Original articles

Fatty acid compositions of the seeds of different *Sanguisorba minor* genotypes

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Summary. The seed oils of twenty *Sanguisorba minor* (Leguminosae) genotypes were investigated for their oil contents and fatty acid compositions. The oil contents of the seeds were found to be between 8.85% and 15.66%. The fatty acid compositions of these twenty different genotypes were determined by the GC of the methyl esters of their fatty acids. The oilseeds of *Sanguisorba minor* genotypes contain palmitic acid as the major component of their fatty acids, among the saturated acids, with small amounts of steraric acid. The major unsaturated fatty acids found in the oilseeds of the genotypes were oleic, linoleic and linolenic acids. In this study, the total saturated fatty acids of *Sanguisorba minor* genotypes were between 6.40% and 15.84% while the total unsaturated fatty acids were between 84.16% and 93.60%.

Key words: Oil content, unsaturated fatty acid, saturated fatty acid, *Sanguisorba minor*

Introduction

Sanguisorba minor is a perennial plant with pointed leaves and redis-green flowers (1). The plant is grown in Eurpope, North Africa, Canarias Islands, Southeastern Asia, New Zealand and England and it is widely used in animal nutrition (2). It has also been used in folk medicine for centuries (3,4). Despite low oil content, the plant has several clinical advantages, thus used as an alternative oil crop. Plants exhibit quite much diversity in macro-micro elements (5) and chemical composition (especially in fatty acids) (6). Genetic diversity is the most significant factor in breeding studies (7). Selection of proper parents is also a significant factor in improving efficiency of breeding programs and performing promising hybridizations. Therefore, all characteristics of local genotypes should be identified in detail.

The present study was conducted to characterize 20 different salad burnet (*Sanguisorba minor*) genotypes with regard to fatty acid compositions.

Material and Methods

Plant samples

In this study, a total of 20 salad burnet (*Sanguisorba minor*) genotypes from Kirsehir, Kahramanmaras, Sivas, Kayseri and Yozgat provinces in Turkey were used as the seed material (Table 1). The seeds were sown and propagated under controlled conditions of Kayseri province of Central Anatolian (39°48'N, 38°73'E). Resultant plants were subjected to fatty acid analyses.

Table 1. Codes and abbreviations of *Sanguisorba minor* genotypes

No	Code	No	Code	No	Code	No	Code
1	ÇD2	**6**	ÇD12	**11**	ÇD26	**16**	ÇD38
2	ÇD5	**7**	ÇD16	**12**	ÇD28	**17**	ÇD40
3	ÇD9	**8**	ÇD17	**13**	ÇD32	**18**	ÇD45
4	ÇD10	**9**	ÇD19	**14**	ÇD33	**19**	ÇD47
5	ÇD11	**10**	ÇD24	**15**	ÇD34	**20**	ÇD57

Oil extraction and preparation of fatty acid methyl esters (FAME)

Impurities were removed from the seeds and the cleaned seeds were ground using mill into powder. The seed material of *Sanguisorba minor* genotypes was homogenized in 10 mL of hexane / isopropanol (3:2) at 10.000 rpm for 30 sec and centrifuged at 5000 rpm for 10 min (8). The upper part was removed and placed in a test tube by filtration.

Capillary GLC

The fatty acids in lipid extracts were converted to methyl esters in methanol with 2% sulfuric acid (v/v) (9). The fatty acid methyl esters were extracted with n-hexane. Then the methyl esters were separated and quantified by gas chromatography and flame ionization detection (Schmiadzu GC, 17 Ver.3) coupled with a glass GC 10 software computing recorder. Chromatography was performed with a capillary column [GC-MS instrument (USA) of Agilent brand 7890A / 5970 C and SGE Analytical BPX90 100 m x 0.25 mm x 0.25 µm column (Australia) were used] using nitrogen as carrier gas (flow rate 1 mL/min) the temperatures of the column, detector and injector valve were 120-220, 240-250 °C, respectively. Identification of the individual method was performed by frequent comparison with authentic standard mixtures analyzed under the same conditions.

