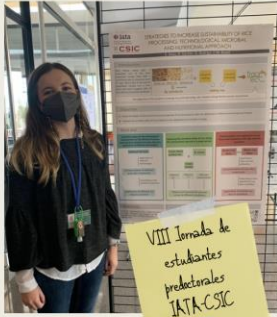
Rice Bran  
RB



- The higher the hydration, the greater the antimicrobial effect of the HPP treatment for molds and yeasts and mesophilic bacteria.
- Spore forming bacteria are not affected by HPP treatment at any hydration level.



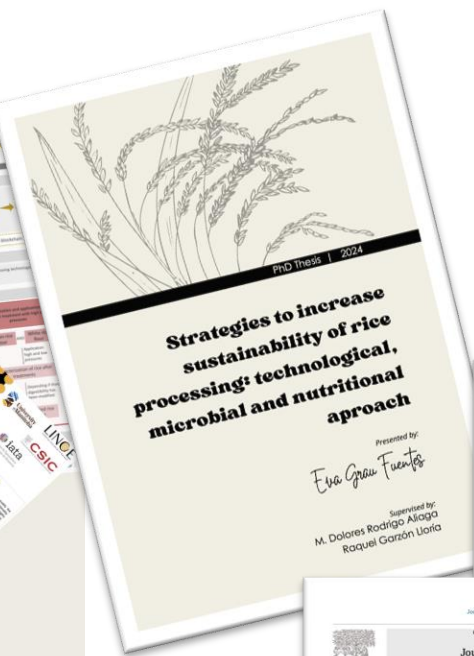
# Science communications



VIII Jornada de estudiantes IATA-CSIC 2021



19th European Young Cereal Scientists and Technologists Workshop 2022



Presented by Eva Grau Fuentes  
Supervised by M. Dolores Rodrigo Alajoga and Raquel Garzón Llorca



Joint effect of heat, pH and grape extract on *Bacillus cereus* spores survival in a rice solution  
Marta Inés Valde-Narváez\*, Eva Grau-Fuentes\*, Natalia Morató, Raquel Garzón-Llorca and Dolores Rodrigo

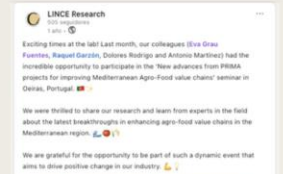


Unlocking hidden potential of rice bran: Enzymatic treatment for enhancing techno-functional properties  
Eva Grau-Fuentes\*, Raquel Garzón\*, Dolores Rodrigo\*, Cristina M. Rosell\*<sup>1,2</sup>



Benchmarking of rice-based beverages  
Grau-Fuentes, E.<sup>1</sup>, Garzón, R.<sup>1</sup>, Rosell, C.M.<sup>1,2</sup>

1.



LINCE Research  
We are proud to share that our colleague, Eva Grau Fuentes, is currently undertaking a PhD research stay at the Industries and Processes Laboratory in the CEB - Centre of Biological Engineering under the supervisors of Professor Antonio Vicente and Ricardo Pereira in Braga, Portugal.



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Evaluation of *Bacillus cereus* behaviour in a rice matrix in the presence of grape extract  
E. Grau, R. Garzón, C.M. Rosell, D. Rodrigo

2.



LINCE Research  
We are excited to share our research and team from experts in the field about the latest breakthroughs in enhancing agro-food value chains in the Mediterranean region.



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Exploring plant-based beverages market: unraveling ingredient functions and nutritional profiles  
Grau-Fuentes, E.<sup>1</sup>, Rodrigo, D., Ferrero, R., Rosell, C.M.<sup>1,2</sup>



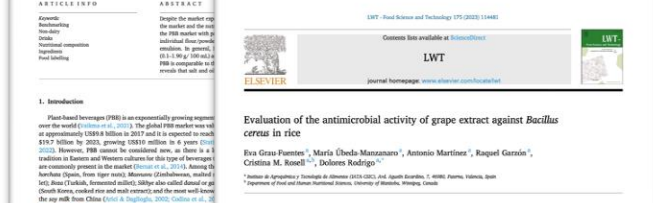
LINCE Research  
New advances from PRIMA projects for improving Mediterranean Agro-Food value chains



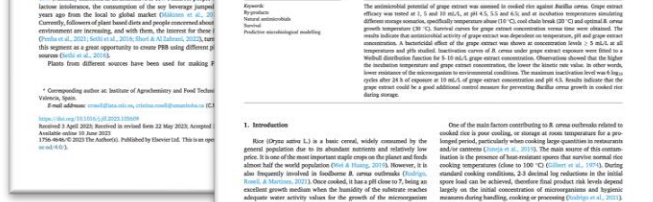
21th European Young Cereal Scientists and Technologists Workshop  
Lisbon, Portugal 2024



Understanding the marketed plant-based beverages: From ingredients technological function to their nutritional value  
Eva Grau-Fuentes\*, Dolores Rodrigo\*, Raquel Garzón\*, Cristina M. Rosell\*<sup>1,2</sup>



Evaluation of the antimicrobial activity of grape extract against *Bacillus cereus* in rice  
Eva Grau-Fuentes\*, María Echea-Manzanaro\*, Antonio Martín\*, Raquel Garzón\*, Dolores Rodrigo\*



Effect of the main factors contributing to in vitro starch release in cooked rice  
Eva Grau-Fuentes\*, María Echea-Manzanaro\*, Antonio Martín\*, Raquel Garzón\*, Dolores Rodrigo\*



## Conclusion

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The research highlights the efficacy of integrating **innovative and sustainable technologies** in the food industry, including **natural antimicrobials**, **enzymatic modifications**, and **high pressure processing**. These approaches enhance the microbiological safety, nutritional quality, and functional properties of rice and rice by-products.



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thank you!