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

05-06 November 2026



Recovery of Bioactive Compounds from *Cytisus* Flowers by Sustainable Green Extraction



Liliana Espírito Santo[1,2] · M. Beatriz P.P. Oliveira[1] · Ana F. Vinha[1,3*]

[1] LAQV-REQUIMTE, Faculty of Pharmacy, University of Porto, Porto, Portugal
[2] Nutrition and Bromatology Group, Department of Analytical Chemistry and Food Science, Faculty of Science, University of Vigo, Ourense, Spain
[3] FCS-UFP, Faculty of Health Sciences, Fernando Pessoa University, Porto, Portugal
* Corresponding author: acvinha@ufp.edu.pt

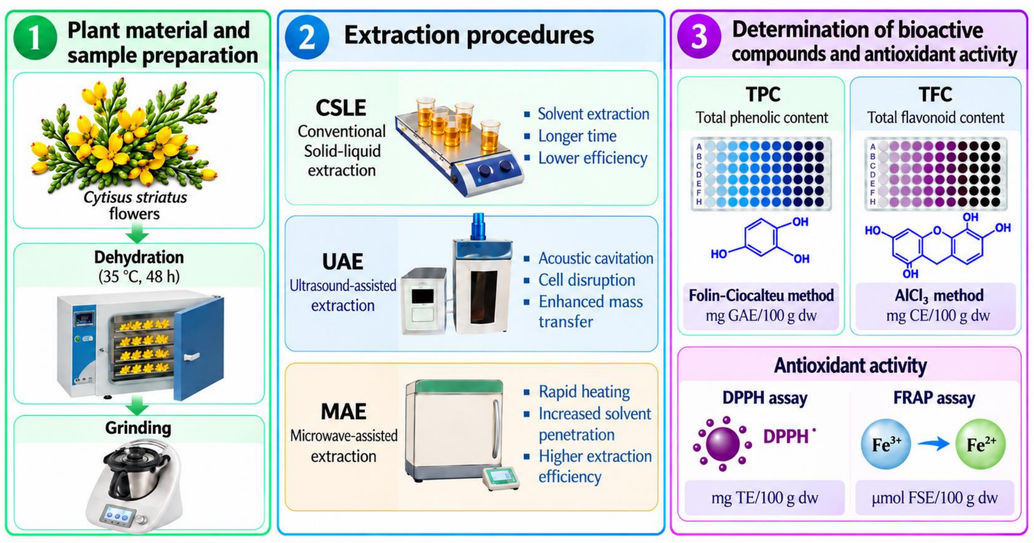
Introduction

Cytisus striatus, commonly known as Portuguese broom, is a perennial leguminous shrub native to the Iberian Peninsula that remains comparatively undervalued despite its ecological and biomass-production potential [1]. The species is characterized by slender green stems and conspicuous bright-yellow, papilionaceous flowers. Underutilized plant species exhibiting high biomass productivity constitute promising yet largely unexplored reservoirs of bioactive compounds, thereby offering significant potential for the sustainable valorization of plant-derived resources within the framework of a circular bioeconomy [2].

OBJECTIVE

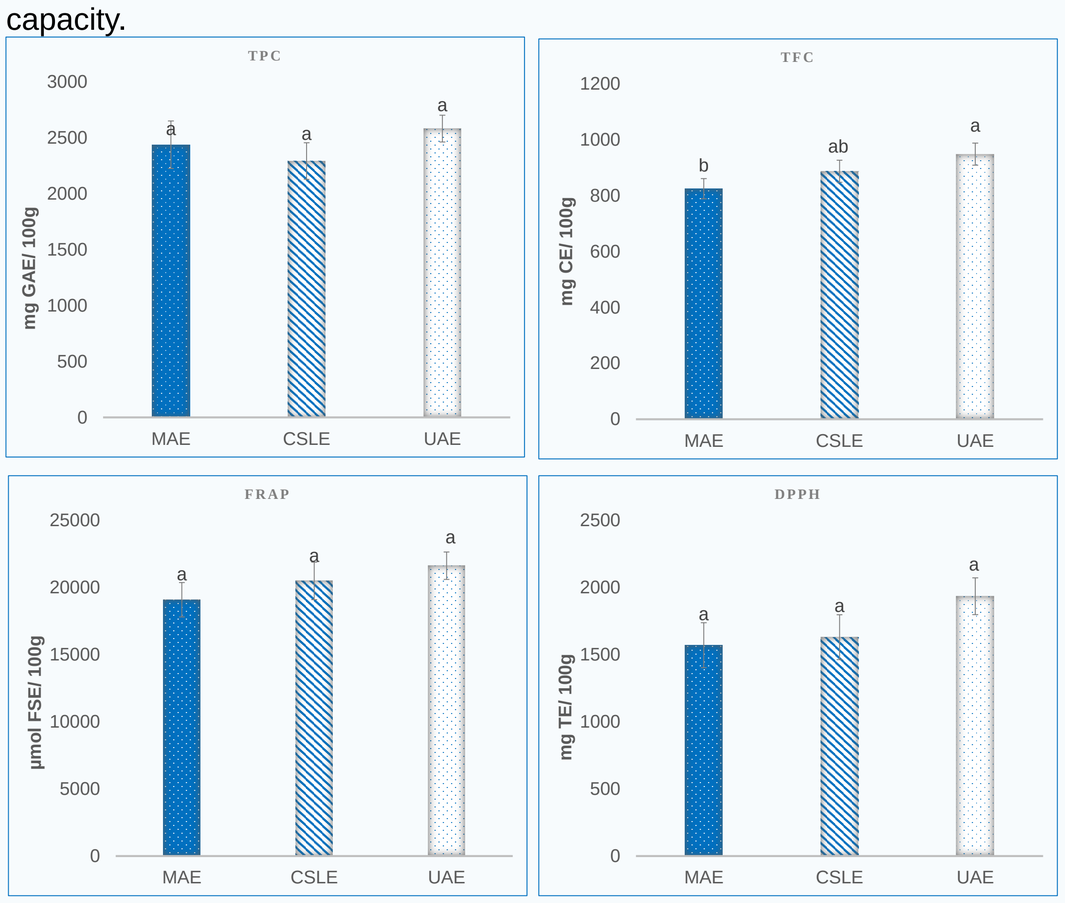
Optimize green extraction of antioxidant phenolics from dehydrated flowers and compare three methodologies (CSLE, UAE and MAE).

