FRUTOS SECOS: VALOR NUTRICIONAL E SAÚDE

Isabel C.F.R. Ferreira

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29 de janeiro de 2016

***Castanea sativa* Miller** Aveleira, Boaventura, Judia, Longal




***Prunus duclis* (Mill.) D.A. Webb**

Cultivares DOP: Casa Nova, Duro Italiano, Marcelina, Molar, Pegarinhos 1 grão e 2 grãos, Refego, Verdeal;

Cultivares comerciais: Ferraduel, Ferragnès, Ferrastar, Guara, Gloriette, Marcona

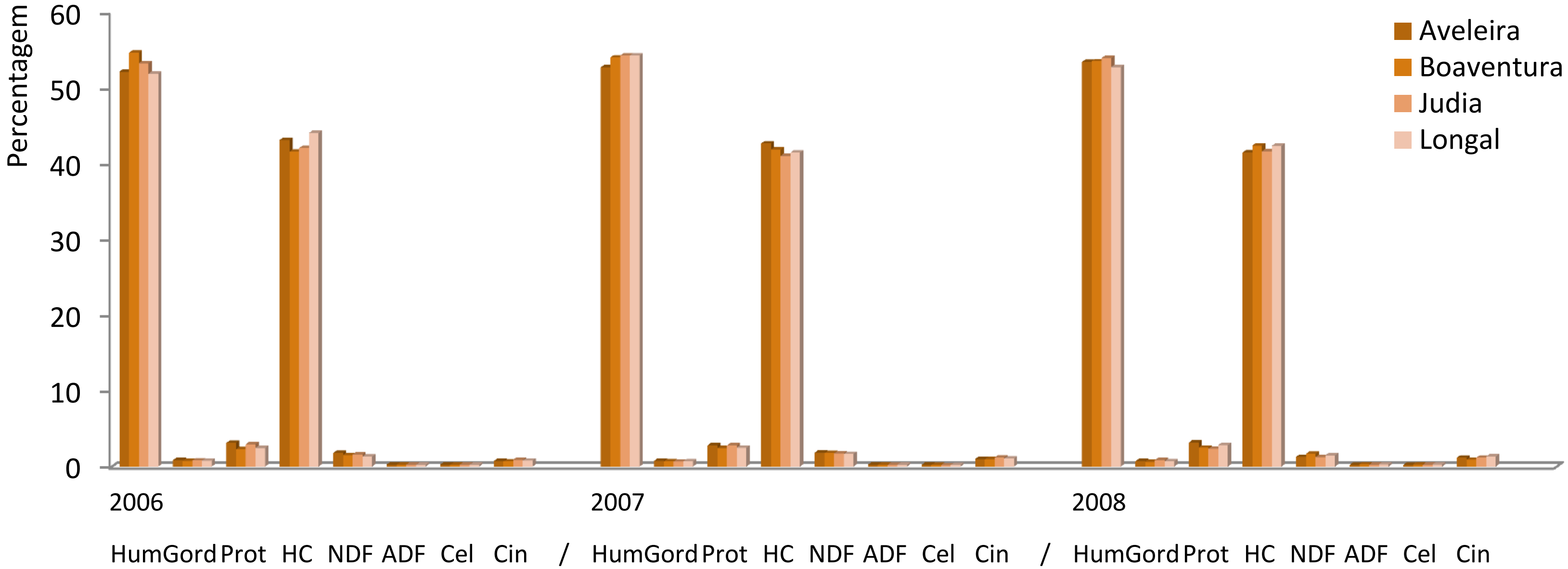


Potencial nutricional

Potencial antioxidante

Potencial antimicrobiano

VALOR NUTRICIONAL CASTANHA



Food and Chemical Toxicology 50 (2012) 2311–2317

Contents lists available at SciVerse ScienceDirect

Food and Chemical Toxicology

journal homepage: www.elsevier.com/locate/foodchemtox

Chemical characterization of chestnut cultivars from three consecutive years: Chemometrics and contribution for authentication

João C.M. Barreira [a,b], Susana Casal [b], Isabel C.F.R. Ferreira [a], António M. Peres [a,c], José Alberto Pereira [a,*], M. Beatriz P.P. Oliveira [b,*]

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[b] REQUIMTE/Departamento de Ciências Químicas, Faculdade de Farmácia da Universidade do Porto, Rua Jorge Viterbo Ferreira, nº 228, 4050-313 Porto, Portugal
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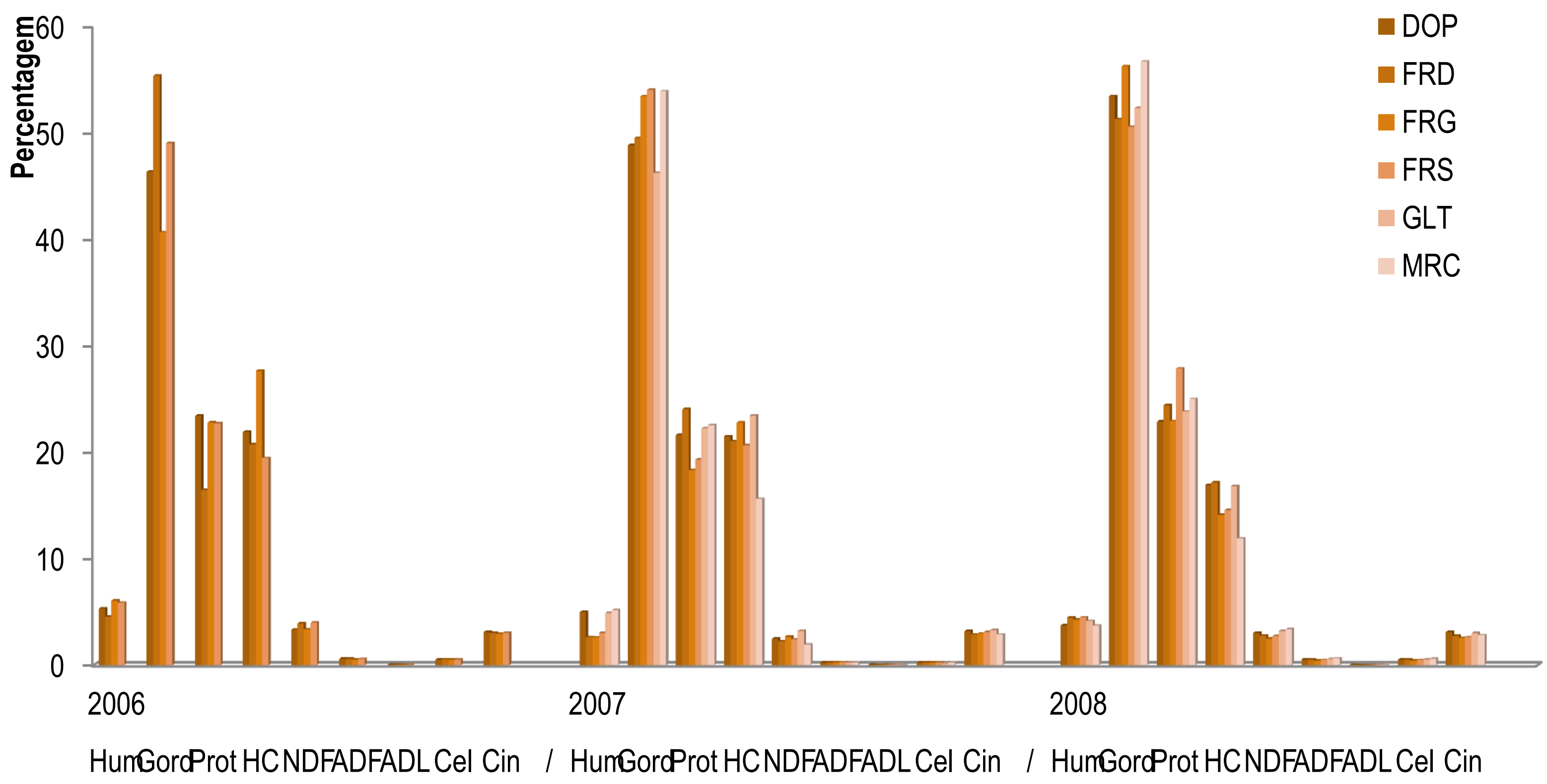
Fonte de Hidratos de carbono

189 kcal/100 g

VALOR NUTRICIONAL AMÊNDOA



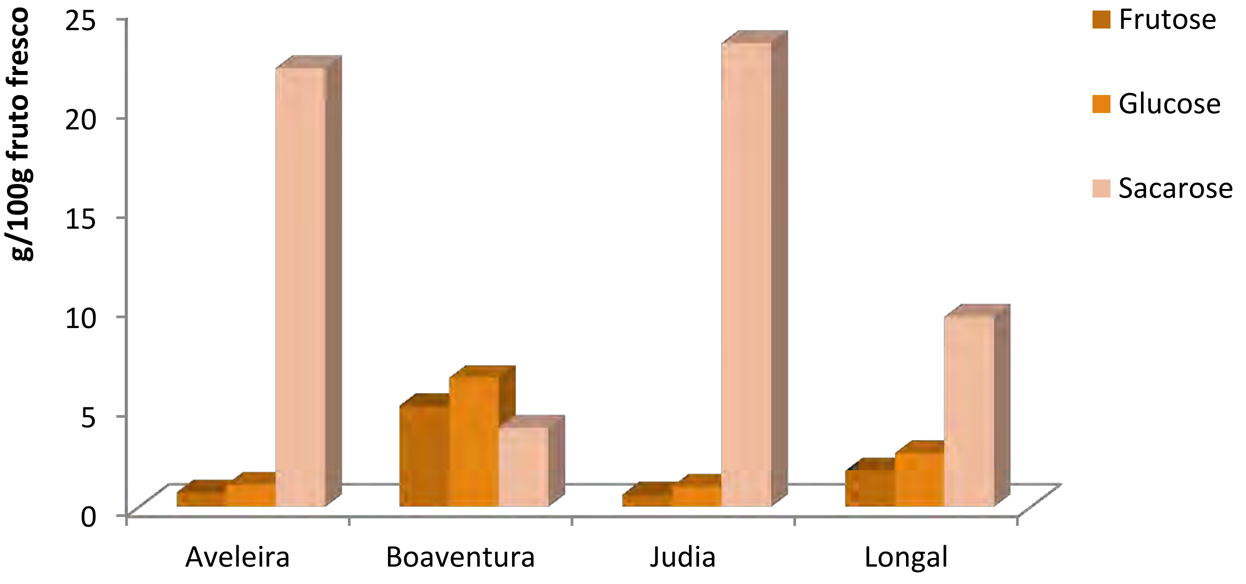
Baixo teor em água: mantém a qualidade e aumenta o tempo de armazenamento

Pode atingir 60% gordura; 100 g amêndoa ultrapassam DDR masculina e feminina

600 Kcal/100 g 20% Proteínas; 7 a 14% Fibras

Ferreira et al., 2012. *Journal of Agricultural and Food Chemistry,* 60, 9697-9704

