Original Article

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Fatty acid composition of flowers of *Crepis foetida* subsp. *rhoeadifolia* from Turkey

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ABSTRACT

This study aims to describe the fatty acid composition of flowers of *Crepis foetida* subsp. *rhoeadifolia*. In order to define qualitative and quantitative profile, fatty acids were derived to their methyl esters, and then these were analyzed by gas chromatography - flame ionization detector. 20 fatty acids were determined in the oil. Palmitic (C 16:0), myristic (C 14:0), and linoleic acids (18:2 ω6) were found to be major fatty acids. Total saturated fatty acids, monounsaturated fatty acids, and polyunsaturated fatty acids (PUFA) were 62.67%, 17.54%, and 19.79%, respectively. Also, total essential fatty acids (EFA) were determined ad 14.48%. Therefore, the oil can be considered as a new source of PUFA, especially EFA.

KEY WORDS: *Crepis foetida* subsp. *rhoeadifolia*, essential fatty acids, palmitic acid, Turkey

INTRODUCTION

The genus *Crepis* is belonging to the family of Asteraceae and consisted of about 200 species. The genus is widely distributed in Turkey and represented with 39 taxa. The species were traditionally called as "Kokarot," "Kohum," "Koyunotu" or "Sütlü ot" in different regions of Anatolia (Tuzlacı, 2011). Also, the members of the genus *Crepis* are used in Anatolian folk medicine for several purposes. For example, *Crepis foetida* used to heart problems and the species are consumed as an herbal tea (Ertug, 2000; Cakilcioglu and Turkoglu, 2010; Altundag and Ozturk, 2011). Again, stems of *C. sancta* are evaluated as a food in the Aegean region of Anatolia (Akyol and Altan, 2013). However, literature is scarce about the biological activities and phytochemical composition of *Crepis* species. In a recent study, Zengin *et al*. (2015) reported that the flower extract of *C. foetida* subsp. *rhoeadifolia* has significant biological effects including antioxidant and anti-proliferative. However, there is no report in the literature on fatty acid composition of *C. foetida* subsp. *rhoeadifolia*.

Lipids display an important role in the human body, acting like hormones or their precursors, helping the digestion process, and constituting a source of metabolic energy (Burtis and Ashwood, 1996). Fatty acids are the main components of most lipids. Some fatty acids such as ω-3 and ω-6 fatty acids are very important as the essential fatty acid (EFA) to human health. Therefore, dietary intake of these fatty acids is very important because the human body is not able to produce them. Moreover, the fatty acids might play a role in decreasing the risk of heart disease and cancer. The fatty acids are the most abundant in plant parts such as fruits (Oomah *et al*., 2000). Thus, new research on the fatty acid composition of different plant species is a very important issue in the scientific area. In this context, the aim of this study was to detect fatty acid composition of *C. foetida* subsp. *rhoeadifolia* by using gas chromatography (GC) - flame ionization detector (FID) technique.

MATERIALS AND METHODS

Plant Material

C. foetida L. subsp. *rhoeadifolia* (Bieb.) Celak. Flowers were randomly collected in May 2013, at the flowering stage, from a wild population in Mugla: Around the campus of Mugla Sıtkı Koçman University. Taxonomic identification of the plant material was confirmed by the senior taxonomist Dr. OlcayCeylan, at Department of Biology, Mugla Sıtkı Koçman University. The voucher specimen was deposited at the Herbarium of the

Department of Biology, Mugla University, Mugla, Turkey (Voucher No: OC824).

Determination of Fatty Acid Composition

The oil extraction of dried and powdered flowers (10 g) was carried out at 60°C for 6 h by Soxhlet extractor using petroleum ether as a solvent. The solvent was evaporated by rotary evaporator. The obtained oil was esterified to determine fatty acid composition. The fatty acids in the total lipid were esterified into methyl esters by saponification with 0.5 N NaOH in methanol and transesterified with 14% BF3 (v/v) in methanol (IUPAC, 1979).

The fatty acid methyl esters were analyzed on a Hewlett-Packard (HP) Agilent 6890N model GC, equipped with a FID, and fitted with a HP-88 capillary column (100 m, 0.25 mm i.d., and 0.2 μm). Injector and detector temperatures were 250°C and 280°C, respectively. The oven was programmed at 60°C initial temperature and 1 min initial time. Thereafter, the temperature increased 20°C/min to 190°C held for 60 min then increased at 1°C/min to 220°C and held for 10 min at 220°C. Total run time was 107.5 min. Carrier gas was helium (1 ml/min).

