



## **Green valorization of plant substrates and Annurca apple peel by-products through microbial fermentation for functional beverage development**

Angela Maione<sup>1\*</sup>, Marianna Imperato<sup>1</sup>, Annalisa Buonanno<sup>1</sup>, Lea Di Massa<sup>1</sup>, Marco Guida<sup>1</sup>, Emilia Galdiero<sup>1</sup>

\*lead presenter: [angela.maione@unina.it](mailto:angela.maione@unina.it)

<sup>1</sup> Department of Biology, University of Naples Federico II, 80126 Naples, Italy

The sustainable valorization of plant biodiversity and agri-food by-products represents a key strategy for developing innovative foods with reduced environmental impact. In this study, vegetable substrates and Annurca apple peel, an agro-industrial by-product, were investigated as sources of bioactive compounds to produce fermented functional beverages.

Extracts obtained from plant matrices, including Annurca apple peel, were recovered through a green extraction process and then subjected to fermentation using a selected microbial consortium composed of lactic acid bacteria and yeasts with potential probiotic traits. The work aimed to evaluate both the technological suitability of these substrates and their potential reuse within a circular bioeconomy framework.

The results showed that the plant-derived matrices effectively supported microbial growth and metabolic activity during fermentation. In addition, fermentation improved the functional profile of the beverages, enhancing their antioxidant potential and promoting biotransformation of plant metabolites. The use of Annurca apple peel is particularly relevant, as it demonstrates the possibility of converting a fruit processing residue into a value-added ingredient for sustainable food applications.

Overall, this study highlights how the combination of green extraction and microbial fermentation can represent an effective strategy for the valorization of plant resources and food by-products. This approach contributes to the development of non-dairy functional beverages and supports the transition toward more sustainable food systems based on the recovery of underused biological materials and the promotion of agrobiodiversity.