

Valorisation of Brewer's Spent Yeast By-Products: Sustainable Innovations for Alternative Protein Development

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Introduction & Objective



The food industry generates substantial amounts of food waste with significant environmental impact,



Brewer's spent yeast (BSY) stands out as a significant residue from the brewing process, typically ranging from 2.0 to 4.0 kilograms per 100 liters of beer produced,



It is imperative for industries to devise innovative solutions to manage these by-products.



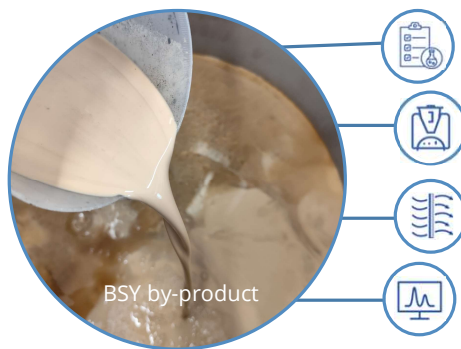
The present work aimed to valorise **BSY by-product** into **high-value products** suitable for diverse food applications. We employed an **innovative green extraction process** to obtain BSY extracts enriched with bioactive compounds:

Added value products

- Proteins & Peptides
- Fiber
- Polyphenols
- β-Glucans



Methodology



BSY by-product

1. The proximate composition was analysed according to AOAC official methods. Dietary fibre was determined by the enzymatic gravimetric method (*Megazyme* kit).
2. Following the washing treatment (1:2 v/w, 5000 rpm, 4°C), the solid fraction underwent to an autolysis process at 70°C for 5 hours.
3. We applied tangential membrane filtration to produce different BSY extracts, using a membrane molecular weight cut-off of 50 kDa and 10 kDa.
4. Size exclusion high-performance liquid chromatography (SE-HPLC) analysis and bioactivity evaluation were performed considering both antioxidants (ORAC, ABTS).

Results

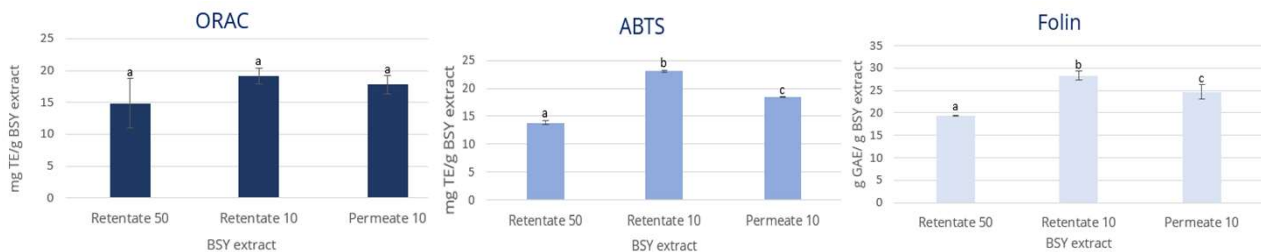


Figure 1 - Antioxidant capacity (ORAC and ABTS assays) and Total phenolic compounds (Folin-Ciocalteu method) of the different BSY extracts. Data are shown as the mean ± SD from three replicates. Different letters represent the significant difference at $p < 0.05$.

Results indicated that both methods revealed **strong antioxidant characteristics** in all BSY extract fractions. ORAC analysis showed no significant differences between samples, but ABTS analysis did show significant differences ($p < 0.05$), highlighting the higher antioxidant activity in the Retentate 10 kDa extract. This result correlates with the amount of phenolic compounds present in each fraction.

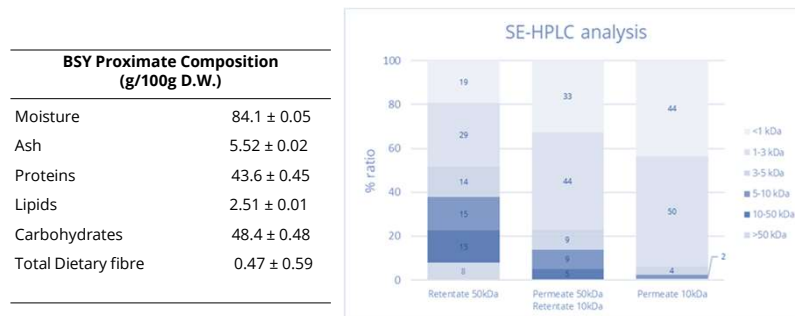


Figure 2- SE-HPLC of BSY extracts profile.

SE-HPLC results show variability in peptide sizes, revealing the composition of the hydrolysates. The 10 kDa permeate had the highest proportion of smaller peptides (<1 kDa and 1-3 kDa).

The BSY by-product shows a high content of proteins and total carbohydrates.

Conclusion

- * This work is align with the United Nations Sustainable Development Goals, particularly Goal 3 and Goal 12 by producing protein extracts from sustainable sources and using by-products like BSY to promote a circular economy in the food industry.
- * High-protein BSY extracts, suitable for potential applications into functional food matrices, were successfully produced.



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