Glúcidos Castanha



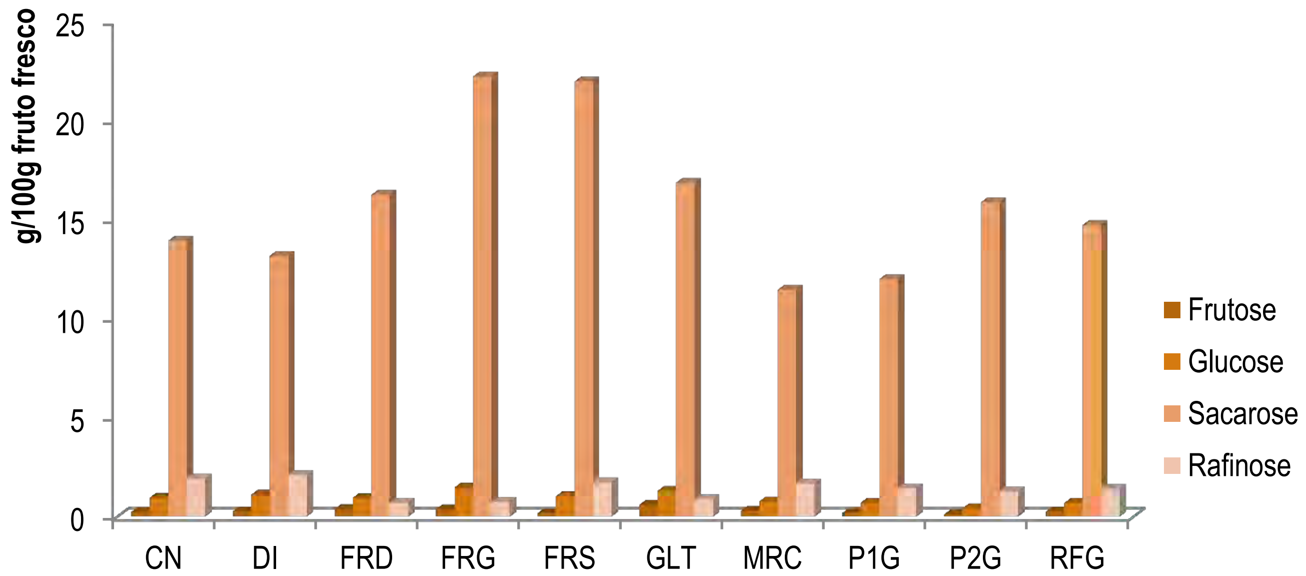
Plant Foods Hum Nutr (2010) 65:38–43
DOI 10.1007/s11130-009-0147-7

ORIGINAL PAPER

Sugars Profiles of Different Chestnut (*Castanea sativa* Mill.) and Almond (*Prunus dulcis*) Cultivars by HPLC-RI

João C. M. Barreira · José Alberto Pereira ·
M. Beatriz P. P. Oliveira · Isabel C. F. R. Ferreira

Glúcidos Amêndoa



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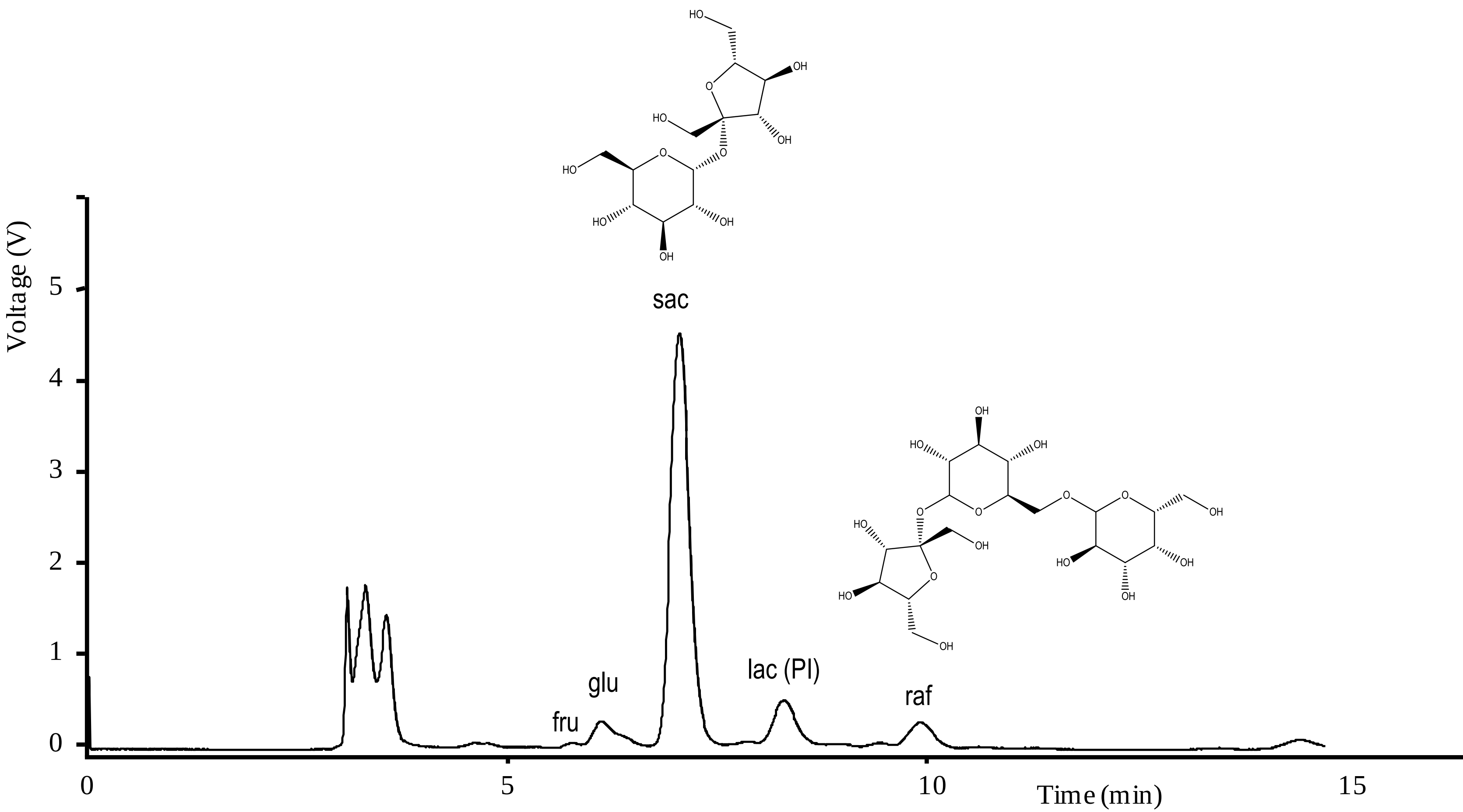
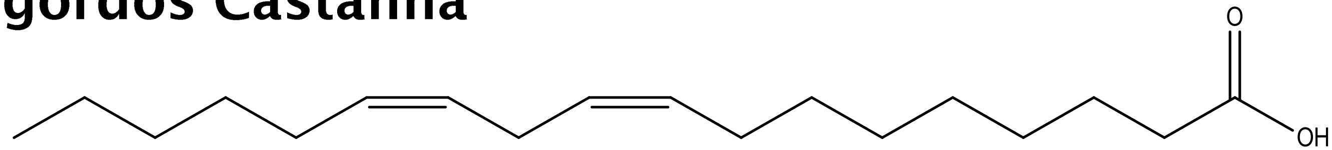
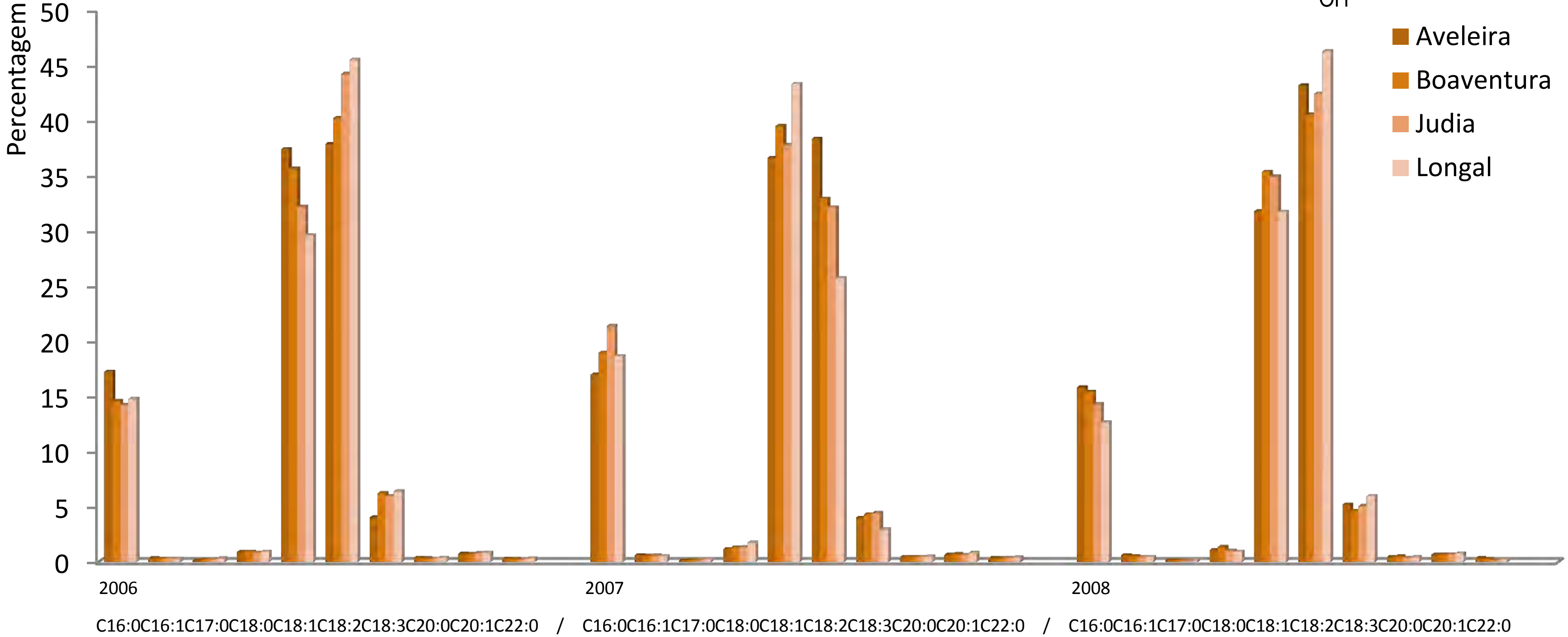
Glúcidos Amêndoa



