



Bee pollen versus Bee bread – nutritional value and biological properties

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Introduction

Bee pollen is a mixture of flower pollen, nectar, enzymes, honey and bee secretions.

Bee Bread is a fermented mixture of plant pollen, honey and bee saliva that worker bees use as source of protein for larvae, and for young bees. Pollen collected by bees is mixed with a small amount of honey and saliva and packed into the cells of the honeycomb where it undergoes a chemical change and the resulting product it is called Bee Bread.





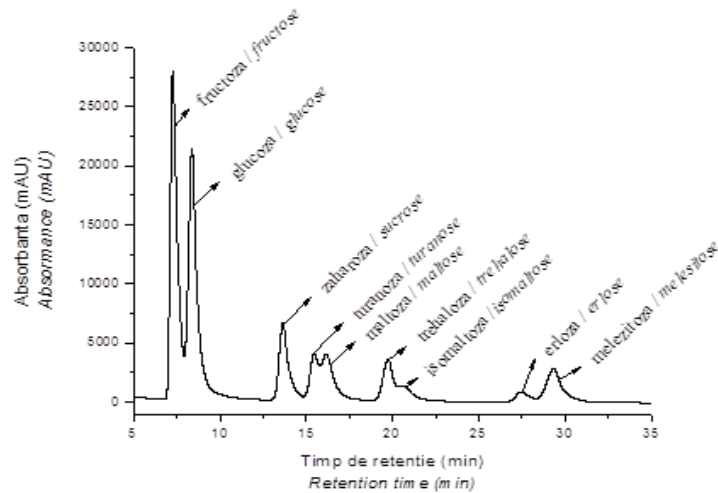
Determination of nutritional value

- Analytical methods:
 - proteins –Kjeldahl method
 - lipids –Soxhlet method
 - carbohydrates – HPLC





Determination of the carbohydrates with HPLC-IR





Nutritional value: Bee pollen vs bee bread

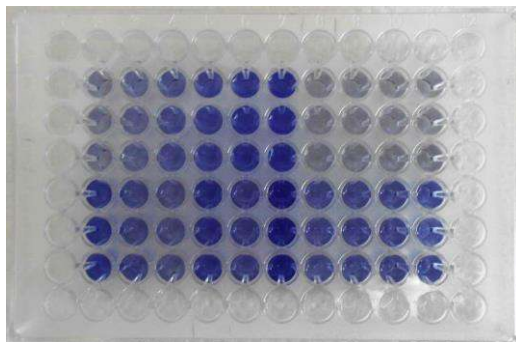
Sample	Moisture \pm SD* [%]	Ash \pm SD* [%]	Lipid \pm SD* [%]	Protein \pm SD* [%]	Carbo- hydrates [%]	Energy value Kcal/ 100g
Bee pollen	22.53 \pm 0.09	2.24 \pm 0.02	6.31 \pm 0.72	23.81 \pm 0.42	46.24	362.64
Bee bread	12.77 \pm 0.09	2.58 \pm 0.01	5.52 \pm 0.02	22.27 \pm 0.13	54.35	348.83



Determination of bioactive compounds

Total polyphenols

by Folin-Ciocalteu method
(Singleton *et al.*, 1999)
Spectrophotometer
multichannel Synergy 2



