Original Article

Essential Oil and Fatty Acid Composition and Antioxidant Capacity and Total Phenolic Content of *Parsley* Seeds (*Petroselinum crispum*) Grown in Hatay Region

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ABSTRACT

The aim of the present study was to investigate the essential oil and fatty acid compositions and antioxidant capacity and total phenolic content of *parsley* seeds grown in Arsuz/ hatay region. *Parsley* seeds had a moisture content of 12,6 wt.% and ash content of 6,86 wt.% while the essential oil content of 2,52 wt.% and total lipid content of 8,85 wt.%. The essential oil was analyzed by gas chromatography and thirty two volatile compounds were determined. The composition of fatty acids were also investigated by GC and seven content were determined. The seeds were extracted with methanol for determination of antioxidant capacity and total phenolic content. Total phenol concentration was found 67.25 ± 5.9mg gallic acid equivalent/g of extract powder. DPPH free radical-scavenging activity IC_{50} was found as 0,523 ± 12 mg/ ml. From the Trolox calibration curve cupric reducing antioxidant capacity TEACCUPRAC:17,95 μg / mL was found. Results were compared with standard antioxidant compound BHA and BHT.

Key words: *Parsley* seed, Essential oil, Fatty acid, Antioxidant activity, Phenolic content.

INTRODUCTION

Parsley (*Petroselinum crispum*) is a species of *Petroselinum* in the family *Apiaceae*, in Europe and in the Mediterranean region (Italy, Greece, Algeria, and Tunisia), and widely cultivated as a herb, a spice, and a vegetable.[1] *Parsley* was traditionally used in making tea for treating gallstones and dysentery. The leaves, seeds and roots of *Parsley* were used in treating numerous digestive problems including diarrhea, ulcer, flatulence and colic pain.[1]

Parsley seeds contain an essential oil, composed mainly of myristicin, apiole, and 2,3,4,5-tetramethoxyallylbenzene (3-methoxy-γ-asarone) and, that is responsible for the pronounced odor and flavor of *parsley*.[2]

Because of the side effects of synthetic preservatives people have preferred to the use of natural products instead of to customary preservatives in the last few decades. As a result of these, consumers interested to natural products, inclusive particularly plant extracts and their essential oils. Spices and herbs have been added to foods to enhance the flavor, color and aroma of foods. As well as they are also known for their preservative and medicinal value.[3]

Sources of natural antioxidants are primarily plant phenolics that may occur in all parts of plants such as fruits, vegetables, nuts, seeds, leaves, root, and barks.[4]

Antimicrobial and antioxidant activities of plants may be due to a variety of different ingredients, including peptides, aldehydes, alkaloids, essential oils, phenols and other soluble constituents. Then these plants have been found to be compounds that are an important therapeutic application against human pathogens.[5,6]

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Among the natural compounds, the phenolic compounds constitute one of the major groups of active principles acting as radical scavengers and antioxidants.[7] The harmful action of free radicals can be blocked by antioxidant substances, which scavenge the free radicals and detoxify the organism.[8,9] The search for newer natural antioxidants, especially of plant origin, has been increasing ever since. Today many people prefer to use medicinal plants rather than chemical drugs.

In this paper the essential oil and fatty acid composition of parsley seeds were determined and antioxidant capacity and total phenolic content of methanol extract was screened.

MATERIAL AND METHODS

Extraction and GC analysis of essential oil

The air-dried and ground seeds were submitted for 3 h to water-distillation using Clevenger apparatus. The obtained essential oil was dried over anhydrous sodium sulphate and after filtration, stored at 4°C until analyzed. GC-MS analysis was performed on a HP6890 gas chromatography instrument. The analytes were separated on a HP-5MS nonpolar capillary column.

Extraction and GC analysis of seed oil

Chemical extraction of seed oil from ground seeds was carried out with soxhlet apparatus by using petroleum ether as solvent. The total extraction process was completed within four hours. The extracted phase was filtered and concentrated to vacuum under reduced pressure in rotary evaporator and dried in desiccators.

