

PhD: Food Science

Title: *Multi-Omics approach for the study of microbiome and metabolome of traditional table olives produced in the Mediterranean area.*

Supervisor: Prof. Francesca De Filippis (AGR16)

Co-supervisor: Prof. Alessandro Genovese (AGR15)

Objectives of the research project and interdisciplinary collaborations:

This project is developed within the PRIN Meta-Olive project, which aims to characterize table olives of different varieties produced in the countries of the Mediterranean basin (Italy, Spain, Greece, Portugal, Cyprus, Egypt), in order to define peculiar microbial traits for each variety and how the microbiome influences the development of typical flavours. This information can be used to develop specific starter cultures for each variety.

The projects will develop as follows:

- i) Characterization of the microbiome (using shotgun metagenomics and MALDI-TOF proteomics) and volatiles (using Gas-Chromatography coupled to Mass Spectrometry) of olives of different varieties produced in various Mediterranean countries;
- ii) Identification of possible genes/metabolic pathways implicated in the production process of table olives (de-bitterization, production of aromas) or associated with alteration phenomena;
- iii) Creation of a collection of bacteria and yeasts isolated from table olives, to develop synthetic microbial communities and verify their development during laboratory-scale olive fermentations.

The project integrates competences in food microbiology (AGR16), food technology (AGR15) and bioinformatics and data science skills. In fact, the data produced on the microbiome and the volatiles will be used to produce machine learning models useful for discriminating olives of different varieties and origins.

Innovation and originality of the project in relation to the state of the art:

Table olives represent one of the few fermented foods for which the use of microbial starters has not yet been optimised. This is mainly due to the reduced knowledge of the microbiome of this product, as well as its high complexity (being characterized by complex microbial dynamics, which see the development of lactic acid bacteria, other species of halophilic bacteria and yeasts). Thanks to the use of an innovative approach that sees the combination of multiple 'omics disciplines, this project will allow us to characterize the microbial biodiversity of table olives and reproduce ad-hoc microbial cultures to obtain greater standardization of the process, without losing the peculiar and typical traits of each product.

Grant availability:

Project PRIN2022 Meta-Olive – meta-omic approaches for traditional table olive fermentation, granted by EU -NextGenerationEU (2022NN28ZZ). PI: Francesca De Filippis

-Project PNRR National Biodiversity Future Center (NBFC) – Spoke 6 (CN_00000033). PI: Marco Moracci (Dip. Biologia).

Collaborations with foreign institutions:

A collaboration with Dr Francisco Noe Arroyo-López (Spanish Research Council, CSIC) is in place. In particular, a 6-month stay at the CSIC is planned to optimize the development of synthetic microbial communities for the fermentation of table olives.

Collaborations with industry:

Numerous national and foreign companies producing table olives will be involved in the sampling and in the optimization of the fermentation process.