Ácidos gordos Castanha





2836 *J. Agric. Food Chem.* **2009,** *57,* 2836–2842

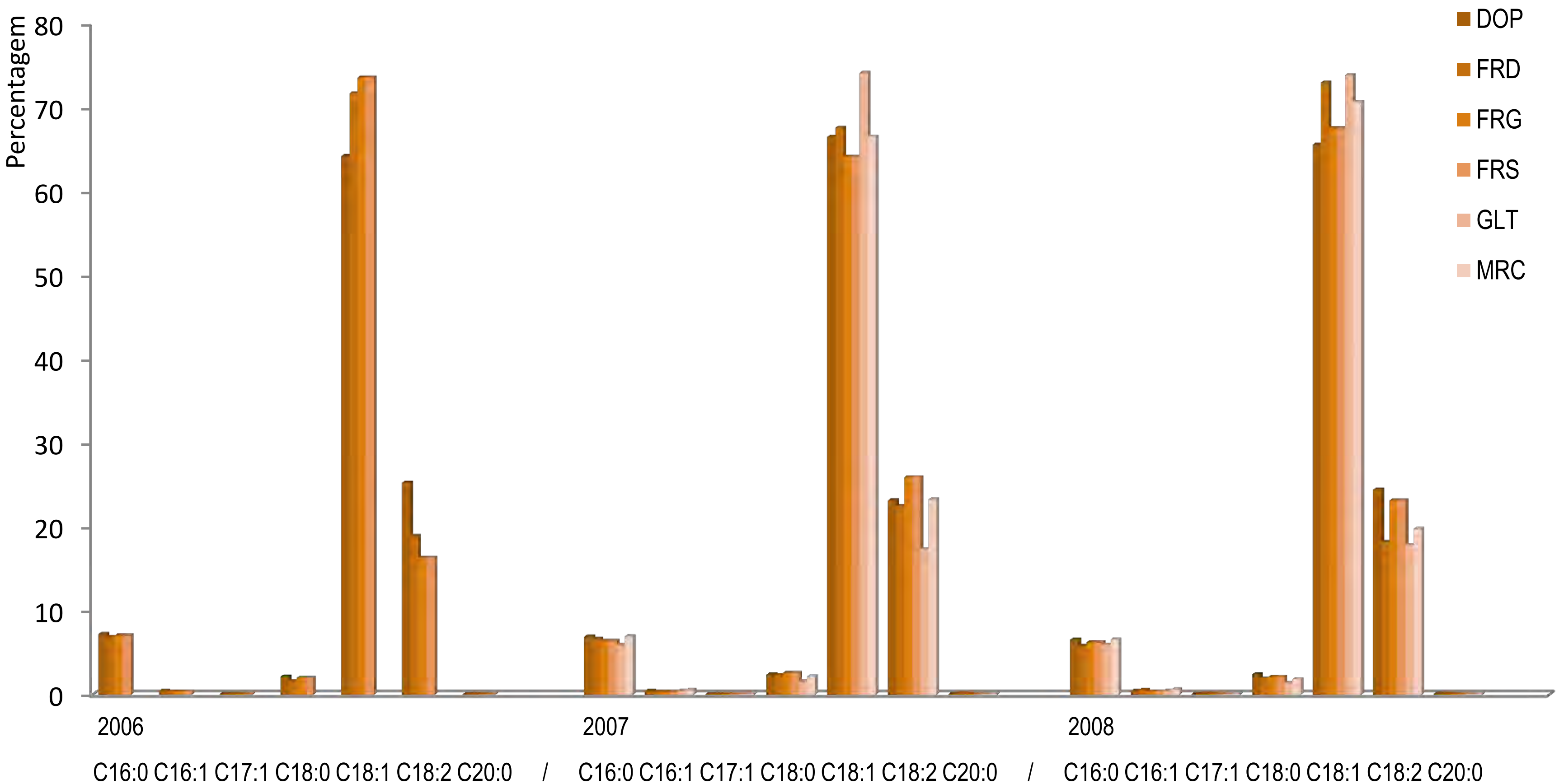
JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY

Nutritional, Fatty Acid and Triacylglycerol Profiles of *Castanea sativa* Mill. Cultivars: A Compositional and Chemometric Approach

João C. M. Barreira,[†,‡] Susana Casal,[‡] Isabel C. F. R. Ferreira,[†] M. Beatriz P. P. Oliveira,[*,‡] and José Alberto Pereira[*,†]

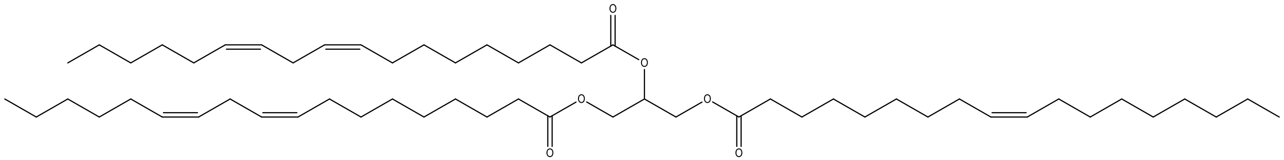
CIMO-Escola Superior Agrária, Instituto Politécnico de Bragança, Campus de Sta. Apolónia, Apartado 1172, 5301-855 Bragança, Portugal, and REQUIMTE/Serviço de Bromatologia, Faculdade de Farmácia da Universidade do Porto, Rua Aníbal Cunha, 164, 4099-030 Porto, Portugal

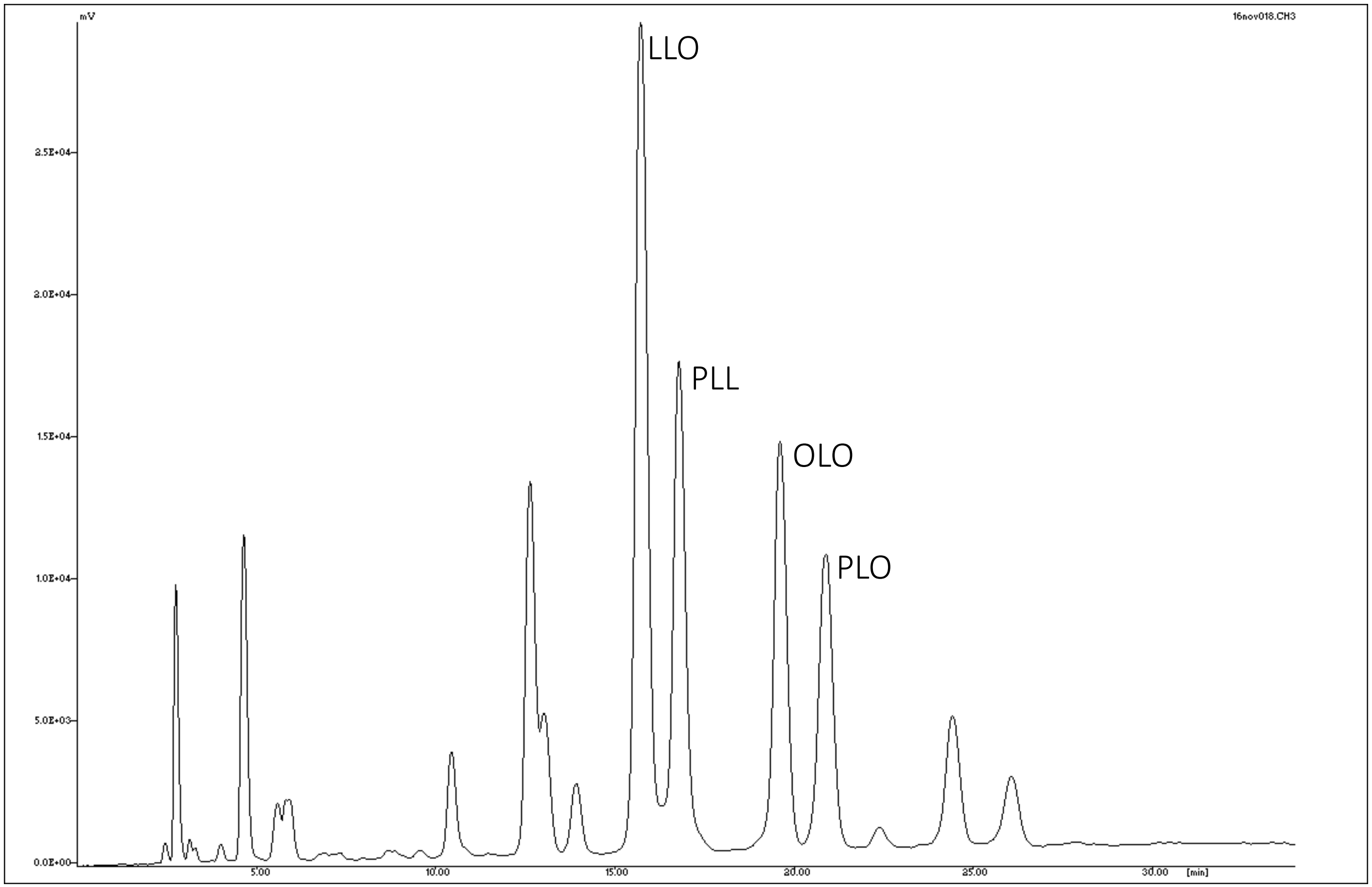
Ácidos gordos Amêndoa



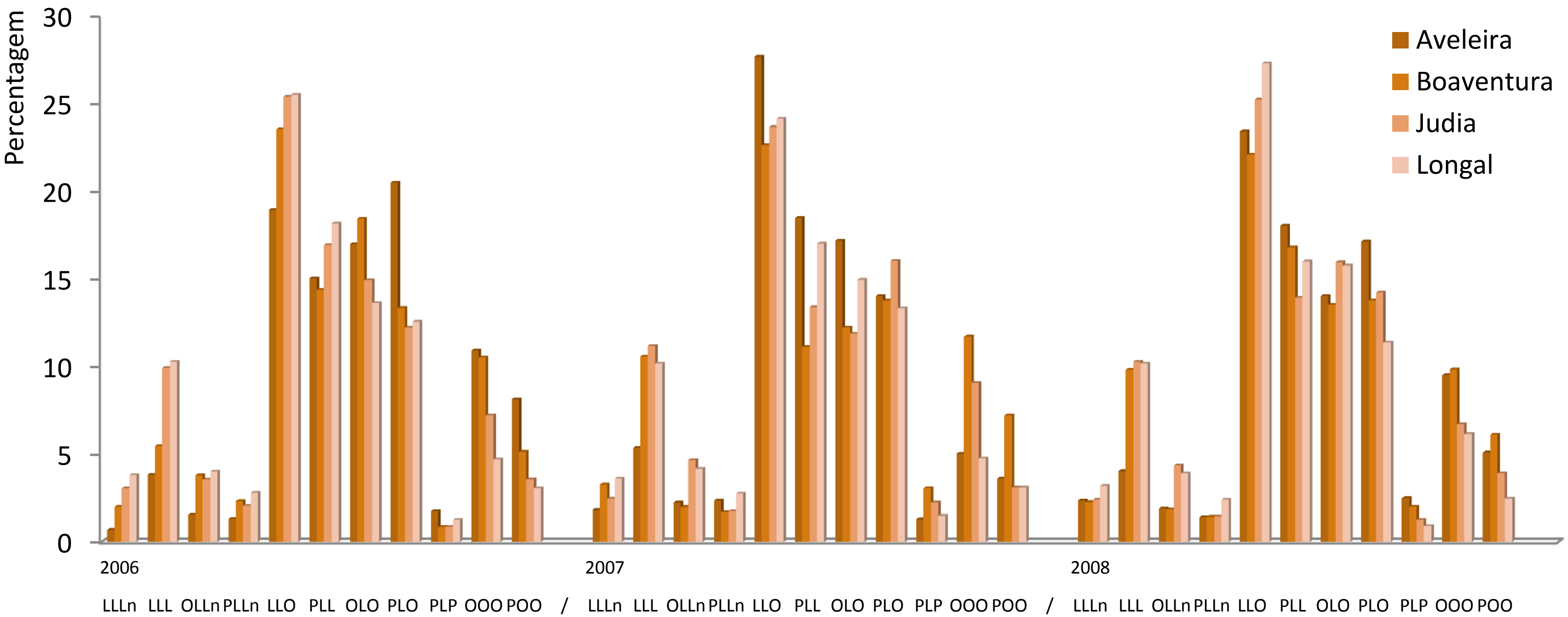
90% AG insaturados: 60% monoinsaturados (ácido oleico) e 30% poilinsaturados (ácido linoleico)

