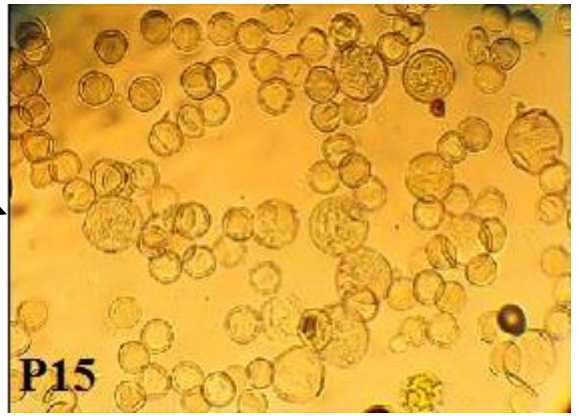
6TH APIMEDICA & 5TH APIQUALITY
ROME
22-25 NOVEMBER 2016
NOVOTEL ROMA EUR

Crataegus monogyna vs. Salix sp. bee pollen: nutritive value and biologicaly activity

Rodica MARGAOAN, Daniel S. DEZMIREAN,
Liviu Al. MARGHITAS, Otilia BOBIS and Flore CHIRILA
University of Agricultural Sciences and Veterinary Medicine, Cluj-Napoca, Romania

Palinological analysis



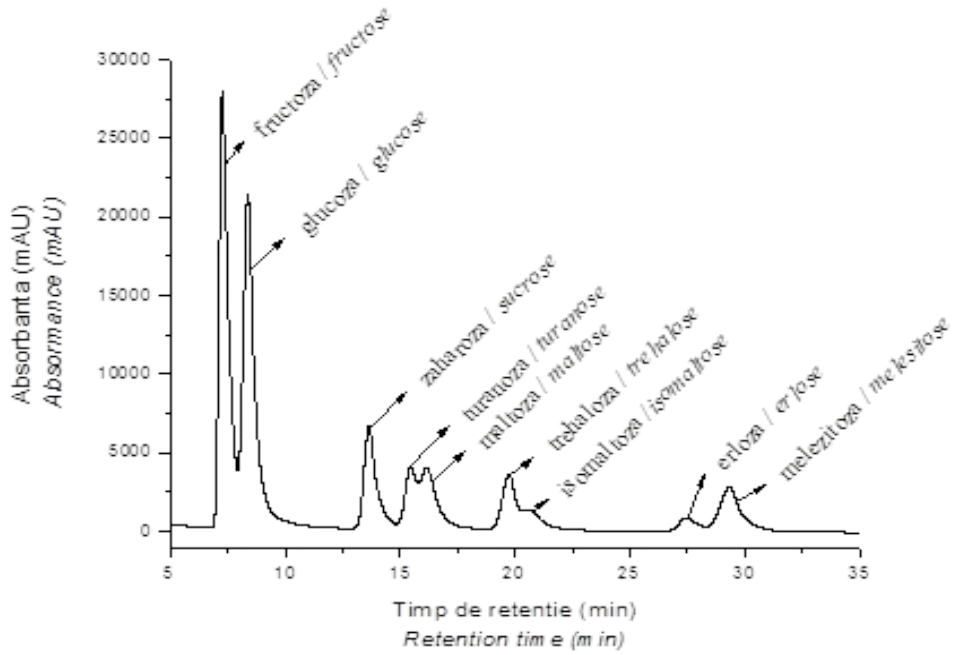
analysis

Predomminant pollen (>45%)		Secondary pollen (16- 45%)					
Family	Species	Family	Species	Family	Species	Family	Species
Rosaceae	**Crataegus monogyna**	**Fagaceae**	**Quercus sp.**	**Brassicaceae**	**Brassica sp.**	**Asteraceae** **Fabaceae**	**Taraxacum officinale** **Onobrychis viciifolia**
Salicaceae	**Salix sp.**	**Betulaceae**	**Carpinus betulus**	**Rosaceae**	**Prunus sp.**	**Asteraceae**	**Taraxacum officinale**

Determination of nutritional value

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

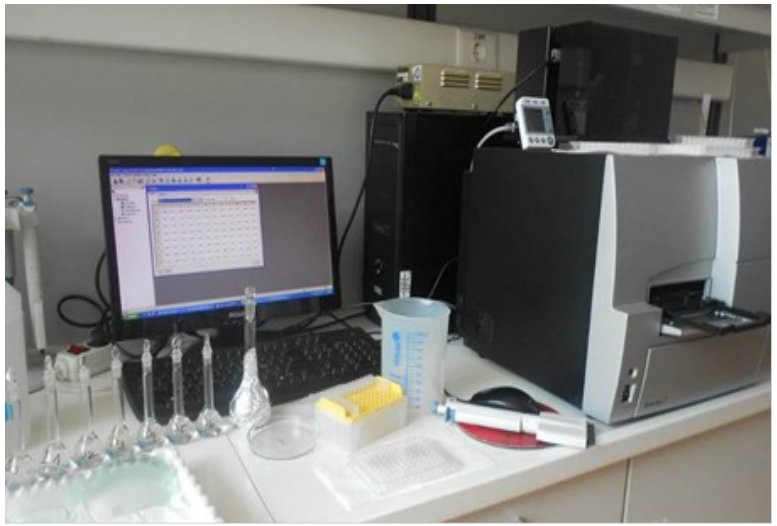
Determination of the carbohydrates with HPLC-IR



Energy value: *Crataegus monogyna* vs *Salix sp*.

