



# 10º Encontro Nacional de Cromatografia

Bragança 2017 – 4 a 6 de dezembro

**Abstracts book / Livro de resumos**



SOCIEDADE PORTUGUESA DE QUÍMICA



INSTITUTO POLITÉCNICO DE BRAGANÇA Centro de Investigação de Montanha

COM O ALTO PATROCÍNIO DE SUA EXCELÊNCIA



*O Presidente da República*

## Title

10th Chromatography Meeting

## Título

10º Encontro de Cromatografia

## Authors / Autores

António M. Peres (Instituto Politécnico de Bragança, Portugal)

Lillian Barros (Instituto Politécnico de Bragança, Portugal)

Luís G. Dias (Instituto Politécnico de Bragança, Portugal)

Isabel C.F.R. Ferreira (Instituto Politécnico de Bragança, Portugal)

## Edition / Edição

Instituto Politécnico de Bragança · 2017

5300-253 Bragança · Portugal

Tel. (+351) 273 303 200 · Fax (+351) 273 325 405

<http://www.ipb.pt>

## Imaging services / Serviços de imagem

Atilano Suarez (Instituto Politécnico de Bragança, Portugal)

## URL

<http://hdl.handle.net/10198/8896>

## ISBN

978-972-745-234-7



## Organizing committee / Comissão Organizadora

Isabel C.F.R. Ferreira (Instituto Politécnico de Bragança)

José Manuel F. Nogueira (Faculdade de Ciências, Universidade de Lisboa)

Anabela Martins (Instituto Politécnico de Bragança)

António Peres (Instituto Politécnico de Bragança)

Cidália Lino (Instituto Politécnico de Bragança)

Helder Gomes (Instituto Politécnico de Bragança)

Joana Amaral (Instituto Politécnico de Bragança)

João Barreira (Instituto Politécnico de Bragança)

Jorge Sá Morais (Instituto Politécnico de Bragança)

Lillian Barros (Instituto Politécnico de Bragança)

Luís Dias (Instituto Politécnico de Bragança)

Luís Pais (Instituto Politécnico de Bragança)

M. Filomena Barreiro (Instituto Politécnico de Bragança)

Miguel Vilas Boas (Instituto Politécnico de Bragança)

Sandrina A. Heleno (Instituto Politécnico de Bragança)

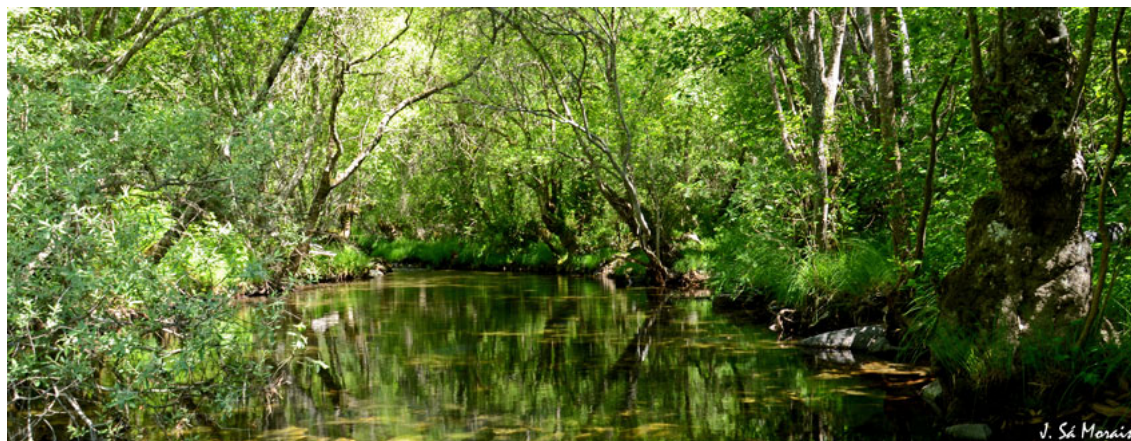
Cristina Campos (Secretariado - Sociedade Portuguesa de Química)

Leonardo Mendes (Secretariado - Sociedade Portuguesa de Química)



