SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Structural Biology Brussels

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

Madina Akan

to obtain the degree of Doctor of Bioengineering Sciences

Joint PhD with Hochschule Geisenheim University

Title of the PhD thesis:

Co-fermentation as a means to generate low alcohol beverages with full flavor

Supervisors:
Prof. dr. ir. Ronnie Willaert (VUB)
Prof. dr. rer. nat. Jürgen Wendland (HGU)

The defence will take place on

Monday, December 1, 2025 at 2.30 p.m. online

The defence can also be followed through a live stream: https://vc-green.hs-gm.de/b/dir-pix-xby-prj

Members of the jury

Prof. dr. Annette Reineke (HGU, chair/secretary)
Prof. dr. Henri De Greve (VUB)
Prof. dr. Ralf Schweiggert (HGU)
Prof. dr. Amparo Querol (IATA, ES)
Prof. dr. Urska Vrhovsek (Istituto Agrario San Michele All'Adige/Fondazione Edmund Mach, IT)

Curriculum vitae

Madina Akan is in a Joint PhD in Bioengineering Sciences at the VUB, and in Microbiology at Hochschule Geisenheim University, Germany. She is a Marie Curie Fellow within the AROMAGENESIS project, where she develops novel yeast strains for aroma and flavor production through metabolic pathway optimization, biochemical assays and fermentation processes. She previously obtained a MS degree in Molecular Biology from the NTNU, Norway, where she worked on drug characterization in basal-like breast cancer, studying cPLA2 inhibition. She is co-author of seven scientific papers, including two as first author.

Abstract of the PhD research

Traditional winemaking relied on starter cultures prepared in wineries for centuries. Nowadays commercial yeasts dominate the industry due to their robust fermentation performance. *Saccharomyces cerevisiae* remains the most widely used yeast due to its fermentation efficiency and historical selection by humans.

However, non-conventional yeasts (NCYs) are gaining interest for their potential to enhance grape wine fermentation, especially in co-fermentations with *S. cerevisiae* to modify fermentation traits such as alcohol levels. This study investigated the use of NCYs, including those obtained from environmental samples, through hybridization or genetic modification.

The role of terrestrial snails as vectors for yeast dispersal in environment was also explored. Yeasts isolated from snails showed significant diversity, despite the small number of the collection. Interesting isolates included some wine-related yeasts and human pathogens, highlighting the ecological impact of snails in yeast transportation and potential in grape wine fermentations.

The study further examines the potential of the non-conventional yeast *Saccharomycopsis fermentans*, particularly its trifluoro leucine (TFL) resistant mutants. New mutants effected the aroma profile of co-fermented wine by increasing the production of higher alcohols, especially isoamyl alcohol.

Additionally, the strategy to improve homologous recombination efficiency in lager yeasts was developed by enabling PCR-based gene targeting. This method has implications for genetic manipulations for different purposes not only in lager yeast but also for NCY strains.

Also, *Saccharomyces jurei* and *S. cerevisiae* strains were hybridized for generation of new genetically modified (GM) and non-GM hybrid strains. These new hybrids were used in co-fermentation with S. cerevisiae and produced new wines, with reduced alcohol content and diverse aroma.

This research demonstrated the potential of NCYs to modify the wine aroma by reducing alcohol levels and adjusting co-fermentation methods.