



Short communication

## Antioxidant Activity and Chemical Composition of the Essential oil of *Ducrosia anethifolia* (DC.) Boiss. from Neyriz

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### Abstract

*Ducrosia anethifolia* (DC.) Boiss. is belongs to the Apiaceae family. It is one of the three species of Iranian *Ducrosia* Boiss. species growing wild in several areas of the country. In this research, we extracted the essential oil and it analyzed by GC/MS. The analysis of essential oil from leaves of *D. anethifolia* about 19 constituents was identified and percentage composition was determined (94.9%). The major constituents identified by this method were  $\alpha$ -pinene (70.3%),  $\beta$ -myrcene (6.9%),  $\beta$ -pinene (6.3%), limonene (4.9%). So, extracts of this species extracted by maceration method and antioxidant activity evaluated by 1,1-diphenyl-2-picrylhydrazyl (DPPH<sup>\*</sup>). Results showed that antioxidant activity of *D. anethifolia* in ethanolic and ethyl acetate extracts are less than Butylated hydroxytoluene (BHT) as a synthetic antioxidant which used for positive control. Although, antioxidant activity of ethanolic extract is more than ethyl acetate extract, but inhibitory power of this extracts is low.

**Key words:** *Ducrosia anethifolia* (DC.) Boiss., Essential oil, Antioxidant activity, DPPH, GC/MS,  $\alpha$ -pinene

### Introduction

*Ducrosia anethifolia* is one of the medicinal plants that belongs to the Apiaceae family. It is one of the three species of Iranian *Ducrosia* species growing wild in several areas of the country [1,2]. This aromatic herb is distributed in Afghanistan, Pakistan, Syria, Lebanon, Iraq, and some other Arab states and countries along the Persian Gulf [2]. *D. anethifolia* is commonly known in Iran as Moshgak, Roshgak, and Moshkbu [1,2]. The whole herb – especially its aerial parts – has been used in Iranian folklore medicine as an analgesic and pain reliever for headache, backache, colic, and colds. In some regions of Iran, it is claimed to be especially effective against anxiety and insomnia. This herb is added to a variety of Persian foods for flavoring [1,3]. In pharmacological and biological tests, extracts and fractions of *D. anethifolia* and some other species of *Ducrosia* are reported to have antimicrobial, antimycobacterial, antifungal effects

[4,5] Phytochemical studies on *D. anethifolia* reveal that aliphatic aldehydes and other monoterpene hydrocarbons in its essential oil, and coumarins such as pangelin are the main components of the aerial parts [3, 6]. A few reports on the analysis of the essential oil of other *Ducrosia* species have been published, and these species contain some similar biologically active compounds [4,7,8]. Essential oils of several *Ducrosia* species have been cited in the literature, *D. anethifolia* and *D. flabellifolia* Boiss. essential oils were recently published by a research group [9]. The major components of *D. anethifolia* and *D. flabellifolia* oils were dodecanal and decanal. Janssen *et al.* (1984) reported  $\alpha$ -pinene (59.2%), myrcene (11.6%) and limonene (7.5%) as the major compounds of the essential oil of *D. anethifolia* [10]. In another report, the major compounds of the oil of *D. anethifolia* were reported to be  $\alpha$ -pinene, terpineolene and ocimene [11]. Haghi *et al.* (2004) reported the presence of  $\alpha$ -pinene,

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citronellal, limonene, linalool and myrcene in this oil [3] while in the other report, n-decanal constitutes more than 70% of the essential oil which has exhibited antianxiety effect in mice [12]. There are lesser studies for *D. assadii* Alava in the literature. A report shows n-decanal (36.4%) as the main component among the 29 constituents characterized in the oil of *D. assadii* [8], meanwhile Mostafavi *et al.* (2008) reported that the essential oil of the aerial parts of the plant is composed of n-decanal (74%), dodecanal (7.2%) and  $\alpha$ -pinene (4.0%) [13].

