



UNIVERSITY OF LIFE SCIENCES "KING MIHAI I" FROM
TIMISOARA
"YOUNG PEOPLE AND MULTIDISCIPLINARY RESEARCH
IN APPLIED LIFE SCIENCES"

13-14 November 2025



Cladodes Flour from *Opuntia ficus-indica*: A Sustainable Source of Dietary Fiber and a Promising Alternative for Gluten-Free Formulations

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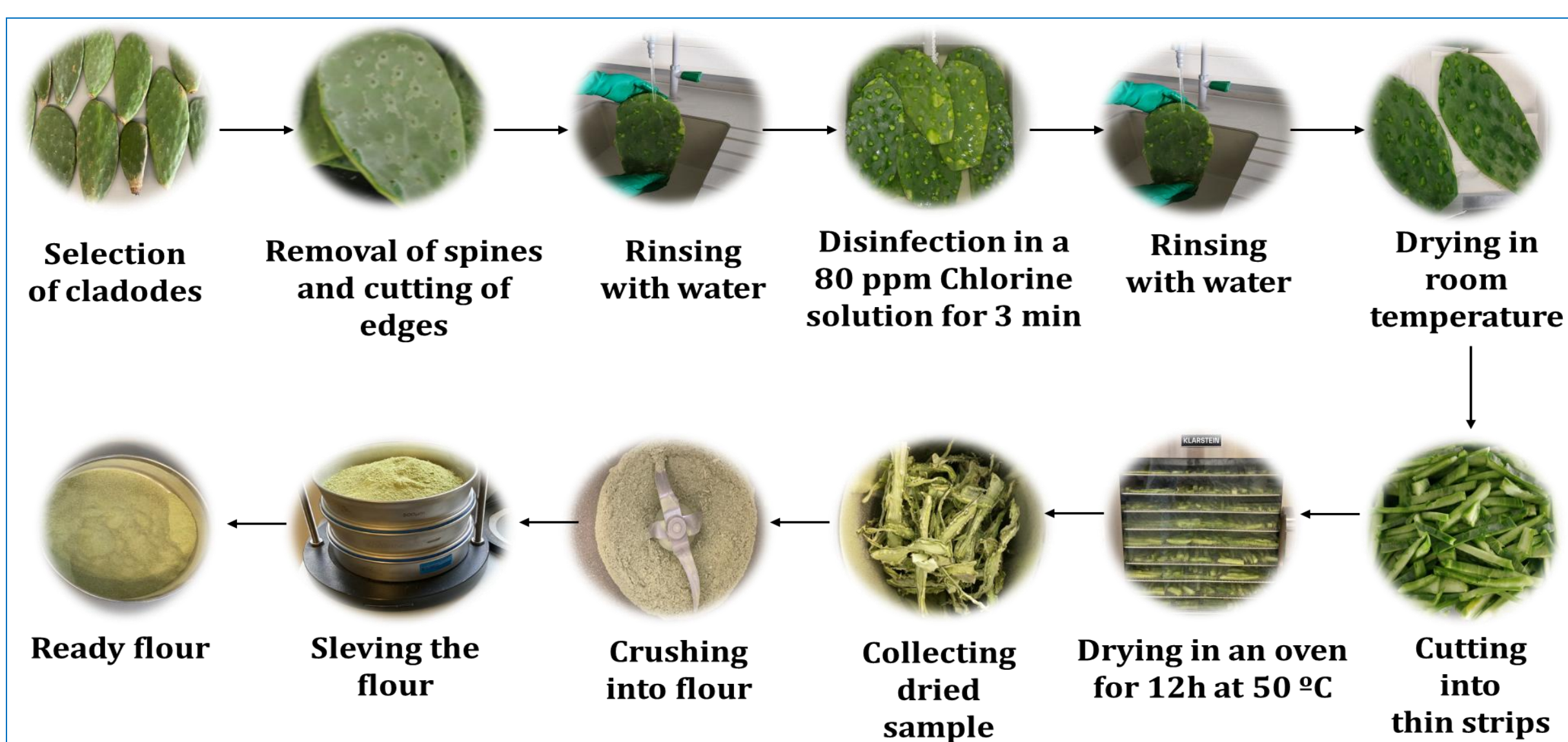
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• Introduction