Results and Discussion

In this study, oil content and fatty acid compositions of the seeds of 20 different *Sanguisorba minor* genotypes were determined and the results were given in Table 2. Oil content of *Sanguisorba minor* genotypes was detected between 8.85% and 15.66%. The ÇD33 genotype had the highest oil content, while the lowest percentage was found in ÇD19 genotype. The main components in the seed oils of *Sanguisorba minor* genotypes are palmitic, oleic, linoleic and linolenic acids. Palmitic acid, a saturated fatty acid, was ranged from 4.55-10.40%, which was lower than those given by Viano et al. (2) as 29.1%. Stearic acid was detected in only 3 genotypes (ÇD2, ÇD19 and ÇD28), ranging from 2.28% to 7.90%. These results were in agree-

Table 2. Fatty acid composition of studied samples (%)

Fatty acid	ÇD2	ÇD5	ÇD9	ÇD10	ÇD11	ÇD12	ÇD16	ÇD17	ÇD19	ÇD24
Oil content	10.83	12.27	11.14	11.38	11.10	13.18	12.94	10.49	8.85	9.77
16:0	4.55	7.98	7.41	7.56	6.92	7.44	6.40	7.80	7.94	10.40
18:0	2.28	-	-	-	-	-	-	-	7.90	-
18:1	34.34	24.78	30.84	23.09	19.57	23.40	25.98	29.54	24.88	-
18:2	31.14	36.76	33.92	38.81	36.62	40.46	36.92	32.16	30.51	49.84
18:3	27.69	30.48	27.83	30.54	36.89	28.70	30.70	30.50	28.77	39.76
∑TSFA	6.83	7.98	7.41	7.56	6.92	7.44	6.40	7.80	15.84	10.40
∑TUSFA	93.17	92.02	92.59	92.44	93.08	92.56	93.60	92.20	84.16	89.60
	ÇD26	ÇD28	ÇD32	ÇD33	ÇD34	ÇD38	ÇD40	ÇD45	ÇD47	ÇD57
Oil content	12.44	13.43	11.33	15.66	13.98	13.11	10.23	10.81	10.49	10.80
16:0	7.55	6.42	7.67	6.52	7.59	7.54	7.37	6.57	8.33	7.47
18:0	-	3.52	-	-	-	-	-	-	-	-
18:1	25.58	26.22	33.02	22.51	28.57	21.28	28.07	30.53	30.33	22.31
18:2	36.12	32.80	33.25	39.62	34.76	37.84	35.70	33.74	32.17	35.53
18:3	30.75	31.04	26.06	31.35	29.08	33.34	28.86	29.16	29.17	34.69
∑TSFA	7.55	9.94	7.67	6.52	7.59	7.54	7.37	6.57	8.33	7.47
∑TUSFA	92.45	90.06	92.33	93.48	92.41	92.46	92.63	93.43	91.67	92.53

C16:0 Palmitic acid; C18:0 Stearic acid; C18:1 Oleic acid; C18:2 Linoleic acid; C18:3 Linolenic acid; TSFA: Total saturated fatty acid; TUSFA: Total unsaturated fatty acid ment with Viano et al. (2) who reported that stearic acid was detected from *Sanguisorba minor* ssp. *muricata* as 6.90%.

Oleic acid was detected between 19.57% and 34.34% in all genotypes except for ÇD24 genotype. From the data presented it could be seen that the highest oleic acid was found in ÇD2 genotype, while the lowest percentage was found in ÇD11 genotype. The values we obtained about oleic acid were found to be higher than those obtained by some research (2,10). It is thought that this is due to the different genotypes used in the research. Linoleic acid was the major unsaturated component in the oil of these seeds, followed by linolenic and oleic acids. Linoleic acid was found to be the highest in the ÇD24 genotype (49.84%) and the lowest in the ÇD19 genotype (30.51%). These results were in disagreement with Viano et al. (2) who reported that linoleic acid was detected from *Sanguisorba minor* ssp. *muricata* as 22.6%. On the other hand, Petersen et al. (10) reported that linoleic acid was found to be 2.6% in DM of *Sanguisorba minor*. The highest linolenic acid was obtained in ÇD24 genotype with 39.76%, while the lowest linolenic acid was obtained in ÇD32 genotype with 26.06%. The values we obtained for linolenic acid were higher than the values of some scientists (2,10).

Total unsaturated fatty acid (TUSFA) of studied *Sanguisorba minor* genotypes was between 84.16% and 93.60% (Table 2). It could be seen in Table 2 that the highest TUSFA was found in ÇD16 genotype, while the lowest percentage was found in ÇD19 genotype. Total saturated fatty acid (TSFA) of studied *Sanguisorba minor* genotypes was between 6.40% and 15.84%. ÇD19 genotype has highest level of TSFA; also in the *ÇD24* genotype (10.40%) and *ÇD28* genotype (9.94%). The lowest percentages of TSFA were found in ÇD16 genotype. The values we acquired related to TSFA and TUSFA were disagree with Viano et al. (2) and Petersen et al. (10).

Conclusion

The oil contents of the studied legumes belonging to the *Sanguisorba minor* genotypes showed quantitative differences but the oilseeds showed uniform fatty acid composition. The results revealed that the oilseeds of the *Sanguisorba minor* genotypes studied with a substantial amount of very long chain fatty acids might have attracted attention because of their value for industrial, nutritional and renewable resources.

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