

Extrusion processing of brewer's spent grains (BSG) toward protein recovery

Srujana Mekala, Sylvain Foret, Julien Lemaire, Brahim Mazian, Patrick Perré, Pedro E. D. Augusto*

*Université Paris-Saclay, CentraleSupélec, Laboratoire de Génie des Procédés et Matériaux,
Centre Européen de Biotechnologie et de Bioéconomie (CEBB), 3 rue des Rouges Terres,
51110, Pomacle, France*

Scientific Topic: *Research for sustainable and innovative food systems*

Sub-themes: *Food waste recovery and valorisation*

Type of Presentation: *Oral Presentation*

Abstract

With the rising demand for proteins, some agro-industrial byproducts arise as potential new sources. BSG constitutes 85% of the brewing industry by-products, containing 20-25% d.b. of proteins. This work developed processing alternatives to extract proteins from BSG, with focus on developing viable proteins sources. In this scenario, the reactive extrusion technology was employed, considering the potential scale up, processing time, and reduced solvent application. Different processing conditions were evaluated, including screw profile and speed, NaOH concentration, solvent/biomass ratio, pH, and temperature. Extrusion was able to both modify the biomass and extract proteins, promoting fractioning. Thanks to extrusion, the process time has been reduced to 2-5 minutes in a continuous operation, compared to up to 12 hours with conventional extraction, which is generally batch-based, while also reducing solvent consumption (solvent/biomass ratio of 1.5/1, compared to 10-20/1 in the conventional process). Additionally, the protein recovery (yield) was about 84%, a high value comparable with traditional approaches. The protein concentration in the final product attained maximum 35% d.b., representing a 60% increase in relation to the initial biomass. Both pre-treatment of maceration and post-treatment of solid-liquid extraction were associated with extrusion with the objective of increasing the product's protein content. Although pre-maceration increased the protein concentration by 20%, the protein

recovery reduced by 60-80%; post solid-liquid extraction had negligible performance. This result highlights the proteins are tightly complexed with other components of BSG, being necessary to develop further processes to increase protein purity. Even so, extrusion proved to be a valuable tool to recover proteins from agro-industrial byproducts with potential industrial application.

Keywords: protein, byproduct valorization, food processing

Acknowledgments: This work was funded by the European Union's Horizon Europe programme as part of the project PROTEIN4IMPACT (Grant Agreement No. 101182324). Views and opinions expressed are, however, those of the author(s) only and do not necessarily reflect those of the European Union or the European Research Executive Agency (REA). Neither the European Union nor the granting authority can be held responsible for them. Communauté Urbaine du Grand Reims, Département de la Marne, Région Grand Est and European Union (FEDER Champagne-Ardenne 2014-2020, FEDER Grand Est 2021-2027) are acknowledged for their financial support to the Chair of Biotechnology of CentraleSupélec and the Centre Européen de Biotechnologie et de Bioéconomie (CEBB).