Triacilgliceróis Castanha





Triacilgliceróis Castanha



2836 *J. Agric. Food Chem.* **2009,** *57,* 2836–2842

JOURNAL OF
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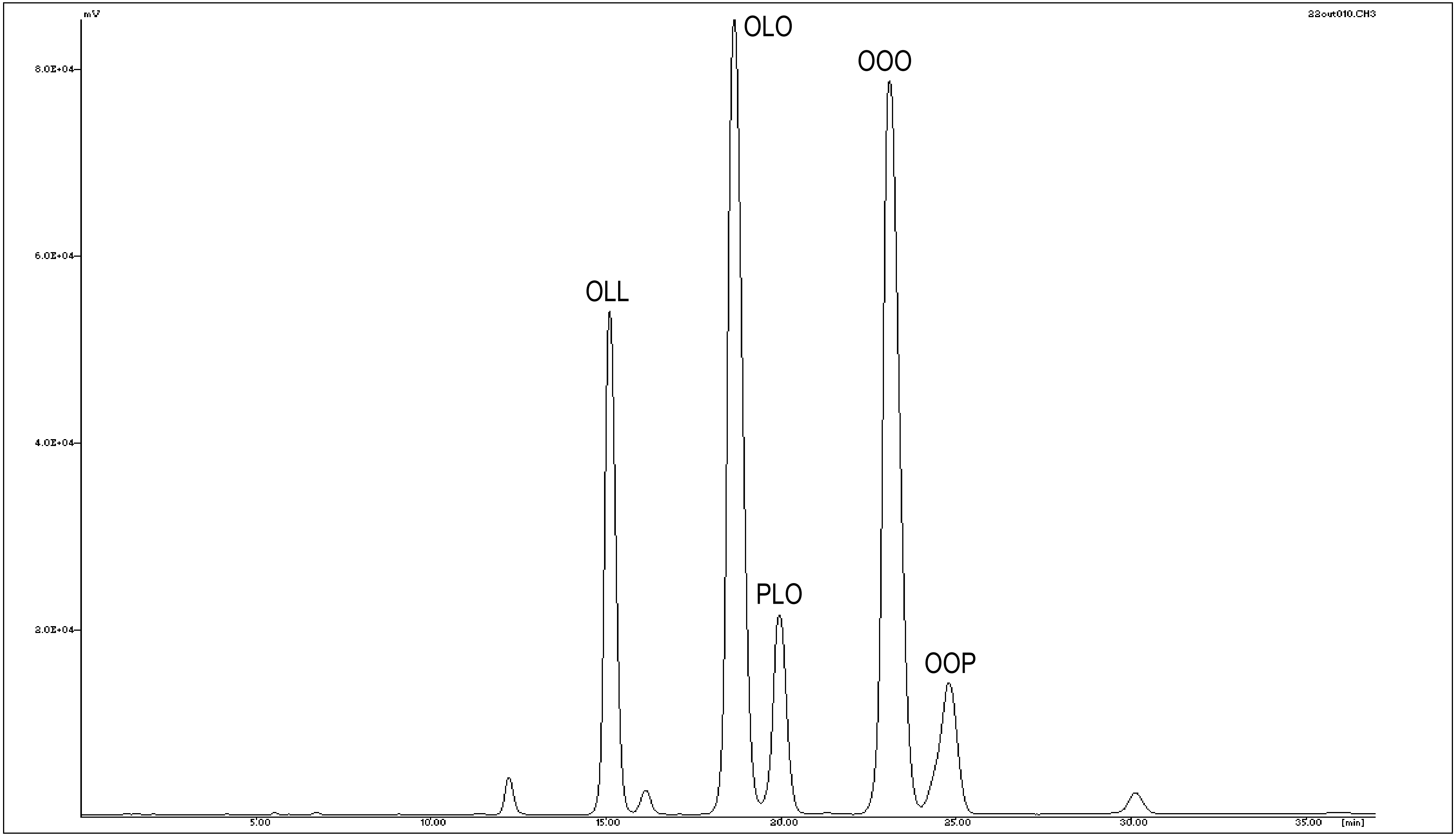
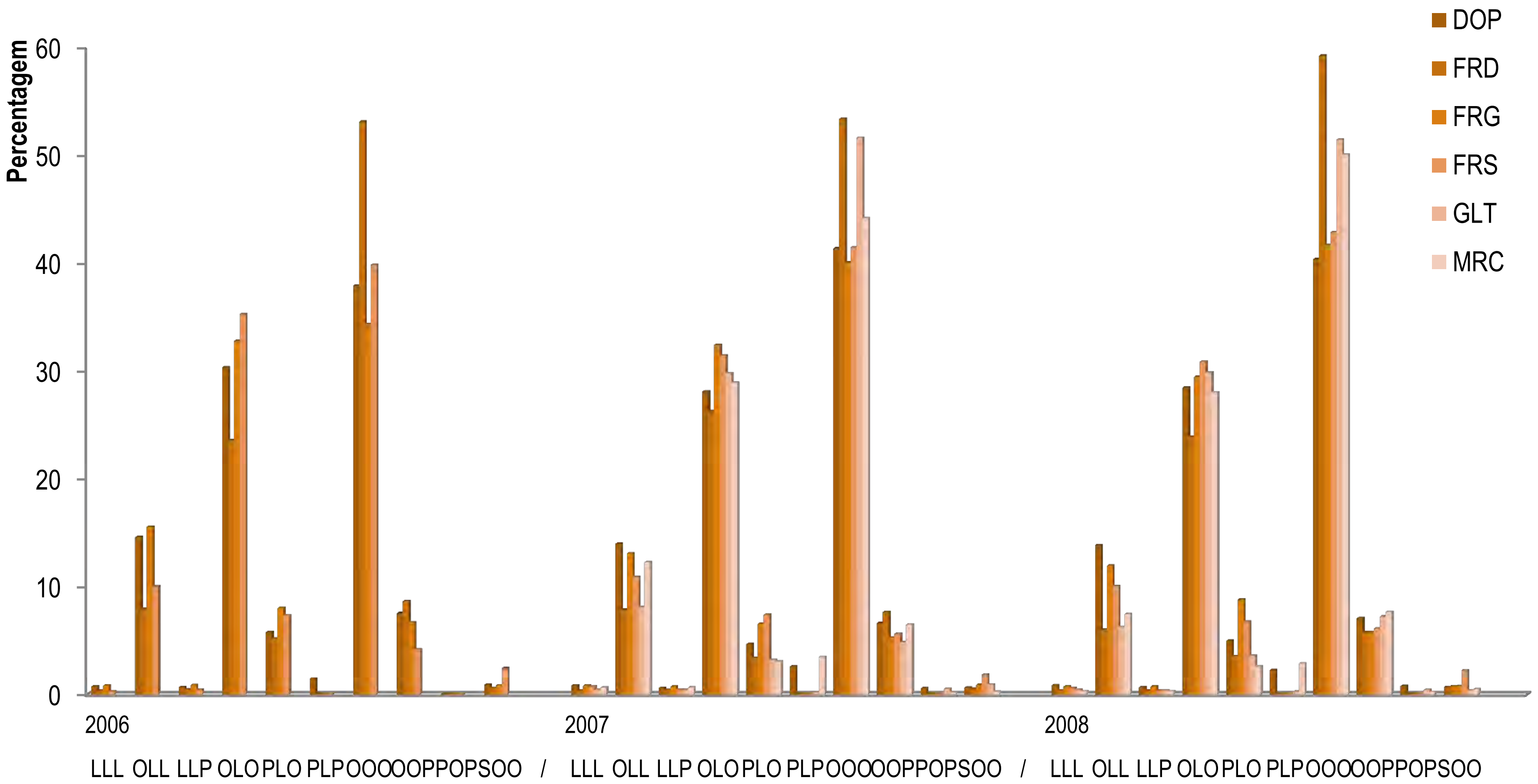
CIMO-Escola Superior Agrária, Instituto Politécnico de Bragança, Campus de Sta. Apolónia, Apartado 1172, 5301-855 Bragança, Portugal, and REQUIMTE/Serviço de Bromatologia, Faculdade de Farmácia da Universidade do Porto, Rua Aníbal Cunha, 164, 4099-030 Porto, Portugal

Triacilgliceróis Amêndoa

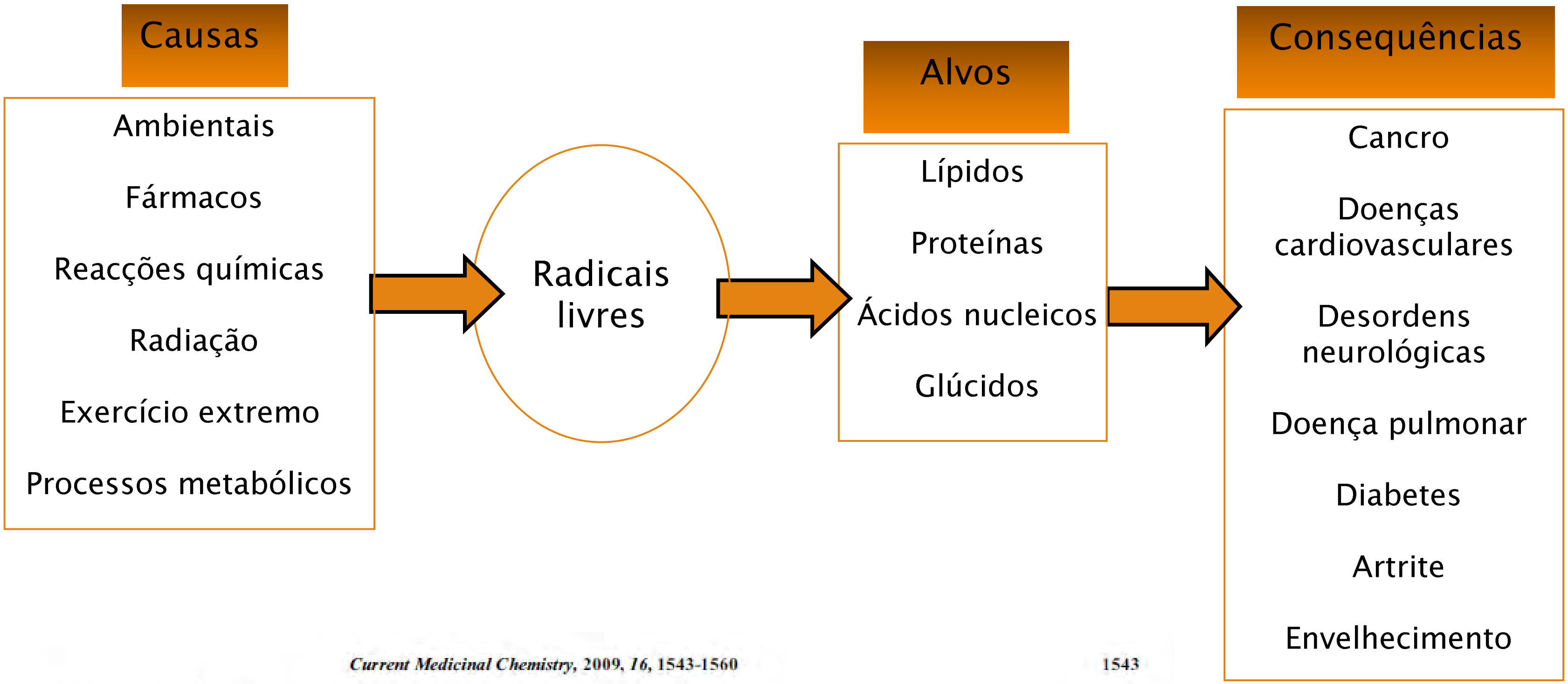


Triacilgliceróis Amêndoa



POTENCIAL ANTIOXIDANTE

<u>Stresse Oxidativo</u>



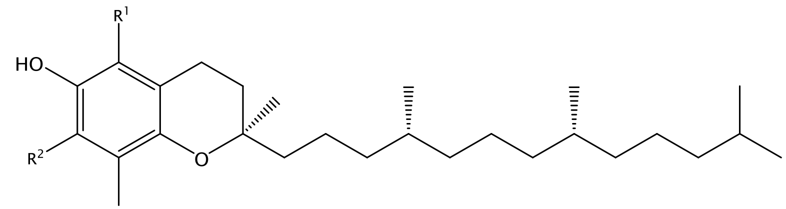
Current Medicinal Chemistry, 2009, *16*, 1543-1560 1543