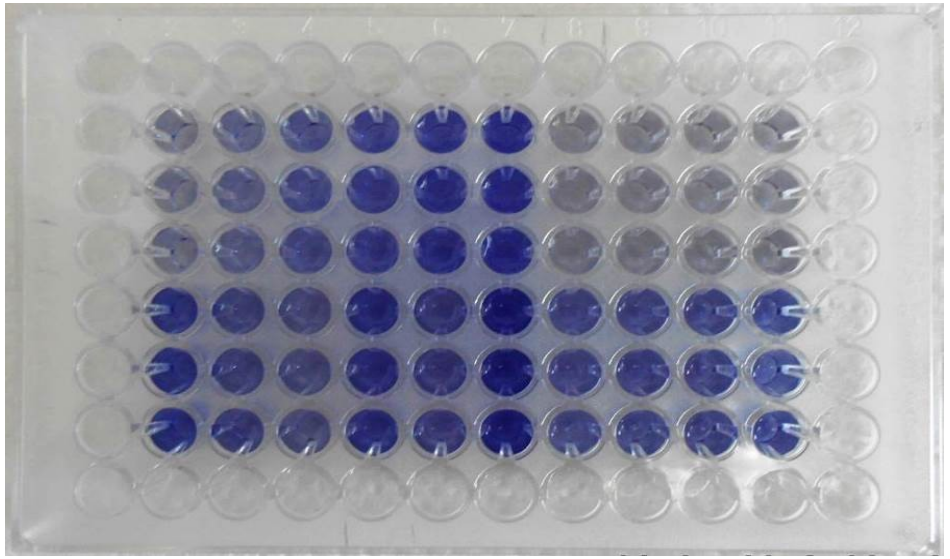
Predomminant pollen (>45%)	Moisture ±SD* [%]	Ash ±SD* [%]	Lipid ±SD* [%]	Protein ±SD* [%]	Carbo-hydrates [%]	Energy value Kcal/ 100g
Crataegus monogyna	20.70±0.09	2.54±0.02	7.29±0.72	23.21±0.42	46.24	352.64
Salix sp.	22.77±0.09	2.38±0.01	4.22±0.02	16.27±0.13	54.35	328.83

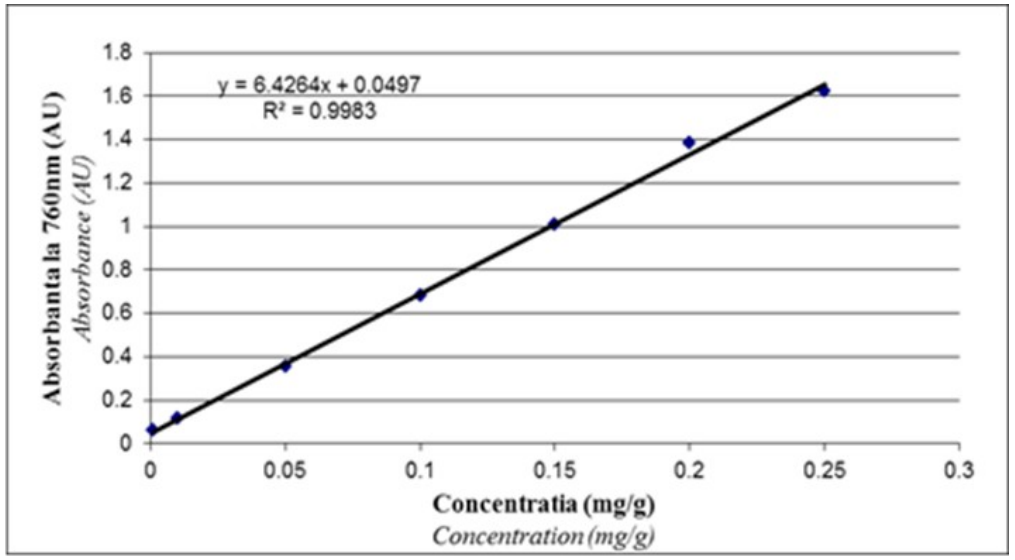
Determination of bioactive compounds



Total polyphenols: spectrophotometric methods

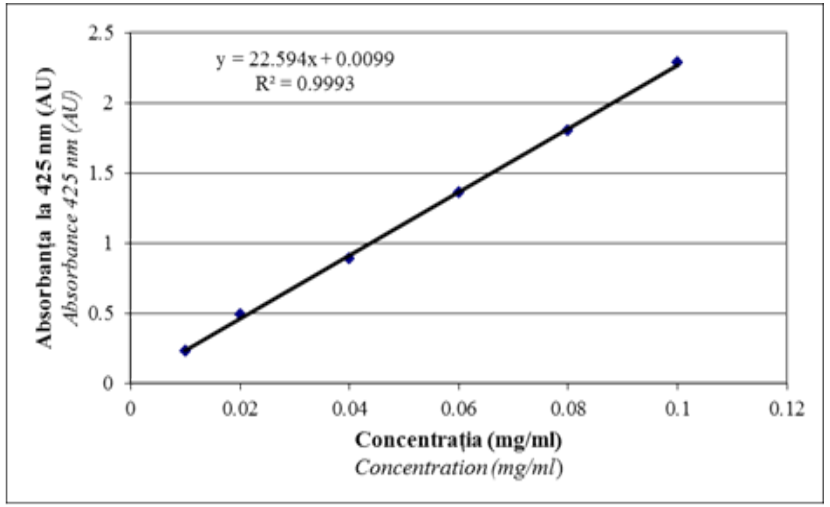
- Folin-Ciocâlteu (Singlenton *et al.,* 1999)
- Spectrophotometer multichanel Synergy 2

