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BRIEF COMMUNICATIONS

FATTY ACIDS IN OIL FROM *Allium* VEGETABLE SEEDS

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Allium vegetables belong to the family of Alliaceae. Due to its valuable chemical composition (secondary metabolites from the flavonoid group, essential oils, saponins, and phytoncides), garden onion (*Allium cepa* L.) is used to produce pharmaceutical preparations (anti-bacterial, anti-fungal, anti-diabetes, anti-parasitic, etc.) [1–3].

Other cultivated *Allium* species are: kurrat (*A. ampeloprasum aegyptiacum*), leek (*A. ampeloprasum porrum*), shallot (*A. cepa ascalonicum*), Japanese bunching (*A. fistulosum*), Chinese chives (*A. tuberosum*), and chives (*A. schoenoprasum*). Mainly tubers and leaves of those species are utilized. The presence of aromatic volatile compounds containing *S*-methylcysteine sulfoxide (SMCS) derivatives makes these species valuable as spices used in cuisine and in the foodstuff industry [2].

Besides commonly used organs, *Allium* plants produce seeds that have not found other applications yet, except for reproduction. Hu et al. report that *A. tuberosum* seeds contain about 16% of fat rich in unsaturated fatty acids (79.2–93.0%) with domination of linoleic acid (57.0–71.6%) [5]. Seeds of *A. tuberosum* have been reputedly used as traditional Chinese medicine for treating both impotence and nocturnal emission [4, 5]. *A. fistulosum* seeds are used as a tonic and an aphrodisiac [6].

The lack of detailed data on the composition of the lipid fraction of Alliaceae seeds forced the authors to undertake a study on that subject. Therefore, the present paper aims at analyzing the fatty acids contained in the lipid fraction isolated from various species and varieties of Alliaceae cultivated in Poland and produced for consumption purposes.

Oil extracted from *Allium* seeds was characterized by "onion-like" fragrance. Table 1 presents data on the fat content and fatty acid (FA) composition in the lipid fraction extracted from the studied seeds. The highest fat content was found in seeds of different garden onion varieties *A. cepa*: from about 25.3% to about 30.2%. Seeds of *A. porrum* contained from about 14.5% to about 16.9% of fat, while seeds of *A. fistulosum* and *A. schoenoprasum* contained about 23.5% and 16%, respectively.

Polyunsaturated along with monounsaturated fatty acids dominated in all tested fats (up to about 51.4% and 19.6%, respectively). Lipids from Alliaceae seeds contained the highest amounts of diunsaturated linoleic acid: from about 44.3% in the fat of A. *schoenoprasum* seeds to about 51.0% in the fat of *A. porrum* Tango seeds. Linoleic acid was also the main fatty acid in oil extracted from *A. tuberosum* seeds (from 57.0% to 71.6%, assuming 100% as the sum of fatty acids in the oil) [5].

Polyunsaturated FAs play an important role for the human organism [7].

Monounsaturated oleic acid (18:1) is the second main fatty acid in the studied oils: from about 15.4% in *A. cepa* Efekt seeds to about 19.6% *A. cepa* Albatros seed oil. In the fatty acid fraction from *A. tuberosum* oil, the acid made up from 17.9% to 22.5% [5].

Significant contents of palmitic acid were recorded in the studied lipid fractions: from about 3.4% in oil from A. *fistulosum* seeds to about 8.3% in fat from *A. porrum* Tango seeds; it was also present in the main fatty acids profile of *A. tuberosum* [5].

Seeds of *Allium* vegetables may be an important source of fat abundant in unsaturated fatty acids. Literature data [5] and results on the qualitative and quantitative composition of fatty acids in oils from cultivated *Allium* species indicate similarity of the studied plant group with respect to chemotaxonomy.

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TABLE 1. Crude Fat and Fatty Acid Content of Some *Allium* sp. Seeds

