

VALORISATION OF SPENT GRAIN FROM BREWING AND MALT WHISKY IN FOOD INDUSTRY

Ancuța CHETRARIU¹, ORCID ID: 0000-0001-5594-8665

Adriana DABIJA^{1*}, ORCID ID: 0000-0002-1877-9142

¹*Stefan cel Mare University of Suceava, Faculty of Food Engineering, Suceava, Romania*

*Corresponding author: Adriana Dabija, adriana.dabija@fia.usv.ro

All over the year 90 billion tonnes by-products from agro-food sector results, but those can be used as source of fibre, lipids, proteins or nutraceuticals. Reducing food waste has a positive environmental impact. From the beer industry and distillation industry results from spent grains, the main by-product, accounting for about 85% of the total by-products generated. This by-product results from the mashing process consisting of insoluble barley malt residues which mainly include the grain coating [1]. The circular economy involves turning by-products into useful resources by minimizing wastes, so it is very important to find the optimal process and percentage of substitute for obtaining high quality food products [2]. Due to bioactive compounds, fibre and protein content, food fortified with spent grain is considered functional food that offers health benefits. In bread making spent grain is added in 0-30%, more decrease texture, volume and general acceptability because of colour, taste, and smell changes. The addition of spent grain as a 5-20% substitute for wheat flour has the advantage of increasing the content of proteins, fibres, lipids and mineral substances, but leads to some rheological disadvantages, for example a higher water absorption and lower dough strength. For pasta production studies shown that spent grain increase fibre content, protein content and beta-glucans, but still with good sensory properties and a little decrease of optimal time of cooking of pasta. Spent grain added to ready-to-eat products has an increase phenolic content and high antioxidant activity. Studies revealed that spent grain can be used as an ingredient in ready-to-eat formulation products with high fibre content. The phenolic content and antioxidant activity has a higher level in fruit juice and smoothies compared with control samples without spent grain addition. Some fish burgers were obtained with different bioactive powders from spent grain. Bioactive compounds were extracted with supercritical carbon dioxide extraction method and the extract was microencapsulated. The control sample has a 30% lower phenolic content and 50% lower flavonoids content. Spent grain can be used to obtain xilooligosaccharides after xilan hidrolisis with demonstrated prebiotics effects. Food packaging can be obtained from proteins from spent grain with antimicrobial and antioxidant properties. The assessment of the physicochemical composition of spent grain is very important to develop new directions for valorisation on this by-product resulting from the brewing and malt whisky industry.

The sustainable utilization of by-products generated within the agri-food sector has become one of the most important challenges in food science.

Keywords: *by-products, circular economy, nutritional value, sustainable products*

References

1. Rachwał, K.; Wa'sko, A.; Gustaw, K.; Polak-Berecka, M. Utilization of brewery wastes in food industry. *PeerJ*, **2020**, 1–28.
2. Akunna, J. C.; Walker, G. M. Co-products from malt whisky production and their utilisation. In *The alcohol textbook* Ethanol Technology Institute, **2017**, pp. 529-537.