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Chemical composition and antioxidant activity from Essential oil of *Capsella bursa-pastoris*

Hossein Kamali[2], Tooba Ahmadzadeh sani[3], Peyman Feyzi[1], Ameneh Mohammadi[*1]

[1]Research center of Natural products and Medicinal Plants Research Center, North Khorasan University of medical Sciences, Bojnurd, Iran
[2]Targeted Drug Delivery Research Center, Mashhad University of Medical Sciences, Mashhad, Iran
[3]School of Pharmacy, Mashhad University of Medical Sciences, Mashhad, Iran

Abstract: *Capsella bursa-pastoris* in Brassicaceae family has some medicinal properties such as anti-bleeding, anticancer, antithrombin, antioxidant, antidiabetes agents and fever treatment and the whole plant is used for treat edema caused by nephritis, hemafecia, odynuria, chyluria, menorrhagia and hypertension. Essential oils from the aerial parts of *C. bursa-pastoris* from north khorasan province of Iran were obtained by steam distillation and The antioxidant activity of essential chemical compositions of oils were analyzed by GC-MS. oil was examined by method of DPPH assay. Analysis of the isolated oils revealed the presence of 19 compounds accounting for 88.24% of total essential oil. The main compounds in essential oils were 1,1-Dimethylcyclopentane , Ethyl linoleate, Palmitic acid and phytane. EC_{50} of essential oil was 100.17 mg/ml and it was 0.15 and 0.3 mg/ml for ascorbic acid and BHT. In conclusion essential oil of this plant isn't a good antioxidant.
Keywords: *Capsella. bursa-pastoris ,* Essential oils , GC-MS, antioxidant activity.

Introduction

Capsella bursa-pastoris (L.) Medik., (Brassicaceae), is found all over the world and it can be eaten raw or cooked commonly known as shepherd's purse and its means is a bag plant, young leaves and roots of this plant have been used as an edible vegetable, eaten raw or cooked in some countries [1, 2]. *C. bursa-pastoris* has some medicinal properties such as anti-bleeding, anticancer, antithrombin, antioxidant, antidiabetes agents and fever treatment [2, 3]. Peptides from the roots showed antibacterial and antifungal activity [2]. The composition of this genus is minerals, ascorbic acid, vitamin A, proteins, linoleic acid and ω3 [1, 3]. The whole plant is used for treat edema caused by nephritis, hemafecia, odynuria, chyluria, menorrhagia and hypertension . flavonoids such as tricin , kaempferol , quercetin , kaempferol, quercetin, quercetin are the main constituents in this plant [4-9]. Also alkaloids such as calystegines, glucosinolates and saponins have been found in this genus [10-11]. In one study, The vegetal material was rich in kaempferol-3-*O*-rutinoside, quinic acid, arginine, palmitic acid and β-sitosterol and the extracts were also acetylcholinesterase inhibitors and antibacterial active [12].

Although there are some studies on chemical composition of essential oil of *C. bursa-pastoris* but there is no research about antioxidant activity of essential oil of this plant and the purpose of this study was evaluation of antioxidant activity from essential oil of *C. bursa-pastoris* from bojnurd.

2. Materials and Methods

2.1. Plant materials

The aerial parts of *Capsella bursa-pastoris* were collected in May 2014 from north khorasan in Iran. The plant was identified by the research center of natural products health (NPH), North Khorasan University of medical sciences (Iran). The voucher specimen has been deposited at the Herbarium of the NPH (No: NP-16/3-1). The aerial parts were air-dried at room temperature in the shade and following the extraction procedures the aerial parts were finely grinded using laboratory equipments and the dried samples were kept within sealed bag in the cold and dry place until they were used [13].

2.2. Hydrodistillation

The plant (80 g of dried material) was submitted to hydrodistillation for 3 h, using a Clevenger-type apparatus, according to the European Pharmacopoeia (1975). The volatile distillate was collected over anhydrous sodium sulphate and refrigerated prior to analysis [14].

2.3. GC/MS analysis

GC/MS analysis was carried out using a Shimadzu- QP2010SE 15A operating at 70 eV ionization energy, equipped with a Rtx-5MS (phenyl methyl siloxane 30 m × 0.25 mm, 0.25 µm film thicknesses) with He as the carrier gas, flow rate 0.9 mL/min and a split ratio of 1:20. Acquisition mass range was 35–300 and scan time was 0.5 s/scan. Retention indices were determined by using retention times of n-alkanes that had been injected after the oil under the same chromatographic conditions. The retention indices for all components were determined according to the Van Den Dool method using n-alkanes as standard [15]. The compounds were identified by comparison of retention indices (RI, Rtx-5MS) with those reported in the literature and by comparison of their mass spectra with the Wiley and Nist libraries or with the published mass spectra [15-17].

