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Shaping the Future of Food Quality, Health and Safety

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CERTIFICATE OF PRESENTATION

We hereby confirm that

Ana Paula Rodrigues Pereira

Presented at the

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Signed

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Poster Session 2

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Emerging non-nutrient bioactives in food - chemistry, analysis, function and health	
[P2.1.01]	Food safety assessment of heavy metal contents in seafood purchased from a market of fishery products in Hungary J. Lehel ¹ , A. Bartha ² , D. Dankó ¹ , K. Lányi* ¹ , P. Laczay ¹ , ¹ University of Veterinary Medicine, Hungary, ² University of Veterinary Medicine, Hungary
[P2.1.02]	Bioactive sweet-tasting protein, brazzein J.H. Chung*, K.H. Kong, <i>Chung-Ang University, Republic of Korea</i>
[P2.1.03]	Quantification of protein NP24 in tomato and PR5-like protein in sweet pepper K. Ippoushi*, Y. Kawasaki, A. Saito, Y. Takano-Ishikawa, H. Oike, M. Kobori, M. Maeda-Yamamoto, <i>National Agriculture and Food Research Organization, Japan</i>
[P2.1.04]	Separation, characterization and quantification of phenolic compounds in the pomace of agraz (<i>Vaccinium meridionale Swartz</i>) G.A. Garzon* ¹ , C.R. Brownmiller ² , L.R. Howard ² , ¹ Universidad Nacional de Colombia, Colombia, ² University of Arkansas, USA
[P2.1.05]	Effect of time and temperature on the extraction of phenolic compounds and in vitro functional properties of organic red rooibos <i>Aspalathus linearis</i> (Fabaceae) J.S. Santos* ¹ , C.T.P. Deolindo ¹ , A.C. Valesse ² , H. Daguer ² , A. Fujita ³ , M.I. Genovese ³ , L.A. Esmerino ¹ , N.D. Rosso ¹ , D. Granato ¹ , ¹ UEPG, Brazil, ² LANAGRO-MAPA, Brazil, ³ FCF-USP, Brazil
[P2.1.06]	ACE inhibitory peptides in standard and fermented deer velvet: An in silico and in vitro investigation S.R. Haines*, M.J. McCann, A.J. Grosvenor, A. Thomas, A. Noble, S. Clerens, <i>AgResearch Ltd, New Zealand</i>
[P2.1.07]	Nutritional value and chemical composition of Greek artichoke ecotypes S.A. Petropoulos* ¹ , A. Fernandes ² , G. Ntatsi ³ , L. Barros ² , N. Danalatos ¹ , I.C.F.R. Ferreira ² , ¹ University of Thessaly, Greece, ² Mountain Research Center, Portugal, ³ Agricultural University of Athens, Greece
[P2.1.08]	Toxic metals (As, Pb, Hg) mopping action of Sri Lankan black tea (<i>Camellia sinensis</i> L.) and black tea inhibition action of metal absorption in intestine of rats K.R.W. Abeywickrama* ¹ , A.M.T. Amarakoon ² , W.D. Ratnasooriya ³ , ¹ Sri Lanka Tea Board, Sri Lanka, ² Tea Research Institute, Sri Lanka, ³ University of Colombo, Sri Lanka
[P2.1.09]	Quantitative chemical analysis of bioactive extracts from leaves of <i>Perilla frutescens</i> grown in a plant factory with different light intensities and nutrient levels N. Kagawa* ¹ , N. Lu ¹ , C. Tippayadarapanich ¹ , M. Takagaki ¹ , W. Yamori ^{1,2} , ¹ Chiba University, Japan, ² The University of Tokyo, Japan
[P2.1.10]	A novel method to improve both oral absorption and photochemical stability of curcumin using functional food additive and polyvinylpyrrolidone Y. Tozuka, K. Kadota*, <i>Osaka University of Pharmaceutical Sciences, Japan</i>
[P2.1.11]	Incorporation of functional food additive and surfactants in improvement of dissolution profile of poor water-soluble compounds M. Fujimori*, K. Kadota, Y. Tozuka, <i>Osaka University of Pharmaceutical Sciences, Japan</i>
[P2.1.12]	Application of functional food additives to preparation of folic acid nanoparticle via wet bead milling K. Kadota*, K. Semba, Y. Tozuka, <i>Osaka University of Pharmaceutical Sciences, Japan</i>
[P2.1.13]	UHPLC analysis of biogenic amines in different cheese varieties H.K. Mayer*, G. Fiechter, <i>BOKU – University of Natural Resources and Life Sciences Vienna, Austria</i>
[P2.1.14]	Mineral composition of walnuts - a powerful vegan food I. Juranovic Cindric* ¹ , D. Hlebec ¹ , M. Zeiner ² , G. Stingeder ² ¹ University of Zagreb, Croatia, ² BOKU – University of Natural Resources and Life Sciences, Austria
[P2.1.15]	Production of bioactive proteins and hydrolysates from <i>nitzschia laevis</i> and their in vitro antioxidative & antihypertensive activities M.A.J. Alzahrani*, C.O. Perera, Y. Hemar, <i>University of Auckland, New Zealand</i>
[P2.1.16]	Pectin from <i>Prunus domestica</i> L. induces proliferation of intestinal cells through the alteration of cell-surface heparan sulfate on differentiated epithelial cells in vitro T. Yabe*, M. Nishida, T. Kuwae, M. Miyamoto, N. Yamane, K. Kitaguchi, <i>Gifu University, Japan</i>
[P2.1.17]	Sensory and instrumental volatile flavor analysis of orange juices with different storage requirement M.K. Kim* ¹ , H.W. Jang ² , K.G. Lee ¹ , ¹ Dongguk University, Republic of Korea, ² Korea Food Research Institute, Republic of Korea