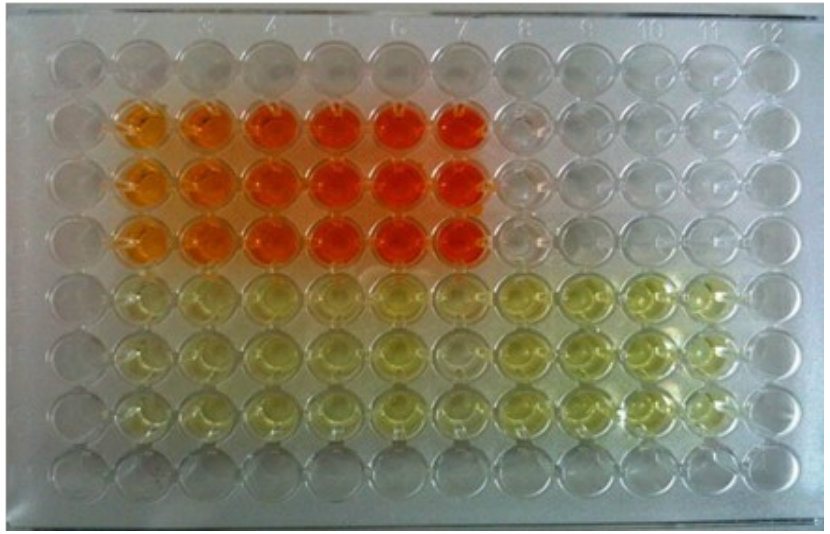




Determination of bioactive compounds

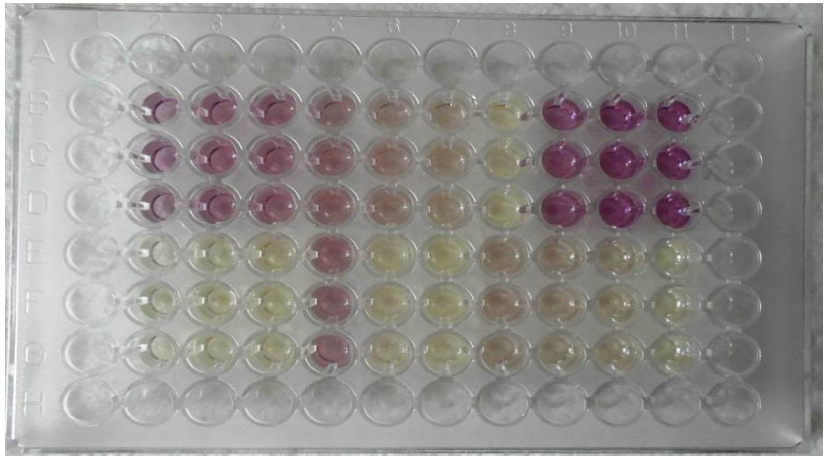
- **Total flavonoids: spectrophotometric methods**
  - Methods: Tămaș, 1979 with $ZrOCl_2$ 2,5% in methanol
  - Spectrophotometer Synergy 2 HT Multi-Detection Microplate Reader