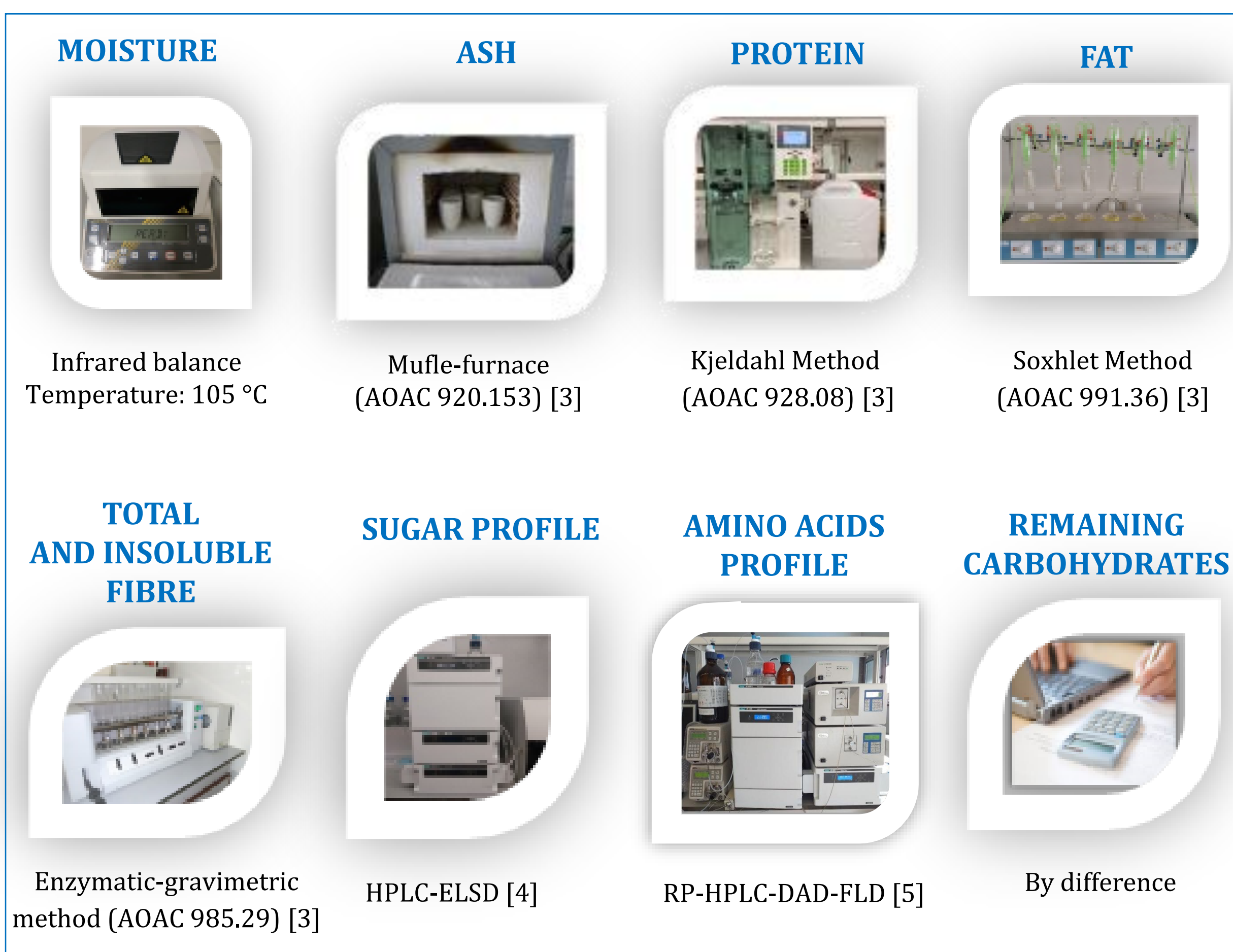
Supporting a growing global population requires significant environmental effort, making more sustainable food practices and appropriate dietary choices, such as low-fat and high fiber, mandatory. In Portugal, while prickly pear (*Opuntia ficus-indica*) is widely grown for its fruit and oil-bearing seeds, its cladodes are currently discarded [1]. Despite their potential value, they are yet to be integrated into the Portuguese diet [1]. This study proposes the valorization of these neglected cladodes for wider food applications, thereby enhancing the overall sustainability of the crop and providing a nutritionally valuable ingredient.