In the present study, we describe the essential oil constituents identified by GC/MS analysis. In addition, we extracted the ethanolic and ethyl acetate extracts and antioxidant activity evaluated by DPPH radical and extrapolated with BHT as synthetic antioxidant. Assadipour *et al.* (2013) in a research reported that both flowering and fruiting essential oils could inhibit DPPH radical in a concentration-dependent manner. The highest inhibition for fruiting is more than flowering [14].

## Materials and Methods

### Plant materials

The leaves of plant were collected during the flowering period from Neyriz in Fars province in May 2012. The plant's identity as *D. anethifolia* was confirmed by the herbarium department of Fars Research Center for Agriculture and Natural Resources, Shiraz, Iran.

### Preparation of the essential oil

The leaves of *D. anethifolia* were dried in shade and ground in a grinder. The dried plant samples were subjected to hydrodistillation for 4 h. using a Clevenger-type apparatus. After distillation and cooling the system, a few drops of distilled n-hexane (Merck) for better separation and a little salt (sodium sulfate) for dehydration, were added. The oil was stored in 4 to 5°C until analysis.

### GC/MS analysis

The oil was analyzed by GC/MS using Agilent Technology (HP) with a HP-5S Agilent 19091S-433 capillary column (30m×250 $\mu$ m, film thickness 0.25 $\mu$ m). For GC/MS detection an EI ionization system with ionization energy of 70 eV was used. In GC, the ion source was Electron Impact (EI) and analyzer was Quadropole. Injector and MS transfer line temperatures were set at 230 °C. Helium was

the carrier gas, with a flow rate of 1 ml/min. The programme used was 50–210 °C at a rate of 6 °C/min and held isothermal for 4 min and finally raised to 280 °C at a rate of 6 °C/min. 0.1  $\mu$ L of diluted sample was injected manually.

### Preparation of the extracts

The air-dried leaves of *D. anethifolia* were pulverized into powdered form. The dried powder (10 g) was extracted by maceration method and with ethanol (EtOH) and ethyl-acetate (EtOAc) separately at room temperature and the solvents from the combined extracts were evaporated by rotary system.

### Chemicals and spectrophotometric measurements

1,1-diphenyl-2-picrylhydrazyl (DPPH), BHT (butylated hydroxytoluene), distilled n-hexane were obtained from Merck company. All other chemicals and solvents were of highest commercial grade. Spectrophotometric measurements were performed by UV-VIS spectrophotometer (UNICO UV-2100).

### Antioxidant activity by DPPH assay

The antioxidant activity of the leaf extracts (ethanol and ethyl acetate) of *D. anethifolia* was measured on the basis of the scavenging activities of the stable 1,1-diphenyl-2-picrylhydrazyl (DPPH) free radical [15].

IC<sub>50</sub> values (concentration of sample required to scavenge 50% of free radicals) were calculated from the regression equation, prepared from the concentration of the extracts, and percentage inhibition of free radical formation/percentage inhibition DPPH was assayed. Synthetic antioxidant reagents, butylated hydroxytoluene (BHT) was used as positive control.

## Results and Discussion

### Chemical composition of the leaf essential oil

The hydrodistillation of the leaves of *D. anethifolia* gave yellowish-green oil. GC–MS analyses of the oil led to the identification of nineteen different compounds, representing 94.9% of the total oil. The essential oil yield was 0.6% (v/w) and its composition is shown in Table 1. According to their elution order on a HP-5S capillary column. The oil contained a complex mixture mainly of monoterpene hydrocarbons and oxygen containing monoterpenes and diterpene and nitrogen containing compounds along with some other

essential phytochemicals. As shown in Table 1, the major compounds were detected in the oil. The major constituents identified by this method were  $\alpha$ -pinene (70.3%),  $\beta$ -myrcene (6.9%),  $\beta$ -pinene (6.3%), limonene (4.9%) and decanal (2.4%) were also found to be the minor components of *D. anethifolia* leaf oil (Table 1).