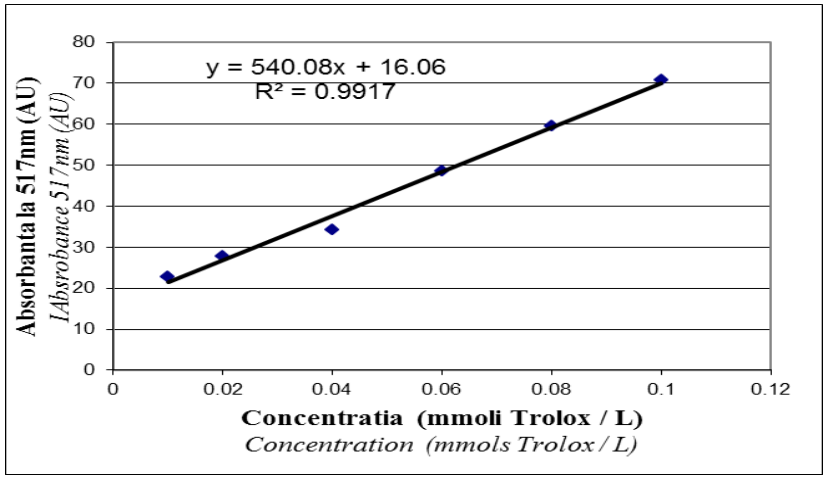




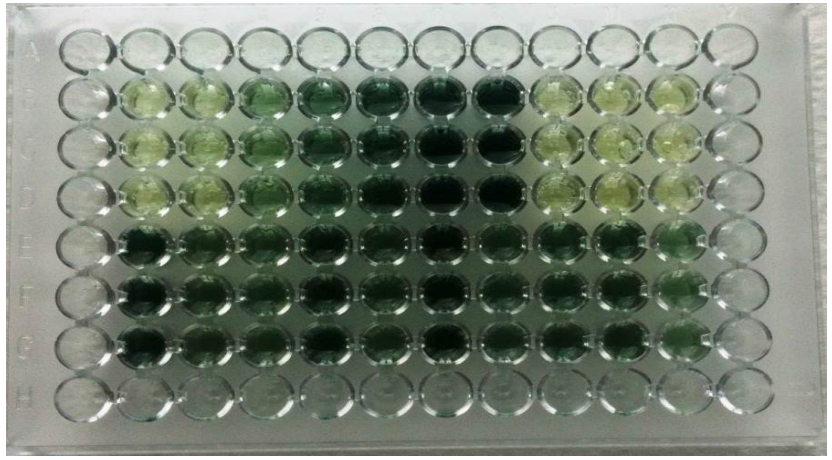
Antioxidant activity

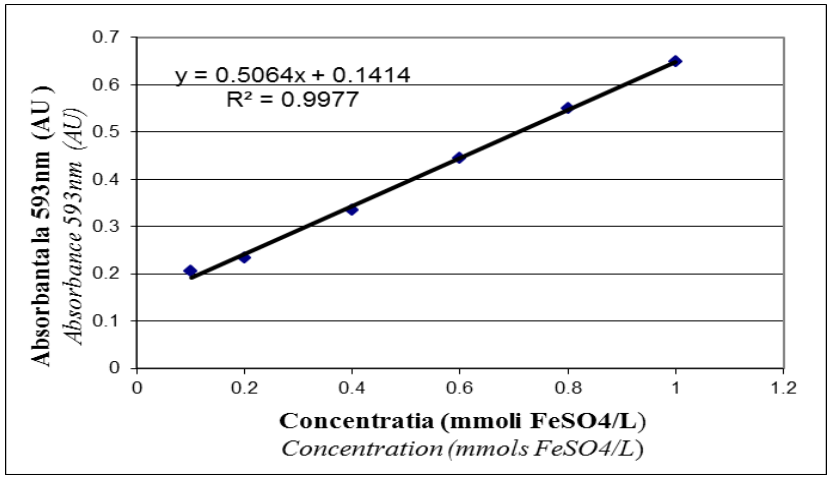
DPPH method





FRAP method





Crataegus monogyna vs. *Salix sp.*

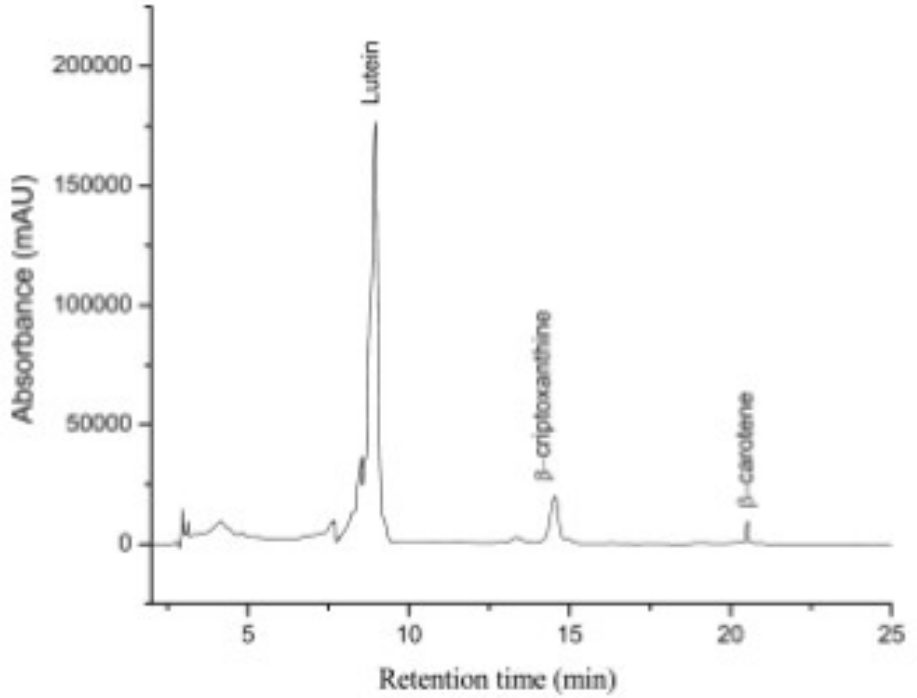
Sample	Total polyphenols (mg GAE/g sample)	Total flavonoids (mg QE/g sample)	Antioxidant capacity DPPH (mmoli Trolox/g sample)	Antioxidant capacity FRAP (mmoli Fe^{II}/g sample)
Crataegus monogyna	8.80±0.19	5.93±0.26	1.59±0.03	2.22±0.02
Salix sp.	7.69±0.07	5.07±0.06	1.66±0.01	2.47±0.11

Determination of carotenoids content

Total carotenoids content:
Method of Breithaupt and Schwack, 2000
Spectrophotometer Schimadzu UV-2102PC
Scaning, 450nm

Determination of carotenoid compounds by HPLC-PDA
lutein
β-criptoxantin
β-caroten

