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BRIEF COMMUNICATIONS

FATTY ACID PROFILES IN WILD MUSHROOM SPECIES FROM ANATOLIA

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Mushrooms are consumed as food due to their unique taste and flavor as well as their chemical and nutritional properties. The presence of less calories, fats, and essential fatty acids but higher amounts of proteins, vitamins, and minerals make it more preferable against obesity and diabetes [1]. The health benefits of mushroom fatty acids has attracted the attention of scientist. The polyunsaturated fatty acids found in mushrooms, including linoleic and linolenic acids, are essential to our basal metabolism and in the mammalian diet [2]. Linoleic acid is a precursor of arachidonic acid, which plays an important role in prostaglandin biosynthesis. Moreover, it is a precursor of 1-octen-3-ol that gives the special aroma to mushrooms [3]. Lack of dietary essential fatty acids can cause cardiovascular diseases [4].

Herein we report on the fatty acid profiles of nine wild mushroom species, i.e., *Fomes fomentarius* (L.) Fr., *Funalia trogii* (Berk.) Bondartsev & Singer, *Ganoderma adspersum* (Schulzer) Donk, *Ganoderma applanatum* (Pers.) Pat., *Ganoderma lucidum* (Curtis) P. Karst, *Gyromitra esculenta* (Pers.) Fr., *Lyophyllum decastes* (Fr.) Singer, *Pleurotus ostreatus* (Jacq.) P. Kumm., and *Russula delica* Fr., collected from Anatolia. Presently, the fatty acid composition of *F. fomentarius* [5], *G. applanatum* [5, 6], *G. lucidum* [7], *L. decastes* [8], *P. ostreatus* [9, 10], and *R. delica* [11, 12] has been reported.

Table 1 shows the fatty acid profiles of the studied mushroom species. Linoleic (16.9–57.4%), oleic (9.1–44.8%), and palmitic (4.1–36.9%) acids were found as the major fatty acids.Both linoleic and oleic acids decrease the risk of cardiovascular disease; thus, mushrooms are recommended to people who have high blood cholesterol [13]. Palmitoleic (2.1–5.8%) and stearic acids (2.2–22.2%) were also found during the study. Normally, mushrooms possess low amounts of linolenic acids; however, in *F. trogii*, the concentration of linolenic acid (18:3) is rather high (10.5%). Fatty acids, i.e., 8:0, 9:0, 10:0, 12:0, 14:0, 15:0, 16:2, 17:0, 20:4, 20:1, 20:0, 21:0, 22:0, 23:0, 24:0, and 25:0, were also identified in less amounts. The total saturated and unsaturated fatty acids found in the studied mushrooms are in the range 22.3–53.8% and 46.2–77.6%, respectively.

The nutritional value of mushrooms is directly proportional to the amount of unsaturated fatty acids. The linoleic and oleic acid ratio (L/O) calculated from Table 1 is between 0.41 and 4.70. The L/O ratio is useful to criticize the chemotaxonomic viewpoint for future studies and for taxonomical discrimination of the species in the same genus.

This is the first study on the fatty acid composition of *F. trogii*, *G. adspersum*, and *G. esculenta*.

Mushroom Materials. *F. fomentarius*, *F. trogii*, and *G. lucidum* were collected from Usak-Esme, Turkey in September 2012. *G. adspersum* and *G. applanatum* were collected from Aydin, Turkey in December 2012. *G. esculenta*, *L. decastes*, *P. ostreatus*, and *R. delica* were collected from Usak-Banaz, Turkey in May 2012. The collected mushrooms were identified by Dr. Aziz Turkoglu, Mugla Sitki Kocman University. The mushroom specimens were deposited at the Fungarium of the Biology Department of Mugla Sitki Kocman University. The mushrooms were stored under –18°C before analyses.

Spectral Measurements and Chemicals Used. GC and GC-MSD analyses were performed on a Shimadzu GC-17 AAF, V3, 230 V series gas chromatograph (Japan) and on a Varian Saturn 2100 (USA) at the Department of Chemistry, Mugla Sitki Kocman University. Methanol, *n*-hexane, and boron trifluoride-methanol complex (BF_3–MeOH) were obtained from E. Merck (Darmstadt, Germany).

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TABLE 1. Fatty Acid Profiles of the Mushroom Species, %

Fatty acid	FF	FT	GAD	GAP	GL	GE	LD	PO	RD
8:0	–	–	–	–	1.5	–	–	–	1.9
9:0 (*iso*)	–	–	0.21	0.21	–	–	–	–	–
9:0	–	–	0.65	0.81	–	–	–	–	–
10:0	–	–	0.27	–	–	–	–	–	–
12:0	Tr.	–	0.15	0.08	1.7	–	–	–	1.9
14:1 ((*Z*)-11)	–	–	0.09	–	–	–	–	–	–
14:0	1.5	–	10.7	0.82	2.0	–	–	0.9	2.2
15:0	–	–	3.2	5.3	1.4	–	–	2.1	–
16:2 (7,10)	–	–	0.28	–	–	–	–	–	–
16:2 (9,12)	–	–	–	0.39	–	–	–	–	–
16:1 ((*Z*)-11)	–	–	0.97	–	–	–	–	–	–
16:1	5.8	–	2.1	2.72	2.4	–	2.3	3.7	4.3
16:0	**20.1**	**19.6**	**18.1**	**21.5**	**13.3**	**36.9**	4.1	**15.9**	**8.9**
17:0	0.57	–	1.8	1.9	0.8	–	–	0.72	0.34
18:3	8.9	10.5	–	–	2.8	–	2.5	2.3	–
18:2	**42.1**	**16.9**	**28.2**	**36.6**	**57.4**	**18.3**	**25.2**	**56.2**	**34.9**
18:1	**9.1**	**17.0**	**29.2**	**17.9**	**12.2**	**44.8**	**42.8**	**12.6**	**38.4**
18:0	8.9	4.3	2.7	2.2	2.6	–	**22.2**	3.6	7.1
20:4	2.9	1.8	–	–	–	–	–	–	–
20:1	–	–	–	0.18	–	–	–	–	–
20:0	–	–	0.27	0.48	1.9	–	0.88	2.0	–
21:0	–	2.2	–	–	–	–	–	–	–
22:0	–	–	–	1.8	–	–	–	–	–
22:0	–	7.8	Tr.	1.1	–	–	–	–	–
23:0	–	7.7	0.42	1.5	–	–	–	–	–
24:0	–	11.7	–	2.7	–	–	–	–	–
25:0	–	0.5	–	1.8	–	–	–	–	–
Unidentif.	0.13	–	0.61	–	–	–	–	–	–
Σsat.	31.1	53.8	38.5	42.2	25.2	36.9	27.2	25.2	22.3
Σunsat.	68.8	46.2	60.8	57.8	74.8	63.1	72.8	74.8	77.6
Sat./Unsat.	0.45	1.16	0.63	0.73	0.34	0.58	0.37	0.33	0.29
L/O*	4.63	0.99	0.97	2.04	4.70	0.41	0.59	4.46	0.91

*L/O: linoleic acid–oleic acid ratio; Tr.: trace < 0.01%. FF: *F. fomentarius*, FT: *F. trogii,* GAD: *G. adspersum*, GAP: *G. applanatum*, GL: *G. lucidum*, GE: *G. esculenta*, LD: *L. decastes*, PO: *P. ostreatus*, RD: *R. delica*.

Determination of Fatty Acids with GC and GC/MS. Derivatization of fatty acids was carried out according to our previous method [14]. Qualitative and quantitative analysis of the fatty acid esters were performed by GC and GC/MSD as reported previously [15].

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