[P2.1.18]	Recovery of green tea catechins following liposomal nanoencapsulation and simulated digestion of full-fat hard cheese A. Rashidinejad ^{1,2} , E.J. Birch ^{*1} , D.W. Everett ^{1,2} , ¹ University of Otago, New Zealand, ² Riddet Institute, New Zealand
[P2.1.19]	Metastasis-inhibitory activity and structural characterization of a polysaccharide isolated from the peels of Korean citrus, Hallabong H.R. Park ^{1,2} , H.D. Choi ³ , H.J. Choi ⁴ , K.S. Shin ^{*1} , ¹ Kyonggi University, Republic of Korea, ² Korea University, Republic of Korea, ³ Korea Food Research Institute, Republic of Korea, ⁴ BK-Bio Co. Ltd., Republic of Korea
[P2.1.20]	Bioactive compounds in commercial nitrite-cured cooked pork products S.T. Pedersen*, L. Duedahl-Olesen, F. Jessen, National Food Institute DTU, Denmark
[P2.1.22]	Investigation of genotypic differences of the secondary metabolite profiles of selected leafy amaranth species D. Schroeter ^{*1} , S. Baldermann ¹ , M. Schreiner ¹ , R. Maul ² , S. Rohn ² , S. Neugart ¹ , ¹ Leibniz-Institute of Vegetable and Ornamental Crops Großbeeren/ Erfurt e.V., Germany, ² Universität Hamburg, Germany
[P2.1.23]	Biorefining of industrial hemp (<i>Cannabis sativa</i> L.) into cannabinoid and antioxidant fractions by high pressure and enzyme-assisted extraction V. Kitryte*, D. Bagdonaite, P.R. Venskutonis, Kaunas University of Technology, Lithuania
[P2.1.24]	Basal resistance to potato tuber moth pass through phenylpropanoid metabolism D. Pacifico ² , J. Sanchez del Pulgar ¹ , C. Onofri ² , B. Parisi ² , G. Mandolino ² , M. Lucarini ¹ , G. Lombardi-Boccia ^{*1} , ¹ CREA-Food and Nutrition, Italy, ² CREA-CIN, Italy
[P2.1.25]	Influence of hawthorn polyphenols on sarcoplasmic and myofibrillar proteins in minced pork V. Nicorescu ^{*1} , N.C. Predescu ¹ , C. Papuc ¹ , C. Petcu ¹ , I. Gajaila ¹ , A.E. Rus ² , ¹ University of Agronomic Sciences and Veterinary Medicine of Bucharest, Romania, ² S.C. Lazar&Sohne S.R.L., Romania
[P2.1.26]	The diversity of volatiles in rice genetic diversity: An exploratory study S. Ray ^{*1} , M.P. Sarkar ¹ , D. Deb ² , ¹ University of Calcutta, India, ² Centre for Interdisciplinary Studies, India
[P2.1.27]	Soluble and bound phenolic profile and antioxidant properties of tef injera as effected by fermentation and variety H. Shumoy*, J. Vandeveld, M. Gabaza, K. Raes, Ghent University, Belgium
[P2.1.28]	HPLC- MS Flavonoid determination and antioxidant capacity of Brazilian dehydrated bee-pollen A.A.M. De-Melo ¹ , M.L.M.F. Estevinho ² , M.M. Moreira ³ , C. Delerue-Matos ³ , L.B. Almeida-Muradian ^{*1} , ¹ University of Sao Paulo, Brazil, ² Polytechnic Institute of Bragança, Portugal, ³ Instituto Superior de Engenharia do Instituto Politécnico do Porto, Portugal
[P2.1.29]	Extraction and characterization of collagen from tuna skin using bacterial collagenase R. Ahmed*, B.S. Chun, Pukyong National University, Republic of Korea
[P2.1.30]	Nutritive, bioactive and prebiotic lupin seeds S.R. Thambiraj*, M. Phillips, S.R. Koyyalamudi, N. Reddy, Western Sydney University, Australia
[P2.1.31]	Screening of hemagglutinins in marine green macroalgae from the southern coast of Java island, Gunung kidul, Indonesia: A preliminary study D. Praseptiangga ^{*1} , L.U.Z. Zulfa ¹ , N.D. Fajarningsih ² , C. Anam ¹ , E. Chasanah ² , ¹ Sebelas Maret University (UNS), Indonesia, ² Ministry of Marine Affairs and Fisheries, Indonesia
[P2.1.32]	Antioxidant and sensory properties of gluten-free muffins fortified with broccoli leaves powder N. Drabinska*, N. Baczek, G. Lamparski, U.K. Krupa-Kozak, Institute of Animal Reproduction and Food Research of Polish Academy of Science, Poland
[P2.1.33]	Organic acids composition of <i>Nypa fruticans</i> Wurmb. sap and its vinegar A. Samad ^{*1} , A. Azlan ¹ , A. Ismail ^{1,2} , ¹ Universiti Putra Malaysia, Malaysia, ² Halal Product Research Institute, UPM, Malaysia
[P2.1.34]	Recovery of functional ingredients from sweet corn cob: Extraction and quantification of polyphenol content T. Lau ^{*1} , M.J. Oruña-Concha ¹ , N. Harbourne ² , ¹ University of Reading, UK, ² University College Dublin, Ireland
[P2.1.35]	Direct solid sampling determination of lead and cadmium in cheese varieties by high-resolution continuum source graphite furnace atomic absorption spectrometry H. Tinas*, N. Ozbek, S. Akman, Istanbul Technical University, Turkey
[P2.1.36]	Validation of faecal sterols determination in faeces with high and low levels of plant sterols M. Cuevas-Tena*, A. Alegría, M.J. Lagarda, University of Valencia, Spain
[P2.1.37]	Wheat beer brewers' spent grain: A rich source of diverse bioactives A.S. Naik*, I. Parekh, A. Khanvilkar, D.Y.Patil University, India

