

Functional foods enriched with melon by-products: A sustainable strategy to improve amino acid profile

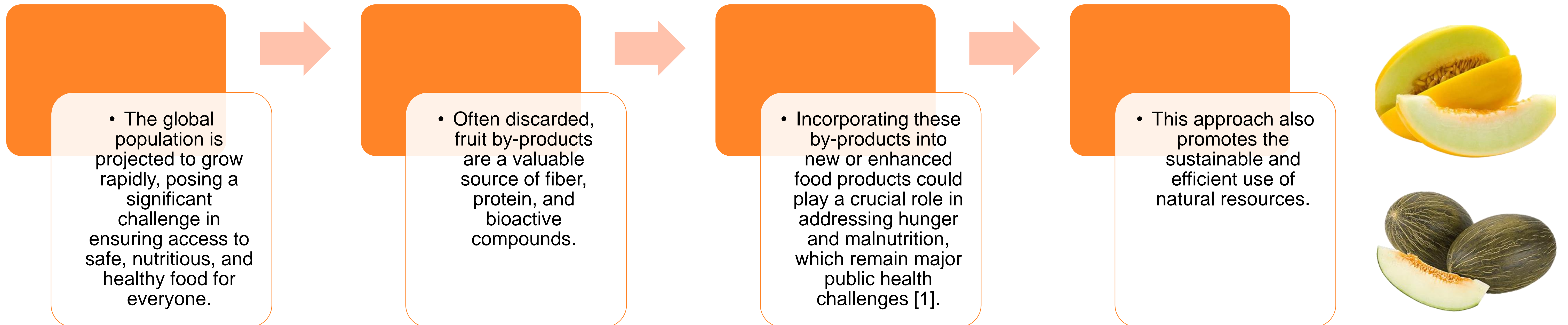
Mafalda Alexandra Silva^{1,2*}, Helena S. Costa^{1,2}, Carla Motta¹, M. Beatriz P.P. Oliveira², Nelson Félix³, Tânia Gonçalves Albuquerque^{2,3}

¹ Department of Food and Nutrition, National Institute of Health Dr Ricardo Jorge

² REQUIMTE-LAQV/ Faculty of Pharmacy of the University of Porto

³ Estoril Higher Institute for Tourism and Hotel

*mafalda.silva@insa.min-saude.pt



This study aimed to develop four innovative types of bread enriched with melon by-products: bread with blanched melon peel flour (BBMPF), bread with blanched melon seed flour (BBMSF), bread with roasted melon peel flour (BRMPF) and bread with roasted melon seed flour (BRMSF). Additionally, a control bread was developed. The protein content and amino acid profile of these breads were evaluated.

