INFLUENCE OF MECHANICAL AND ENZYMATIC TREATMENTS ON THE MICRONIZATION AND FUNCTIONAL PROPERTIES OF HAZELNUT SKINS

DI PIERRO P. (1,2), SORRENTINO A. (2), FALCIANO A. (2), CAVELLA S. (1), MASI P. (1,2)
1 University of Naples "Federico II" - Department of Agricultural Sciences, Portici (NA), Italy
2 University of Naples "Federico II" - Centre of Food Innovation and Development in the Food Industry (CAISIAL), Portici (NA), Italy

Nowadays, in the European Union the agri-food sector generates around 88 million tonnes of waste per year causing and high environmental impact and resulting in the loss of valuable nutrients and bioactive compounds. Hazelnut (*C. avellana* L.) is a feedstock used in the food industry, especially in the confectionary. sector. About the 90% of the hazelnuts are used as shelled and roasted and the main waste derived from the roasting process is represented by skin which account for 2.0 % of the entire fruit. Recently, studies on the composition of hazelnut skin suggest their application as functional food ingredients due to its richness in polyphenols and dietary fiber. However, the main applications consist in the use of hazelnut skin extracts.
This study aims to transform whole hazelnut skin in a byproduct with improved physicochemical and functional properties to be used as a bioactive supplement in food by using mechanical micronization associated with enzymatic hydrolysis.
High-shear homogenization was performed by using Colloidal mill by set the lowest gap between the rotor and stator and keeping the temperature at 50°C for different time (5, 10, and 20 min). Xylanase and alkaline-cellulase were added separately and in sequential combination during the milling treatments. Finally, the particle size, swelling index, water and oil retention capacity of the treated hazelnut skin were detected.
The results shows that the lowest particle size (D_{50}: 67.2 µm and D_{90}: 180 µm) was obtained after 20 min of milling. Moreover, the enzyme-assisted micronization via sequential addition (10 min xylanase - 10 min alkaline cellulase) represent the best condition to significantly reduce the particle size (D_{50}: 45.3 µm and D_{90}: 104 µm). This is because the enzymatic degradation of superficial fiber of microparticles reduce the hydrodynamic diameter and modify the structural and functional attributes of the hazelnut skin particles increasing the swelling index and their water and oil retention capacity.
In conclusion the enzyme-assisted micronization can be considered a new approach to recovery hazelnut skin to be incorporated directly into food formulations as a vehicle of bioactive compounds and/or as food stabilizer.