Peptide-rich extracts from spent yeast waste streams as a source of bioactive compounds for nutraceutical market

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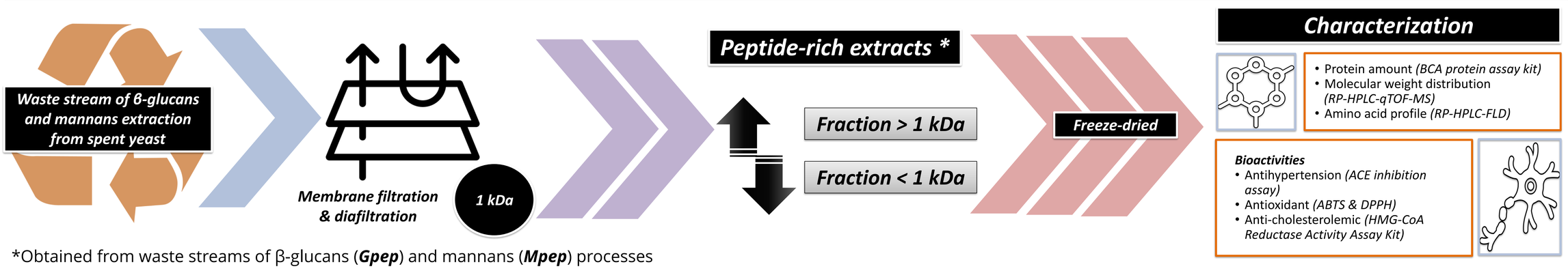
Introduction

The growing brewing industry [1] generates increasing amounts of spent yeast from its fermentation processes. To apply a circular economy concept, spent yeast can be used to produce ingredients from yeast cell wall such as β-glucans and mannans [2] whereas the remaining fractions are further processed to recover proteins and peptides. The high protein content of spent yeast (about 45-60%), including essential amino acids with high biological value, low cost and safety, are primarily responsible for its use in agri-food sector. Meanwhile, cosmeceutical and health sectors have also been working on yeast bioactive peptides because of their antihypertensive, antioxidant and antimicrobial properties, among others. In fact, peptides have been described as bio-functional ingredients in the nutraceutical and functional food market, and due to fewer side-effects when compared with synthetic drugs, they are becoming an option in health sector as well.

Methods



*Obtained from waste streams of β-glucans (***Gpep***) and mannans (***Mpep***) processes

Results

Table 1. Protein concentration (% w/w) and amino acid profile (free and total content, mg/g extract) of peptide-rich extracts.

	Protein (%)	*Total AA (mg/g)*	*Free AA (mg/g)*	*Main AA*
Gpep > 1 kDa	67.2 ± 16.0	770 ± 255	19.6 ± 4.0	Lys, Val + Met, Phe, Ile and Leu
Gpep < 1 kDa	67.6 ± 25.6	688 ± 183	363 ± 143	Glu, Arg + Ala, Val + Met, Leu, Ile, Phe, Lys, His, Thr, Asp, Gly , Ser, Tyr, Asn and Cys
Mpep > 1 kDa	86.4 ± 8.7	900 ± 286	10.2 ± 5.8	Lys, Val + Met, Phe, Ile and Leu
Mpep < 1 kDa	48.3 ± 15.9	526 ± 176	251 ± 135	Glu, Arg + Ala, Val + Met, Leu, Ile, Phe, Lys, His, Thr, Asp, Gly , Ser, Tyr, Asn and Cys

