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FATTY ACID PROFILE OF FOUR *ANTHEMIS* SPECIES GROWING IN İZMİR, TURKEY

ABSTRACT

In this study, the fatty acid compositions of *Anthemis aciphylla* var. aciphylla, *Anthemis pseudocotula*, *Anthemis macrotis* and *Anthemis coelopoda* var. *bourgaei* growing in İzmir, Turkey were determined. The fatty acid composition was analyzed using gas chromatography. Generally, C 4:0 butyric acid, C 18:2 linoleic acid and C 6:0 caproic acid were found to be the major fatty acids in all species.

Keywords: *Anthemis*, Fatty Acid Composition, Butyric Acid, Linoleic Acid, Caproic Acid

İZMİR, TÜRKİYE'DE YETİŞEN DÖRT *ANTHEMIS* TÜRÜNÜN YAĞ ASİDİ PROFİLİ

ÖZ

Bu çalışmada, İzmir, Türkiye'de yetişen *Anthemis aciphylla* var. Aciphylla, *Anthemis pseudocotula*, *Anthemis macrotis* ve *Anthemis coelopoda* var. *bourgaei* bitkilerinin yağ asidi içeriği tespit edilmiştir. Yağ asidi içeriği, gaz kromatografisi kullanılarak tespit edilmiştir. Genel olarak tüm türlerde majör yağ asitleri olarak C 4:0 butirik asit, C 18:2 linoleik asit ve C 6:0 kaproik asit bulunmuştur.

Anahtar Kelimeler: *Anthemis*, Yağ Asidi İçeriği, Butirik Asit, Linoleik Asit, Kaproik Asit

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1. INTRODUCTION

The genus *Anthemis* L., in the family Asteraceae, is represented in the Flora of Turkey by 51 species, 29 of which are endemic to Turkey[1]. Generally *Anthemis* species are known as "papatya" and "yavşan" in the west part of Turkey[2]. These species are extensively used in Turkish folk medicine for the treatment of some diseases like gastrointestinal disorders, hemorrhoid, stomachache, abdominal pain, hepatic diseases and cough[2-6]. *Anthemis* species usually contain some chemical compounds such as sesquiterpene lactones, flavonoids and polyacetylenes[7-11]. Also they have wide range of biological activities such as antioxidant[12-16,19], antimicrobial[17-19], antiprotozoal[20] and anti-inflammatory[21] activities.

2. RESEARCH SIGNIFICANCE

To the best of our knowledge, no previous work has been reported on the fatty acid compositions of four *Anthemis* species from Turkey except the antioxidant activity study on *Anthemis pseudocotula* from Konya, Turkey[19]. The aim of the present study is to evaluate the fatty acid compositions of *Anthemis aciphylla* var. aciphylla Boiss., *Anthemis pseudocotula* Boiss., *Anthemis macrotis* (Rech.f.) Oberpr. & Vogt and *Anthemis coelopoda* var. *bourgaei* Boiss. growing in Izmir, Turkey.

3. MATERIALS AND METHODS

3.1. Plant Materials

The species *Anthemis aciphylla* var. aciphylla, *Anthemis pseudocotula*, *Anthemis macrotis* and *Anthemis coelopoda* var. *bourgaei* were collected from Izmir. The plants were identified by one of authors (B. Kivcak) of Ege University. The voucher specimens (herbarium numbers; 1365 for *Anthemis aciphylla* var. *aciphylla*, 1333 for *Anthemis pseudocotula* , 1368 for *Anthemis macrotis* and 1332 for *Anthemis coelopoda* var. *bourgaei* have been deposited at the Herbarium of the Ege University, Faculty of Pharmacy, Department of Pharmacognosy.

3.2. Oil Extraction

The dried and powdered aerial parts of the plant material (40 g) have been extracted by petroleum ether (400 ml) for 6 h at 60°C by Soxhlet extractor. The solvent was evaporated by a rotary evaporator[22]. The obtained oil was esterified to determine the fatty acid composition. The extraction yields were found of *Anthemis aciphylla* var. aciphylla, *Anthemis pseudocotula*, *Anthemis macrotis* and *Anthemis coelopoda* var. *bourgaei* were 0.96%, 1.08%, 2.34% and 1.51%, respectively.

3.3. Preparation of Fatty Acid Methyl Esters (FAMEs)

The fatty acids were esterified into methyl esters by saponification with methanol (50%) containing 5% sodium hydroxide at 100°C for 10 min and transesterified with 14% (v/v) boron trifluoride (BF_3) in methanol 100°C for 5 min[23].

