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Essential Oil Constituents of *Thuja orientalis* Berries

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Abstract – The essential oil of *Thuja orientalis* berries was produced by steam distillation using the Clevenger apparatus. The oil was analyzed by gas chromatography and mass spectrometry (GC-MS). The main constituents of the oil were D-Limonene (36.71%), β-Phellandren (36.69%), β-Myrcene (15.29 %).

Keywords – *Thuja orientalis essential oil*

1. Introduction

Natural products play an important role in drug discovery and advancement, since the chemical and pharmaceutical varieties of them provide the progression of therapeutic agents. Almost 80% of medicines were natural products or modification of natural compounds [1].

Thuja orientalis (*Platycladus orientalis*), belonging to the Cupressaceae family is large, dense, evergreen and coniferous shrub three. It has been used in the treatment of various diseases as a folk medicine such as rheumatism, gout, dermatitis, and diarrhea [2]. The plant has been exhibited extensively biological activities including antiepileptic [3],

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antiinflammatory [4], hair growth-promoting [5], antiviral [6], antiallergic [7], antibacterial [8], antioxidant [9], molluscicidal [10], antifungal activities. Phytochemical study on *Thuja orientalis* resulted in the isolation and identification of secondary metabolites such as sesquiterpenes [11], diterpenoids [4, 12], flavonoids [13, 14]. The cancer chemopreventive agent, labdane type diterpene, firstly isolated from the *Thuja standishii* was successfully synthesized [15].

Essential oils (EOs) are natural products, volatile, with terpenic structure and are mostly found in plant leaves and flowers. They are secondary metabolites playing significant functions such as protection of the plants against bacteria, viruses, fungus, insects and herbivores. Due to the wide range of pharmaceutical activities and having the fragrance property, EOs have been used extensively in food, drug and perfumery industries [16].

In this work essential oil constituents of *Thuja orientalis* berries were presented

2. Material and Methods

Plant Materials

Thuja orientalis were collected from the Gaziosmanpasa University Campus, Tokat, Turkey, and identified by Prof. Dr. Isa Telci.

Isolation of essential oil

Thuja orientalis berries (50 g) were applied steam distillation using Clevenger apparatus for 3.5 h. The essential oil sample was separated, dried ($MgSO_4$) and stored at a fridge (50 mg).

GC analysis

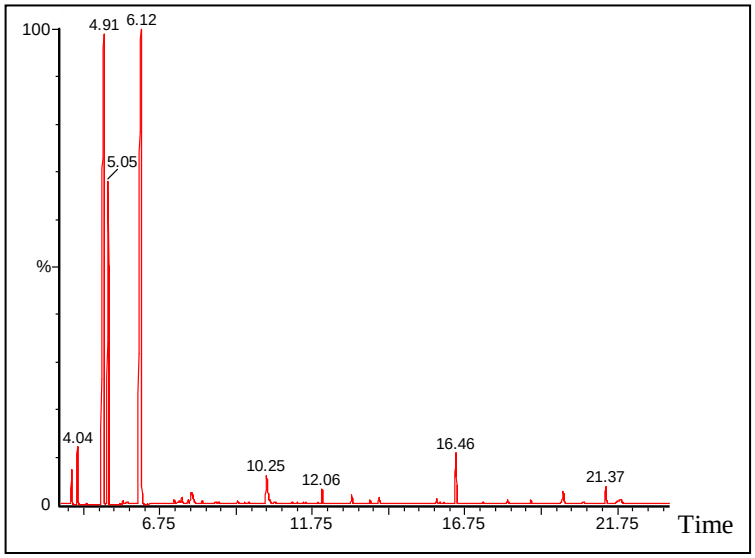
GC analyses of essential oil were performed on Perkin-Elmer Clarus 500 model Autosystem GC. Acetone was used for dilation of oil (1:10) then injected in the HT-5 column (25 m×0.22 mm×0.1μm film). The column temperature was programmed from 50 to 120 °C at 3 °C/min, 120 to 220 °C 5 °C/min with initial and final temperatures held for 0,64 min (totally 44 min). Helium was used as carrier gas at 5 psi inlet pressure. The temperature was 250 °C for both injector and detector (FID). Diluted samples (1.0 μL) were injected in the split/splitless (50:1 split) mode.

