

The Research Group
Industrial Microbiology and Food Biotechnology

has the honor to invite you to the public defence of the PhD thesis of

Inés Pradal Álvarez-Prida

to obtain the degree of Doctor of Bioengineering Sciences

Title of the PhD thesis:

**Toward a new ester-producing and
stable microbial consortium for sourdough production**

Supervisors:

Prof. dr. ir. Luc De Vuyst (VUB)

Prof. dr. Stefan Weckx (VUB)

The defence will take place on

Friday, November 7, 2025 at 4 p.m.

VUB Etterbeek campus, Pleinlaan 2,
Elsene, **Promotiezaal D.2.01**

Members of the jury

Prof. dr. ir. Geert Angenon (VUB, chair)

Prof. dr. Bruno Pot (VUB)

Prof. dr. ir. Steven Ballet (VUB)

Prof. dr. ir. Christophe Courtin (KU Leuven)

Prof. dr. ir. Mia Eeckhaut (UGent)

Dr. ir. Fabienne Verté (Puratos Group)

Curriculum vitae

Inés Pradal studied at Universidad Autónoma of Madrid, Spain, and obtained a Master's degree in Microbiology. Thereafter, she received a research grant from The Spanish National Research Council (CSIC) and contributed to research on bacteriophages to tackle antibiotic-resistant bacteria. In March 2020, she started her PhD research at IMDO under the supervision of Prof. Dr. ir. Luc De Vuyst and Prof. Dr. Stefan Weckx, in the framework of the VLAIO/Flanders FOOD-ICON project SourFun. She is co-author of fourteen scientific papers published in peer-reviewed journals, among which seven as first author.

Abstract of the PhD research

Sourdough is a water-flour mixture fermented mainly by lactic acid bacteria (LAB) and yeasts. The use of well-chosen starter culture strains delivers sourdoughs and sourdough breads with specific flavours, such as fruity notes. In this context, the production of esters, the responsible of the fruity notes, by specific LAB species was shown. Further, assays to screen and select yeast and LAB strains were developed and applied.

The sourdough productions started with two selected LAB strains highlighted their competitiveness and robustness. Further, a new LAB-yeast consortium composed of *Companilactobacillus crustorum* LMG 23699 and *Wickerhamomyces anomalus* IMDO 010110 was unravelled. This mixed-strain starter culture was used during sourdough productions and fermentation processes carried out in wheat sourdough simulation media. These experiments showed that the use of this consortium can lead to interesting characteristics both in view of competitiveness towards background microbiota and in sourdough and sourdough bread productions. Further, a transcriptomic analysis based on RNA-seq and differential gene expression analysis revealed the complex cross feeding strategy underlying the interaction between of *Coml. crustorum* LMG 23699 and *W. anomalus* IMDO 010110 and how the desirable traits described during fermentation processes are the result of both, the LAB and the yeast strain metabolism.

Finally, sourdough breads were successfully produced with a sourdough started with the new mixed-strain starter culture. These breads were characterized by high lactic acid and amino acid concentrations, which can be related to health-promoting characteristics. Further, they had distinct volatile organic profile characterized by fruity esters resulting in sour and fruity breads. In addition, fruity yeast-leavened breads were successfully produced with *W. anomalus* IMDO 010110 solely. Therefore, this leavening agent could be an alternative to obtain breads with a more desirable flavour than baker's yeast breads, but without the sourness of sourdough breads.