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The essential oils of Dill (*Anethum graveblens* L.) collected from Gilan, Iran

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ABSTRACT

Dill weed (Anethum graveblens L.) is a perennial herb of Apiaceae which all of its vegetative parts contains volatile compounds with various pharmaceutical properties. With regards to the dramatically quantitative and qualitative changes of dill volatiles and also plant growth conditions, the essential oils of dill leaves in relation to the ecological growing properties of dill in Ramsar were studied in this present study. According to the results dill leaves contains 17 various essential oils consists of Eugenol, Trans-caryophyllene, Mefranal, Beta-santalene, Pentadecane, Dill apiole, Eudesmol, Haxadecanol, Methyl undecanoate, Limonene , n-octane, α-Phellandren, sabinene bicycle, D-Carvone and Cyclohexasiloxane.

Keywords: dill, essential oil, volatiles, growth condition, pharmaceutical properties.

INTRODUCTION

Dill weed (*Anethum graveblens* L.) is a perennial and aromatic herb of *Apiaceae* which originated from Mediterranean, and the South of Russia. Dill leaves are threadlike and divided into slender parts in both sides of the petiole [5]. Essential oils and other compounds of dill are mainly used in food and drug industries. As a folk remedy, dill is considered for some gastrointestinal ailments such as flatulence, indigestion, stomachache and colic [1]. In addition, volatile oils of dill at low doses have remarkably antimicrobial effects [2,6]. There are some reports in relation to the antiappetite effects of dill [3]. Anethum which is one of the botanical drugs used for decreasing blood cholesterol in Iran which consists of 83% dill seeds and leaves, 6% fumaria flowering shoots and 5% dried lime [4]. All vegetative parts of dill plant contain essential oils and the amount of such compounds in different parts of plant is various. The essential oil color of dill is nearly light yellow and the aroma is relatively tang and similar to cumin odor [8]. Commonly the dill essential oil obtained from its leaves and seeds [16]. Because of having flavonoids and querecetin, the compounds of dill extraction and essential oil have antioxidant properties [12]. Such antioxidants effectively in various ways can inhibit the interaction of free radicals in the form of ROS or NOS with biomolecules like proteins, amino

acids, lipids and DNA and can lead to decrease cell death and damage, heart diseases and cancers [10,11].

Although most of the diseases being treated by botanical therapy, highly toxic effects of dill on human lymphocytes have been reported [13]. Follow by the above; it is essential to notice that in addition to the ecological properties of the area and implanting positions, environmental conditions for plant growth and development such as temperature, light and nutritional conditions and so on, will be effective on active ingredients and metabolic processes of dill plants. So, this study has been done with the aim of studying the effects of environmental conditions on the types of essential oils of dill collected from Gilan, Iran.

MATERIALS AND METHODS

Dill plants collected from an area of Ramsar located in Gilan province, Iran, with the longitude of 37, 4, 18, latitude of 50, 23, 57, and 20 m below the sea level in late October. The relative humidity of the area was 85%. The dill leaves were selected and isolated for the study. All the experiments have been done at the laboratory of Science and Research Branch, Islamic Azad University, Tehran.

Reagents and solvents

All solvents and reagents were purchased from Merck, Germany: dichloromethane, supraSolv for gas chromatography, anhydrous Na_2SO_4 granulated for organic trace analysis, the C_8-C_{20} n-alkanes used for the determination of Kovats retention indices.

Plant material

The raw material consisted of the leaves of *Anethum graveolens* L. (*Apiaceae*) was collected in 2011 from Gilan in Iran. The products were naturally dried in shadow and stored in controlled laboratory conditions.

Isolation of the essential oil

23 grams of fragmented dried *Anethum graveolens* of Gilan were hydrodistilled with 1000 ml water in a Clevenger-type apparatus for 3h.

The essential oils were dried over anhydrous Na_2SO_4 and stored in a dark glass bottle at low temperature before analysis.

Gas chromatography

GC analysis was performed on a Shimadzu 15A gas C was employed. The carrier°chromatograph. A split-splitless injection at 250 gas (N_2) was 1 mL/min and the capillary column used was DB-5 (50 m x 0.2 mm, C for 3 min and then°film thickness 0.32 µm). The column temperature was 60 C for 5 min. °C and finally held at 220 °C/min to 220 raised at 5

GC-MS analysis

GC-MS analysis was performed using a Hewlett Packard 5973 with a fused silica capillary column 5% phenyl-poly-dimethyl-siloxane (DB-5MS 30 m x 0.25 mm i.d. and 0.25 µm film thickness).