GC–MS analysis

GC/MS analyses were performed on Perkin-Elmer mass spectrometer using BPX5 column (30 m×0.25 mm×0.25μm film). An electron ionization system with ionization energy of 70 eV was used for GC–MS detection. The carrier gas was helium with a flow rate of 1.3 ml/min. Injector and MS transfer line temperatures were set at 230 °C and 250 °C, respectively. The oven temperature was the same as with GC analysis. Diluted samples (1/10 in acetone, v/v) of 1.0μL were injected in the split/splitless (5:1 split) mode.

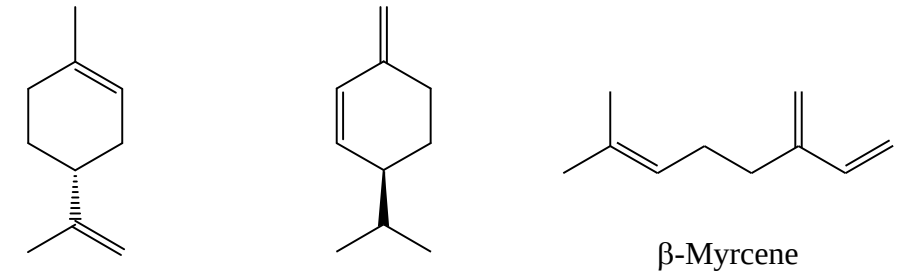
3. Results and Discussion

The essential oil of *Thuja orientalis* berries was obtained by steam distillation and analyzed by GC-MS (Scheme 1). The main constituents of the oil were D-Limonene (36.71%), β-Phellandren (36.69%), β-Myrcene (15.29 %) (Scheme 2).



Scheme 1. Essential oil chromatogram of *Thuja orientalis* berries

Essential oil analysis was carried out on *Thuja orientalis* grown in different countries. It is known that the environment, abiotic stress and genetic heritance affect the essential oils compounds and their quantities [17].



Scheme 2. Chemical structure of main constituents of essential oil from *Thuja orientalis* berries

Thuja orientalis leaves, grown in Himalaya consisted of α-pinene (29.2%) as the major constituent [18]. The main essential oil component of *T. orientalis* fruit grown in Iran was α-pinene (52.4%) [19].

Table 1. Chemical composition of *Thuja orientalis* berries essential oil analyzed by gas chromatography-mass spectrometry

Compounds	Rt (min)	Oil composition (%)
α-Phellandrene	3,852	1,04
α-Pinene	4,043	1,95
β-Phellandren	4,897	36,69
β-Myrcene	5,048	15,29
D Limonene	6,114	36,71
Linalool	7,782	1,14
4-Terpineol	10,25	2,25
Citronellic acid	12,065	0,59
Carvone	13,04	0,47
Caryophyllene	16,453	2,30
γ-Elemene	19,976	0,82
Caryophylene oxide	21,368	0,74

Limonene, the main constituent of essential oil of *Thuja orientalis* berries grown in Tokat, naturally occurring monoterpene, has been found to posses many therapeutic properties. Many essential oils consist of limonene as a major product, therefore the activities of essential oils could be attributed to the limonene which exhibited antifungal [20], antimicrobial [21], antioxidant [22], antiinflammatory, antiproliferative [23], antitrypanosomal and antiplasmodial [24], antitrypanosomal [24], antiprotozoal [25], antitumor activities [26]. In addition, it has been used as a flavoring agent in food industry [27].

As a result, the essential oil obtained from *Thuja orientalis* berries grown in Tokat could be valuable material for food and pharmaceutical industries.

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