Identification of fatty acids was carried out by comparing sample FAME peak relative retention times with those obtained for Alltech standards. Results were expressed as FID response area relative percentages. Each reported result is the average value of three GC analyses. The results are offered as mean ± standard deviation.

RESULTS AND DISCUSSION

In recent years, several plant species have attracted much attention as a source of healthy oils. Fatty acid profile is a good indicator of lipid quality, because many chronic diseases are related to the fatty acid profile. Also, the profile is an important parameter to evaluate the new source of functional foods. In this sense, the fatty acid profile of *C. foetida* subsp. *rhoedafolia* flowers was determined in order to evaluate lipid quality. The result may be used as ingredients in food and as natural health products to impart health benefits and is presented in Table 1. 20 fatty acids were identified in the flower's oil with palmitic (C16:0), myristic (C14:0) and linoleic (C 18:2 ω6) detected as the major fatty acids. These fatty acids accounted for about 55% of total fatty acids. Saturated fatty acids (SFA)were the main component of the oils extracted from the studied flower, representing 62.67% of the oil. The content of monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids were 17.54 and 19.79%, respectively. The level of total unsaturated fatty acids reached 37.37% [Figure 1]. Among the MUFA, oleic acid (C18:1 ω9) was the most abundant (8.21%) followed by myristoleic (14:1 ω5) and palmitoleic (C16:1 ω7). Furthermore, long-chain SFA (arachidic [20:0], heneicosanoic [21:0] and behenic [22:0]) were estimated in low amounts. The oil contained EFA (14.48%), namely linoleic and α-linolenic acid which have important nutritional value. These fatty acids cannot be synthesized by the human body and are mostly obtained through the diet. Thus, the oil may be considered a source of EFA. As far as our literature survey could ascertain, this study is the first to examine the fatty acid composition of oil from *C. foetida* subsp. *rhoeadifolia* flowers.

Table 1: Fatty acid composition of flowers of *C. foetida* subsp. *rhoeadifolia* (%)

Fatty acids	*C. foetida* subsp. *rhoeadifolia*
C 10:0	0.28±0.07[a]
C 12:0	1.34±0.02
C 13:0	0.28±0.01
C 14:0	14.39±0.08
C 15:0	0.11±0.01
C 16:0	31.05±0.28
C 17:0	0.26±0.01
C 18:0	9.05±0.02
C 20:0	0.51±0.02
C 21:0	1.79±0.16
C 22:0	3.61±0.04
ΣSFA	62.67±0.37
C 14:1 ω5	6.00±0.08
C 15:1 ω5	0.50±0.01
C 16:1 ω7	2.44±0.03
C 17:1 ω8	0.19±0.01
C 18:1 ω9	8.21±0.16
C 18:1 ω7	0.20±0.01
ΣMUFA	17.54±0.21
C 18:2 ω6	10.48±0.06
C 18:3 ω3	4.00±0.19
C 18:3 ω6	5.31±0.01
ΣPUFA	19.79±0.15
ΣUFA	37.32±0.36
ΣEFA	14.48±0.13

[a]Values reported are means±SD, SFA: Saturated fatty acids, MUFA: Monounsaturated fatty acids, PUFA: Polyunsaturated fatty acids, UFA:Unsaturated fatty acids, EFA: Essential fatty acids, *C. foetida: Crepis foetida*, SD: Standard deviation

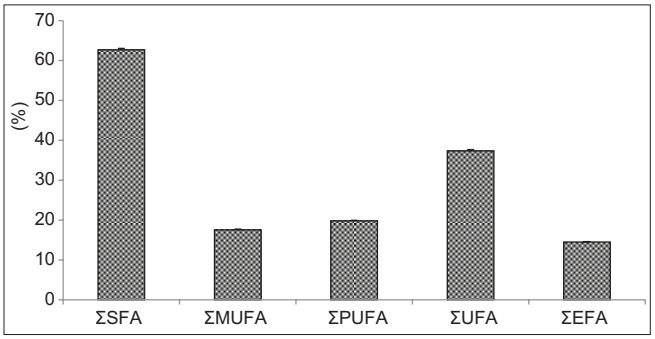

Figure 1: The fatty acid classes of flowers of *Crepis foetida* subsp. *rhoeadifolia*

CONCLUSION

As far as we know, the fatty acid profile of flowers of *C. foetida* subsp. *rhoeadifolia* described for the first time. Total unsaturated fatty acids were determined as 37.32% in the oil. From this point, the flower could be a valuable source of the fatty acids.

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