[P2.2.20]

Effect of storage conditions on bee pollen quality

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Bee pollen is a complete and valuable food that contains proteins, carbohydrates, lipids, fibers, minerals, vitamins, enzymes and phenolic compounds. Their chemical composition is influenced by the conservation methods applied, especially if these involve heat, as well as by the storage processes. The main goal of this study was to evaluate the effect of two storage conditions on the nutritional and microbiological quality of nine Portuguese pollen with different botanical origin after six months of storage.

Pollinic analysis of the samples allowed their codification according to the predominant pollen, being 7 monofloral and 2 multifloral. All samples were subjected to two different storage methods: frozen and dehydration. The quality of pollen was assessed through several chemical and microbiological parameters and the fatty acid profile. A two-way analysis of variance (ANOVA) was performed to analyse the effects of the storage method and the different predominant pollen species. The results were also subjected to a multivariate analysis to study the relation between variables and cases.

Of the several parameters assessed only pH, total acidity, fibres and ashes content were not significantly affected by the storage methods ($P > 0.05$). Total phenols, flavonoids, vitamin C and β carotenoid content were strongly influenced by the botanical origin as well as by the dry process of pollen. The composition of fatty acids was more affected by the storage method, since this factor explains higher percentages of the total variability. Regarding the microbiological quality of the stored pollen, in general the populations of mesophilic aerobic and the yeasts and molds presented higher levels in frozen pollen.

This study revealed that the storage method is more significant than the botanical origin to establish differences between the types of pollen analyzed and the frozen process is recommended in order to preserve the nutritional values of this product.

Keywords: Bee pollen, Storage conditions, Microbiological quality, Nutritional value

Effect of Storage Conditions on Bee Pollen Quality

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Objectives

Bee pollen is a complete and valuable food that contains proteins, carbohydrates, lipids, fibers, minerals, vitamins, enzymes and phenolic compounds [1,2]. Their chemical composition is influenced by the conservation methods applied, especially if these involve heat, as well as by the storage processes [3].

This study aimed to evaluate the effect of two storage conditions on the nutritional and microbiological quality of nine Portuguese pollen samples.

