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SHORT COMMUNICATION

Essential Oil Composition of *Capsella bursa-pastoris* (L.) Medik. Aerial Parts

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ABSTRACT

Objectives: *Capsella* Medik. belongs to Brassicaceae family and is represented by 4 species in Türkiye. Among them, *Capsella bursa-pastoris* (L.) Medik. is a cosmopolite species and grows naturally throughout Türkiye. There have been a few studies on the essential oil composition of different parts of the plant, and, as far as we are concerned, the essential oil composition of the plant growing in Türkiye has not been studied previously. Thus, in this study, we isolated and analyzed the essential oil composition of the aerial parts of *C. bursa-pastoris* growing naturally in Ankara, Türkiye.
Materials and Methods: Plant material was collected from Ankara University, Tandoğan Campus, and essential oil of the aerial parts was obtained from hydrodistillation using a Clevenger-type apparatus for 3 h and analyzed by gas chromatography (GC)-flame ionization detection and GC-mass spectrometry simultaneously.
Results: The essential oil yield was determined to be 0.2%, and 90.2% of the essential oil composition was identified, corresponding to 21 components. The major components of the oil were determined to be nonacosane (19.6%), phytol (19.3%), pentacosane (13.5%), heptacosane (9.9%), and hexadecanoic acid (9.9%).
Conclusion: Phytol was found to be the main component of the essential oil of leaves and aerial parts (16.34% and 13.14, respectively) in a literature study consistent with the results of our study. The essential oil content of other parts of the species, along with species collected from different localities, would be an important contribution to the species and the genus and should be performed in the future.
Keywords: *Capsella bursa-pastoris,* çobançantası, shepherd's purse, Brassicaceae, essential oil

INTRODUCTION

Capsella Medik. is a genus of the Brassicaceae family, and four species naturally grow in Türkiye: *Capsella grandiflora* (Fauché & Chaub.) Boiss, *C. lycia* Stapf., *C. rubella* Reut, and *C. bursa-pastoris* (L.) Medik. Among these species, *C. bursa-pastoris* is cosmopolitan and grows in Europe, Asia, America, Australasia, and Africa.[1]

The plant is mostly known as shepherd's purse in English [2,3] and is also called caseweed, lady's purse, rattle pouches, pickpocket, pepper-and-salt, and poor man's pharmacetti. It is known as "hirtentasche" in German; "bourse de Pasteur" in French, "madakat el raee" in Arabic,[3] and "çoban çantası, çıngıldaklı ot/çıngıldak otu" in Turkish.[4]

Morphological properties of the plant, such as size, fruits, and leaf shape, may vary according to locality; however, the species can be identified by its terminal racemose inflorescence bearing small white flowers and toothed rosette leaves.[1] The general appearance of the plant can be seen in Figure 1.

The plant is known to have various primary and secondary metabolites phytoalexins;[5] carotenoids, flavonoids, anthocyanins;[6] alkaloids[7] and is thus known as poor man's pharmacetti because it is also used in traditional medicine for various ailments and is also eaten as a salad or as cooked dishes.[8] Aerial parts of the plant are used against edema, enteritis, and nephritis in traditional Chinese medicine;[7] the plant is used as a uterine tonic and hemostatic;[9] and against ulcers, tumors, and uterine cancer.[10]

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

Due to the rich composition of the plant, it is actually known to possess various biological activities such as inhibition of hepatocarcinogenesis[11] and inhibition of tumors;[12,13] antibacterial;[14] anticholinesterase;[15] anti-inflammatory;[16] antioxidant;[15-17] hepatoprotective[18] and anti-hemorrhagic,[19] antihemorrhoidal;[20] neuroprotective,[21] cholesterol lowering activities.[22] These biological activities are usually based on the traditional uses of the plant, which include its use against stomach cramps, bleeding (internal and external), wounds and burns, premenstrual syndrome, and malignant ulcers.[13]

In addition to studies performed on the composition, ethnobotanical usages, and biological activities of the species, studies related to the essential oil composition of different plant parts are scarce[17,23-26.] As far as we are concerned, essential oil obtained from the aerial parts of plants growing in Türkiye was not analyzed before. Therefore, in this study, we aimed to analyze the essential oil isolated from *C. bursa-pastoris* (aerial parts) that grows naturally in Türkiye; specifically in Ankara.

