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FATTY ACID COMPOSITION OF MONOFLORAL BEE POLLEN

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Introduction

Bee pollen as well as honey has been used in human nutrition since ancient times. Although it has been the subject of research for a long time, it is still significantly less characterized than honey, and in Croatia such research is still rare.

The composition and amount of fatty acids in diet are important for both, the bees community and humans. Considering that the chemical composition of bee pollen is strongly related to botanical origin, and that the vegetation is specific to a particular geographical area, the aim of this study was to collect samples of unifloral bee pollen from different locations in Croatia and examine specifics of fatty acids composition, and the influence botanical origin on bee pollen fatty acid composition.

Materials and methods

Samples

Seven monofloral bee pollen samples (**Table 1**)

Methods

- Melissopalynological analysis of bee pollen
- Lipid extraction by Folch
- Fatty acid methyl exters preparation by cold methanolic KOH
- FAMEs determination by GC-FID

Data analysis

- Microsoft Office Excel 2016, Statistica 13.5.0.17

Table 1 Monofloral bee pollen samples characteristics

Sample	Dandelion	Wilow	Blackthorn	Horse chestnut	Mahaleb cherry	Pubescent oak	Dropwort
Dominate botanical source	*Taraxacum officinale*	*Salix* spp.	*Prunus spinosa*	*Aesculus hippocastanum*	*Prunus mahaleb*	*Quercus pubescens*	*Filipendula vulgaris*
%	86	100	100	100	100	84	97
Flower							
Pollen							
Location	Krapina	Krapina	Otočac	Krapina	Senj	Otočac	Otočac

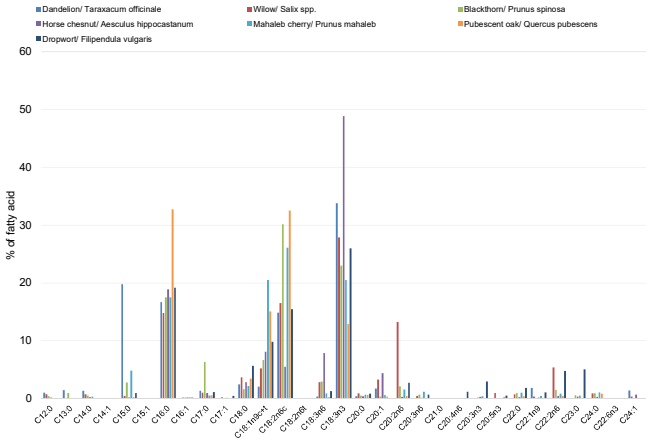

Figure 1 Fatty acids composition of monofloral bee pollen samples

Results

After sorting pollen load by colour and qualitative melissopalynological analysis, seven monofloral samples were selected. A total of 25 fatty acids (from C12 to C24) were identified with a significant difference in their proportions in the samples. n-3 fatty acids (**Figure 1**) are most prevalent in *Aesculus hippocastanum* bee pollen (49.11 %) and least present in *Quercus pubescens* (13.12 %). α-linolenic acid (ALA, C18:3n-3) is dominant fatty acids in n-3 fatty acids, represented between 88.4 % (*Filipendula vulgaris*) and 100 % (*Taraxacum officinale*). The proportion of n-6 fatty acids in the samples ranged between 14.04 % in *A. hippocastanum* bee pollen to 38.28 % in *Salix* spp. bee pollen, with a predominance of linoleic acid (LA, C18:2n-6) in proportions between 39 % (*A. hippocastanum*) and 98 % (*T. officinale*) (**Figure 2**). Palmitic acid (C16:0) was dominant saturated fatty acid in most analysed samples, ranged from 14.78 % in *Salix* spp. pollen to 32.70 % in *Q. pubescens* pollen (**Figure 1**).

Odd-chain fatty acids, pentadecanoic (C15:0) and heptadecanoic acid (C17:0), were found in all samples, ranged from 0.12 % to 6,27 %, with the exception of *T. officinale* bee pollen where pentadecanoic acid share was 19.72 %. Odd-chain fatty acids are present in small amounts in dairy fat, some fish and plants and have been associated with lower risks of cardiovascular disease, adiposity, type 2 diabetes and many other diseases.

Assessing composition through the nutritional indices, it is evident that bee pollen is characterized by high polyunsaturated fatty acids/saturated fatty acids (PUFA/SFA) and unsaturated fatty acids/saturated fatty acids (UFA/SFA) ratios, high n-3/n-6 and ALA/LA ratios, very low atherogenic (IA) and thrombogenic indexes (IT) and high hypocholesterolemic/ hypercholesterolemic (HH) index values (**Table 2**), that all are comparable to those in fish.

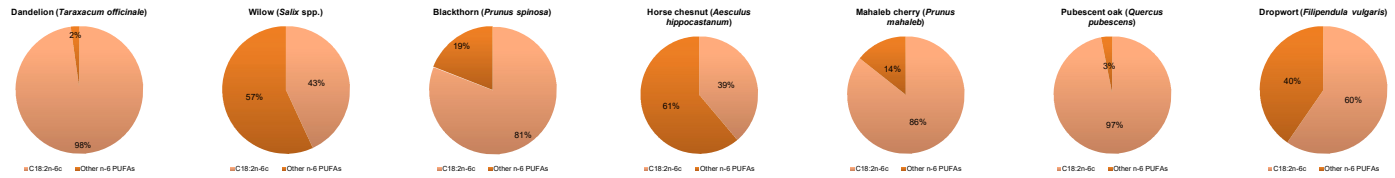

Figure 2 Share of linoleic acid in total n-6 PUFAs

Table 2 Selected nutritional indices monofloral bee pollen

Fatty acids indices	Dandelion *Taraxacum officinale*	Wilow *Salix* spp.	Blackthorn *Prunus spinosa*	Horse chesnut *Aesculus hippocastanum*	Mahaleb cherry *Prunus mahaleb*	Pubescent oak *Quercus pubescens*	Dropwort *Filipendula vulgaris*
n-3/n-6	2.23	0.75	0.62	3.50	0.68	0.39	1.13
ALA/LA	2.28	1.69	0.76	8.96	0.78	0.40	1.68
PUFA/SFA	1.11	2.85	1.85	2.62	1.81	1.21	1.60
UFA/SFA	1.26	3.24	2.07	3.17	2.57	1.61	1.93
IA	0.41	0.24	0.29	0.26	0.26	0.53	0.29
IT	0.18	0.17	0.21	0.13	0.22	0.56	0.23
HH	2.69	4.47	3.65	3.71	4.04	1.89	3.39

ALA-α-linolenic acid (C18:3n-3); LA-Linoleic acid (C18:2n-6); PUFA-Polyunsaturated fatty acids; UFA-Unsaturated fatty acids; SFA-Saturated fatty acids; IA-Index of aterogenicity; IT-Index of thrombogenicity; HH-Hypocholesterolemic/Hypercholesterolemic ratio

Conclusion

Considering the fatty acids composition and all evaluated indices, bee pollen is a valuable product, which through this parameter can have a positive impact on human health too.

In addition, finding of odd chain fatty acids in significant proportions in some bee pollen type, is a strong motivation for further research.

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