• Material and methods

Flour preparation

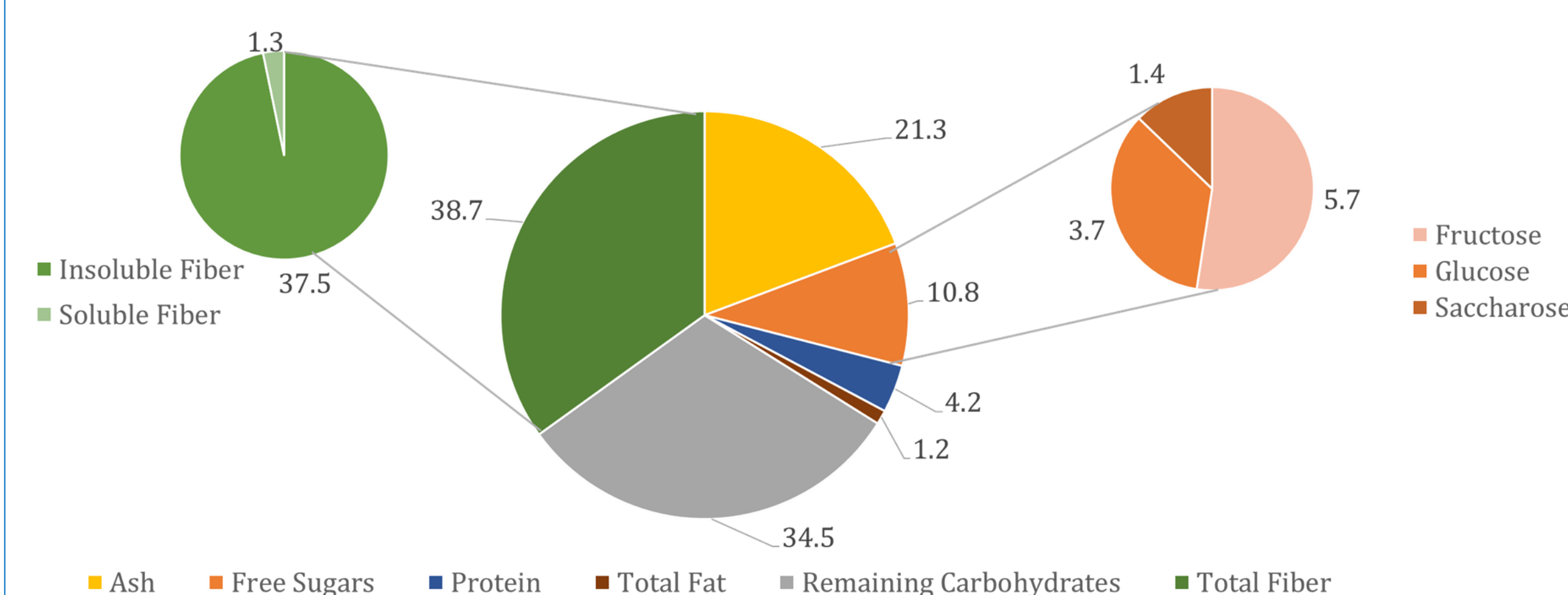


Chemical composition

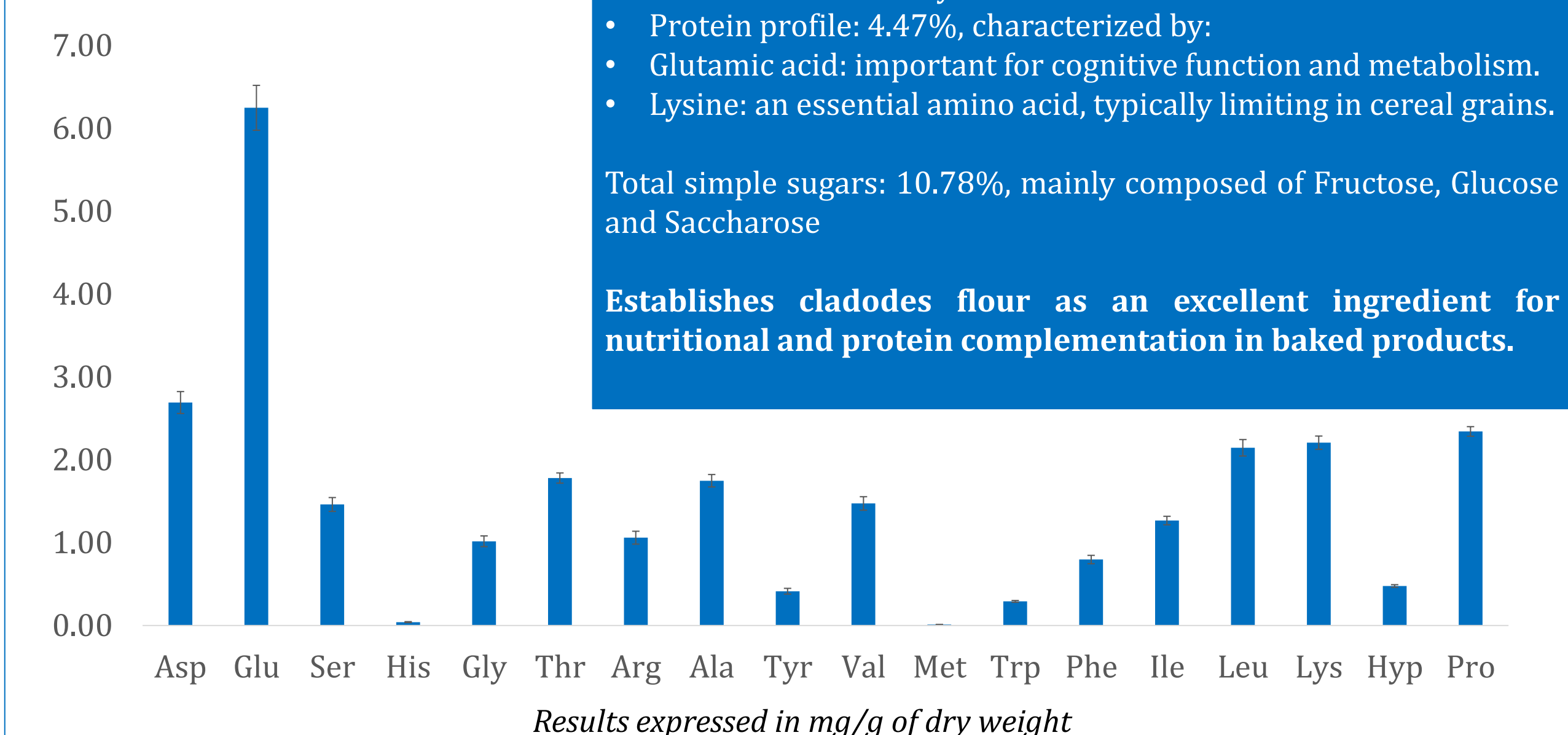


• Results and discussions

Chemical composition



Amino Acids Profile



• Low fat content: 1.24%.
• High ash content: 21.34%.
• Rich source of dietary fiber: 38.66%.
• Protein profile: 4.47%, characterized by:
• Glutamic acid: important for cognitive function and metabolism.
• Lysine: an essential amino acid, typically limiting in cereal grains.

Total simple sugars: 10.78%, mainly composed of Fructose, Glucose and Saccharose

Establishes cladodes flour as an excellent ingredient for nutritional and protein complementation in baked products.

• Conclusions

Recognized as a sustainable source of functional ingredients, this flour contributes to enhancing the economic and environmental viability of the *Opuntia ficus-indica* crop. Given its promising nutritional profile and inherent gluten-free nature, the flour is validated as a viable ingredient for food formulations, representing a valuable alternative for gluten-free products, particularly within the bakery sector.

