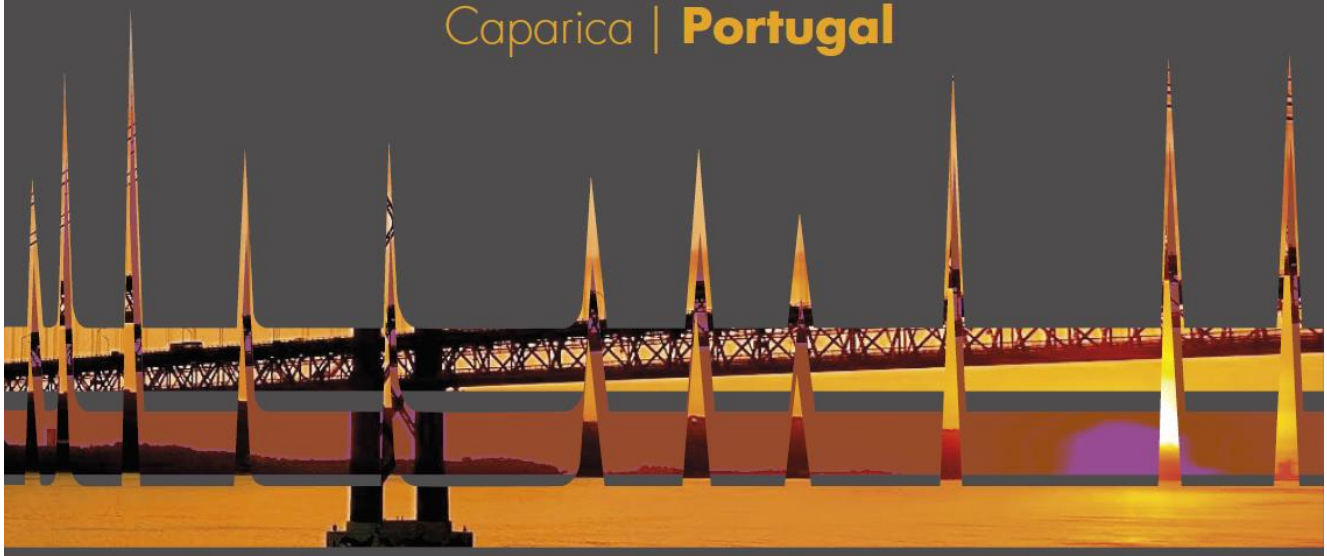
11º CONGRESSO NACIONAL DE **CROMATOGRAFIA**

20 anos CROMATOGRAFIA

11th NATIONAL MEETING ON CHROMATOGRAPHY

9|11 Dezembro 2019

Caparica | **Portugal**



Faculdade de Ciências e Tecnologia,
Universidade NOVA de Lisboa

Sociedade Portuguesa de Química

FCT Faculdade de Ciências e Tecnologia Universidade Nova de Lisboa

Universidade de Évora

Ciências ULisboa

Title
11th National Chromatography Meeting

Título
11º Encontro Nacional de Cromatografia

Authors
Eduardo Mateus (Universidade Nova de Lisboa)
José Manuel F. Nogueira (Universidade de Lisboa)
Marco Gomes da Silva (Universidade Nova de Lisboa)
Maria João Cabrita (Universidade de Évora)

Edition
Faculdade de Ciências e Tecnologia
Universidade Nova de Lisboa
Campus de Caparica, Portugal
https://www.fct.unl.pt/

Imaging services
Camy (FCT, Universidade Nova de Lisboa)

URL
http://11enc.eventos.chemistry.pt/
e-mail: 11enc@chemistry.pt

ISBN: 978-989-8124-29-6

O35 Influence of the growth cycle on the chemical composition and biological properties of *Cynara cardunculus* L. var. *altilis* blades and petioles

Filipa Mandim,[1,2] Ângela Fernandes,[1] Maria Inês Dias,[1] José Pinela,[1] Spyridon A. Petropoulos,[3] Marina Kostic,[4] Marina Sokovic,[4] Lillian Barros,[1] Celestino Santos-Buelga,[2] Isabel C.F.R. Ferreira[1]

[1] *Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança, Bragança, Portugal*
[2] *GIP-USAL, Faculdad de Farmácia, Universidad de Salamanca, Salamanca, Spain*
[3] *University of Thessaly, Department of Agriculture, Crop Production and Rural Environmental, Magnissia, Greece*
[4] *Institute for Biological Research "Siniša Stanković", University of Belgrade, Belgrade, Serbia*
Email: iferreira@ipb.pt