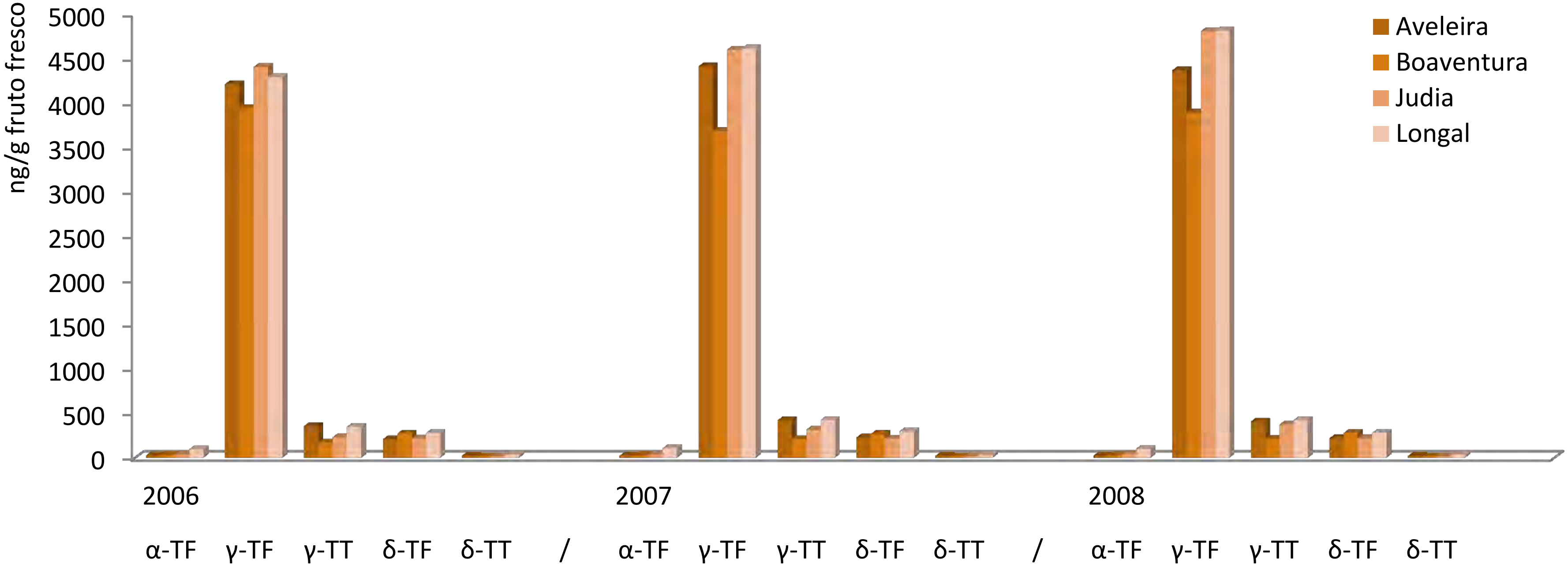
Antioxidants in Wild Mushrooms

Isabel C.F.R. Ferreira*, Lillian Barros and Rui M.V. Abreu

CIMO-ESAB, Instituto Politécnico de Bragança, Campus de Sta. Apolónia, 1172, 5301-855 Bragança, Portugal

Tocoferóis Castanha





5524 *J. Agric. Food Chem.* **2009,** *57,* 5524–5528
DOI:10.1021/jf900435y

JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY
ARTICLE

Vitamin E Profile as a Reliable Authenticity Discrimination Factor between Chestnut (*Castanea sativa* Mill.) Cultivars

João C. M. Barreira,[†,§] Rita C. Alves,[†] Susana Casal,[†] Isabel C. F. R. Ferreira,[§] M. Beatriz P. P. Oliveira,[*,†] and José Alberto Pereira[*,§]

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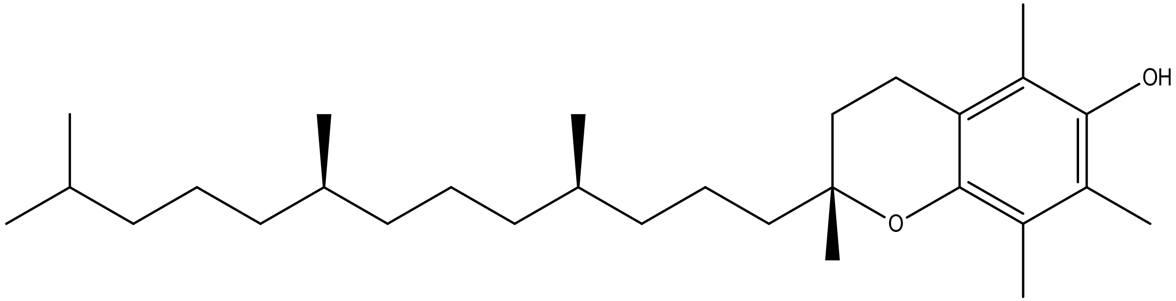
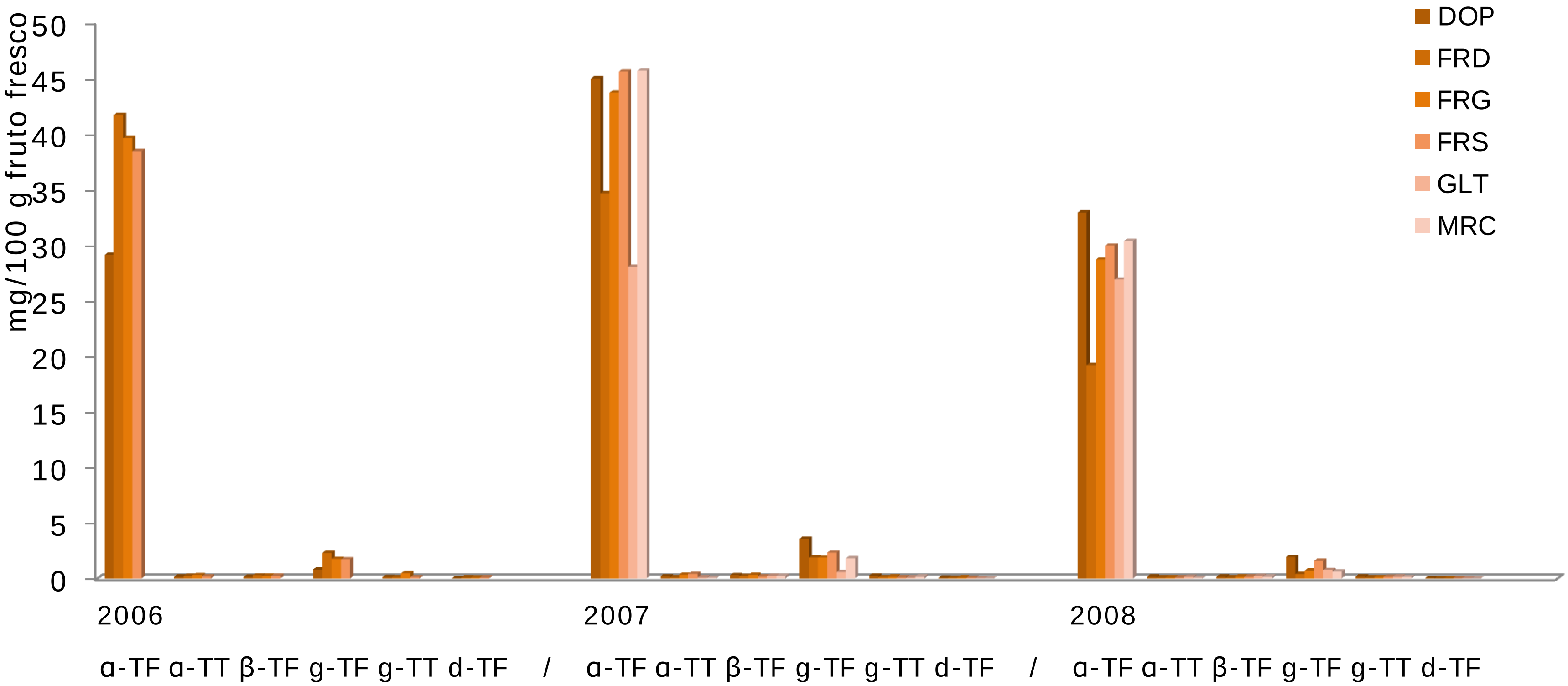
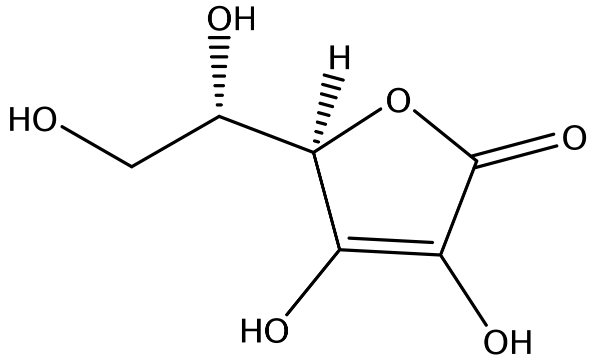
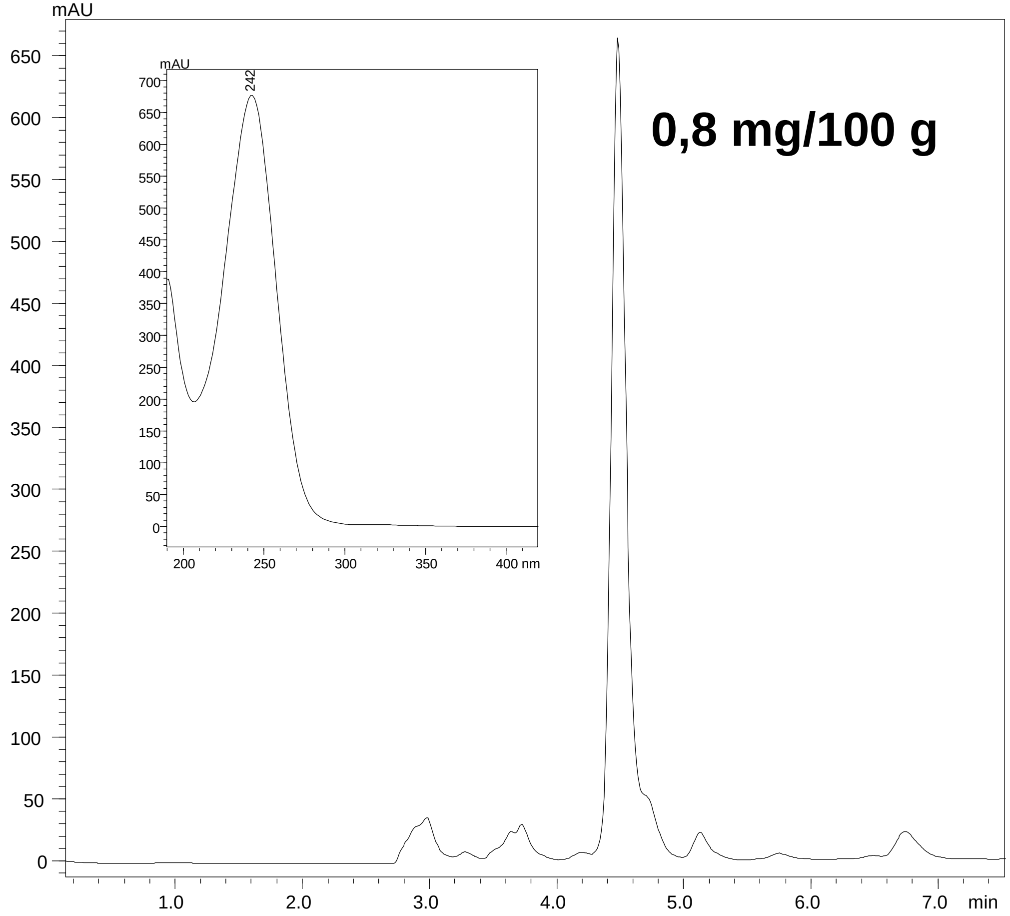
Tocoferóis Amêndoa

