Effect of enzymatic hydrolysis of brewer's spent grain on bioactivity, techno-functional properties and nutritional value when added to a bread formulation.

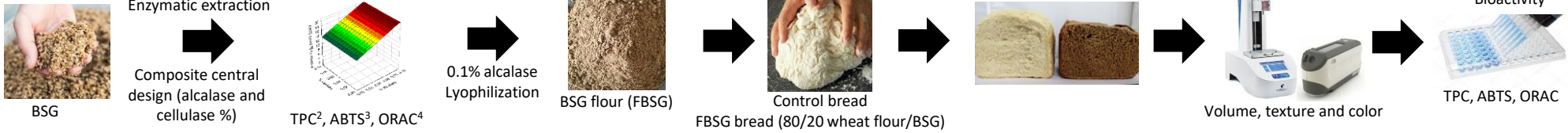
Báez Jessica, Fernández-Fernández Adriana, Briozzo Federico, Díaz Sofía, Dorgans Agustina, Tajam Valentina, Medrano Alejandra

Laboratorio de Bioactividad y Nanotecnología de Alimentos. Departamento de Ciencia y Tecnología de Alimentos. Facultad de Química. Universidad de la República, Uruguay.

Introduction and Objective

The interesting nutritional value and abundance of brewer´s spent grain (BSG) may be adequate for its use as a sustainable functional ingredient[1]. The aim of the present work was to enhance BSG bioactive properties by enzymatic hydrolysis, along with studying the technological feasibility by rheological properties evaluation of a bread with BSG flour (FBSG) from hydrolysed BSG.

Materials and Methods



Results and Discussion

Table 1. Total dietary Fiber and antioxidant composition of control bread and FBSG bread.

Composition	Control bread	FBSG bread
Total Dietary Fiber	2.8 ± 0.5 [a]	6.9 ± 1.3 [b]
Antioxidants		
TPC (mg GAE/g)	0.27 ± 0.01[a]	0.46 ± 0.06[b]
ABTS (µmol Trolox/g)	1.7± 0.1[a]	2.0 ± 0.2[b]
ORAC (µmol Trolox/g)	0.11 ± 0.01[a]	0.40 ± 0.04[b]

ANOVA analysis was performed per row using Tukey's test. The means in the row with different letters indicate significant differences (p<0.05).

FBSG bread adopts the Nutritional Claim **"high fiber content"** by MERCOSUR regulation N°01/12. The increased antioxidant capacity may be due to release of polyphenols by hydrolysis of the BSG and subsequent formation of bioactive peptides of the BSG in the fermentation of bread.

MR and RSM showed a positive effect for alcalase % and non-significant for cellulase %. The optimal condition for the extraction was 0.1% alcalase.

Table 2. Volume and texture results of control bread and FBSG bread.

Bread parameters		Control bread	FBSG bread
Volume (cm^3)		2359±106 [b]	1890±7 [a]
Texture	Chewiness (Kg)	6.5 ± 0.9 [a]	6.9± 0.1 [a]
	Cohesiveness	0.59 ± 0.09 [a]	0.61 ± 0.03 [a]
	Resilience	24.6 ± 5.5 [a]	27.5 ± 2.3 [b]
	Elasticity	96.1 ± 2.8 [a]	89.8 ± 0.1 [b]
	Rubberiness ($Kg.m.s^{-2}$)	6.8 ± 1.1 [a]	7.6 ± 0.2 [b]

The decrease (p<0.05) in volume of FBSG bread could be due to the presence of arabinoxylans, the main components of the BSG fiber. Regarding texture, differences were observed in elasticity, rubberiness and resilience. This differences can also be the result of the presence of BSG arabinoxylans

ANOVA analysis was performed per row using Tukey's test. The means in the row with different letters indicate significant differences (p<0.05).

Regarding color, a significant increase (p<0.05) of Chroma (parameters L, a, b) was observed for the FBSG bread, developing brown / reddish tones in the crumb, typical of BSG color

Conclusions

In conclusion, a sustainable "high fiber content" and antioxidant bread was obtained presenting suitable rheological properties like wheat flour bread. Further studies on sensory profile and acceptability of the novel food should be addressed in order to evaluate the consumers' perception on rheological parameters.

References: 1 K. M. Lynch, E. J. Steffen and E. K. Arendt (2016). Brewers' spent grain: a review with an emphasis on food and health. *Institute of Brewing & Distilling*. **2**. Slinkard, K.; Singleton, V.L. Total Phenol Analysis: Automation and Comparison with Manual Methods. *Am. J. Enol. Vitic.* 1977, 28, 49–55. **3.** Re, R.; Pellegrini, N.; Proteggente, A.; Pannala, A.; Yang, M.; Rice-Evans, C. (1999). Antioxidant activity applying an improved ABTS radical cation decolorization assay. *Free Radical Biology & Medicine*, 26(98), 1231- 1237. **4.** Ou, B., Hampsch-Woodill, M., & Prior, R. (2001). Development and validation of an improved Oxygen Radical Absorbance Capacity Assay using fluorescein as the fluorescent probe. *Journal of Agricultural and Food Chemistry*, 49, 4619–4626 **5.** AOAC 1999 Official methods of analysis, 16 th ed Association of Official Analytical Chemists

Acknowledgements: Programa de Apoyo a la Investigación Estudiantil (PAIE CSIC), Agencia Nacional de Investigación e Innovación (ANII) POS_NAC_M_2020_1_164417 and Programa de Desarrollo de las Ciencias Básicas (PEDECIBA-UDELAR).