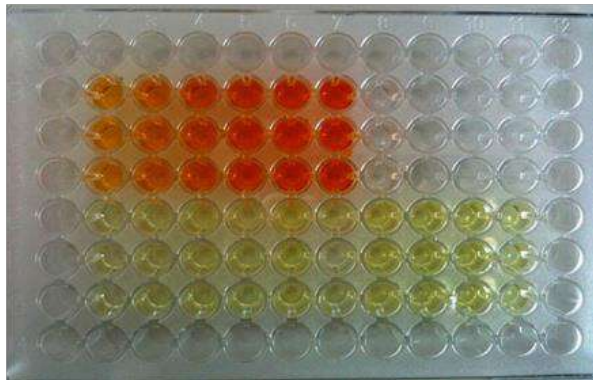
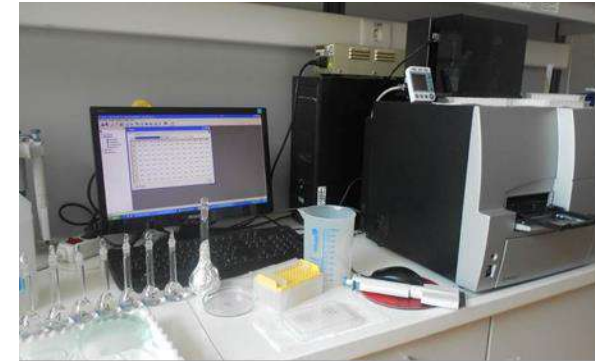
Sample	Total polyphenols (mg GAE/g sample)
Bee pollen	8.80±0.19
Bee bread	7.69±0.07



Total flavonoids

with $AlCl_3$ 10% in methanol

Spectrophotometer Synergy 2
HT Multi-Detection Microplate
Reader



Sample	Total flavonoids (mg QE/g sample)
Bee pollen	4.03 ± 0.26
Bee bread	5.07 ± 0.06

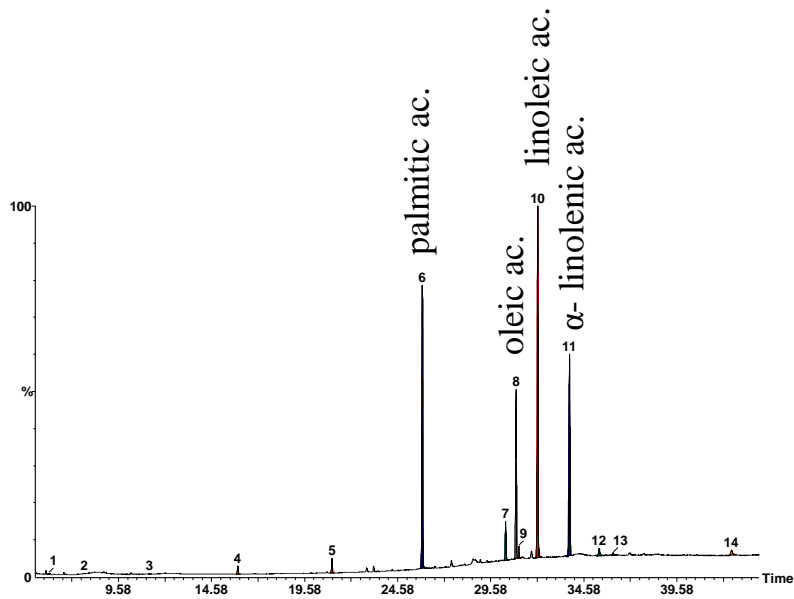


Fatty acids determination by gas-chromatographic method coupled with mass-spectrometry (GS-MS)

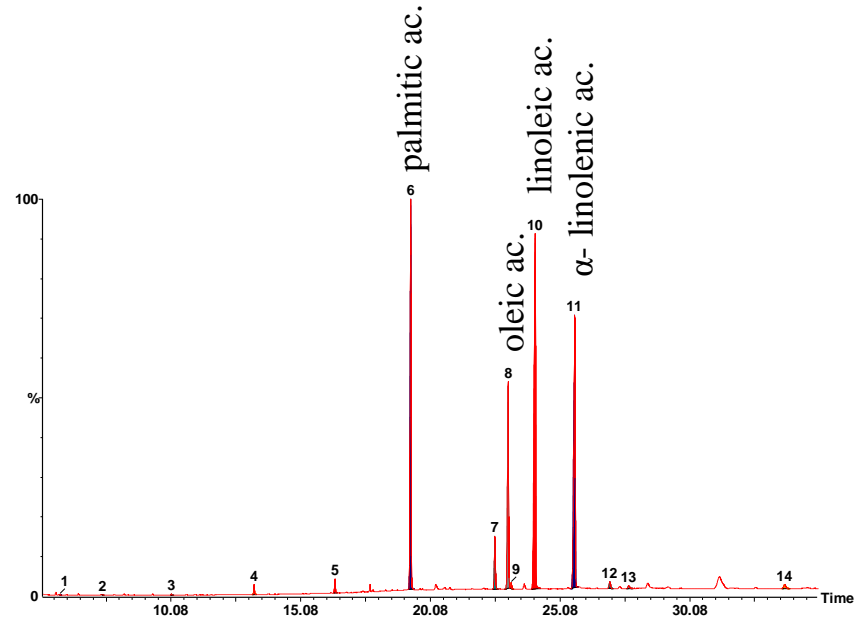
- Total lipids(TL)
chloroform/methanol:
2/1(v/v), Folch et al., 1951
- GS-MS PerkinElmer Clarus
600 T (PerkinElmer, Inc,
Shelton, U.S.A.)