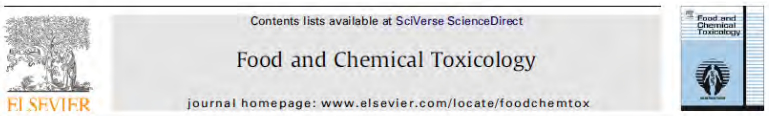




Ácido ascórbico Castanha







Food and Chemical Toxicology 55 (2013) 348–352

Contents lists available at SciVerse ScienceDirect

Food and Chemical Toxicology

journal homepage: www.elsevier.com/locate/foodchemtox

Analysis of organic acids in electron beam irradiated chestnuts (*Castanea sativa* Mill.): Effects of radiation dose and storage time

Márcio Carocho [a], Lillian Barros [a], Amilcar L. Antonio [a,b,c], João C.M. Barreira [a,d], Albino Bento [a], Iwona Kaluska [e], Isabel C.F.R. Ferreira [a,*]

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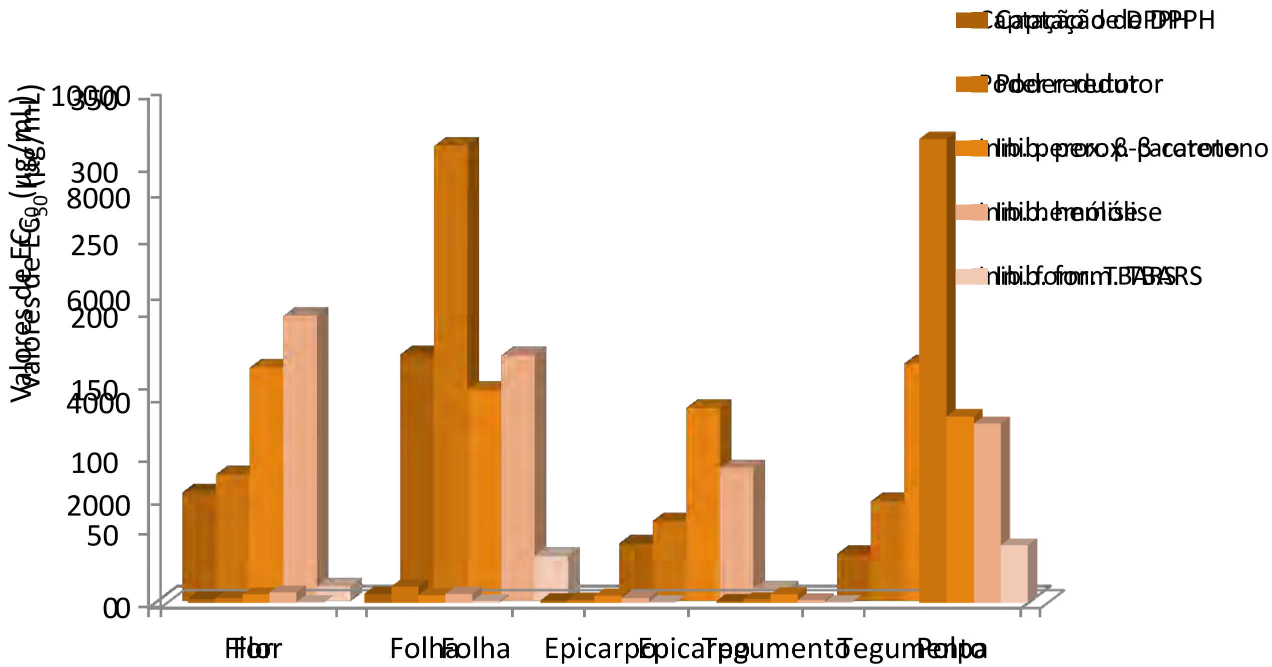
[d] REQUIMTE, Departamento de Ciências Químicas, Faculdade de Farmácia da Universidade do Porto, Rua Jorge Viterbo Ferreira, 228, 4050-313 Porto, Portugal
[e] Centre for Radiation Research and Technology, Institute of Nuclear Chem. and Technology, Dorodna str. 16, 03-195 Warsaw, Poland

POTENCIAL ANTIOXIDANTE Castanha



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Food Chemistry 107 (2008) 1106–1113

Food Chemistry

www.elsevier.com/locate/foodchem

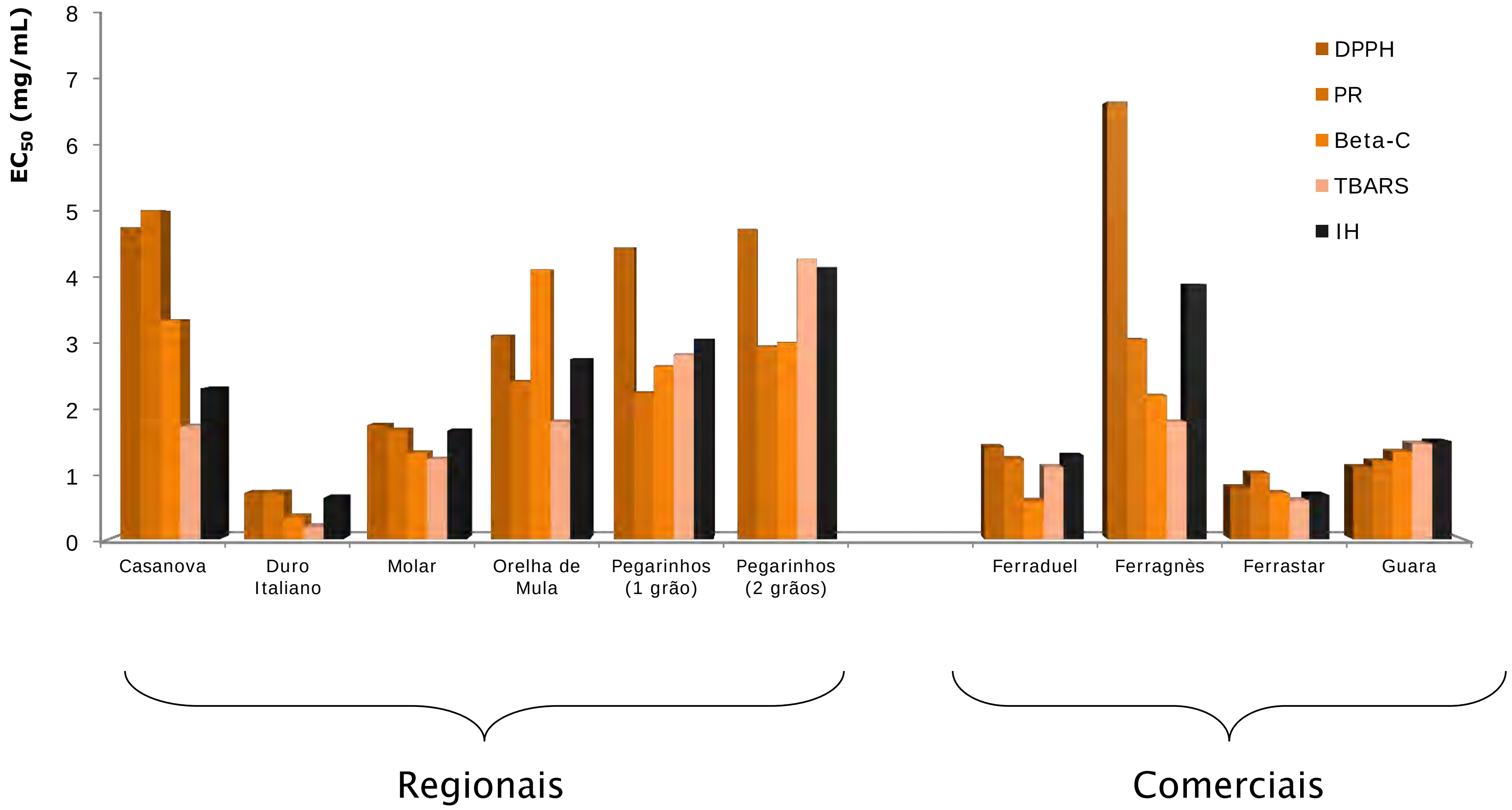
Antioxidant activities of the extracts from chestnut flower, leaf, skins and fruit

João C.M. Barreira [a,b], Isabel C.F.R. Ferreira [a,*], M. Beatriz P.P. Oliveira [b], José Alberto Pereira [a]

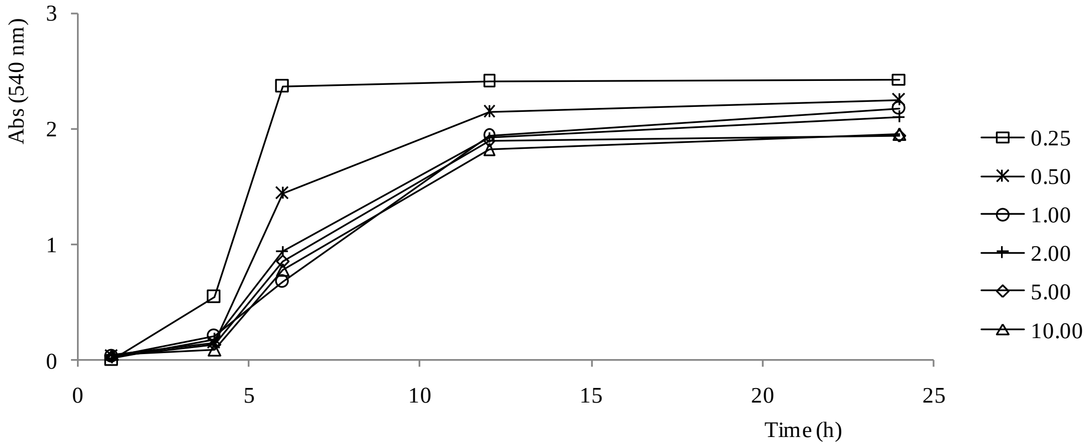
[a] CIMO/Escola Superior Agrária, Instituto Politécnico de Bragança, Campus de Santa Apolónia, Apartado 1172, 5301-855 Bragança, Portugal
[b] REQUIMTE/Serviço de Bromatologia, Faculdade de Farmácia da Universidade do Porto, Rua Aníbal Cunha, 164, 4099-030 Porto, Portugal

Received 22 May 2007; received in revised form 17 August 2007; accepted 11 September 2007

POTENCIAL ANTIOXIDANTE Amêndoa



POTENCIAL ANTIOXIDANTE Amêndoa



O efeito protetor da cultivar "Duro Italiano" na hemólise de eritrócitos manteve-se durante 4 horas!