2.4. DPPH: free radical scavenging assay

The antioxidant activity of the essential oils was measured on the basis of the scavenging activity of the stable radical DPPH according to the method of Wang [18]. 100 µl from essential oil at different concentration range (0.25-100 mg/ml) were mixed in the freshly prepared 4 mM DPPH in methanol. Absorbance at 517 nm was determined after 30 min. The scavenging activity was calculated using Eq.1.

$$\% \text{ DPPH scavenging activity} = \frac{[A\ 517 \text{ of control} - A\ 517 \text{ of sample}]}{A\ 517 \text{ of sample}} \quad (1)$$

The percentage of scavenging activity was plotted against the sample concentration to obtain EC_{50} (effective concentration) defined as the concentration of sample necessary to scavenge 50% of the DPPH radicals and it was calculated using graphpad prism (version 5.0) software. BHT and ascorbic acid were used as reference antioxidants.

3. Results

The data obtained from the essential oils are shown in Table 1 and 19 compounds were isolated and identified, accounting for 88.24% of total essential oil. The main compounds in essential oils were 1,1-Dimethylcyclopentane , Ethyl linoleate, Palmitic acid and phytane. The radical scavenging effect of the essential oil was concentration dependent and sample with the highest concentration had strong scavenging effect, as shown in Fig 1. Results were reported as EC_{50}, which is defined as the amount of antioxidant required to inhibit 50% of DPPH free radicals. EC_{50} of essential oil was 100.17 mg/ml and it was 0.15 mg/ml and 0.3 mg/ml for BHT, as a result we can say essential oil of this plant isn't a good antioxidant.

Table 1. Chemical Composition of the essential Oils of *Capsella bursa-pastoris (L.) Medik*

RI	Compound	Area%	R.time	NO
694.1	1,1-Dimethylcyclopentane	16.67	3.014	1
700.8	2,4-Dimethylpentane	2.27	3.113	2
713.2	cyclohexane	8.46	3.294	3
718.3	3-methylhexane	1.76	3.368	4
724.3	trans-1,2-Dimethylcyclopentane	2.48	3.455	5
785.2	Toluene	3.05	4.344	6
793.3	3-methylHeptane	2.74	4.463	7
806.8	cis-1-ethyl-3-methylCyclopentane	1.26	4.685	8
809.7	cis-1-ethyl-3-methylCyclopentane	1.45	4.738	9
820.4	Octane	5.56	4.932	10
833.5	2,4-dimethylHexane	10.36	5.171	11
886.5	p-Xylene	2.44	6.136	12
901.5	Allyl isothiocyanate	4.92	6.409	13
1015.7	Decane	7.03	8.473	14
1205.9	Dodecane	3.20	11.656	15
1856.6	phytane	1.21	20.115	16
1919.6	Ethyl Linoleate	7.26	20.788	17
1946.7	Palmitic acid	4.79	21.093	18
2911.4	nonacosane	1.32	29.276	19
	total	88.24		

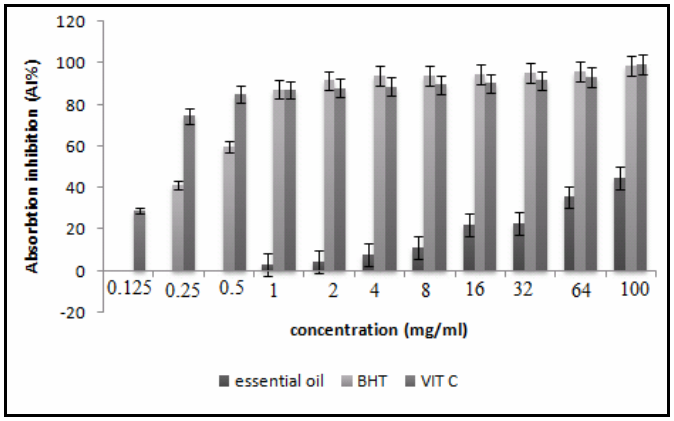

Fig 1: DPPH radical scavenging activity of *Capsella bursa-pastoris* essential oil and positive controls

4. Discussion

In essential oil, hydrocarbons formed the most abundant portion of the oil. Main compounds in essential oil were 1, 1-Dimethylcyclopentane (16.67 %), Ethyl linoleate (7.27%), Palmitic acid (4.79%) and phytane (1.21%) that these compounds were 27.73% of total essential oil.

But in another study, 45 compounds were isolated and identified, accounting for 71.53% of total essential oil and the main components of the essential oil were identified as palmitic(28.32%),phytane(10.15%), oleic acid(8.63%) and octacosane(4.73%) [19]. Allyl isothiocyanate is the organosulfur compound and it serves the plant as a defense against herbivores and it is separated from plants with myrosinase enzyme. When an animal chews the plant, the allyl isothiocyanate is released. allyl isothiocyanate exhibits many desirable attributes of a cancer chemopreventive agent [20]. Palmitic acid is the most common fatty acid found in

animals, plants and microorganisms and it is an antioxidant and a source of vitamin A added to low fat milk to replace the vitamin content lost through the removal of milk fat [21].

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