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Quality evaluation of cold-pressed edible oil from peanut produced from Macedonian “Virginia” variety

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Introduction

The conventional processing of peanuts in the food industry involves mechanical pressing during which the temperature does not surpass 40 °C. This process yields cold-pressed peanut oil and low-value peanut cake. the main object of this study was to give an overview of the chemi cal composition and general quality parameters including fatty acid profile, content of tocopherols and phytosterols as well as physicochemical evaluation, oxidative stability and antioxidant activity of cold-pressed peanut oil from the Macedonian “Virginia” variety.

Materials and methods

The peanuts (*Arachis hypogea*, L.) were cultivated in the valleys of Strumica and Gevgelija regions with an average yield of 1200 kg·ha−1. The peanuts collected for the experimental purpose of this study belong to the “Virginia” variety. The peanuts from the Macedonian “Virginia” variety were collected in mid-October from the valleys of Gevgelia and Strumica, 2012. The selected plant from Arachis hypogea, L., was hand-picked and dried for 7–10 days. After drying, the peanut seeds were separated from plant material and sorted according to their quality and maturity.

TABLE 1. Fatty acid composition of cold-pressed peanut oil (%). Fatty acid analyses were performed in duplicate and the variation between duplicates was less than 1%

Fatty acids	(%)
C16:0	**10.06±0.00^{b}**
C18:0	**4.40±0.01^{c}**
C18:1, trans 1	0.51±0.00^{e}
C18:1, trans 2	0.25±0.00^{e}
C18:1, trans 3	0.16±0.01^{e}
C18:1 D9	**34.19±0.01^{a}**
C18:1 D11	0.57±0.01^{e}
C18:2	**36.13±0.01^{a}**
C18:3	0.33±0.00^{e}
C20:0	0.10±0.00^{e}
C20:1	**1.37±0.00^{d}**
C20:2, 11, 14	0.16±0.00^{e}
C24:0	**3.93±0.00^{c}**
SFA	**18.49±0.01**
MUFA	**37.05±0.03**
PUFA	**36.62±0.01**
Total	**92.16±0.05**

GC analyses were performed in duplicate. The different letters mean significant differences (p<0.05) among results. The letters are a, b, c, d and e according to the decrease in the result values.

TABLE 4. Determination of the content of pytosterols (mg·kg^{-1})

Phytosterols in cold pressed peanut oil	
Cholesterol	3.78±0.25^{i}
Brassicasterol	7.99±0.09^{h}
24-Methylencholesterol	14.55±0.02^{g}
Champesterol	**320.55±17.07^{b}**
Champestanol	32.55±1.72^{e}
Stigmasterol	**133.12±12.51^{d}**
Δ7-Champesterol	5.78±0.59^{g}
Δ5,23-Stigmastadienol	0.81±0.01^{j}
Chlerosterol	13.81±0.11^{g}
ß-Sitosterol	**1812.21±22.17^{a}**
Sitostanol	29.88±1.33^{e}
Δ5-Avenasterol	**236.16±14.18^{c}**
Δ5,24-Stigmastadienol	14.52±1.28^{g}
Δ7-Stigmastenol	8.63±1.07^{h}
Δ7-Avenasterol	24.25±2.52^{f}
Total	**2658.59±74.82**

GC analyses were performed in duplicate. The different letters mean significant differences (p<0.05) among results. The letters are a, b, c, d, e, f, g, h and i according to the decrease in the result values.

TABLE 2. Oil stability index (OSI) from the Rancimat test, peroxide number, free fatty acids (FFA), specific extinction and DPPH assay

Cold- pressed peanut oil	Induction time at 120 °C (h)	Peroxide number (meq O_2·kg^{-1} oil)	FFA (%)	Specific extinction K_{232}	Specific extinction K_{268}	Consumption of DPPH after 15 min. at 517 nm (equivalent as mg·L^{-1} α-tocopherol)
Sample	6.3±0.3^{b}	5.1±0.1^{b}	0.55±0.00^{c}	1.82±0.00^{c}	0.22±0.00^{d}	288.63±59.78^{a-b}

All analyses were performed in duplicate. The different letters mean significant differences (p<0.05) among results. The letters are a, b, c and d according to the decrease in the result values.

TABLE 3. Vitamin-E-active compounds in cold-pressed oils (mg·100 g^{-1} of oil). HPLC analyses were performed in duplicate

	α-tocopherol	γ-tocopherol	β-tocotrienol	δ-tocopherol	Total
Cold- pressed peanut oil	**14.39±0.2^{a}**	**14.51±0.2^{a}**	0.35±0.0^{b}	0.31±0.0^{b}	**29.56±0.4**

HPLC analyses were performed in duplicate. The different letters mean significant differences (p<0.05) among results. The letters are a and b according to the decrease in the result values.

Results and discussion

Oleic acid and linoleic acids presented in Table 1 as unsaturated fatty acids were the most dominant with levels of 34.19±0.01 and 36.13±0.01%, respectively. Regarding the results from Table 2, the cold pressed peanut oil from Macedonian “Virginia” variety had a very good oxidative stability index (OSI) of 6.3±0.3 h which corresponded to over 18% of saturated fatty acids in this oil. Table 3 shows almost equal amounts of α and γ tocopherols (14.38±0.20 and 14.51±0.20 mg·100 g−1 of oil, respectively). Table 4 shows the level of particular phyrosterols as well as the total content of phytosterols in peanut oil (2658.59±74.82 mg·kg−1 of oil). β-sitosterol was the major phytosterol with amounts of 1812.21±22.17 mg·kg−1 oil. Champesterol was the second, most dominant phytosterol in cold-pressed peanut oil with a level of 320.55±17.07 mg·kg−1 oil. Δ5-avenasterol was found to be the third most abundant sterol with a level of 236.16±14.18 mg·kg−1 oil.

Conclusion

Results from this study show that the most im portant class of compounds responsible for the anti oxidant activity of peanut oil measured by the DPPH assay was Vitamin-E-active compounds. Almost equal amounts of α and γ-tocopherol indicated peanut oil as a valuable source of Vitamin-E-active com pounds with a total amount of 29.56±0.4 mg·100 g−1 oil.

References:

Kostadinovic Velickovska Sanja, Mitrev Sasa and Mihajlov Ljupco (2016) Physicochemical characterization and quality of cold-pressed peanut oil obtained from organically produced peanuts from Macedonian “Virginia” variety. Grasas y Aceites, 67 (1).