AA – Amino acids, EAA – Essential amino acids

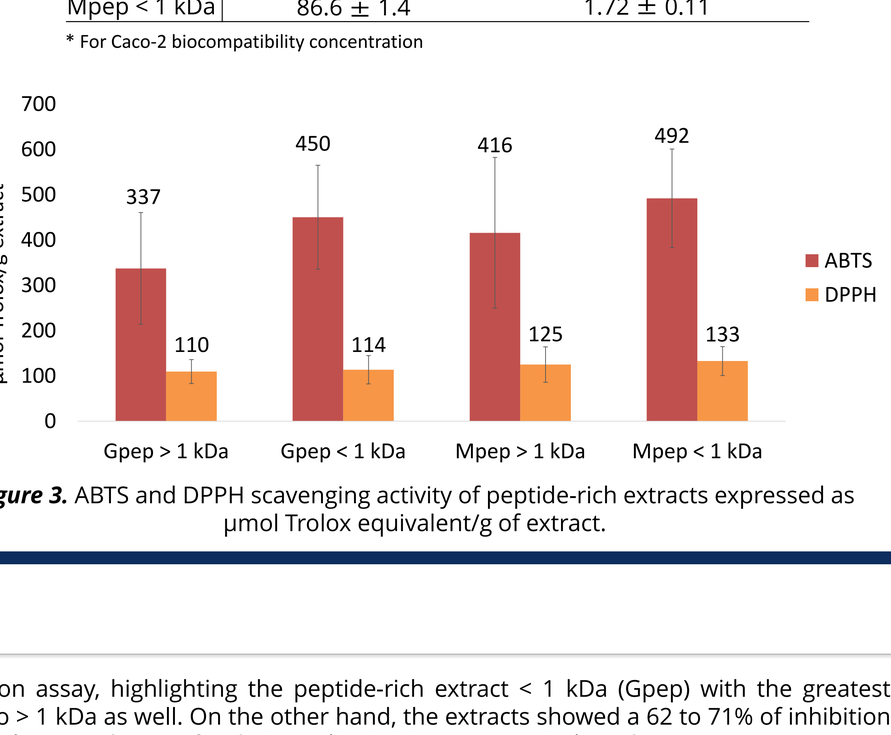


Figure 1. Peptides molecular weight distribution in peptide-rich extracts under and above 1 kDa.

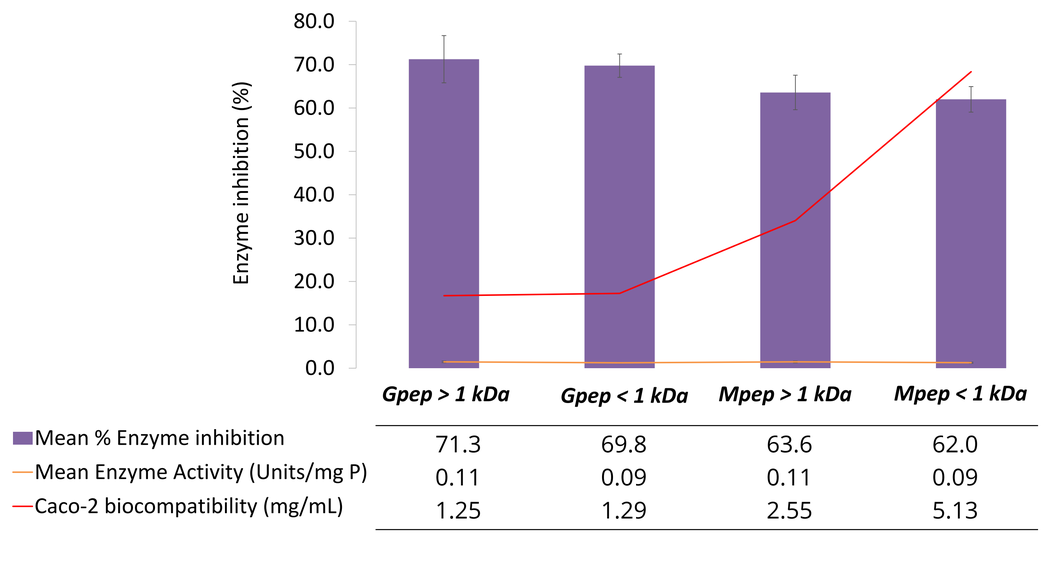


Figure 2. HMG-CoA reductase inhibition (%), activity (Units/mg protein) and Caco-2 biocompatibility concentrations (mg/mL) for the peptide-rich extracts.

Table 2. ACE inhibition (%) and IC50 values (mg/mL) for the peptides-rich extracts.

	*% Inhibition**	IC50 (mg/mL)
Gpep > 1 kDa	43.2 ± 3.3	1.54 ± 0.04
Gpep < 1 kDa	67.5 ± 1.9	0.99 ± 0.04
Mpep > 1 kDa	51.6 ± 3.9	1.43 ± 0.07
Mpep < 1 kDa	86.6 ± 1.4	1.72 ± 0.11

* For Caco-2 biocompatibility concentration

Figure 3. ABTS and DPPH scavenging activity of peptide-rich extracts expressed as µmol Trolox equivalent/g of extract.

Conclusions

Results revealed that different yeast peptide-rich extracts showed IC50 values between 0.99 and 1.72 mg/mL in ACE inhibition assay, highlighting the peptide-rich extract < 1 kDa (Gpep) with the greatest antihypertensive activity. In fact, the extracts < 1 kDa showed a greater capacity to capture the cationic radical ABTS • compared to > 1 kDa as well. On the other hand, the extracts showed a 62 to 71% of inhibition of the enzyme HMG-CoA reductase. Together, the chemical characterization and potential bioactivities of peptide-rich extracts results pave the way for their application in nutraceutical products.

References

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