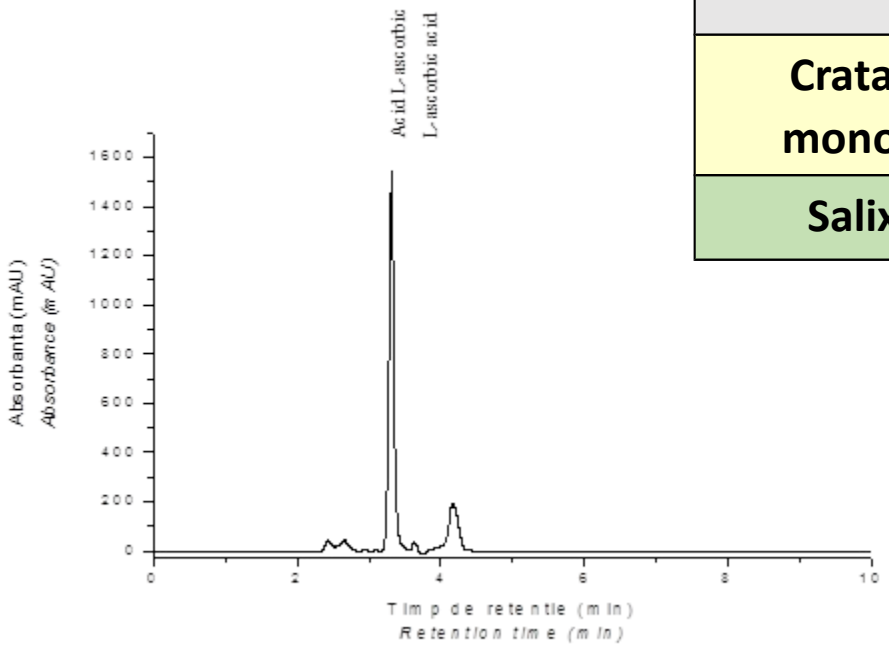
Carotenoids content: *Crataegus monogyna* vs. *Salix sp*.



Sample	Total carotenoids (µg /g)							
	FW			DW				
Crataegus monogyna	58.30	73.52	50.89	64.17	1.04	1.31	0.17	0.21
Salix sp.	77.62	100.48	65.90	85.33	2.13	2.76	2.09	2.71

Crataegus monogyna vs. *Salix sp*. vitamin C content

- **Method: Yuvena et al., 2006**
- HPLC Agilent 1200 cu detector UV-Vis



Sample	Ascorbic acid content (mg/100g sample)
Crataegus monogyna	0.80±0.08
Salix sp.	2.99±0.26

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

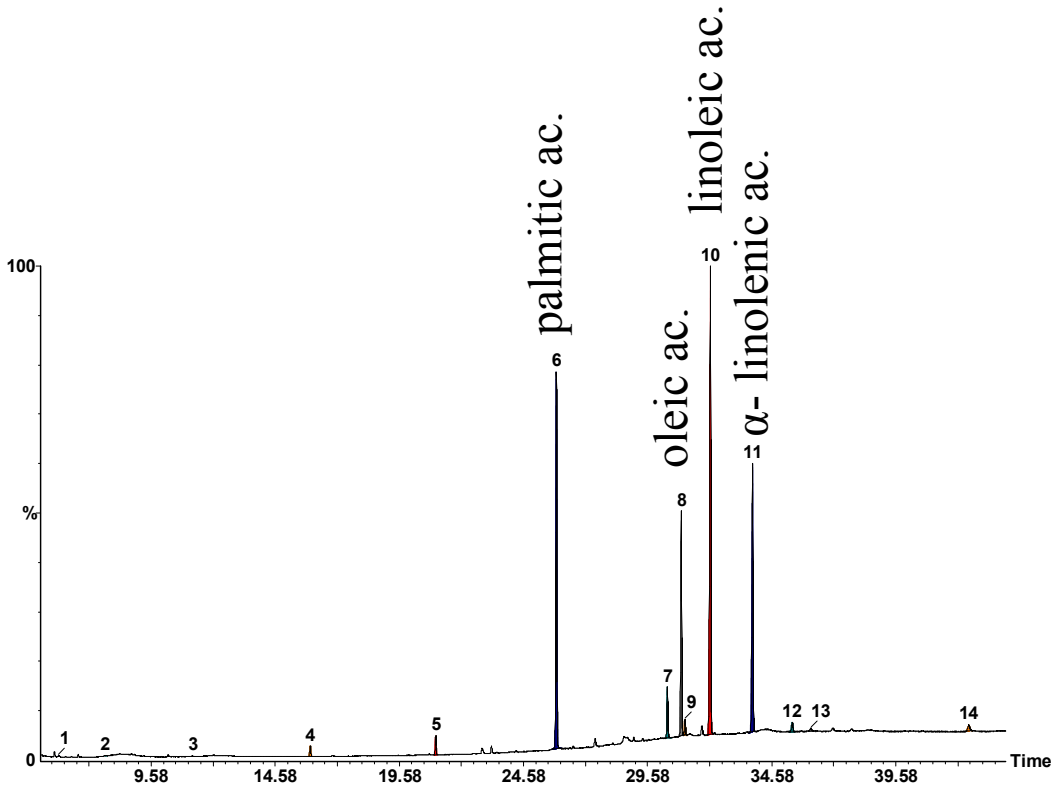
- Total lipids(TL) chloroform/methanol: 2/1(v/v), **Folch et al., 1951**

- GS-MS PerkinElmer Clarus 600 T (PerkinElmer, Inc, Shelton, U.S.A.)