**Table 1** Chemical composition of the leaf essential oil of *Ducrosia anethifolia*

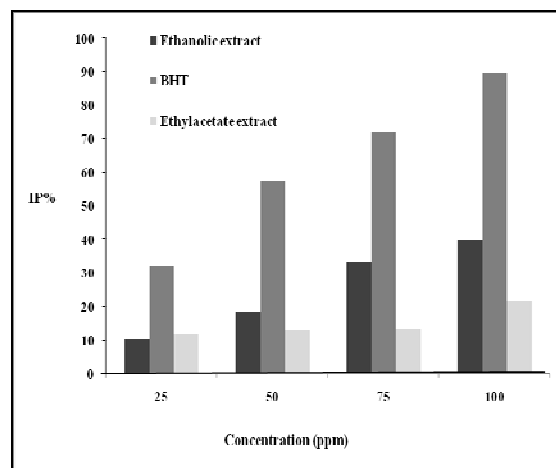
No.	<sup>a</sup> Compound	<sup>b</sup> RT	%
1	$\alpha$ -pinene	7.9	70.3
2	$\beta$ -pinene	9.2	6.3
3	$\beta$ -myrcene	9.7	6.9
4	Limonene	10.7	4.9
5	$\Delta$ -3-carene	11.6	0.4
6	1-methyl Tricyclo[2.2.1.0(2,6)]heptanes	12.7	0.9
7	(S)-3-hydroxypyrrolidine	13.3	0.1
8	Citronella	14.1	0.2
9	Decanal	15.4	2.4
10	2,3-epoxy-1- (methoxymethoxy)geraniol	16.0	0.1
11	Propane	17.8	0.04
12	Dodecanal	20.1	0.5
13	3-dodecanal	21.3	0.1
14	<i>n</i> -docosane	22.0	0.04
15	2-octyldodecan-1-ol	23.9	0.04
16	<i>n</i> -tetradecane	25.8	0.05
17	<i>n</i> -heptadecane	27.6	0.06
18	2,4-quinolinedicarboxylic acid	41.8	0.8
19	Luciduline	49.8	0.8
	Total		94.9

<sup>a</sup> Compounds listed in order of elution from a HP-5-MS column.

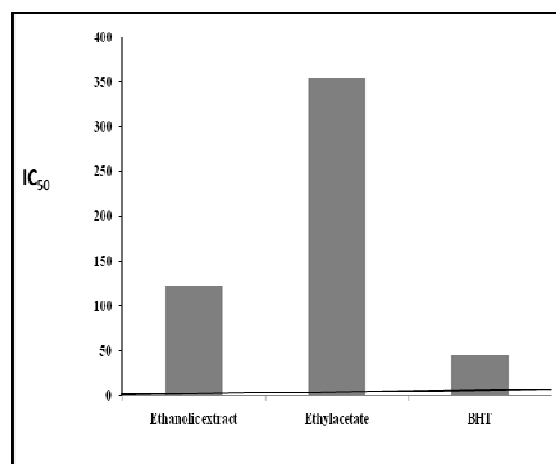
<sup>b</sup> Retention time (as minutes).

#### Antioxidant activity

Inhibitory power percent (IP%) of extracts of *D. anethifolia* are showed in Fig. 1. Constituents of extract not identify. The DPPH free radical scavenging activity of the leaf extracts (ethanol and ethyl acetate) has been shown in Fig. 2. The IC<sub>50</sub> values of the extracts were compared with the standard butylated hydroxytoluene (BHT = 45.64 ppm). A lower IC<sub>50</sub> value indicates a greater antioxidant activity. The free radical scavenging activities of ethanolic extract is IC<sub>50</sub> = 122.02 ppm and ethyl acetate extract is IC<sub>50</sub> = 354.37 ppm. However, ethanolic extract has a antioxidant activity rather than ethyl acetate extract. So, low polar extracts exhibited low DPPH scavenging activity.



**Fig. 1** Comparison of scavenging effect of BHT and ethanolic and ethyl acetate extracts on DPPH radicals (IP% : Inhibitory power percent)



**Fig. 2** DPPH IC<sub>50</sub> values for extracts of *D. anethifolia* and positive control (BHT).

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