Fatty acids contents: Bee pollen vs bee bread



Bee pollen



Bee bread



Fatty acid composition (% of total fatty acids) of total lipids in bee pollen and bee bread

Fatty acids	6:0	8:0	10:0	12:0	14:0	16:0	18:0	18:1(n-9)	18:1(9t)(n-9)	18:2(n-6)	18:3(n-3)	(20:0)	20:1(n-9)	(22:0)	n-6 / n-3
Bee pollen	0.03	-	0.03	0.70	1.19	23.28	3.25	15.11	0.99	35.11	19.28	0.63	0.19	0.87	1.54
Bee bread	-	-	0.05	0.24	0.69	25.56	3.67	14.28	0.36	37.65	26.26	0.44	0.23	0.49	1.26

PUFAs-polyunsaturated fatty acids

caproic acid (6:0); caprylic acid (8:0); capric acid (10:0); lauric acid (12:0); myristic acid(14:0); palmitic acid(16:0); stearic acid (18:0); oleic acid [18:1 (n-9)]; elaidic acid [18:1 (9 t) (n-9)]; linoleic acid [18:2 (n-6)]; α - linolenic acid [18:3 (n-3)]; arachidic acid (20:0); eicosenoic acid [20:1(n-9)]; behenic acid (22:0)



Amino acids composition of bee pollen and bee bread

The liquid chromatography technique was used with a mass spectrometer detector (LC-MS);

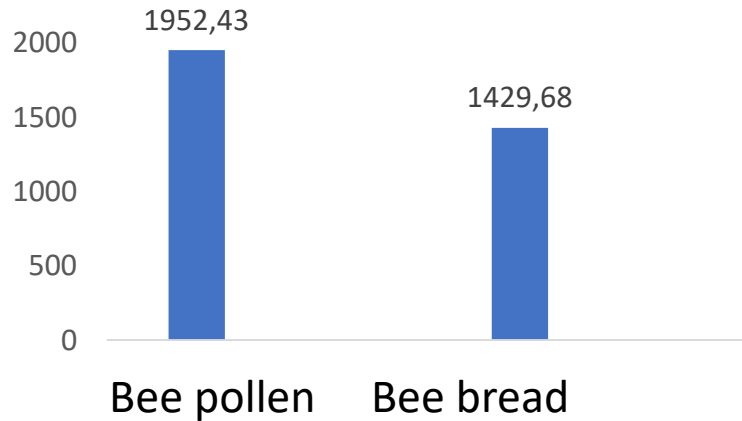
28 amino acids has been identified, of which 9 are essential amino acids.