3.4. Fatty Acid Analysis

Fatty acid methyl esters (FAMEs) were analyzed on a HP (Hewlett Packard) Agilent 6890 N model gas chromatograph (GC), equipped with a flame ionization detector (FID) and fitted to a Supelco SP-2380 Fased Silica capillary column (60m, 0.25mm i.d. and 0.2µm). Injector and

detector temperatures were set at 250°C and 260°C, respectively. The oven was programmed at an initial temperature of 140°C and an initial time of 5 min. Thereafter the temperature was increased up to 240°C at a rate of 3°C min^{-1}. The total run time was 41.33 min. Helium was used as the carrier gas (1 ml min^{-1}). Identification of fatty acids was carried out by comparing sample FAME peaks from samples with standarts. The results were expressed as FID response area in the relative percentages. Each reported result is given as the average value of three GC analyses. The results are offered as means ±S.D.

4. RESULTS AND DISCUSSION

The fatty acid compositions of studied *Anthemis* species are given in Table 1. GC analysis revealed that the major fatty acids of *A. aciphylla* var. *aciphylla*, *A. pseudocotula*, *A. macrotis* and *A. coelopoda* var. *bourgaei*. were C 4:0 (butyric acid) (73.72%, 58.64%, 72.09% and 68.74%), C 18:2 (linoleic acid) (18.42%, 20.56%, 17.02% and 28.92%) and C 6:0 (caproic acid) (7.68%, 7.76%, 5.13% and 6.61%). The principal fatty acid in our *Anthemis* species investigated was C 4:0 (butyric acid), in the saturated form of fatty acids (SFAs). Also C 18:2 (linoleic acid) was the major PUFAs (polyunsaturated form of fatty acids).

Table 1. Fatty acid compositions of *Anthemis* species (%)

Fatty Acids	*A. aciphylla* var. *aciphylla*	*A. pseudocotula*	*A. macrotis*	*A. coelopoda* var. *bourgaei*
C 4:0(Butyric acid)	73.72[a]	58.64	72.09	68.74
C 6:0 Caproic acid)	7.68	7.76	5.13	6.61
C 10:0(Capric acid)	0.02	0.03	0.01	0.03
C 12:0(Lauric acid)	0.04	0.02	0.03	0.02
C14:0(Mrystic acid)	0.17	0.21	0.13	0.19
C16:0(Palmitic acid)	2.55	1.96	2.03	2.37
C17:0(Heptadecanoic acid)	0.05	0.09	0.11	0.17
C18:0(Stearic acid)	0.79	0.85	1.02	1.11
C23:0(Tricosanoic acid)	0.05	0.07	0.02	0.12
∑SFA[b]	85.07	69.63	80.57	79.36
C16:1ω7(Palmitoleic acid)	0.09	0.17	0.07	0.11
C 18:1 ω9(Oleic acid)	3.75	4.58	2.25	6.82
∑MUFA[b]	3.84	4.75	2.32	6.93
C 18:2 ω 6(Linoleic acid)	18.42	20.56	17.02	28.92
C20:5n3(Eicosapentanoic acid)	0.79	1.47	2.02	1.52
∑PUFA[b]	19.21	22.03	19.04	30.44

[a] Average of three lots analysed
[b]SFA: Saturated fatty acids, MUFA: Monounsaturated fatty acids PUFA: Polyunsaturated fatty acids

In our earlier study, we found that butyric acid (36.13%), arachidic acid (18.80%) and linoleic acid (22.22%) were the major fatty acids of *Anthemis widemanniana* oil extract[24] . recently, cerotic and palmitic acids were claimed to be the major MUFAs in the oil of *Anthemis tinctoria* var. *tinctoria* and *A. austriaca* [25]. In a previous study, palmitic acid and α-linolenic acid were reported to be the main constituents of *A. triumfetti*[11]. The species have a high content of butyric acid. Butyric acid is found in colon as well as other parts of the digestive tract. This acid has the ability to induce HIV reactivation[26]. Butyric acid a short chain fatty acid and butyrate

derivatives producing bacteria are promising probiotic treatment for gastrointestinal tract diseases such as inflammatory bowel disease, Chron' s disease and ulcerative colitis[27]. PUFAs ranged from 19.04 to 30.44% while linoleic acid content ranged from 17.02 to 28.92%. Linoleic acid cannot be synthesized by the human body[28]. Linoleic acid with protective effect against heart diseade has been shown to play arole in the development of the brain and retina[29]. In conclusion, this is the first report on the fatty acid compositions of *Anthemis aciphylla* var. aciphylla, *Anthemis pseudocotula*, *Anthemis macrotis* and *Anthemis coelopoda* var. *bourgaei*.

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