NVEO
Natural Volatiles & Essential Oils

ISEO 2021
51st International Symposium on Essential Oils (ISEO 2021)
12-14 November 2021, Online

Essential oil composition of *Capsella bursa-pastoris* (L.) Medik herba

Safa Gümüşok[1], Damla Kırcı[2,3], Betül Demirci[2], Ceyda Sibel Kılıç[1*]

[1] Department of Pharmaceutical Botany, Faculty of Pharmacy, Ankara University, 06100, Ankara, TURKEY
[2] Department of Pharmacognosy, Faculty of Pharmacy, Anadolu University, 26470, Eskişehir, TURKEY
[3] Department of Pharmacognosy, Faculty of Pharmacy, Selçuk University, 22040, Konya, TURKEY

INTRODUCTION

Capsella Medik. genus belongs to Brassicaceae family and is represented by 4 species in Turkey. Among them, *C. bursa-pastoris* (L.) Medik. is a cosmopolite species and grows naturally throughout Turkey (Mutlu, 2012). There are a few studies on the essential oil composition of different parts of the plant (Miyazawa et al., 1958, Lee and Choi, 1996; Choi et al., 2006; Gao et al., 2009; Kamali et al., 2015), and as far as we are concerned, essential oil composition of the plant growing in Turkey has not been studied previously. Thus, in this study we aimed to analyze the essential oil composition of the aerial parts of *C. bursa-pastoris* growing naturally in Ankara, Turkey. General appearance of the plant can be seen in **Figure 1**.

MATERIALS & METHODS

Plant material

Plant material, consisting of the aerial parts of the plant, was collected from Ankara University Tandoğan Campus in April 2021 and voucher specimen is kept in AEF with herbarium number 30718.

Isolation of the Essential Oils

Air aerial parts were subjected hydrodistillation for 3 h using a Clevenger-type apparatus according to the method recommended in the European Pharmacopoeia. Obtained essential oil was dried over anhydrous sodium sulfate and stored in a sealed vial at +4°C in the dark until analyzed and tested.

GC (Gas Chromatography) and GC-MS (Gas Chromatography-Mass Spectrometry) Analyses

GC-MS analysis

The GC-MS analysis was carried out with an Agilent 5975 GC-MSD system. Innowax FSC column (60 m x 0.25 mm, 0.25 μm film thickness) was used with helium as carrier gas (0.8 ml/min). GC oven temperature was kept at 60°C for 10 min and programmed to 220°C at a rate of 4°C/min, and kept constant at 220°C for 10 min and then programmed to 240°C at a rate of 1°C/min. Split ratio was adjusted at 40:1. The injector temperature was set at 250°C. Mass spectra were recorded at 70 eV. Mass range was from *m/z* 35 to 450.

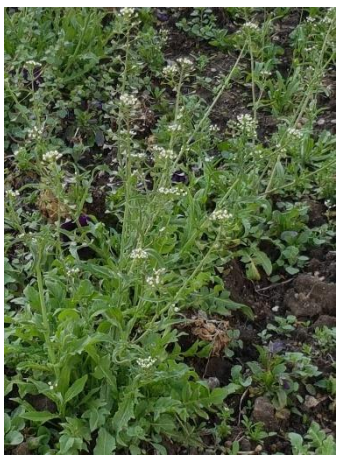

Figure 1: General appearance of the plant (Photo by C. S. Kılıç)

Gas Chromatography (GC) analysis

GC analysis was carried out using an Agilent 6890N GC system. Flame ionization detector (FID) temperature was set to 300°C. To obtain the same elution order on the GC-MS, simultaneous auto-injection was performed on the same type of column (InnowaxFSC column, 60 m x 0.25 mm, 0.25 μm film thickness), applying identical operational conditions. Relative percentage amounts of the separated compounds were calculated from FID chromatograms, respectively.

Identification of the volatile compounds

Identification of the essential oil components were carried out by comparison of their relative retention times with those of authentic samples or by comparison of their relative retention index (RRI) to series of *n*-alkanes. Computer matching against commercial (Wiley GC/MS Library, MassFinder 3 Library), and in-house "Başer Library of Essential Oil Constituents" built up by genuine compounds and components of known oils (McLafferty and Stauffer, 1989; Hochmuth et al., 2008).

RESULTS & DISCUSSION

Essential oil yield was 0.2% and 90.2% of the essential oil was identified, corresponding to 21 components. Major components of the oil were determined to be **nonacosane** (19.6%) **phytol** (19.3%), **pentacosane** (13.5%), **heptacosane** (9.9%), **hexadecanoic acid** (9.9%). Essential oil constituents of the aerial parts can be seen in **Table 1**.

When we searched the literature, we could find some studies on the lipids of the aerial parts (Bekker et al., 2002) and the fixed oil content of the seeds of the species (Kılıç et al., 2007; Mose et al., 2010; Singh et al., 2014); however studies on essential oils composition of various parts of the species were scarce.

In a study by Lee et al., (1996) performed on aerial parts, roots and leaves of the plant individually, phytol was also found to be the main component of the essential oil of the leaves and aerial parts (16.34% and 13.14, respectively). However the percentage of nonacosane and pentacosane found in the aerial parts were lower (3.81% and 0.37%, respectively) compared to the findings of our study.

In another study by Miyazawa et al. (1979), camphor (20.2%) and α-phellandrene (7.8) were found to be the major constituents and in the study by Kamali et al. (2015), 1,1-dimethycyclopentane, ethyl linoleate, palmitic acid and phytane were found to be the major constituents.

There are also other studies performed on different parts of the species (Choi et al., 2006; Gao et al., 2009) and one study performed on another *Capsella* species, namely *C. rubella* Reut (Radonic et al., 2020) having different main components.

As far as we are concerned, this is the first study performed on the essential oil composition of the aerial parts of the plant growing in Ankara city of Turkey. Examination of the other parts of the species along with species collected from different localities would be an important contribution to the studies performed on *Capsella* genus and should be performed in the future.

Table 1. Composition of the essential oil of *aerial parts*

RRI	Compound	EO (%)
1203	Limonene	0.3
1294	1,2,4-Trimethylbenzene	0.1
1398	2-Nonanone	0.5
1571	trans-p-Menth-2-en-1-ol	0.3
1604	2-Undecanone	1.6
1706	α-Terpineol	0.4
1933	Tetradecanal	0.5
1958	(E)-β-Ionone	0.2
2041	Pentadecanal	0.4
2131	Hexahydrofarnesyl acetone	3.0
2143	α-Cedrol	2.6
2223	6,10,14-Trimethyl pentadecan-2-ol	0.2
2226	Methyl hexadecanoate	0.4
2300	Tricosane	5.5
2500	**Pentacosane**	**13.5**
2622	**Phytol**	**19.3**
2700	**Heptacosane**	**9.9**
2600	Hexacosane	1.9
2700	Heptadecanal	0.1
2931	**Hexadecanoic acid**	**9.9**
2900	**Nonacosane**	**19.6**
	Total	90.2

RRI Relative retention indices calculated against *n*-alkanes; % calculated from FID data

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