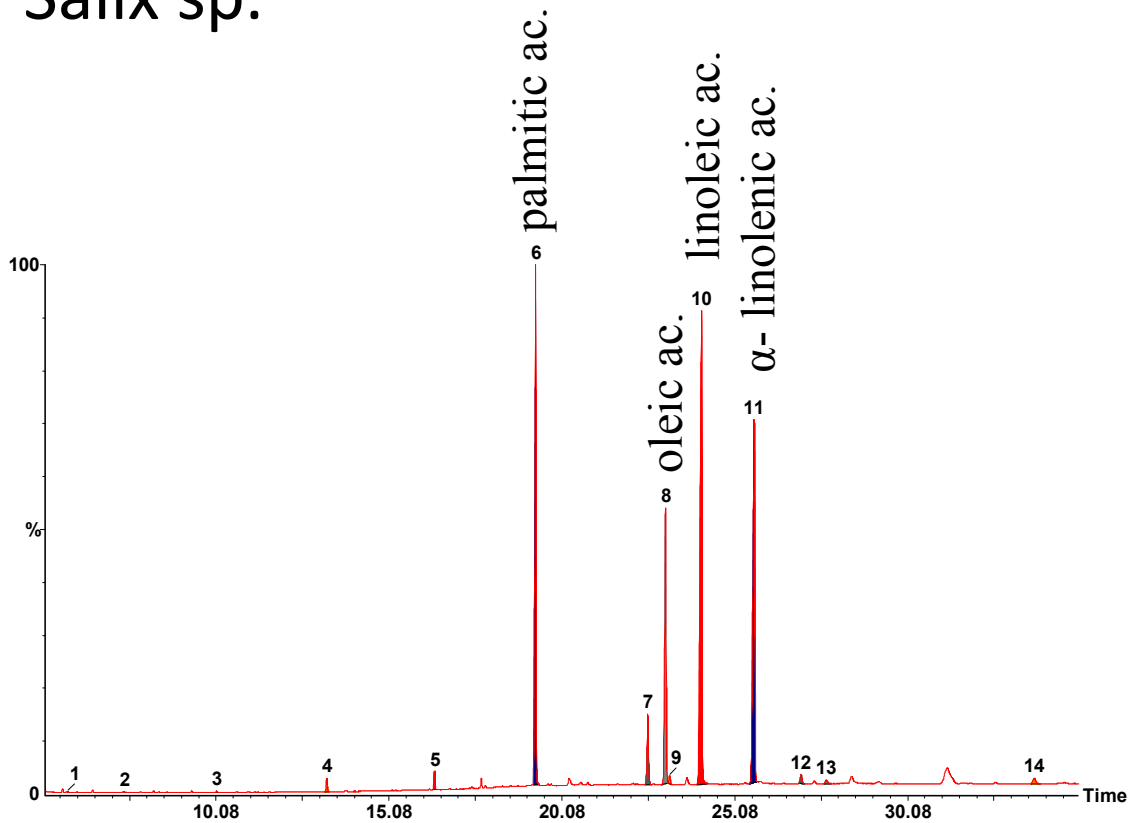
Fatty acids contents:

Crataegus monogyna vs. *Salix sp*.

Crataegus monogyna



Salix sp.



Fatty acid composition (% of total fatty acids) of total lipids in the bee-collected pollen

Fatty acids	6:0	8:0	10:0	12:0	14:0	16:0	18:0	18:1(n-9)	18:1(9 t)(n-9)	18:2(n-6)	18:3(n-3)	(20:0)	20:1(n-9)	(22:0)	n-6 / n-3
Crataegus monogyna	0.05	-	0.05	0.60	1.10	24.28	3.25	14.41	0.99	33.21	20.28	0.73	0.19	0.87	1.64
Salix sp.	-	-	0.04	0.49	0.69	24.46	3.50	14.28	0.36	30.65	24.26	0.55	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)

JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY

Article

pubs.acs.org/JAFC

Predominant and Secondary Pollen Botanical Origins Influence the Carotenoid and Fatty Acid Profile in Fresh Honeybee-Collected Pollen

Rodica Mărgăoan,[†] Liviu Al. Mărghitaş,[†] Daniel S. Dezmirean,[†] Francisc V. Dulf,*[,‡] Andrea Bunea,[‡] Sonia Ancuţa Socaci,[#] and Otilia Bobiş[†]