Materials and methods



Results and discussion

Ultrasound-assisted extraction (UAE) consistently achieved the highest total phenolic content (TPC), total flavonoid content (TFC), and antioxidant capacity.



Total phenolic (TPC) and flavonoid (TFC) contents and antioxidant activity (FRAP and DPPH) of *Cytisus striatus* flower extracts obtained by MAE, CSLE, and UAE. Results are expressed as mg GAE/100 g (TPC), mg CE/100 g (TFC), µmol FSE/100 g (FRAP), and mg TE/100 g (DPPH). Values represent mean ± SD (n = 3). Different lowercase letters indicate statistically significant differences among extraction methods.

- ✓ Ultrasound-assisted extraction (UAE) achieved the highest TPC, reaching 2581.64 mg GAE/100 g, and the highest TFC (948.20 mg CE/100 g).
- ✓ UAE exhibited the highest antioxidant activity, with DPPH and FRAP values of 1935.16 mg TE/100 g and 21626.06 µmol FSE/100 g, respectively.
- ✓ Overall, ultrasound-assisted extraction (UAE) outperformed microwave-assisted extraction (MAE) and conventional solid–liquid extraction (CSLE) regarding bioactive compounds recovery and antioxidant activity. These findings highlight the potential of UAE as an efficient and sustainable extraction strategy for the valorization of *C. striatus* flowers and the recovery of valuable bioactive compounds.

Conclusions

These findings highlight the potential of *C. striatus*, an underutilized species with substantial biomass production, as a renewable source of bioactive compounds and support the use of green extraction technologies for its valorization.

Acknowledgments Financial support: FCT/MECI national funds, project UID/50006 — Laboratório Associado para a Química Verde – Tecnologias e Processos Limpos.

References

[1] Caramelo, D.; Pitacas, I.; Vitória, C.; Gonçalves, J.; Gominho, J.; Gallardo, E.; Anjos, O. Chemical Composition and Nutritional Value of Flowers and Fruits of *Cytisus striatus* (Hill) Rothm. Plants 2024, 13(15), 2121.

[2] Ferreira-Sousa, D.; Genisheva, Z.; Rodríguez-Yoldi, M.J.; Gullón, B.; Costa, C.E.; Teixeira, J.A.; Botelho, C.M.; Ferreira-Santos, P. Exploration of Polyphenols Extracted from *Cytisus* Plants and Their Potential Applications: A Review. Antioxidants 2024, 13(2), 192.

[3] Vinha, A.F.; Costa, A.S.G.; Espírito Santo, L.; Ferreira, D.M.; Sousa, C.; Pinto, E.; Almeida, A.; Oliveira, M.B.P.P. High-value Compounds in Papaya By-products (*Carica papaya* L. var. Formosa and Aliança): Potential Sustainable Use and Exploitation. Plants 2024, 13(7), 1009.

[4] Costa, A.S.G.; Alves, R.C.; Vinha, A.F.; Barreira, S.V.P.; Nunes, M.A.; Cunha, L.M.; Oliveira, M.B.P.P. Optimization of Antioxidants Extraction from Coffee Silverskin, a Roasting By-product, Having in View a Sustainable Process. Industrial Crops and Products 2014, 53, 350–357.