## Scientific committee / Comissão Científica

Alírio Rodrigues (Universidade do Porto)  
Ana Costa Freitas (Universidade de Évora)  
Anabela Romano (Universidade do Algarve)  
Armando Venâncio (Universidade do Minho)  
Carlos Cavaleiro (Universidade de Coimbra )  
Cristina Delerue Matos (Instituto Politécnico do Porto)  
Elisabete Lima (Universidade dos Açores)  
Fernando Nunes (Universidade de Trás-os-Montes)  
Helena Soares Costa (Instituto Nacional de Saúde Dr. Ricardo Jorge)  
Isabel C.F.R. Ferreira (Instituto Politécnico de Bragança)  
Ivonne Delgadillo (Universidade de Aveiro)  
João Carlos Marcos (Universidade do Minho)  
João Queiroz (Universidade da Beira Interior)  
José António Rodrigues (Universidade do Porto)  
José Câmara (Universidade da Madeira)  
José Manuel F. Nogueira (Universidade de Lisboa)  
M. Beatriz Oliveira (Universidade do Porto)  
Manuel António Coimbra (Universidade de Aveiro)  
Manuela Pintado (Universidade Católica)  
Marcela Segundo (Universidade do Porto)  
Marco Gomes da Silva (Universidade Nova de Lisboa)  
Maria Rosário Bronze (Universidade de Lisboa)  
Nuno Mateus (Universidade do Porto)  
Raquel Aires Barros (Universidade de Lisboa)  
Sílvia M. Rocha (Universidade de Aveiro)



PC-91		
	Comparison of <i>Ulva rigida</i> fatty acid profile in summer and winter seasons	158
	<i>Andreia Silva, Ana Sofia Queiroz, Helena Abreu, Artur M.S. Silva, Susana M. Cardoso</i>	
PC-92		
	Lipophilic profile of four European macroalgae species	159
	<i>Andreia F.R. Silva, Rodrigo T. Neto, Ana Sofia Queirós, Artur M.S. Silva, Susana M. Cardoso</i>	
PC-93		
	Caracterização de compostos antociânicos em flores comestíveis	160
	<i>Tânia C.S.P. Pires, Maria Inês Dias, Lillian Barros, Celestino Santos-Buelga, Isabel C.F.R. Ferreira</i>	
PC-94		
	Gas chromatography: a useful tool for bakery products differentiation	161
	<i>Tânia Gonçalves Albuquerque, Joana Santos, Mafalda Alexandra Silva, M. Beatriz P.P. Oliveira, Helena S. Costa</i>	
PC-95		
	Profile of Bound Phenolic Compounds from Olive Pomace	162
	<i>Tânia I.B. Ribeiro, Ana L. Oliveira, João Nunes, António A. Vicente, Manuela Pintado</i>	
PC-96		
	Application of GC-MS to characterize the volatile composition of fruit distillates made with honey	164
	<i>Teresa Delgado, Ilda Caldeira, Ofélia Anjos</i>	
PC-97		
	HPLC/DAD fingerprint of standardized extracts from <i>Ligustrum lucidum</i> Aiton berries, for bioactive activity screening	165
	<i>Teresa Delgado, Vanessa B. Paula, Maria Graça Campos, Nelson Farinha, André Caeiro, Leticia M. Estevinho, Ofélia Anjos</i>	
PC-98		
	Similarity analysis between four Portuguese propolis samples using UHPLC-DAD-ESI-MSn chromatographic profiles of phenolic compounds	166
	<i>Vanessa B. Paula, Susana M. Cardoso, Luís G. Dias, Leticia M. Estevinho</i>	
PC-99		
	Determination of organophosphorus pesticides in strawberries using modified QuEChERS method with magnetic nanoparticles and GC-FPD	167
	<i>Virgínia Cruz Fernandes, José Maria Oliveira, João Grosso Pacheco, Maria Freitas, Valentina F. Domingues, Cristina Delerue-Matos</i>	
PC-100		
	Occurrence of Organophosphorus pesticide in sediments from Portuguese rivers	168
	<i>Carolina Rodrigues, Virgínia Cruz Fernandes, Cristina Delerue-Matos, Natividade Vieira</i>	
PC-101		
	Total fat content and fatty acid profile of pseudocereals	169
	<i>Roberts R. Slaukstins, Santa Jakobsone, Vitor M. R. Martins, Clementina M.M. Santos</i>	
PC-102		
	Enantiomeric separation and chiral recognition mechanisms of different macrocyclic glycopeptide-based chiral stationary phases	170
	<i>Ye Zaw Phyo, Andreia Palmeira, Sara Cravo, Maria Elizabeth Tiritan, Anake Kijjoo, Madalena M.M. Pinto, Carla Fernandes</i>	
PC-103		
	Pyrolytic appraisal of the effect of agricultural practices on soil organic matter quality	171
	<i>Zulimar Hernández, Gonzalo Almendros, Tomas de Figueiredo</i>	
PC-104		
	Gas chromatographic signature of soil lipids associated to land-use changes	172
	<i>Zulimar Hernández, Gonzalo Almendros, Jesús Sanz, Tomás de Figueiredo</i>	
PC-105		
	Influência do método de secagem no perfil fenólico e propriedades bioativas de <i>Galium aparine</i> L.	173
	<i>Sylwia Senio, Carla Pereira, Lillian Barros e Isabel C.F.R. Ferreira</i>	
PC-106		
	A novel natural colouring strategy for ice cream: effects on the profiles of individual sugars	174
	<i>Custódio Lobo Roriz, João C.M. Barreira, Patricia Morales, Lillian Barros, Isabel C.F.R. Ferreira</i>	