Food and Chemical Toxicology
Volume 46, Issue 6, June 2008, Pages 2230–2235

Antioxidant activity and bioactive compounds of ten Portuguese regional and commercial almond cultivars

João C.M. Barreira[a, b], Isabel C.F.R. Ferreira[a], M. Beatriz P.P. Oliveira[b], José Alberto Pereira[a]

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doi:10.1016/j.fct.2008.02.024

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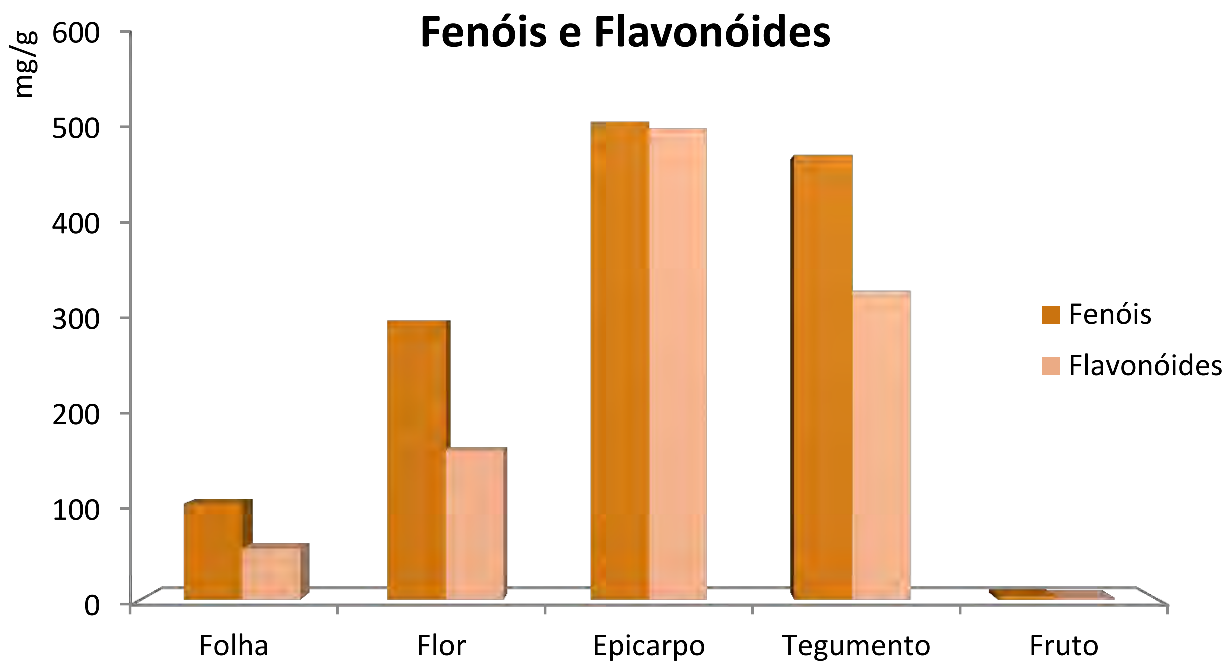
POTENCIAL ANTIOXIDANTE Castanha



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Food Chemistry 107 (2008) 1106–1113
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Antioxidant activities of the extracts from chestnut flower, leaf, skins and fruit

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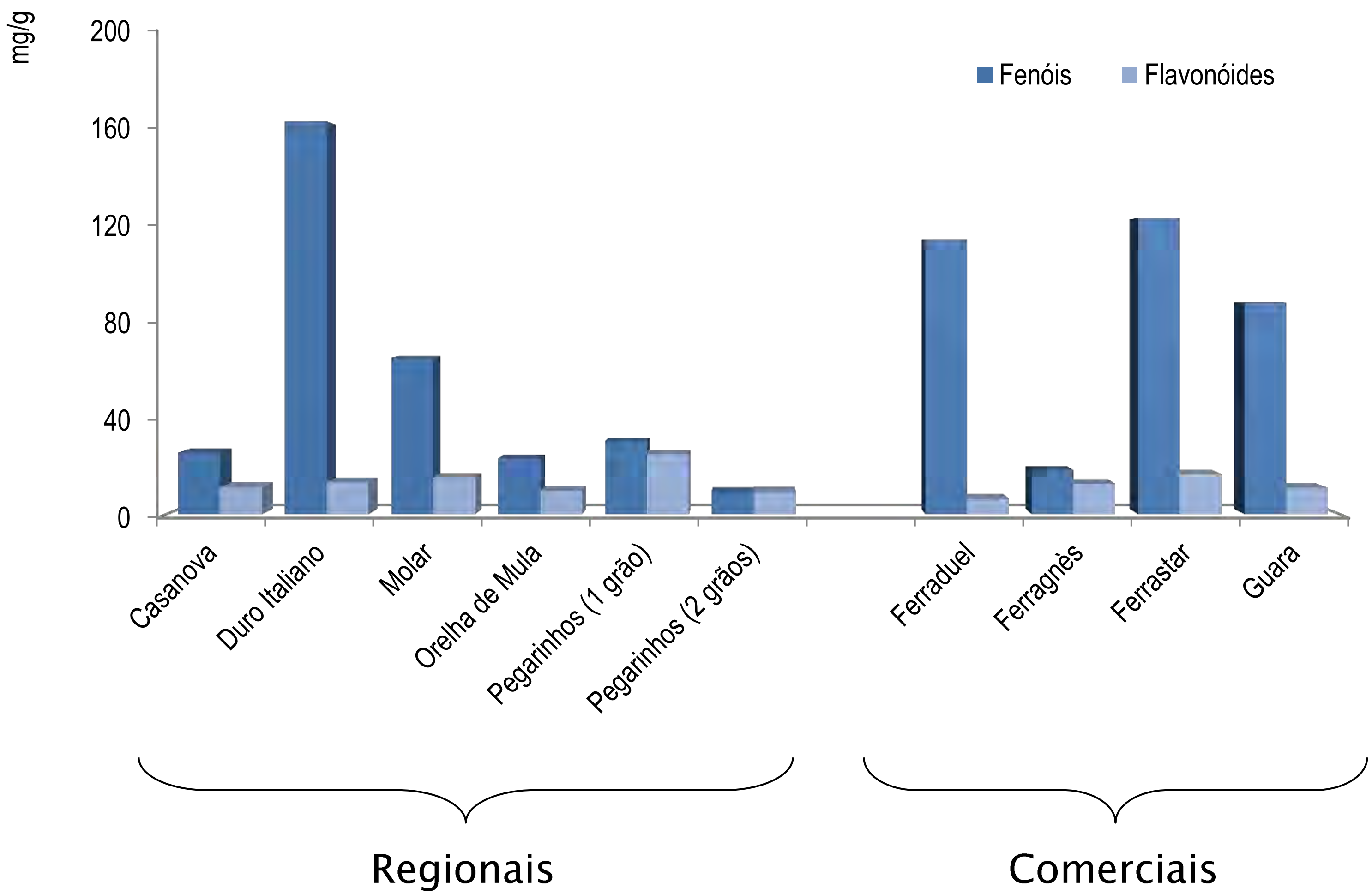
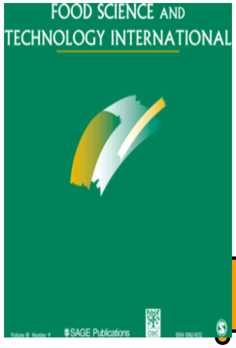


A casca de amêndoa também tem propriedades antioxidantes …

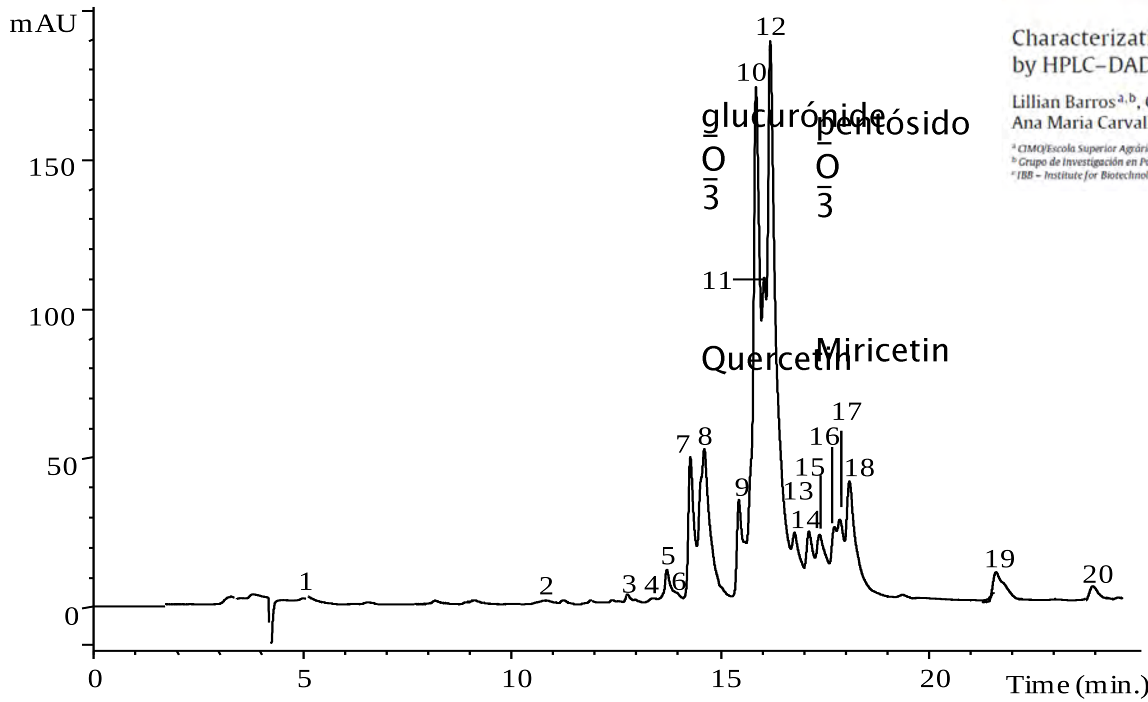
	β-car	BARS	RSA	PR
Duro Italiano	227.37±18.44^{c}	29.20±2.65^{d}	175.03±11.42^{c}	206.96±20.63^{c}
Ferraduel	284.91±17.52^{a}	103.52±6.78^{a}	216.37±14.15^{a}	376.30±27.67^{a}
Ferranhês	250.23±18.83^{b}	39.95±3.63^{c}	209.22±14.61^{a}	218.11±21.06^{c}
Ferrastar	211.37±9.25^{d}	28.11±1.15^{d}	176.82±12.34^{c}	169.85±4.53^{d}
Orelha de Mula	276.77±10.53^{a}	74.15±3.61^{b}	190.33±4.53^{b}	306.46±22.13^{b}



Ferreira et al. Food Science and Technology International, 2010, 16, 209-216.

FLOR DE CASTANHEIRO: Compostos fenólicos

	Rt (min)	λ_{max} (nm)	Ion Molecular [M-H]⁻ (m/z)	MS² (m/z)		Quantificação (μg/g, fw)
Castanea sativa (flores)						
1	5.0	270	169	125(100)	Gallic acid	**16.71 ± 0.62**
2	10.3	280	289	245(35), 203(14), 137(21)	(+)-Catechin	**379.94 ± 17.18**
3	13.4	276	635	465(100), 313(15), 169(6)	Trigalloyl glucose	**2067.68 ± 17.22**
4	13.7	276	937	937(100), 767(4), 635(4), 465(26), 301(3)	Trigalloyl HHDP glucose	**1508.57 ± 23.32**
5	13.9	274	937	937(100), 637(8), 465(67), 301(10)	Trigalloyl HHDP glucose	**9854.25 ± 73.64**
6	14.0	356	493	317(100)	Myricetin 3-*O*-glucuronide	**359.41 ± 0.09**
7	14.1	358	479	317(100)	Myricetin 3-*O*-glucoside	**380.92 ± 4.98**
8	15.3	274	937	937(100), 767(2), 637(4), 467(81), 301(25)	Trigalloyl HHDP glucose	**992.26 ± 65.69**
9	15.6	354	609	301(100)	Quercetin 3-*O*-rutinoside	**65.68 ± 7.90**
10	15.8	354	477	301(100)	Quercetin 3-*O*-glucuronide	**672.55 ± 51.58**
11	15.9	276	937	937(100), 767(12), 637(12), 467(20), 301(30)	Trigalloyl HHDP glucose	**450.54 ± 35.57**
12	16.0	356	449	317(100)	Myricetin 3-*O*-pentoside	**386.14 ± 2.94**
13	16.1	356	463	301(100)	Quercetin 3-*O*-glucoside	**899.07 ± 0.88**
14	16.8	342	593	285(100)	Kaempferol 3-*O*-rutinoside	**191.58 ± 18.99**
15	17.1	356	623	315(100)	Isorhamnetin 3-*O*-rutinoside	**135.73 ± 11.90**
16	17.3	356	433	301(100)	Quercetin *O*-pentoside	**138.75 ± 7.35**
17	17.7	348	447	301(100)	Quercetin 3-O-rhamnoside	**100.75 ± 7.50**
18	18.0	356	477	315(100)	Isorhamnetin 3-*O*-glucoside	**249.33 ± 6.70**
19	21.6	354	609	463(100), 301(93)	Quercetin-*O*-rhamnoside-*O*-hexoside	**53.05 ± 3.65**
20	**23.9**	**356**	**593**	**447(8), 285(100)**	**Kaempferol-*O*-rhamnoside-*O*-hexoside**	**71.00 ± 5.10**