METHODS

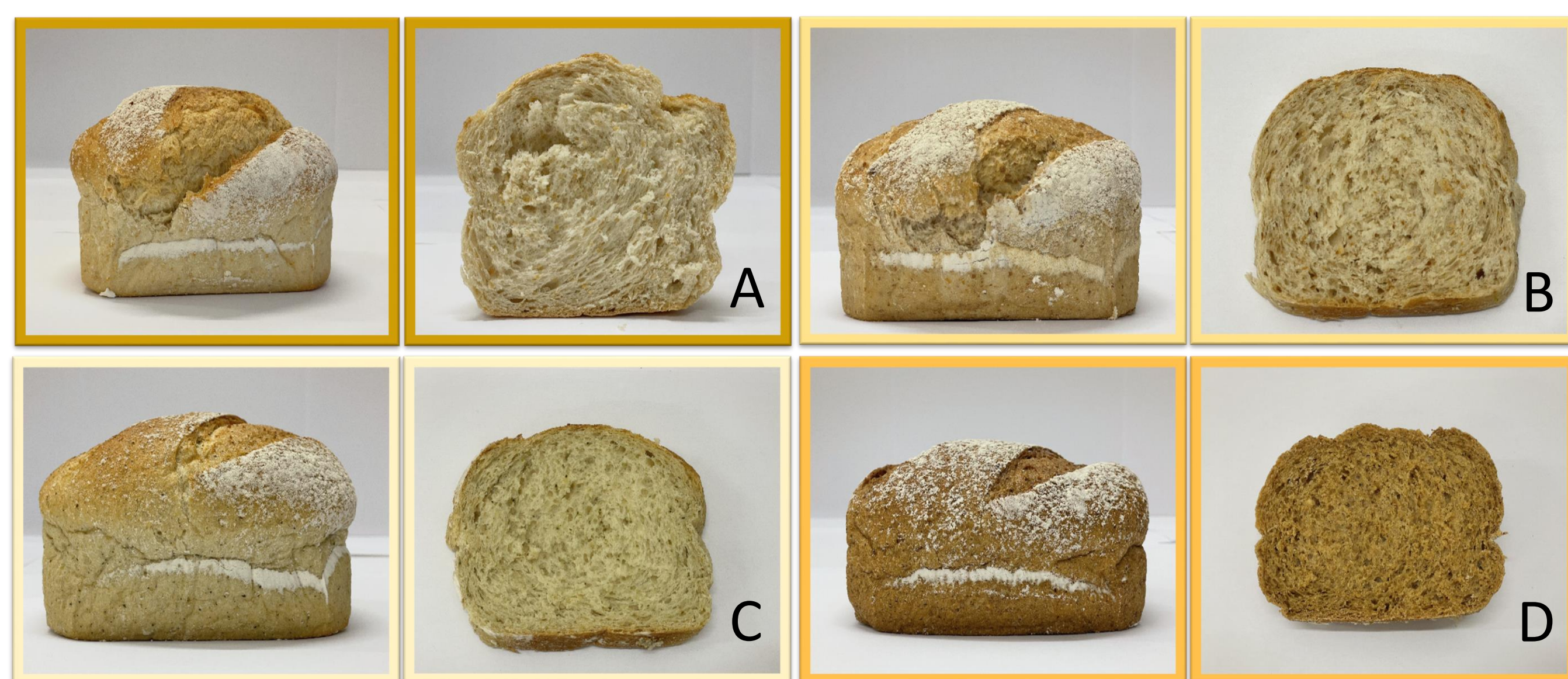


Figure 1. Innovative food products: A) Bread with blanched melon seeds flour; B) Bread with roasted melon seeds flour; C) Bread with blanched melon peel flour; D) Bread with roasted melon peel flour.

In 2022, by-products from melon production and distribution companies were recovered.

The melon peels were dehydrated, and the seeds were oven-dried. Both by-products were ground to produce melon peel flour and melon seed flour.

These flours were then subjected to either blanching or roasting, and used to develop the innovative types of bread (Table 1).

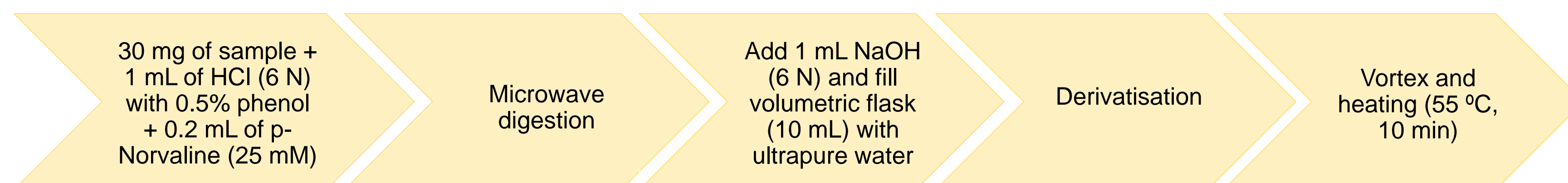
Table 1. Bread formulations.