## PC-101

# Total fat content and fatty acid profile of pseudocereals

Roberts R. Slaukstins<sup>a</sup>, Santa Jakobsone<sup>a</sup>, **Vitor M.R. Martins**<sup>b,c</sup>, Clementina M.M. Santos<sup>b</sup>

<sup>a</sup>Faculty of Food Technology, Latvia University of Agriculture, Liela street 1, Jelgava, Latvia

<sup>b</sup>Escola Superior Agrária, Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253 Bragança, Portugal

<sup>c</sup>CIMO-Mountain Research Center, Campus de Santa Apolónia, 5300-253 Bragança, Portugal

\*vmartins@ipb.pt

Amaranth, quinoa, and buckwheat are called “pseudocereals” since they produce starch-rich seeds like cereals but they are dicotyledonous plants (and not monocotyledonous as cereals). According to some phylogenetic classifications, amaranth (*Amaranthus*) and quinoa (*Chenopodium*) genera belong to the order *Caryophyllales*, whereas buckwheat (*Fagopyrum*) belongs to *Polygonales* [1]. Pseudocereals have recently gained more popularity as a part of human diet thanks to their chemical composition, particularly as a source of protein, vitamins of B group, minerals and also for their gluten-free flour [2]. Some pseudocereals can even present a fat content three times higher than cereals, with a fatty acid profile dominated by unsaturated fatty acids [3-5].

The total fat content was determined using Soxhlet method, and the fatty acid profile was subsequently determined using gas chromatography with flame ionization detection (GC-FID). The results for total fat content ranged from 3.1% to 8.0%. and evidenced a significant predominance of unsaturated fatty acids. For amaranth and buckwheat unsaturated fatty acids composed up to 81% of the total chromatographic area while for quinoa this value ranged from 87.6% to 90.4%, depending on variety. Polyunsaturated fatty acids formed 48.8% in amaranth, 61.1-64.9% in quinoa and 40.9% while monounsaturated fatty acids compose 32.2% in amaranth, 26.7-29.2% in quinoa and 40.2% in buckwheat. Main unsaturated fatty acids consisted of linoleic acid followed by oleic, linolenic and nervonic acids. Main dominance for saturated fatty acids was for palmitic acid. Buckwheat shown significant differences in fatty acid composition having much higher amount of oleic acid but lower amount of linoleic acid and no signs of nervonic acid. This distinct fatty acid profile may be partially explained by the different botanical origin of buckwheat, which belongs to the *Polygonales* order, while amaranth and quinoa are classified into the *Caryophyllales* order.

### Acknowledgements:

Thanks are due to Polytechnic Institute of Bragança, CIMO Research Unit, Latvia University of Agriculture, and the ERAMUS Mobility program for the financial support.

### References:

- [1] R. Schoenlechner, S. Siebenhandl, E. Berghofer, in *Pseudocereals*, (Eds E.K. Arendt, F.D. Bello) Elsevier, Amsterdam, 2008, pp. 149-190.
- [2] R. J. Fletcher, in *Encyclopedia of Grain Science*, (Ed C. Wrigley), Elsevier Academic Press, Oxford, 2004, pp. 488–493.
- [3] F. Bavec, *Organic Agriculture Towards Sustainability*, InTech, 2014, pp. 237-241.
- [4] R. Repo-Carrasco, C. Espinoza, S. -E. Jacobsen, *Food Rev. Int.* 2003, 19, 179-189.
- [5] G. Bonafaccia, M. Marocchini, I. Kreft, *Food Chem.* 2003, 80, 9-15.