The fatty acid composition of seed oil was determined by gas chromatography of the methyl esters using a HP 6890N gas chromatograph integrated hp Innovax column.[10]

Methanolic extract

Parsley seeds were powdered by electric blender. Approximately 100g of powder was added to 400ml methanol and soaked for 2h at 40 ºC. This process was repeated ten times. Removal of the powder from solvent was done by filtration and the filtrate was concentrated using a rotary evaporator at 40 ºC and extract was stored at–4°C until analyzed for antioxidant activity.

Determination of total phenolic content

The total phenolic content of the extract was determined by the Folin-Ciocalteau method.[11,12] Estimations were carried out in triplicate and calculated from a calibration curve obtained with gallic acid. Total phenolic concentrations were expressed as gallic acid equivalents (μg GAE/mL methonolic solution). The absorbances of all samples were measured at 765 nm.

DPPH radical-scavenging activity

The free radical scavenging activity of the methanolic extract of parsley seeds was measured in terms of hydrogen donating or radical scavenging ability using the stable DPPH radical method.[13] The DPPH solution (6×10^{-5}mol/L) in methanol was prepared and 3,75 ml of this solution was added to 1,25 ml of extract solution (or standard) in methanol at different concentrations (0,4-0,025μg/mL). After 30 minutes of incubation at 40°C in a thermostatic bath, the decrease in the absorbance (n =3) was measured at 517 nm. The same procedure was repeated with synthetic antioxidant, BHT and BHA, as positive control and a blank. Inhibition level (measured as percentage, I %) of the free radical.

The percent DPPH scavenging ability was calculated as follows:

$$I\ \% = (A_{blank} - A_{sample}/A_{blank}) \times 100$$

where A_{blank} is the absorbance of the control reaction (containing all reagents except the test compound) and A sample is the absorbance of the test compound. The extract concentration required for 50% inhibition (IC_{50}) was calculated from the graph by plotting inhibition percentage against extract concentration. Tests were carried out in triplicate and BHT and BHA were used as positive controls

CUPRAC assay of total antioxidant capacity

The total antioxidant capacity was determined by the CUPRAC method.[14] Estimations were carried out in triplicate and calculated from a calibration curve obtained with TROLOX . Total antioxidant concentrations were expressed as mmol TR/g dry matter. The absorbances of all samples were measured at 450 nm.

RESULTS & DISCUSSION

In the steam distillation of *Parsley* seeds two volatile oils were obtained, one of which was light from water and one of which was heavy from water. The color of the volatile oil is very pale yellow with a total yield of 2.52% (w/w). The yield was based on the dry weight of seeds. The volatile oil constituents and their percentages are listed according to their elution order on hp 5 capillary column in Table 1. In the light oil, twenty two components were identified that represented 96.86% of the oil and in the heavy oil, thirty two components were identified that represented 94.56% of the oil . The volatile oil consists of mainly aliphatic esters, alcohols and hydrocarbons. The major components of the volatile oil are

Table 1: Volatile constituents of *Parsley* seeds

Peak no	Component	%(light)	%(heavy)
1	Alpha-pinene	2,52	14.96
2	Camphene	-	tr
3	Beta-pinene	2,37	13.03
4	Sabinene	tr	0.9
5	Alpha-Phellandrene	tr	tr
6	Beta myrcene	tr	tr
7	Limonene	tr	tr
8	Beta phellandrene	1.33	5.83
9	Gamma terpinene	tr	tr
10	Cymene	-	tr
11	**İsopropenyl tolüene**	-	tr
12	Terpinolene	-	tr
13	Adamantane	-	tr
14	4-(1,2,4-triazole-1-yl)phenol	-	tr
15	Alpha bergamotene	-	tr
16	Caryophyllene	-	tr
17	Myrtenal	tr	1.13
18	Beta cubebene	-	tr
19	Beta farnesene	tr	tr
20	2-vinyl-2-butenal	-	tr
21	Alpha cubebene	tr	tr
22	Alpha ocimene	tr	tr
23	Alpha himachalene	tr	tr
24	2-ethyl-2-hexanal	-	tr
25	Beta sesquiphellanderene	-	tr
26	Carotol	tr	0.95
27	Levojunenol	-	tr
28	3-methoxy-γ-asarone	34.19	21.82
29	Elemicin	5.09	3.33
30	Myristicin	23.83	16.72
31	Methoxyeugenol	tr	tr
32	Apiol	27.53	17.02