C° The column temperature was programmed as follows: from 60 C for 5°C and finally held at 220°C/min to 220° (3 min hold) then raised at 5 min. The carrier gas (helium) flow rate was 1mL/min.

The identification of compounds was performed by comparing their mass spectra with data from Adams. The identification of compounds was also based on the Kovats retention indices.

The Kovats retention indices were calculated using *n*-alkanes C_8-C_{20} and the experimental values were compared with those reported in literature.

RESULTS AND DISCUSSION

According to the results (Fig 1), 17 various compounds like Eugenol, Trans-caryophyllene, Mefranal, Beta-santalene, Pentadecane, Dill apiole, Eudesmol, Haxadecanol, Methyl undecanoate, Limonene , n-octane, α- Phellandren, sabinene bicycle, D-Carvone, Cyclohexasiloxane identified in the essential oil extracted from dill collected from Gilan; whereas Yazdani, Jamshidi, Rezazadeh, Mojab and Shahnazi (2004) reported only four compounds (α- Phellandren, Limonene, Carvone, Diethyl) in the dill essential oil collected from Helgerd in Alborz province.

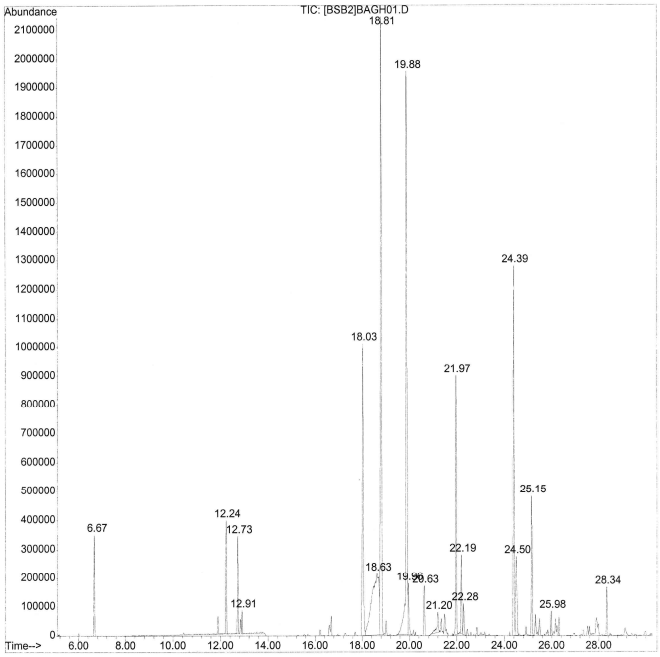

Fig1- Essential oils extracted from dill plant.

Therefore various factors such as plant genotype and cultivar and also environmental parameters have great effects on the compounds variety of plant essential oils [19]. In addition, Reichert and Masandl found that essential oils compounds differed from one part and growth stage of the same plant to others [17]. Singh, Maurya and Catalan (2005) have shown that the main compounds of seed essential oil of dill were D-Carvone, dill apiole, Limonene, Trans Dihydrocarvone, Linalool, cis Dihydrocarvone, and Tranc Iso crocin [9]. According to the Sefidkon's findings (2001) the main compounds of dill flower essential oil consisted of α-Phellandren, Limonene and ρ-Cymene [8]. Oyoughi, Barzegar, Sahari and Naghdi Badi (2010) identified 21 different compounds in dill essential oil such as Sabinene,β- Myrcene, α-Phellandren, Limonene γ-Terpinene ρ-Cymene Linalool E-Limonene Oxid Estragole α-Pinene α- Terpineol Z Dihydrocarvone E-Dihydrocarvone Cumin aldehyde D-Carvone Thymol Carvacrol β- Caryophyllen D-Germacrene Myristiscin Dill apiole [18].

Moreover, Reineccius (1992) has reported that the main essential oil compounds of dill fruits were d-Carrone، d-limenene and a-phellandrene and also other compounds like kampferol, Coumarin, Vicenin, Myristicin and other flavonoids can be found in the essential oil [12].

Furthermore, Ishikawa Kudo and Kitajima (2002) demonstrated that the essential oil of dill fruit which was the 3-4% of the fruit consisted of d-carvone, dihydrocarvone, carveol, limonene, d-hydrocarveol and carvacrol thymol [15].

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