Methods

Samples (codification according to predominant pollen)

- Ru - *Rubus* spp.
- Ca - *Castanea* spp.
- Ci - *Cistus* spp.
- Le - *Leontodon* spp.
- Cy - *Cytisus* spp.
- Ec - *Echium* spp.
- Er - *Erica* spp.
- CaCi - *Castanea* spp. and *Cistus* spp.
- EuEr - *Eucaliptus* spp. and *Erica* spp.

Storage methods

- F (Frozen)
- D (Dehydration)

Chemical composition
 Microbiological analysis
 Fatty acid profile

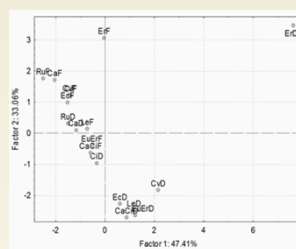
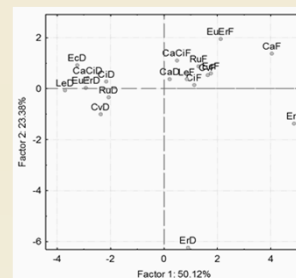
Results

Effect of the pollen species and storage method on the chemical and fatty acids composition according to a two-way analysis of variance (ANOVA)

	Pollen Species (PS)		Storage method (SM)		PS x SM	
	Sig. level	Var. (%)	Sig. level	Var. (%)	Sig. level	Var. (%)
pH	0.022 *	21.5	0.761 ns	0.0	0.273 ns	0.0
Total acidity (meq/kg)	0.000 ***	73.2	0.424 ns	0.0	0.657 ns	0.0
Fiber content (%)	0.000 ***	95.1	0.098 ns	0.0	0.243 ns	0.0
Ashes content (%)	0.000 ***	35.2	0.144 ns	0.0	0.001 ***	35.3
Reducing sugar (%)	0.006 **	9.6	0.000 ***	30.4	0.000 ***	35.6
Protein content (%)	0.008 **	9.8	0.020 *	5.0	0.000 ***	57.7
Phenolic compounds (mg GAE/g)	0.000 ***	50.7	0.000 ***	37.2	0.015 *	4.6
Flavonoids (mg CAE/g)	0.000 ***	36.9	0.000 ***	22.4	0.000 ***	35.5
Vitamin C (µg/g)	0.000 ***	52.2	0.000 ***	41.1	0.000 ***	5.0
β-carotene (µg/g)	0.000 ***	42.7	0.000 ***	36.7	0.000 ***	18.7
Lipids content (%)	0.000 ***	20.1	0.000 ***	61.4	0.353 ns	0.0
Unidentified fatty acids (%)	0.657 ns	0.0	0.000 ***	35.3	0.402 ns	0.0
C4 (Butyric acid) (%)	0.000 ***	20.5	0.000 ***	47.0	0.307 ns	0.0
C6 (Caproic acid) (%)	0.016 *	12.3	0.000 ***	44.0	0.042 *	13.3
C8 (Caprylic acid) (%)	0.002 **	14.5	0.000 ***	56.2	0.331 ns	0.0
C10 (Capric acid) (%)	0.000 ***	43.6	0.000 ***	35.8	0.405 ns	0.0
C12 (Lauric acid) (%)	0.000 ***	42.7	0.000 ***	27.9	0.066 ns	0.0
C14 (Myristic acid) (%)	0.000 ***	32.2	0.000 ***	25.0	0.000 ***	28.0
C16 (Palmitic acid) (%)	0.001 ***	13.4	0.000 ***	61.5	0.269 ns	0.0
C18 (Stearic acid) (%)	0.002 **	19.5	0.000 ***	33.6	0.019 *	17.1
C18:1 (Oleic acid) (%)	0.000 ***	29.8	0.000 ***	50.3	0.005 **	8.9
C18:2 (Linoleic acid) (%)	0.000 ***	41.5	0.008 **	12.7	0.156 ns	0.0
C18:3 (Linolenic acid) (%)	0.116 ns	0.0	0.000 ***	42.5	0.383 ns	0.0

Sig. level – significance level; Var. – variance percentage; ns – not significant ($p > 0.05$);
 *Significant ($0.01 < p < 0.05$); **Very significant ($0.001 < p < 0.01$); ***Highly significant ($p < 0.001$)

Principal Component Analysis



Conclusions

- Composition of fatty acids was more affected by the storage method, since this factor explains higher percentages of the total variability;
- PCA of the chemical parameters allowed the separation of samples by the storage method;
- Populations of mesophilic aerobic and yeasts and molds presented, in general, higher levels in frozen pollen;
- In sum, storage method is more significant than the botanical origin to establish differences between the pollen samples.

Microbiological Analysis



References

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