Industrial Crops and Products 44 (2013) 104–110
Contents lists available at SciVerse ScienceDirect
Industrial Crops and Products
journal homepage: www.elsevier.com/locate/indcrop

Characterization of phenolic compounds in wild medicinal flowers from Portugal by HPLC–DAD–ESI/MS and evaluation of antifungal properties

Lillian Barros[a,b], Carlos Tiago Alves[c], Montserrat Dueñas[b], Sónia Silva[c], Rosário Oliveira[c], Ana Maria Carvalho[a], Mariana Henriques[c,**], Celestino Santos-Buelga[b], Isabel C.F.R. Ferreira[a,*]
[a] CIMO/Escola Superior Agrária, Instituto Politécnico de Bragança, Campus de Santa Apolónia, Apartado 1172, 5301-855 Bragança, Portugal
[b] Grupo de Investigación en Polifenoles (GIP-USAL), Facultad de Farmacia, Universidad de Salamanca, Campus Miguel de Unamuno, 37007 Salamanca, Spain
[c] IBB – Institute for Biotechnology and Bioengineering, Centre of Biological Engineering, University of Minho, 4710-057 Braga, Portugal

TrigaloIL-HHDP-glucósido
Pentagaloil glucose
Isómero de Pedunculagin(bis-HHDP-glucose)

Decocções melhores que infusões

Hindawi Publishing Corporation
BioMed Research International
Volume 2014, Article ID 232956, 7 pages
http://dx.doi.org/10.1155/2014/232956

Research Article

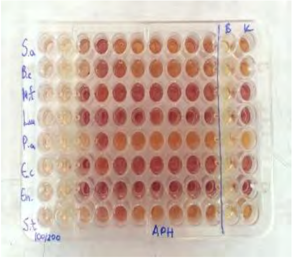
Castanea sativa Mill. Flowers amongst the Most Powerful Antioxidant Matrices: A Phytochemical Approach in Decoctions and Infusions

Márcio Carocho,[1,2] Lillian Barros,[1] Albino Bento,[1] Celestino Santos-Buelga,[3] Patricia Morales,[2] and Isabel C. F. R. Ferreira[1]

Atividade antimicrobiana e citotoxicicdade

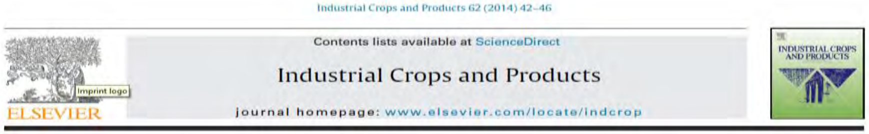
	C. albicans	*C. glabrata*	*C. parapsilosis*	*C. tropicalis*
Castanea sativa	0,625	< 0,05	< 0,05	0,625

Bacillus cereus
Salmonella typhimurium
Enterobacter cloacae



Aspergillus versicolor
Trichoderma víride
Penicillium ochlochloron

HCT15 (carcinoma colon)
HepG2 (carcinoma hepatocelular)
Ausência de hepatotoxicidade- PLP2


Industrial Crops and Products 62 (2014) 42–46
Contents lists available at ScienceDirect
Industrial Crops and Products
journal homepage: www.elsevier.com/locate/indcrop

Infusions and decoctions of *Castanea sativa* flowers as effective antitumor and antimicrobial matrices

Márcio Carocho[a,b], Ricardo C. Calhelha[a,c], Maria-João R.P. Queiroz[c], Albino Bento[a], Patricia Morales[b], Marina Soković[d], Isabel C.F.R. Ferreira[a,*]

Comprehensive REVIEWS in Food Science and Food Safety

Adding Molecules to Food, Pros and Cons: A Review on Synthetic and Natural Food Additives

Márcio Carocho, Maria Filomena Barreiro, Patricia Morales, and Isabel C.F.R. Ferreira

Abstract: The pressing issue to feed the increasing world population has created a demand to enhance food production, which has to be cheaper, but at the same time must meet high quality standards. Taste, appearance, texture, and microbiological safety are required to be preserved within a foodstuff for the longest period of time. Although considerable improvements have been achieved in terms of food additives, some are still enveloped in controversy. The lack of uniformity in worldwide laws regarding additives, along with conflicting results of many studies help foster this controversy. In this report, the most important preservatives, nutritional additives, coloring, flavoring, texturizing, and miscellaneous agents are analyzed in terms of safety and toxicity. Natural additives and extracts, which are gaining interest due to changes in consumer habits are also evaluated in terms of their benefits to health and combined effects. Technologies, like edible coatings and films, which have helped overcome some drawbacks of additives, but still pose some disadvantages, are briefly addressed.

Future trends like nanoencapsulation and the development of "smart" additives and packages, specific vaccines for intolerance to additives, use of fungi to produce additives, and DNA recombinant technologies are summarized.

Keywords: natural food additives, antimicrobial, antioxidant, conservatives, 34 Colorants

Historic Background of Food Additives

Since the dawn of man, our species searches for better ways to feed itself, by developing more efficient methods of hunting, animal/vegetable domestication, food preservation by physical methods, and finally, by adding molecules to food in order to enhance flavors or to preserve it.

Back in the 1800s, food additives were intentionally used for food adulteration. This practice was widespread due to the centralization of food processing, decline of personal accountability, birth of analytical chemistry, and inadequate governmental regulation. The consequence of such uncontrolled tampering of food led to a serious worldwide problem with concern about food quality rising gradually. In 1920, the availability of effective methods for food analysis, together with regulatory pressures, started to reduce the significance of this problem. In the middle of the 20th century, processed food became an important part of human nutrition, and legal chemical additives became increasingly prevalent in them, fostering tight regulation, which still remains controversial due to the high number of studies concerning food additives that produce conflicting results and different interpretations by governments (Fennema 1987).

Today, more than 2500 additives are intentionally added to food in order to keep certain properties or to extend shelf life, while many others were banned throughout the years, some of them at a global level and others only in specific countries (Branen and others 2001). The definition of food additive has changed during time, being today defined as "any substance not normally consumed as a food by itself and not normally used as a typical ingredient of the food, whether or not it has nutritive value, the intentional addition of which to food for a technological (including organoleptic) purpose in the manufacture, processing, preparation, treatment, packing, packaging, transport or holding of such food results, or may be reasonably expected to result (directly or indirectly), in it or its by-products becoming a component of or otherwise affecting the characteristics of such foods. The term does not include contaminants or substances added to food for maintaining or improving nutritional qualities" (Codex Alimentarius). This definition was proposed in 1995 by the joint panel, comprised by the Food and Agriculture Organization (FAO) of the United Nations and by the World Health Organization (WHO) and being revised during all the subsequent years, with the last revision in 2012. Today, the Codex Alimentarius gathers all the information regarding standards, codes of practice, and guidelines

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doi: 10.1111/1541-4337.12065

Food & Function

REVIEW

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Cite this: Food Funct., 2015, 6, 1035

Microencapsulation of bioactives for food applications†

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Health issues are an emerging concern to the world population, and therefore the food industry is searching for novel food products containing health-promoting bioactive compounds, with little or no synthetic ingredients. However, there are some challenges in the development of functional foods, particularly in which the direct use of some bioactives is involved. They can show problems of instability, react with other food matrix ingredients or present strong odour and/or flavours. In this context, microencapsulation emerges as a potential approach to overcome these problems and, additionally, to provide controlled or targeted delivery or release. This work intends to contribute to the field of functional food development by performing a comprehensive review on the microencapsulation methods and materials, the bioactives used (extracts and isolated compounds) and the final application development. Although several studies dealing with microencapsulation of bioactives exist, they are mainly focused on the process development and the majority lack proof of concept for final applications. These factors, together with the lack of regulation, in Europe and in the United States, delay the development of new functional foods and, consequently, their market entry. In conclusion, the potential of microencapsulation to protect bioactive compounds ensuring their bioavailability is shown, but further studies are required, considering both its applicability and incentives by regulatory agencies.

Received 19th December 2014,
Accepted 7th February 2015

DOI: 10.1039/c4fo01175a

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1. Introduction

1.1. The increasing interest in functional foods

Nowadays, food not only serves to satisfy the primal urge of hunger, but also is a means to promote consumer's health. In this context, the food industry has focused on avoiding the potential harmfulness of synthetic food additives and on developing novel food products containing health-promoting ingredients. Therefore, bioactive natural products are considered as viable and safer substitutes to satisfy the world market demand for new products.[1]

"Functional foods" arise as the frontier between nutrition and health, providing a long-term beneficial physiological/health effect beyond their nutritional properties.[1] The concept of functional food appeared 40 years ago, however the growing interest in this type of product, either from industry (through patents) or academia (through scientific research articles and reviews), was only observed from the second half of the 1990s, indicating an increasing tendency (Fig. 1). The exponential growth of patents and scientific research articles/reviews observed since 2005 was accompanied by the regulation (EC) no. 1924/2006 publication by the European Parliament on nutrition and health claims in foods, which was completed and finalized in 2011 by the European Food Safety Authority (EFSA) regarding beneficial health claims in certain food ingredients.[2,3] In the United States (US) the regulation of functional foods is facilitated, as the food industry itself provides the product definition that will be placed on the market; food companies are only obliged to follow labelling and safety rules implemented by the Food and Drug Administration (FDA).[4]

Nowadays, consumers' awareness of health issues is growing together with the increasing incidence of chronic age-related diseases, such as neurodegenerative diseases, diabetes and cancer, usually correlated with the lifestyle and dietary habits of our societies.[5] Moreover, as the life expectancy is rising, with the consequent increase of health care costs, pharmaceutical and food industries have started to consider functional foods as a new market with huge growth potential. Nowadays, Japan, the United States (US) and the European Union (EU) are the leading markets for functional foods, representing in total 90% of the world market supply for this type of product.[6] In 2006, US and EU markets were valued at 33 billion US$ and at 15 billion US$, respectively, with a

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† Electronic supplementary information (ESI) available. See DOI: 10.1039/c4fo01175a

FLOR DE CASTANHEIRO EM ALIMENTOS FUNCIONAIS…

Antioxidantes naturais como conservantes na industria alimentar

Um novo queijo

6 meses

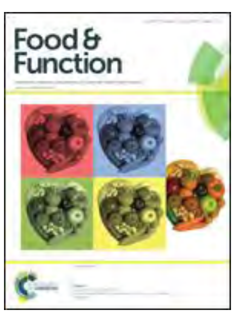
ALIMENTOS FUNCIONAIS

Alimentos Funcionais

Alimentos ou componentes de dietas que para além de nutrir têm também benefícios para a saúde de quem os consome

Nutracêuticos

Substância que existe no alimento funcional e contém propriedades que permitem a prevenção ou tratamento de uma doença ou trazer algum benefício para a saúde



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ROYAL SOCIETY OF CHEMISTRY

Algumas conclusões deste projeto

Desenvolvimento de produto

Novo produto na indústria de laticínios

Queijo com cores e sabores diferentes

Bioatividade

Bioatividade conferida ao queijo pelas flores de castanheiro e respetivas decocções (efeitos benéficos para a saúde).

Conservação

A perda de água mais rápida (nos queijos funcionalizados) ajuda a reduzir o risco do desenvolvimento de fungos proteolíticos.

Conservação de alguns ácidos gordos insaturados

Investigadores doutorados

       

Estudantes de doutoramento

             


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