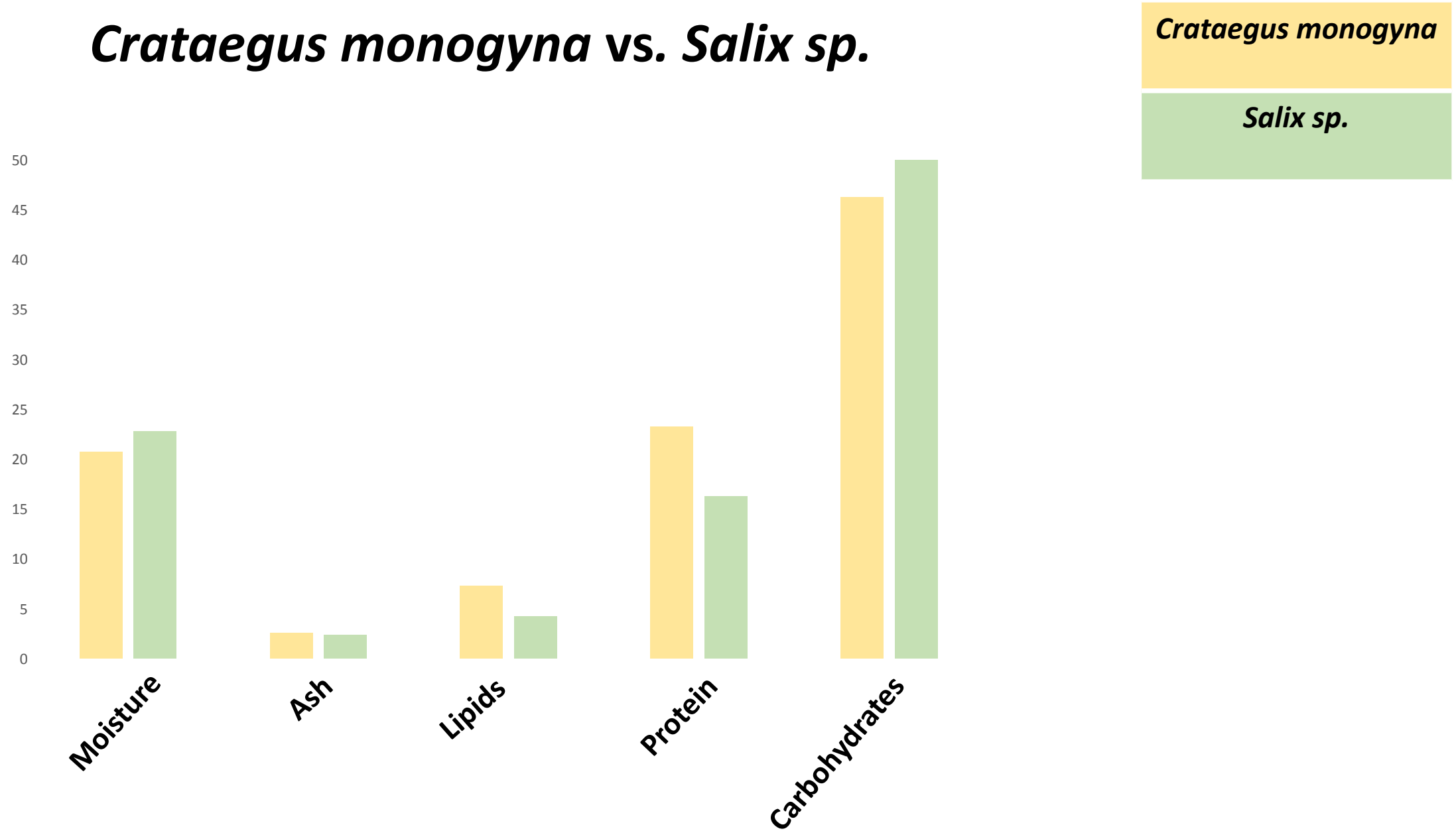
[†]Department of Technological Sciences, Animal Breeding, [‡]Department of Biochemistry, and [#]Faculty of Food Science, University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca, Calea Mănăştur 3-5, 400372 Cluj-Napoca, Romania

Supporting Information

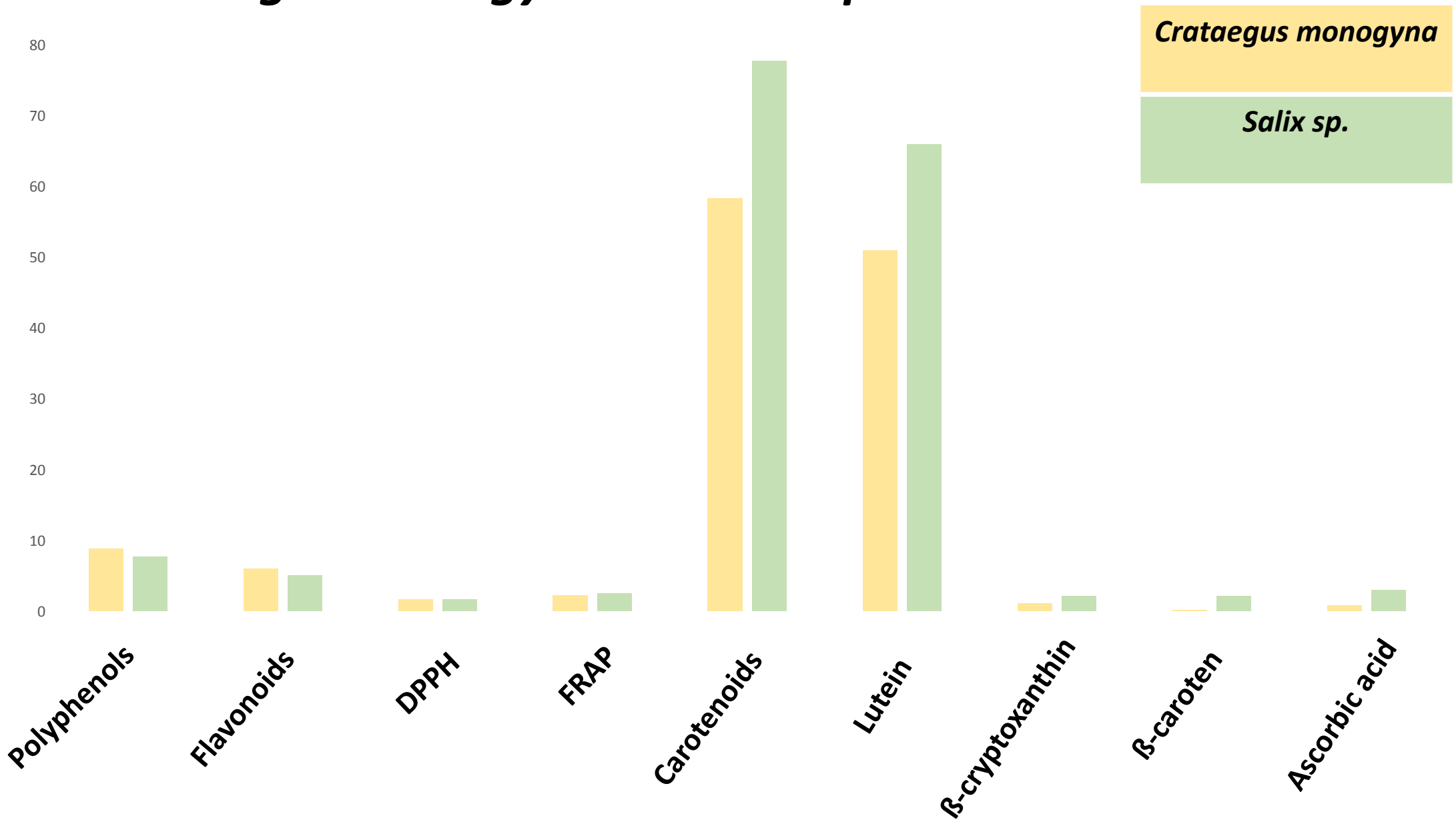
ABSTRACT: Total and individual carotenoids, fatty acid composition of total lipids, and main lipid classes of 16 fresh bee-collected pollen samples from Romania were determined by high-performance liquid chromatography with photodiode array detection and capillary gas chromatography with mass detection. Analyzed samples were found rich in lutein, whereas *β*-criptoxanthin and *β*-carotene were present in a wide range of amounts correlated with predominant botanical origin of the samples. High amounts of lutein were correlated with the presence of *Callendula officinalis*, *Taraxacum officinale* and *Anthylis* sp. The highest amount of total lipids was found in samples where pollen from *Brassica* sp. was predominant. Lipid classes were dominated by polyunsaturated fatty acids. Saturated fatty acids were determined in variable amounts. Lipid and carotenoid contents present great variability, explained by the various botanical species present in the samples.

