

EVALUATION OF QUALITY INDICATORS OF WALNUT OIL AND OILCAKE

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Abstract: This article presents a bibliographic and experimental study was to identify the fatty acid composition of oil and oilcake walnuts. The article presents a case study of quality indicators evolution: Atherogenic Index (AI), Lipid Preventive Score (LPS) Index of thrombogenicity in walnut oil and oilcake samples cultivated in Moldova.

Keywords: walnut, quality indicators walnuts oil

Introduction

Walnuts are rich in polyunsaturated fatty acids and have been shown to improve various cardio metabolic risk factors. Nuts are a good source of mono- and poly-unsaturated fatty acids, and they also contain dietary fiber, phytosterols, and polyphenols. Walnuts are composed largely of poly unsaturated fatty acids (PUFAs): ALA and linoleic acid with CHD benefits [7]. The ratio of polyunsaturated to saturated fats in walnuts is 7.1, one of the highest among naturally occurring foods. Almonds, walnuts, hazelnuts, and pistachios have shown reductions in LDL-C. Walnut supplementation may beneficially alter lipid distribution among various lipoprotein subclasses even when total plasma lipids do not change. This may be an additional mechanism underlying the antiatherogenic properties of nut intake [10].

Materials and methods

Materials

Walnuts (*Juglans regia* L.) from Cogalniceanu and Calaras variety, harvested in Moldova. Walnut oil and oilcake it was obtained by cold pressing laboratory Technical University of Moldova. Oil extraction was carried out with mechanical press. After extraction oil was filtered and treated with antioxidants.

Methods

Calculation of Atherogenic Index (AI)

Index of atherogenicity (IA): indicating the relationship between the sum of the main saturated fatty acids and that of the main classes of unsaturated, the forme being considered pro-atherogenic (favouring the adhesion of lipids to cells of the immunological and circulatory system), and the latter anti-atherogenic (inhibiting the aggregation of plaque and diminishing the levels of esterified fatty acid, cholesterol, and phospholipids, there- by preventing the appearance of micro- and macro- coronary diseases) [2].

$$AI_1 = \frac{4 * C14:0 + C16:0 + C18:0}{\sum MUFA + \sum PUFA - \omega6 + \sum PUFA - \omega3}, \quad (1)$$

The atherogenic index (AI) of the fatty acids in the formulated samples were calculated on the basis of the content of the middle chain fatty acids C12:0, C14:0 and C16:0, and the groups MUFA and PUFA as described by Ulbricht TL (1991) with the following cut-off < 0.11 for low cardiovascular risk, 0.11- 0.21 for intermediate cardiovascular risk and > 0.21 for increased cardiovascular risk. [5].

$$AI_2 = \frac{C12:0 + 4 * C14:0 + C16:0}{MUFA + PUFA}, \quad [2]$$

Index of thrombogenicity (IT)

Index of thrombogenicity (IT) is showing the tendency to form clots in the blood vessels. This is defined as the relationship between the pro-thrombogenic (saturated) and the anti-thrombogenic fatty acids (MUFAs, PUFAs – n6 and PUFAs – n3), [2].

$$IT = \frac{C14:0 + C16:0 + C18:0}{0,5 \times MUFA + 0,5 \times PUFA - \omega 6 + 3 \times PUFA - \omega 3 + PUFA - \omega 3 / PUFA - \omega 6}, \quad [3]$$

Calculation Lipid Preventive Score (LPS)

The Lipid Preventive Score (LPS) was calculated using the formula reported by [5].

$$LPS = Total\ lipid + 2 \cdot SPA - MUFA - 0,5 \cdot PUFA, \quad (4)$$

Results and discussion

Walnuts have generated considerable interest in the last decade because the fatty acid profile found in walnut oil, in particular the presence of ω 3 and ω 6 PUFAs which are essential dietary fatty acids and to their favorable ratio in walnut oil [8]. Consumption of nuts has been associated with a decreased risk of cardiovascular disease events and death. Walnuts in particular have a unique profile: they are rich in polyunsaturated fatty acids, which may improve blood lipids and other cardiovascular disease risk factors [1]. Consumption of moderate quantities of walnuts decreases LDL-C by 18.2 mg/dl [9]. Consumption of 28 g of unsalted nuts daily is recommended to enhance LDL-C lowering and decrease CVD risk [6]. MUFAs in olive oil, nuts reduce LDL by 5-10%, lower TGs by 10-15%, increase HDL by 5%, decrease ox LDL, reduce oxidation and inflammation, improve erectile dysfunction, lower blood pressure, and decrease thrombosis and CHD incidence [4]. Nuts are high in fat, but most of the fat is monounsaturated and polyunsaturated.