Ingredients (%)	CB	BBMSF	BRMSF	BBMPF	BRMPF
Wheat flour	54.2	48.8	48.8	48.8	48.8
Melon seeds flour (blanched)		5.4			
Melon seeds flour (roasted)			5.4		
Melon peel flour (blanched)				5.4	
Melon peel flour (roasted)					5.4
Yeast (fresh)	1.1	1.1	1.1	1.1	1.1
Water	38.0	38.0	38.0	38.0	38.0
Salt	0.8	0.8	0.8	0.8	0.8
Mother dough	5.4	5.4	5.4	5.4	5.4
Bread improver	0.5	0.5	0.5	0.5	0.5

CB - Control bread; BBMSF - Bread with blanched melon seeds flour; BRMSF - Bread with roasted melon seeds flour; BBMPF - Bread with blanched melon peel flour; BRMPF - Bread with roasted melon peel flour.

The total protein content was evaluated by Kjeldhal method [2,3].

Amino acids analysis [4]



Chromatographic conditions [4]

Detector: Photodiode array detector (PDA)
Column: C18 column (100 mm x 2.1 mm i.d., 1.7 µm)
Flow rate: 0.7 mL/min
Detection: λ = 260 nm
Mobile phase: AccQTag ultra eluent A diluted in 95% of ultrapure water and AccQ-Tag ultra eluent B.