KEYWORDS: *bee-collected pollen, carotenoids, fatty acids, HPLC, GC, botanical origin*

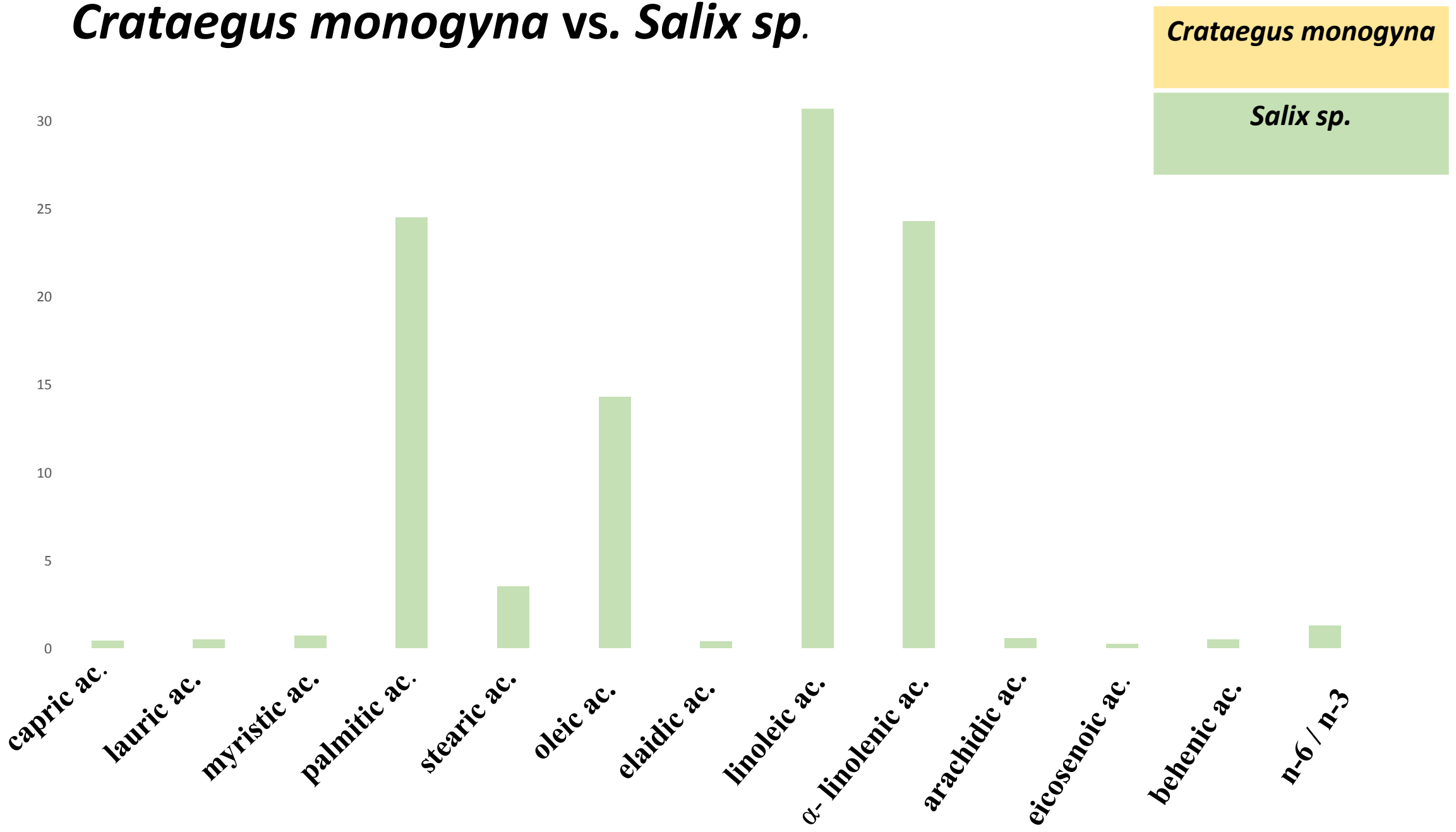
Crataegus monogyna vs. *Salix sp.*



Crataegus monogyna vs. *Salix sp.*



Crataegus monogyna vs. *Salix sp.*



Thank you for your atention!