Compound	ACE	ACK	ACA	ACS	AF	AS	APW	APT	APAm	APB	APA1	APA2
	Fat, g/100 g DM											
	27.24	25.28	30.16	26.63	23.46	15.98	16.89	14.50	16.19	15.26	15.07	15.97
	Fatty acids, g/100 g crude fat											
14:0	0.09	0.10	0.12	0.11	0.06	0.13	0.10	0.15	0.10	0.12	0.10	0.12
16:0	6.39	6.25	6.41	6.42	3.41	4.89	7.48	8.27	8.20	8.02	6.77	7.78
16:1	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.
18:0	1.05	1.25	1.64	1.64	1.34	1.06	1.67	2.09	1.90	1.59	1.61	2.27
18:1	15.39	17.62	19.63	18.53	15.93	17.30	18.36	16.03	15.75	16.72	15.97	17.45
18:2	46.28	47.08	45.98	45.57	48.69	44.25	46.85	51.02	45.85	47.70	50.00	45.87
α-18:3	0.94	0.71	0.36	0.54	0.32	1.85	0.58	0.38	0.18	0.23	0.22	0.12
20:0	Tr.	Tr.	Tr.	Tr.	0.24	0.28	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.
20:2	Tr.	Tr.	Tr.	Tr.	0.23	0.18	Tr.	Tr.	Tr.	Tr.	Tr.	Tr.
$\Sigma_{Sat.}$	7.53	7.61	8.17	8.17	5.05	6.36	9.25	10.52	10.20	9.73	8.70	10.17
$\Sigma_{Monounsat}$	15.39	17.62	19.63	18.53	15.93	17.30	18.36	16.03	15.75	16.72	15.22	17.45
$\Sigma_{Polyunsat..}$	47.22	47.79	46.34	46.11	49.24	46.28	47.44	51.40	46.03	47.93	47.73	45.99
Σ_{Total}	70.14	73.02	74.14	72.81	70.22	69.94	75.04	77.95	71.98	74.38	71.65	73.61

ACE: *A. cepa* (var. Efekt), ACK: *A. cepa* (var. Kristine), ACA: *A. cepa* (var. Albatros), ACS: *A. cepa* (var. Sochaczewska), AF: *A. fistulosum*, AS: *A. schoenoprasum*, APW: *A. porrum* (var. Varna), APT: *A. porrum* (var. Tango), APAm: *A. porrum* (var. Amundos), APB: *A. porrum* (var. Bluvetia), APA1: *A. porrum* (var. Alita), APA2: *A. porrum* (var. Alita). Tr.: trace (<0.01g/100 g).

Fats. The percentage of crude fat was measured by means of the extraction-gravimetric Soxhlet's method [8].

Preparation and Analysis of Fatty Acid Methyl Esters (FAME). The contents of fatty acids as methyl esters were determined using a GC technique, after preliminary fat saponification and acid esterification according to AOAC-969.33 and 963.22 procedures [9, 10], applying an internal standard technique (heptadecanoic acid).

GC-MS and GC. GC was performed with a Unicam 610 Series gas chromatograph equipped with a flame-ionization detector and a 60 m (0.25 mm i.d.) column coated with a 0.25 μm film of HP-23. A temperature gradient was applied (160°C for 1 min, then incremented by 2.75°C/min to 215°C, 215°C for 2 min, then incremented by 40°C/min to 230°C, 230°C for 2 min). The injection port and detector temperatures were 270°C; split ratio 1:50. Hydrogen was used as carrier gas at a flow rate of 1.3 mL/min. Calculations were based on earlier analyses of standard mixture and calculation of the individual correction coefficients [11].

REFERENCES

1. P. Czikow and J. Laptiew, *Medical and vitamin-rich plants*, PWRiL Warszawa, 1983, p. 82.
2. G. Griffiths, L. Trueman, T. Crowther, B. Thomas, and B. Smith, *Phytother. Res.,* **16**, 603 (2002).
3. K. T. Augusti, *Indian Medicinal Plants,* in: P. C. Trivedi (ed.), *Medicinal Plants, Traditional Knowledge.* I.K., International Publishing House Pvt. Ltd., New Delhi, 2006, pp. 61–99.
4. G. Hu, *Bioresource Technol.*, **96**, 1630 (2005).
5. G. Hu, Y. Lu, and D. Wei, *Food Chem.*, **99** (4), 693 (2006).
6. S. Sang, A. Lao, Y. Wang, C. K. Chin, R. T. Rosen, and C. T. Ho, *J. Agr. Food Chem.,* **50**, 6318 (2002).
7. S. Ziemlanski, *Zywienie Cziowieka i Metabolizm,* **24** (2), 35 (1997).
8. C. S. James, *Analitycal Chemistry of Foods,* Chapman and Hall, London, 1995, pp. 91–92.
9. AOAC, *Official Methods of Analysis of the AOAC 963.22. Methyl esters of fatty acids in oils and fats.* 17th Ed. Arlington, Virginia, USA, 2000.
10. AOAC, *Official Methods of Analysis of the AOAC 969.33. Fatty acids in oils and fats.* 17th Ed. Arlington, Virginia, USA, 2000.
11. R. Kowalski, *Acta Chromatogr.,* **18**, 15 (2007).