MATERIALS AND METHODS

Plant material

Aerial parts of the plant were collected on April 2021 from Tandoğan Campus of Ankara University (Türkiye). Herbarium specimens prepared from the collected species were placed in Herbarium of Ankara University Faculty of Pharmacy (AEF) with the number AEF 30718.

Essential oil isolation

Hydrodistillation was performed on air-dried plant material for a period of 3 h using a Clevenger-type apparatus as recommended by European Pharmacopoeia.[27] Isolated oil was dried with the help of sodium sulfate, anhydrous, and then stored at a temperature of +4 ˚C in a vial with the lid closed and in the dark until examination.

Essential oil analysis

Essential oil analysis was performed using gas chromatography-mass spectrometry (GC-MS) and GC according to the method used in a previous study.[28]

Determination of the volatile compounds

The of the essential oil was determined by comparing the relative retention times (RRI) of the components with the genuine samples or by comparing their RRI with *n*-alkane series. The obtained results were analyzed by computer-matching using the Wiley GC/MS Library and MassFinder 3 Library[29,30] and in-house "Başer Library of Essential Oil Constituents" formed by authentic compounds and the components from recognized oils.

RESULTS AND DISCUSSION

Essential oil yield was determined to be 0.2%, and 90.2% of this oil was identified, corresponding to 21 components, yielding major components as nonacosane, phytol, pentacosane, heptacosane, and hexadecanoic acid (19.6%, 19.3%, 13.5%, 9.9%, 9.9%, respectively). Table 1 lists the components of the oil.

RRI calculated against *n*-alkanes; %: calculated from FID data; IM: identification method, based on the RRI of genuine compounds on the HP innowax column; MS, determined by computer matching of the mass spectra with Wiley and MassFinder Libraries and comparing them with data found in the literature.

Some studies on the lipids of the aerial parts[31] and the fixed oil content of the seeds of the species can be found in the literature;[32-34,] however, studies analyzing the essential oil of different parts of the species are scarce.

In a study by Lee and Choi[24] performed on aerial parts, roots, and leaves of the species individually, phytol was stated to be the significant component of the essential oil of the leaves (16.34%) and aerial parts (13.14%). However, the percentages of nonacosane and pentacosane found in the aerial parts were lower (3.81% and 0.37%, respectively) than those in our study.

In another study by Miyazawa et al.,[23] camphor (20.2%) and α-phellandrene (7.8%) were determined to be the major components. In another work by Kamali et al.,[17] 1,1-dimethylcyclopentane, ethyl linoleate, palmitic acid, and phytane were found to be the major constituents.

There are also some other studies performed on different parts of the species[25,26] and one study performed on another *Capsella* species, namely *C. rubella*,[35] which has different main components.

To our knowledge, this is the first study performed on the essential of the aerial parts of the species growing naturally in Ankara city (Türkiye). Examination of the other parts of the

Table 1. List of essential oil components of the aerial parts

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

RRI: Relative retention times, MS: Mass spectrometry, IM: Identification method

species along with species collected from different localities would be an important contribution to the literature on *Capsella* genus and more relevant studies should be performed in the future.

Ethics

Ethics Committee Approval: Not required.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Concept: S.F., D.K., B.D., C.S.K., Design: C.S.K., Data Collection or Processing: D.K., B.D., Analysis or Interpretation: S.F., D.K., B.D., C.S.K., Writing: S.F., D.K., B.D., C.S.K.

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