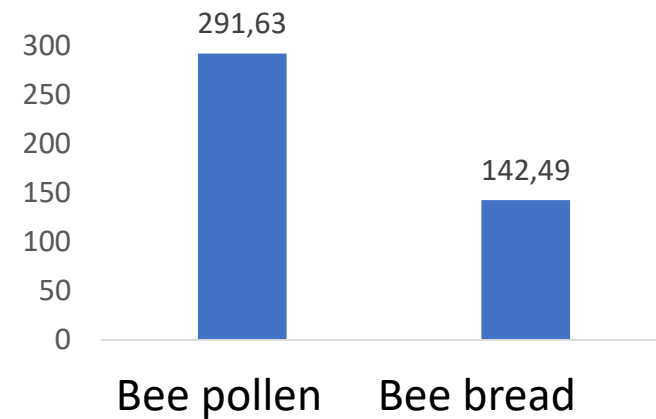


Amino acids composition of bee pollen and bee bread

Total amino acids mg/100

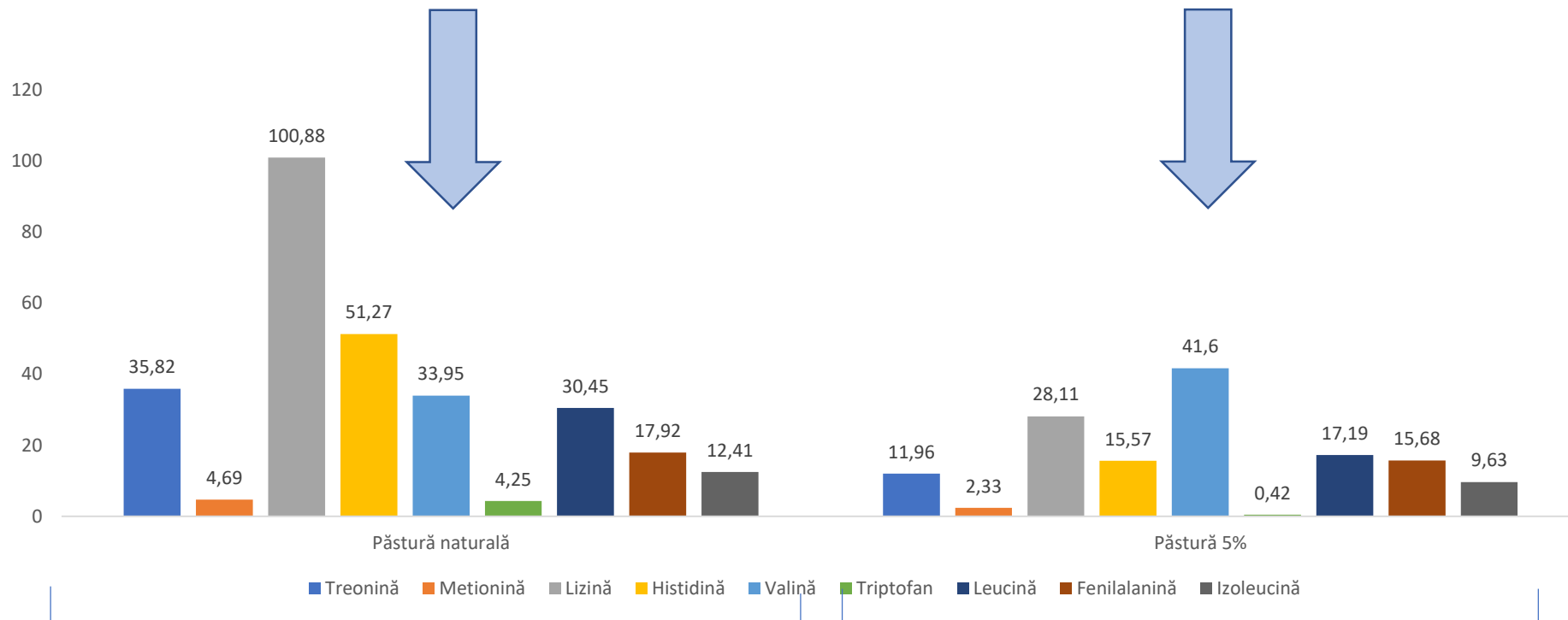


Total essential amino acids mg/100





Total essentials amino acids, mg/100g



Bee pollen

Bee Bread

Conclusions

- Bee pollen and bee bread nutritional value is given by its protein content, lipids, carbohydrates, minerals and vitamins.
- Bee pollen and bee bread are natural sources of biologically active compounds such as polyphenols, flavonoids, fatty acids and amino acids.
- The differences between pollen and bee bread were predominantly given by different botanical origins of the plant pollen.





Thank you for your
attention!