tr: Trace (<o.6%)

3-methoxy-γ-asarone, apiol, myristicin, alpha-pinene, beta pinene and beta-phellandrene respectively.

Parsley seed oil extracted by soxhlet extraction apparatus using petroleum ether as solvent and yield obtained 8,85 wt.%. The yield was based on dry weights of milled seeds. The seed oil constituents and their percentages are listed in Table 2 according to analyses the composition of volatile oil and fixed oil is similar and major components are 3-methoxy-γ-asarone, myristicin and apiol respectively.

The total phenolic content was 67.25 5.9 mg gallic acid equivalent/g of extract powder in reference to the standard curve (y = 1,9409x+0,0032, r^2 = 0,9996).

Table 2: The seed oil constituents of Parsley seeds

Peak no	Compound	%
1	3-methoxy-γ-asarone	26,93
2	Palmitic acid	1,31
3	Elemicin	0,85
4	Myriticin	13,48
5	Stearic acid	0,43
6	Oleic acid	25,91
7	Apiol	30,38

DPPH radical-scavenging activity

IC_{50} for DPPH radical-scavenging activity was 0,523 12 mg/ ml. The IC_{50} values for BHA and BHT were 0,022 0.11, and 0,0570.07 mg/ ml, respectively. According to the results the parsley seeds revealed the poor antioxidant properties.

From the Trolox calibration curve CUPRAC activity TEACCUPRAC:17,95 µg / mL was found.

CONCLUSION

We have determined that the essential oil and fatty acid composition and antioxidant capacity and total phenolic content of *parsley* seeds (*petroselinum crispum*) which is grown in Hatay region for better pharmacognostical knowledge of the *parsley* seed. It is obvious that the obtained results shows that *parsley* seeds have poor antioxidant activity than synthetic antioxidants BHT (Butylated Hydroxytoluene) and BHA (Butylated Hydroxanisole). Nowadays, as the tendency of natural treatment methods increases, the composition of medicinal and aromatic plants should be determined and their use efficiency will be increased according to active compounds.

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None

CONFLICT OF INTEREST

None

ABBREVIATION USED

GC: Gas chromatography; DPPH: 2,2-diphenyl-1-picrylhydrazyl; TEACCUPRAC: Torolox Equivalent Cupric Reducing Antioxidant Capacity; BHA: Butylated Hydroxanisole; BHT: Butylated Hydroxytoluene; GAE: Gallic Acid Equivalent; I: Inhibition; A: Absorbance.

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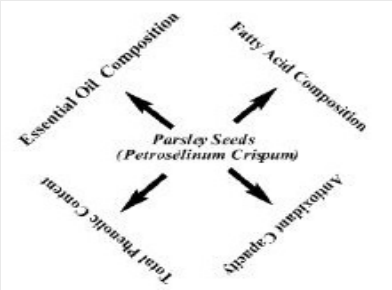
PICTORIAL ABSTRACT



SUMMARY

- Essential oil include thirty two components and the major components of the volatile oil are 3-methoxy-γ-asarone, apiol, myristicin, alpha-pinene, beta pinene and beta-phellandrene.
- Apart from oleic acid, volatile oil and fixed oil have similar composition.
- The total phenolic content was 67.25±5.9 mg gallic acid equivalent/g of extract powder.
- *Parsley* seeds have poor antioxidant activity than synthetic antioxidants.

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