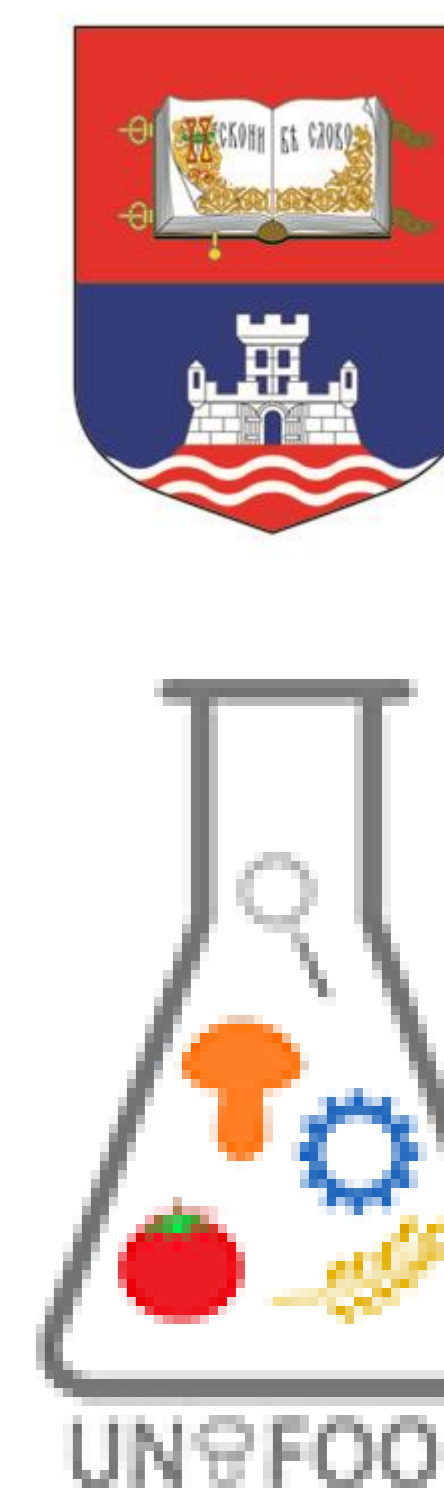


PUMPKIN SEED CAKE – ANTIOXIDANT AND NUTRITIONAL VALUE OF SELECTED SAMPLES



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Pumpkin seed cake, which remains after cold pressing oil extraction, is a nutritionally valuable but inexpensive raw material which is also considered as a potential rich source of biologically active substances.

The aim of this study was to measure total phenolics content (TPC) of four samples of pumpkin seed cake flour (table 1), as well as their antiradical potency by means of DPPH radical scavenging. In order to determine the nutritional value of each sample moisture, ash, cellulose, lipids, proteins, carbohydrates, mineral content and fatty acid composition were also investigated using conventional methods. Concerning food safety issues the amounts of heavy metals and pesticides were also determined.

Methods. Total phenolics content (TPC) was determined spectrophotometrically with Folic-Ciocalteu reagent and expressed as gallic acid (GA) equivalents (mg GA/100 mg) [1]. Antiradical potency was measured by DPPH radical scavenging assay [2]. In order to determine the nutritional value of each sample moisture, ash, cellulose, lipid, protein, and carbohydrate contents were investigated using conventional methods [3]. Amounts of minerals and heavy metals were determined using atomic absorption spectrometry (AAS), while fatty acid composition and pesticide residues were investigated by GC/MS technique.

RESULTS

The results on antioxidant and nutritional characteristics of selected pumpkin seed cakes are presented in Tables 1-5.

Total phenolics content (TPC) of samples ranged from 24.9-194.1 mg GA/100 g. Observed anti-DPPH activity was correlated with TPC, but it could be considered as modest with SC₅₀ values ranged from 0.9-18.5 mg/ml, respectively (Table 2).

As for parameters of nutritional value, obtained results were in line with previous findings, with low lipid and high protein content (table 3).

In all samples unsaturated oleic and linoleic and saturated palmitic and oleic acids were the major components, constituting >95% of total fatty acid content (table 5). Arachidic and lignoceric acid weren't detected in sample 4.

All tested samples complied with the approved health standards related to the content of heavy metals (Pb, As, Cd, Hg) and pesticides.

Table 3. Nutritional characteristics

	Sample 1	Sample 2	Sample 3	Sample 4
Water content (%)	6.14	5.61	7.49	8.51
Ash (%)	7.84	9.54	7.68	8.56
Celulose (%)	13.74	14.16	14.04	8.37
Lipids (%)	9.99	8.15	7.21	3.03
Carbohydrates (%)	11.00	9.38	14.50	21.86
Proteins (%)	51.29	53.16	49.08	49.66

Table 4. Mineral content

	Sample 1	Sample 2	Sample 3	Sample 4
Fe (mg/100 g)	10.71	10.63	6.86	17.0
Cu (mg/100 g)	1.62	1.21	1.19	2.2
Zn (mg/100 g)	2.53	2.44	2.79	11.5
Mg (mg/100 g)	3.94	3.91	3.78	6.6
Se (mg/100 g)	<0.01	<0.01	<0.01	<0.01

Table 1.

Sample	Origin
1	Beltinci (Slovenia)
2	Novo Miloševo (Serbia)
3	Debeljača (Serbia)
4	Commercial sample (Serbia)



Table 2.

	Sample 1	Sample 2	Sample 3	Sample 4
TPC (mg GA/100 g)	43.1	24.9	194.1	29.6
SC ₅₀ (mg/ml)	10.0	13.5	0.9	18.5

Table 5. Fatty acid composition (%)

Fatty acid	Sample 1	Sample 2	Sample 3	Sample 4
Myristic (C14:0)	0,156	0,141	0,142	0,266
Palmitic (C16:0)	13,688	13,228	13,279	17,610
Stearic (C18:0)	7,301	5,816	6,700	6,177
Oleic (C18:1 n-9)	41,814	27,237	40,046	27,477
Vaccenic (C18:1 n-7)	0,831	0,702	0,821	0,447
Linoleic (C18:2 n-6)	32,812	50,219	34,609	44,377
α-linolenic (C18:3 n-3)	0,426	0,397	0,418	1,036
Arachidic (C20:0)	0,188	0,250	0,182	-
Lignoceric (C24:0)	2,783	2,011	3,804	-

As it could be seen from the results presented, there are variations between samples, mainly in TPC, the mineral (14.61-30.70 mg/100 g) and the carbohydrate content (9.38-21.86%). This could be explained by different geographical origin of the pumpkins.

Nevertheless observed differences, it could be concluded that pumpkin seed cake could be considered as a naturally rich source of proteins, cellulose and minerals (Fe, Cu, Zn, Mg) with a reduced amount of oil, safe for human consumption. It is also good source of polyphenols, thus its potential as a functional food ingredient should not be neglected.

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