

FATTY ACIDS COMPOSITION OF SELECTED MACEDONIAN GOJI BERRIES DETERMINED BY GC-FID

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Results and Discussion

Introduction

Goji berries or wolfberries (*Lycium barbarum* L.) have been used in traditional Chinese medicine for over 2000 years. They are known as anti-aging fruits, fat-free and a good source of fibers and antioxidants. Seeds of goji berries contain fatty acids.

In general, fatty acids are classified according to their degree of saturation: saturated or unsaturated with one double bond (mono-unsaturated) or more than one double bond (poly-unsaturated). The major unsaturated fatty acids are oleic acid (OA), linoleic acid (LA) and α -linolenic acid (ALA). An even number of carbon atoms, from 16 to 18, with a single carboxyl group, are the most common fatty acids present in vegetable oils.

✓. This study, for the first time, presents the fatty acids composition of Macedonian goji berries determined using GC-FID technique.

Materials and Methods

Goji berries samples

Goji berry (*Lycium barbarum*) fruits were collected in July and August 2014 and 2015, grown in the east part of Republic of Macedonia.

Fatty acids derivatization

➤ 2 g of air-dried seed sample was extracted three times by sonication with petroleum ether in a ultrasonic bath [1]. All tree extracts were combined together, obtaining 100 mg oil sample.

➤ transmethylation method under alkali-catalysed conditions was applied on the oil samples to convert the fatty acids glycerides into the corresponding methyl esters [2].

GC-FID analysis

- GC-FID instrument: 7890 Agilent Technologies
- Fused silica capillary column (30 m x 0.32 mm i.d.) with a film thickness of 0.25 μ m
- Temperature programme: 1 min isothermal at 50 °C, 25 °C min⁻¹ to 200 °C, followed by a temperature ramp of 25 °C min⁻¹ to 230 °C and kept for 18 min.
- Injector temperature: 250°C; Temperature of the detector : 250 °C

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Table 1. Linearity data for fatty acids

FAME/Linearity Data	S _{y/x}	Intercept	Slope	LOD*	LOD**	LOQ***	r	R ²
C8:0	615.5	-120.3	244436	0.0080	0.016	0.0482	0.9998	0.9997
C10:0	0.56	0.016	268.7	0.0062	0.012	0.037	0.99992	0.9998
C12:0	0.57	0.085	285.5	0.0054	0.0108	0.036	0.99993	0.9998
C14:0	0.53	4.86	293.3	0.0054	0.011	0.036	0.99994	0.9998
C16:0	0.58	2.85	307.2	0.0057	0.011	0.034	0.99996	0.9999
C16:1	0.32	0.21	302.6	0.0024	0.0049	0.014	0.99979	0.9996
C18:0	0.41	2.13	313.6	0.0039	0.0079	0.023	0.99997	0.9999
C18:1n9	0.33	10.4	295.9	0.0033	0.0067	0.020	0.99994	0.9998
C18:2n6	0.47	24.4	265.1	0.0053	0.010	0.031	0.99985	0.9997
C18:3n3	0.24	0.29	303.8	0.0014	0.0028	0.0086	0.99997	0.9999
C20:0	0.38	0.64	322.2	0.0016	0.0032	0.0096	0.99997	0.9999
C22:0	0.45	1.09	325.0	0.00085	0.0017	0.0051	0.99996	0.9999
C22:1n9	0.26	0.46	321.0	0.0010	0.0020	0.0061	0.99997	0.9999
C24:0	0.46	0.86	329.8	0.0015	0.0031	0.0095	0.99996	0.9999

Table 2. Fatty acids percent composition (%) of Goji Berries

FAME/Samples	GB-1	GB-2	GB-3	GB-4	GB-5	GB-6	GB-7	GB-8	GB-9	GB-10
C10:0	0.08	0.26	0.636	n.d.	0.21	2.21	0.25	0.09	1.15	0.85
C12:0	0.06	0.29	n.d.	1.28	0.21	n.d.	n.d.	0.09	0.84	0.81
C14:0	0.1	0.09	n.d.	0.12	0.18	0.12	0.16	0.11	0.10	0.08
C16:0	8.42	10.6	10.6	11.7	10.7	13.2	11.8	8.31	11.4	9.93
C16:1	0.24	0.21	0.01	n.d.	0.32	n.d.	n.d.	0.20	0.04	0.18
C18:0	3.40	3.34	3.89	3.75	3.35	4.12	2.87	3.41	3.71	4.00
C18:1n9	12.7	13.2	17.3	13.8	15.0	14.5	13.4	15.2	14.3	18.1
C18:2n6	70.5	70.0	65.2	65.0	68.9	55.9	67.3	71.3	64.9	59.2
C18:3n3	3.53	0.58	0.75	1.61	0.32	3.32	2.05	0.04	0.93	3.00
C20:0	0.68	0.91	0.82	1.4	0.59	1.43	1.54	0.86	1.52	1.59
C22:0	0.18	0.09	0.18	0.05	0.07	n.d.	n.d.	0.24	0.01	1.26
SFAs	13.0	16.0	16.7	19.5	15.4	26.3	17.4	13.2	19.8	19.5
MUFAs	13	13.4	17.3	13.9	15.4	14.5	13.4	15.4	14.3	18.3
PUFAs	73.9	70.6	65.9	66.6	69.3	59.3	69.3	71.4	65.9	62.2

•In all the analyzed fruit samples, the predominant fatty acid is linoleic, followed by oleic, palmitic and stearic acids. Hence, it can be categorized as linoleic-oleic acid. The erucic (C22:1n9) and lignoceric (C24:0) acids were not detected in any of the analyzed samples.

•Analysed fruits were mainly constituted by PUFAs (59.25–73.98%), followed by SFAs (13.02–26.27%), and finally by MUFAs (13.00–18.29%). The total unsaturated fatty acids (UFAs=MUFAs+PUFAs) varied between 73.73% and 86.98%, with average of 82.33%.

Conclusion

Optimization and validation of the GC-FID method before transmethylation were performed. Method was applied on analysis of ten goji berry samples, in which linoleic acid (C18:2n6) was predominant acid, followed by oleic (C18:1n9), palmitic (C16:0) and stearic (C18:0) acids.

References

- [1] Endes Z., Uslu N., Özcan M. M., Er F., Physico-chemical properties, fatty acid composition and mineral contents of goji berry (*Lycium barbarum* L.) fruit, Journal of Agroalimentary Processes and Technologies 2015, 21(1), 36-40.
- [2] ISO 12966-2:2011. Animal and vegetable fats and oils - Gas chromatography of fatty acid methyl esters - Part 2: Preparation of methyl esters of fatty acids.