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

**Short Title:** *Capsella bursa-pastoris* Essential Oil Composition

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**ABSTRACT**

**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. There are a few studies on the essential oil composition of different parts of the plant 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 isolate and analyze the essential oil composition of the aerial parts of *C. bursa-pastoris* growing naturally in Ankara, Turkey.

**METHODS:** Plant material was collected from Ankara University Tandoğan Campus in and essential oil of the aerial parts was obtained by hydrodistillation using a Clevenger type apparatus for 3h and analyzed both by GC-FID and GC-MS, simultaneously.

**RESULTS:** Essential oil yield was determined to be 0.2% and 90.2% of the essential oil composition 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%).

**DISCUSSION AND CONCLUSION:** Phytol was found to be the main component of the essential oil of the leaves and aerial parts (16.34% and 13.14, respectively) in a literature study consistent with the results of our study. Essential oil content of other parts of the species, along with species collected from different localities would be an important contribution the species and the genus and should be performed in the future.

**Keywords:** *C. bursa-pastoris*, çobançantası, shepherd’s purse, Brassicaceae, essential oil.
INTRODUCTION
Capsella Medik. is a genus of the Brassicaceae family and 4 species naturally grow in Turkey; Capsella grandiflora (Fauché & Chaub.) Boiss, C. lycia Stapf. C. rubella Reut and C. bursa-pastoris (L.) Medik. Among these species, C. bursa-pastoris is known to be cosmopolite and grows in Europe, Asia, America, Australasia and Africa. The plant is mostly known as shepherd’s purse in English; and is called case-weed, Lady’s purse, Rattle pouches, pick-pocket, pepper-and-salt, poor man’s pharmacetti, as well. It is known as Hirtentasche in German; Bourse de Pasteur in French, Madakat el Raee in Arabic and Çoban çantası, çingildaklı ot/çingildak otu in Turkish. Morphological properties of the plant such as size, fruits and leaf shape might vary according to locality; however, the species can be identified with its terminal racemose inflorescence bearing small white flowers and toothed rosette leaves. General appearance of the plant can be seen in Figure 1.

The plant is known to have various primary and secondary metabolites phytoalexins; carotenoids, flavonoids, anthocyanins; alkaloids and thus known as poor man’s pharmacetti since it is also used in traditional medicine for various ailments and also eaten as salad or as cooked dishes. Aerial parts of the plant are used against edema, enteritis and nephritis in Traditional Chinese Medicine; the plant is used as uterine tonic and hemostatic; against ulcers, tumors, uterine cancer. Due to the rich composition of the plant, it is actually known to possess various biological activities such as inhibition of hepatocarcinogenesis and inhibition of tumors; antibacterial; anticholinesterase; anti-inflammatory; antioxidant; hepatoprotective and anti-hemorrhagic; antihemorrhoidal; neuroprotective, cholesterol lowering activities etc. These biological activities are usually based on the traditional uses of the plant.
which include its usage against stomach cramps, bleeding (internal and external), wounds and
burns, premenstrual syndrome, malignant ulcers. In addition to the studies performed on composition, ethnobotanical usages and biological activities of the species, studies related to the essential oil composition of different plant parts are scarce and as far as we are concerned, essential oil obtained from the aerial parts of the plant growing in Turkey was not analyzed before. Therefore, with this study, we intended to analyze the essential oil isolated from C. bursa-pastoris (aerial parts) that grows naturally in Turkey; specifically in Ankara.

MATERIALS AND METHODS

Plant material
Aerial parts were collected in April 2021 from Tandoğan Campus of Ankara University. Herbarium specimen prepared from the collected species is placed in AEF (Herbarium of Ankara University Faculty of Pharmacy) with the number 30718.

Essential Oil Isolation
Hydrodistillation was performed on air dried plant material for a period of 3 h via a Clevenger-type apparatus as recommended by European Pharmacopoeia. 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 examined.

Essential oil Analysis
Essential oil analysis was performed with Gas Chromatography-Mass Spectrometry (GC-MS) and Gas Chromatography (GC) according to the method used in a previous study.

Determination of volatile compounds
Composition was determined with comparison of the RRI (relative retention times) of the components with the genuine samples or by comparing their RRI with n-alkanes series. Obtained results were analyzed by computer matching against Wiley GC/MS Library and MassFinder 3 Library and also against in-house “Basar 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.

<table>
<thead>
<tr>
<th>RRI</th>
<th>Compound</th>
<th>(%)</th>
<th>IM</th>
</tr>
</thead>
<tbody>
<tr>
<td>1203</td>
<td>Limonene</td>
<td>0.3</td>
<td>RRI, MS</td>
</tr>
<tr>
<td>1294</td>
<td>1,2,4-trimethylbenzene</td>
<td>0.1</td>
<td>MS</td>
</tr>
<tr>
<td>1398</td>
<td>2-Nonanone</td>
<td>0.5</td>
<td>MS</td>
</tr>
<tr>
<td>1571</td>
<td>trans-p-menth-2-en-1-ol</td>
<td>0.3</td>
<td>MS</td>
</tr>
<tr>
<td>1604</td>
<td>2-undecanone</td>
<td>1.6</td>
<td>MS</td>
</tr>
<tr>
<td>1706</td>
<td>α-terpineol</td>
<td>0.4</td>
<td>RRI, MS</td>
</tr>
<tr>
<td>1933</td>
<td>Tetradecanal</td>
<td>0.5</td>
<td>MS</td>
</tr>
<tr>
<td>1958</td>
<td>(E)-β-ionone</td>
<td>0.2</td>
<td>MS</td>
</tr>
<tr>
<td>2041</td>
<td>Pentadecanal</td>
<td>0.4</td>
<td>MS</td>
</tr>
</tbody>
</table>
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 with computer matching of the mass spectra with Wiley and MassFinder libraries and also comparing them with data found in the literature

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

In a study by Lee and Choi performed on aerial parts, roots and leaves of the species individually, phytol was stated to be the major component of the essential oil of the leaves (16.34%) and aerial parts (13.14%), as well. 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., camphor (20.2%) and α-phellandrene (7.8) were determined to be the major components and in another work by Kamali et al., 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 and one study performed on another Capsella species, namely C. rubella having 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 (Turkey). Examination of the other parts of the species along with species collected from different localities would be an important contribution to the literature on Capsella genus and should be performed in the future.

REFERENCES