It was conducted a bibliographic and experimental study of the walnuts *Juglans Regia* L. oil SFA MUFA, PUFA composition. Table 2 presents these values. The cultivated varieties in Moldova are included in these limits.

Table 2 Fatty Acid Composition of Walnuts Oil [3, 7-9]

Parameters	Fatty Acid	Carbon number	g/100g, (%)
SFA	Myristic	C (14:0)	0 - <0,5
	Stearic	C (16:0)	2.5 - 7.0
	Stearic	C (18:0)	0.9 - 2.5

Parameters	Fatty Acid	Carbon number	g/100g, (%)
	Behenic	C (22:0)	0.08 - 0.2
	Lignoceric	C (24:0)	0.03
MUFA	Palmitoleic	C (16:1)	0.1 - 0.4
	Oleic	C (18:1)	9.0 - 35.0
	Gadoleic	C (20:1)	0,21 - 1,7
PUFA	Erucic	C (22:1)	0.1 – 3.8
	Linoleic	C (18:2), n-6	53.0 - 83.0
	Linolenic	C 18:3 , n-3	3.0 - 14.8
Σ SFA			3.51 – 10.23
Σ MUFA			9.51 – 40.9
Σ PUFA			56.0 - 97.8
TUFA/TSEA			9.56 - 15.95

SFA: Saturated Fatty Acids; MUFA: Monounsaturated Fatty Acids; PUFA: Polyunsaturated Fatty Acids;

In the walnut oil samples was identified MUFAs: myristic acid, palmitic acid, stearic acid, oleic acid and PUFAs: linoleic acid and linolenic acid. The predominant fatty acid composition in walnut oil obtained from walnut kernels is the linoleic acid (54.8%).

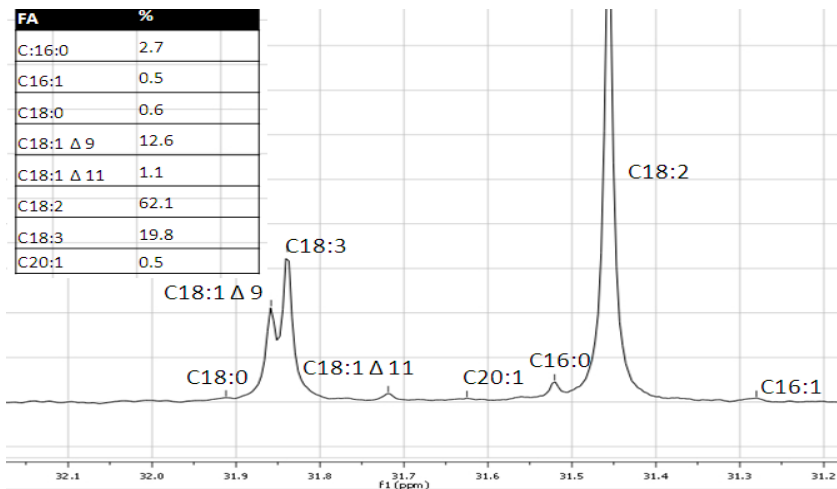


Fig. 1 Walnut oil gas chromatography [3]

Table 3 Determination of Quality Indicators

Nutritional parameters	Walnuts cultivated in Moldova		Walnuts – bibliographical values
	oil	oilcake	Oil
Atherogenic Index (AI ₁)	0.036	0.040	0.04 – 0.05
Atherogenic Index (AI ₂)	0.072	0.072	0.038 - 0.065
Index of thrombogenicity (IT)	0.023	0.024	0.017 - 0.036
Lipid Preventive Score (LPS)	31.13	3.29	3.9 - 34.51

Conclusion

The evidence summarized in this review indicates that walnuts can be incorporated into one's diet for the improvement of CVD risk factors, namely lipid profiles. The conducted experimental study results are within the limits of values showed in bibliographic study and < 0.11 for low cardiovascular risk.

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