Cynara cardunculus L. (cardoon) is a typical Mediterranean species comprising the ancestor wild cardoon (var. *sylvestris*) and the cultivated leafy cardoon (var. *altilis*) and globe artichoke (var. *scolymus*). It has a worldwide distribution as a result of the high adaptability to climate change, such as resistance to temperature extremities, water stress, and soils with variable pH.[1,2] It is also considered a multipurpose crop due to its nutritional, pharmacological and industrial potential. It is consumed as an antidiabetic and anticholesterolemic agent and to increase liver function. In recent years, it has been recognized as a promising energy crop as a result of its possible use in new and environmentally friendly industrial applications for energy production.[2,3] Due to the increase of its commercial and economic value, this study aimed to evaluate the chemical composition and bioactive potential of cardoon blades and petioles in relation to plant growth cycle.

Samples of *Cynara cardunculus* L. var. *altitis* were collected in central Greece at different maturation stages. The individual profiles in tocopherols, free sugars, organic acids, and fatty acids were determined by chromatographic methodologies. The polyphenolic profiles of their hydromethanolic extracts were analyzed by HPLC-DAD-ESI/MS. The antioxidant potential was assessed through the cell-based TBARS and OxHLIA assays. The cytotoxic activity against four human tumor cell lines (HeLa, HepG2, MCF-7, NCI-H460) and a non-tumor cell line (PLP2) was screened by the sulforhodamine B assay. The anti-inflammatory activity was evaluated by the inhibition of NO production. The antibacterial and antifungal activities were evaluated by the broth microdilution method.

Thirteen phenolic compounds were tentatively identified in blade extracts and quantified in higher amounts in samples at an intermediate maturation stage. On the other hand, eleven phenolic compounds were identified in petiole extracts and the immature samples revealed the higher contents as also the best antioxidant capacity. Alpha and gamma tocopherols were found in both cardoon parts (petioles and blades), while beta-tocopherol was present only in petioles; the higher amounts were quantified in more mature samples. Regarding free sugars, fructose, glucose, sucrose, trehalose, and raffinose were detected in both plant tissues, mostly in immature samples. Oxalic, quinic malic, citric, and fumaric acids were detected and quantified in higher quantities in mature blades and immature petioles. Finally, twenty-six fatty acids were found in blades and twenty-seven in petioles. Among them, palmitic, linoleic and alpha linolenic acids stood out for their relative abundance. In addition, blades had more saturated fatty acids, whereas petioles had a higher polyunsaturated content. In terms of bioactivity, both blade and petiole extracts revealed anti-inflammatory and cytotoxic potential, especially the samples at an intermediate maturation stage, as well as antibacterial and antifungal activities. Extracts of mature blades and immature petioles were those with higher antibacterial activity. Regarding the antifungal potential, the results varied according to the tested fungi, since some fungi were inhibited by immature sample extracts (*e.g. Aspergillus versicolor*, *Penicillium ochroloron* and *P. aurantiogriseum*) and others by mature sample extracts (*e.g. Aspergillus fumigatus*, *A. niger* and *P. funiculosum*).

In conclusion, this study showed how chemical features and biological activities of cardoon blades and petioles are affected by the maturity stage. However, further studies are needed to better understand which compounds are responsible for the observed bioactivities.

Acknowledgements: To the Foundation for Science and Technology (FCT, Portugal) for the contracts of Â. Fernandes, M.I. Dias, J. Pinela, and L. Barros through the institutional scientific employment program.

Funding: This work was financially supported by FEDER-Interreg España-Portugal programme through the project 0377_Iberphenol_6_E. We also thank the FCT and ERDF under the PT2020 Program for financial support to CIMO (UID/AGR/00690/2019).

References:

1. S. Petropoulos, Â. Fernandes, C. Pereira, N. Tzortzakis, J. Vaz, M. Soković, L. Barros, I.C.F.R. Ferreira, Food Chem. 289 (**2019**), 404-412.
2. J. Gominho, M.D. Curt, A. Lourenço, J. Fernández, H. Pereira, Biomass Bioenerg., 109 (**2018**), 257-275.
3. B. de Falco, G. Incerti, M. Amato, V. Lanzotti, Phytochem Rev., 14 (**2015**), 993-1018.