References: [1] Espírito Santo, L. (2020). *Opuntia ficus-indica* (L.) Miller: valorização dos cladódios para consumo alimentar. [2] Sapata, M. Margarida, Armando Ferreira, and M. Manuela Oliveira. "Cladódios de figueira-da-índia para a indústria alimentar." *Vida Rural* (2018): 30-33. [3] AOAC. Official methods of analysis (22nd ed.). Arlington, VA, USA (2023). [4] Ma, Chunmei, Zhen Sun, Changbao Chen, Lili Zhang, and Shuhua Zhu. "Simultaneous separation and determination of fructose, sorbitol, glucose and sucrose in fruits by HPLC-ELSD." *Food Chemistry* 145 (2014): 784-788. [5] 19.Machado, S.; Costa, A. S.; Pimentel, F.; Oliveira, M. B. P.; Alves, R. C. A Study on the Protein Fraction of Coffee Silverskin: Protein/Non-Protein Nitrogen and Free and Total Amino Acid Profiles. *Food Chemistry* 2020, 326, 126940;

Acknowledgement: This work received financial support from the PT national funds (FCT/MECI, Fundação para a Ciência e Tecnologia and Ministério da Educação, Ciência e Inovação) through the project UID/50006 -Laboratório Associado para a Química Verde - Tecnologias e Processos Limpos. Liliana Espírito Santo is grateful for her research Grant (Ref. COMPETE2030-FEDER-02182500). Also, to Paulo Costa – Olaia Natura, due to the assignment of the samples.

