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FATTY ACID COMPOSITION OF *Rosa* SPECIES SEEDS IN TURKEY

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The genus *Rosa* contains approximately 100 species that are widely distributed in Europe, Asia, the Middle East, and North America.

Although there are some studies related to the fatty acid content of a single rose species, *Rosa canina* [1–3], a comparative study using different *Rosa* species have not been carried out so far.

Here we report on the fatty acid compositions of seven *Rosa* species, namely *Rosa villosa, Rosa pulverulanta, Rosa dumalis* subsp. *boissieri, Rosa pisiformis, Rosa dumalis, Rosa dumalis* subsp. *antalyensis,* and *Rosa canina.*

The yield of seed oil was between 4.79% (*Rosa villosa*) and 5.37% (*Rosa canina*), 5.13% (*R. pulverulanta*), 4.84% (*R. dumalis boissieri*), 4.60% (*R. pisiformis*), 5.22% (*R. dumalis*), and 5.01% (*R. dumalis antalyensis*).

The fatty acid composition of the oils was analyzed according to a previous method [4], and the results are given in Table 1.

Fatty acid components representing about 91.17% (*Rosa dumalis* subsp. *antalyensis*) to 99.93% (*Rosa canina*) of total oil were characterized. The amount of saturated and unsaturated fatty acids in seed oils was found to be 7.75% (*Rosa dumalis* subsp. *boissieri*) to 14.68% (*Rosa dumalis*) and 77.80% (*Rosa dumalis* subsp. *antalyensis*) and 91.85% (*Rosa canina*), respectively. Unsaturated fatty acids (18:1, 18:2 and 18:3) as triglycerides in the oil from hip seed samples are the predominant constituents. An average of 90% of the fatty acids (Table 2) are unsaturated, as previously described for *Rosa xanthina* Libnal [5].

Fatty acid analysis has shown that the eight *Rosa* species studied contained eleven major compounds, and statistically a much greater variation of fatty acids was found among *Rosa* species (Table 1). Linoleic acid (46.31–54.03%) was the main fatty acid for *Rosa villosa, Rosa pulverulanta, Rosa dumalis* subsp. *boissieri, Rosa pisiformis,* and *Rosa canina,* while α-linolenic (79.89%) and oleic acid (43.81%) were the dominant fatty acid for *Rosa dumalis* and *Rosa dumalis* subsp. *antalyensis,* respectively (Table 1). In previous studies conducted on *Rosa canina* seeds, the main fatty acids were found to be linoleic and linolenic acids [1, 3], in agreement with our present study. A high content of linoleic and linolenic acid (polyunsaturated fatty acids) is favorable for medicinal (prophylaxis and treatment of arteriosclerosis, eczema) and nutritional applications since these components particularly linolenic acid, are responsible for cardioprotective, antidiabetic, and antimicrobial activities [6–9].

Margaric, veccenic, heneicosenoic, and 11-eicosenoic acid were determined for the first time in this study.

The palmitic and stearic acid detected in all samples were between (3.14–8.01%) and (2.82–5.34%), respectively. Ozcan [2] reported that rose hip seeds belonging to *Rosa canina* had 1.71–3.71% palmitic and 1.69–2.47% stearic acid, which is close to our results.

Margaric acid was detected only in Rosa *villosa, Rosa pulverulanta, Rosa pisiformis,* and *Rosa dumalis* in trace amounts (0.40–0.75%), and vaccenic acid was also found in trace amounts only in *Rosa dumalis* (0.66%) and *Rosa dumalis* subsp. *antalyensis* (0.62%), respectively. It was interesting that among the species studied only *Rosa dumalis* included γ-linolenic acid (0.52%). On the other hand, heneicosenoic acid was detected in *Rosa dumalis subsp. boissieri* (0.18%) and *Rosa dumalis* (0.24%), respectively (Table 1).

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TABLE 1. Fatty Acid Composition (%) of *Rosa* Species

Fatty acid	*R. villosa*	*R. pulverulanta*	*R. dumalis boissieri*	*R. pisiformis*	*R. dumalis*	*R. dumalis antalyensis*	*R. canina*
16:0	3.14d	3.50 cd	4.20c	4.07c	8.01a	7.10b	3.87c
17:0	0.70a	0.75a	N.d.c	0.46b	0.40b	N.d.c	N.d.c
18:0	5.18ab	4.31 ab	2.82b	4.10ab	4.93ab	5.34a	3.65ab
18:1	N.d.b	N.d.b	N.d.b	N.d.b	0.66a	0.62a	N.d.b
18:1	N.d.c	N.d.c	38.08a	40.89a	N.d.c	43.81a	21.96b
18:2	49.93a	54.03a	49.39a	46.31a	N.d.b	N.d.b	51.18a
α-18:3	32.94b	34.38b	N.d.c	N.d.c	79.89a	32.62b	18.13bc
γ-18:3	N.d.b	N.d.b	N.d.b	N.d.b	0.52a	N.d.b	N.d.b
20:0	N.d.c	N.d.c	0.55b	0.47b	1.10a	0.93a	0.56b
20:1	N.d.c	N.d.c	0.39b	0.46b	0.71a	0.75a	0.58b
21:0	N.d.b	N.d.b	0.18a	N.d.b	0.24a	N.d.b	N.d.b
Σ	91.19	96.97	95.61	96.76	96.46	91.17	99.93
$\Sigma_{Sat.}$	8.32	8.56	7.75	9.10	14.68	13.37	8.08
$\Sigma_{Unsat.}$	82.87	88.41	87.86	87.66	81.78	77.80	91.85

N.d.: Not determined.

*Values in the same line with different lower-case letters are significantly different at $p<0.05$.

Plant Material. Rose hips harvested manually from *Rosa villosa*, *Rosa pulverulanta*, *Rosa dumalis* subsp. *boissieri*, *Rosa pisiformis*, *Rosa dumalis*, *Rosa dumalis* subsp. *antalyensis*, and *Rosa canina* shrubs found at the same age and in the same collection parcel at Ataturk University Agricultural Faculty Department of Horticulture, Erzurum-Turkey were investigated in 2005. All fruits were picked commercially at the ripe stage. The fruits were selected according to uniformity of shape and color. The seeds were obtained from these fruits.

Oil Extraction. Ground samples were extracted in a Soxhlet extraction apparatus with diethyl ether (Merck, Darmstadt) as solvent. Then the solvent was removed completely by rotary evaporation.

Sample Preparation and Fatty Acid Analysis. Sample preparation and analysis of the fatty acid composition of the oils was conducted according to a previous method [7].

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