RESULTS

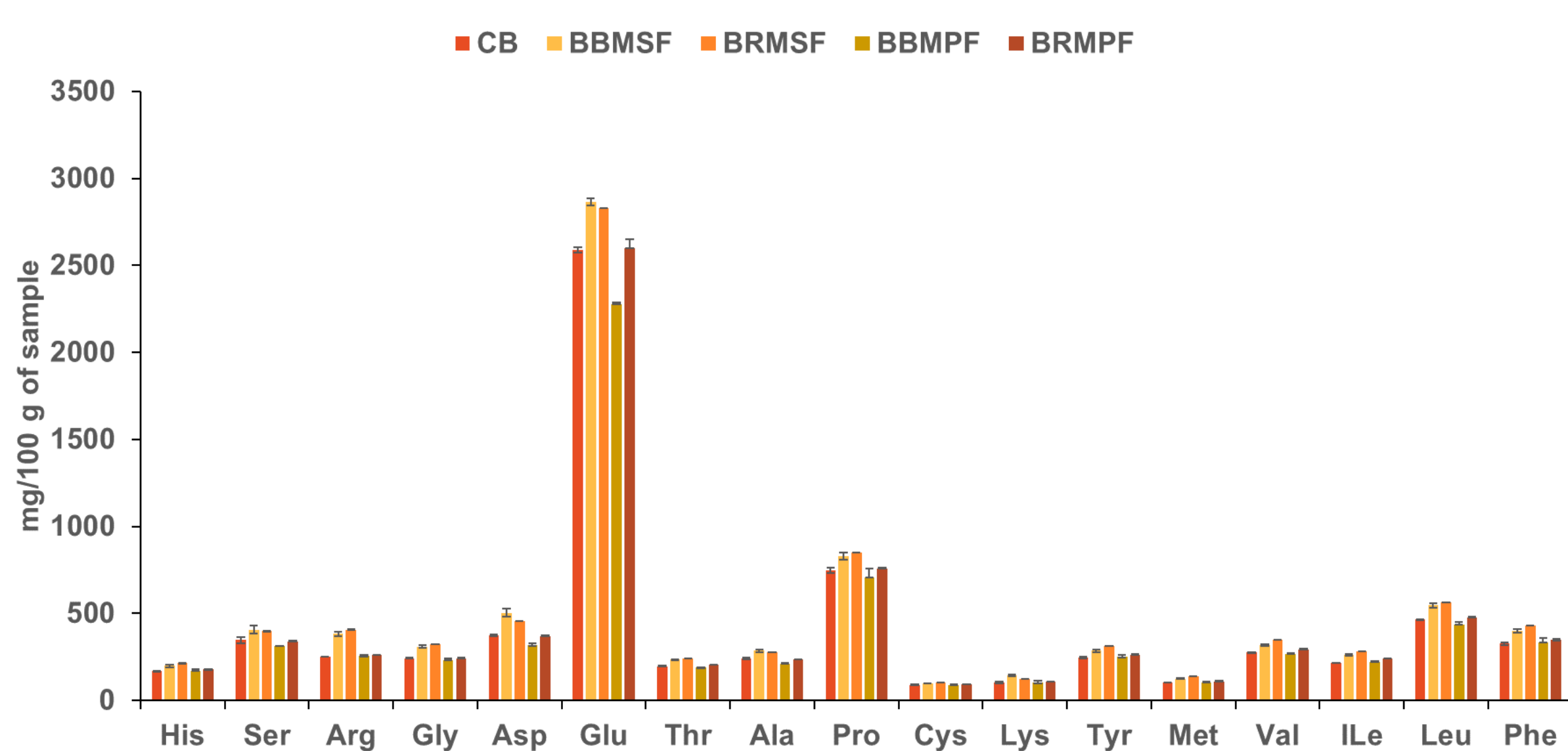


Figure 2. Amino acids content (mg/100 g of sample) of the control and the innovative food products.

CB - Control bread; BBMSF - Bread with blanched melon seeds flour; BRMSF - Bread with roasted melon seeds flour; BBMPF - Bread with blanched melon peel flour; BRMPF - Bread with roasted melon peel flour.

Table 2. Total protein content (g/100 g) of the control and the innovative food products.

Innovative food products	Total protein content (g/100 g)
CB	7.3 ± 0.1
BBMSF	8.7 ± 0.3
BRMSF	8.8 ± 0.1
BBMPF	6.3 ± 0.3
BRMPF	7.5 ± 0.2

- Protein content ranged from **6.3 g/100 g (BBMPF)** to **8.8 g/100 g (BRMSF)** (Table 2).
- The **most abundant essential amino acids** found in the breads were **leucine, phenylalanine and valine** (Figure 2).
- **Breads with melon seed flours** have a **higher increase** in amino acid content than those with melon peel flours.
- BRMPF (1959 mg/100 g), BBMSF (2219 mg/100 g) and BRMSF (2341 mg/100 g) had **higher essential amino acid** levels than the control bread (1849 mg/100 g).

Conclusion

These results suggest that using melon flour, especially seeds flour, may be an effective strategy to improve the amino acid profile in functional foods. Furthermore, these findings not only contribute to improving public health, but also promote the valorisation of melon by-products, reducing the economic, social, and environmental impacts of these currently discarded by-products, meeting the Sustainable Development Goals of the United Nations.

References

- [1] Silva, M.A., Albuquerque, T.G., Alves, R.C., Oliveira, M.B.P.P. & Costa, H.S., 2021. Fruit byproducts as alternative ingredients for bakery products. Academic Press.
- [2] Albuquerque, T.G., Oliveira, M.B.P.P., Sanches-Silva, A., Bento, A.C. & Costa, H.S., 2016. Food Funct, 7, pp.2736–2746.
- [3] Greenfield, H. & Southgate, D.A.T., 2003. Food Composition Data: Production, Management and Use. 2nd ed. Rome: FAO Publishing Management Service.
- [4] Mota, C., Santos, M., Mauro, R., Samman, N., Matos, A.S., Torres, D. & Castanheira, I., 2016. Food Chem, 193, pp.55–61.

Acknowledgements

This work was financially supported by Foundation for Science and Technology (FCT) under the projects Food4DIAB (EXPL/BAA-AGR/1382/2021); UIDB/50006/2020 DOI 10.54499/UIDB/50006/2020, UIDP/50006/2020 DOI 10.54499/UIDP/50006/2020, LA/P/0008/2020 DOI 10.54499/LA/P/0008/2020 and by AgriFood XXI I&D&I project (NORTE-01-0145-FEDER-000041) co-financed by European Regional Development Fund (ERDF), through the NORTE 2020 (Programa Operacional Regional do Norte 2014/2020).