

Chemical composition of ethanol/n-hexane extract of the leaf from *Tanacetum polycephalum* subsp. *duderanum* as a herbal plant in Iran

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ABSTRACT

*The chemical compositions of the plant extract obtained by ethanol and n-hexane(50% v/v) from the leaf of *Tanacetum polycephalum* subsp. *duderanum* was analyzed by GC/MS and 13 compounds constituting of the extract were identified .The major components were, 1,8-cineole(1.34%), verbenol(2.48%), epoxylinolol(1.29%), p-cymene (29.68%), isopulegol(2.02%), α -humulene (4.2%), viridiflorol (14.35%) , caryphyllen- oxide(6.38%), carotol(1.16%). It was found about 59.41% of the leaf extract for monoterpenes and 36.97% for sesquiterpenes. The most amount of the extract was p-cymene($C_{10}H_{14}$).*

Keywords:*Tanacetum polycephalum* subsp.*duderanum*, GC/MS, extract.

INTRODUCTION

The genus *Tanacetum*,(*T. cadmeum* ssp. *cadmeum*, *T. parthenium*, *T. corymbosum* ssp. *cinereum*, *T. chiliophyllum* var.*chiliophyllum*, *T. kotschyi* and *T. cadmeum* ssp.) which is an important member of the Compositae family, is widespread in Europe and Western Asia and consists of about 150- 200 species [1]. The genus *Tanacetum* (Compositae) is represented by 26 species in the flora of Iran, 12 of them are endemic. *Tanacetum polycephalum* subsp. *duderanum* grow up wild in North-East of Iran [2].

These species have traditionally been used as a spicy additive for food, in cosmetics and as herbal remedies due to their biologically active compounds and many infectious diseases are known to be treated with herbal remedies throughout the history of mankind [3-6].This genus is rich in essential oils, bitter substances and sesquiterpene lactones[7].

The determination of the composition of plants, fungi, or bacteria is based on consecutive (or, very rarely, simultaneous) application of several techniques for preliminary preparation of the examined material. First, the material is dried or lyophilized, followed by comminution or homogenization. Next, the material is extracted (leached) with a specific solvent or either a series or mixture of solvents. Each extract (leachate) is purified by removing solids via filtration,

ultrafiltration, or centrifugation. The majority of these sample preparation techniques have been used for a long time. However, recently some of the “classical” extraction techniques carried out at elevated temperature, such as several-day maceration, long-term leaching with stirring, agitation in water or a buffer solution, and Soxhlet extraction are being replaced with more modern techniques, which are more effective, require less solvent, and permit more readily automation of the apparatus and procedures [8].

Gas chromatographic (GC) methods have been extensively applied for the determination of individual components of plant extract [9]. Identification of terpenoids can be performed using standard detectors such as GC-FID (flame ionization detection) as well as more sophisticated techniques like GC-MS (mass spectroscopy) and GC-FTIR-MS [2]. Alternatively, different vibrational spectroscopic methods were successfully applied for the identification of the main compounds in the isolated extract and for the discrimination of different species of various spice plants.

In this study we reports the chemical composition of a ethanol/n-hexane extract of the *Tanacetum polycephalum* subsp. *duderanum* using GC/MS isolation and identification.

MATERIAL AND METHODS

Plant material

The plant of *Tanacetum polycephalum* subsp. *duderanum* were collected (May, 2009) from Arzane waterfall of Bakharz town, Khorasan Razavi Province, Iran at altitude of 1700m [4]. Voucher specimens was deposited in the Herbarium of Ferdowsi University of Mashhad (FUMH) with Herbarium number 39340. Fig. 1, shows the plant photo that is taken from the mentioned region of Iran. It is air dried in a shadow place and powderd before using in the experiments.



Fig.1.The photo of *Tanacetum polycephalum* subsp. *duderanum*

Extraction

Dried and powderd plant of leaf (10g) was placed in to a cartuche and extracted by distillation with ethanol and n-hexane(50% v/v) for 11h using a Soxhlet-type apparatus. After evaporation of the solvent about 0.01 g of the green extract was dissolved in mixture of ethanol and n-hexane(50% v/v). After this step the solution(0.1µl) was injected to the GC-MS instrument.

Analysis

The extract was analyzed by gas chromatography mass spectroscopy (GC/MS). The GC/MS analysis was carried out on a Shimadzu GC/MS model QP 5050. The capillary column was DB-5(30 × 0.2 mm, film thickness 0.32 μm). The operating conditions were as following [2]; carrier gas, helium with a flow rate of 1.7 ml/min; injector and detector temperatures, were both at 280°C; volume injected 0.1 μl of the extract and ionization potential 70 ev. The initial temperature of column was 60°C (held 1 min) and then heated to 200°C with a 3°C/min rate and then heated to 250°C and kept constant for 2 min. Identification of components in the extract was based on the similarity index (SI), Wiley computer library and literature survey. The relative percentage of the extract constituent was calculated (Table 1).

RESULTS AND DISCUSSION

The qualitative and quantitative analytical results of leaf extraction of *Tanacetum polycephalum* subsp. *duderanum* are show in Table1. A total of 13 components were identified by GC/MS, representing 74.63% of the extract : *p*-cymene (29.68%) was determined as the first major constituent in the extract, the seconded compound was viridiflorol (14.35%) followed by *beta*-thujone(7.22%).

Table1. Percentage composition of plant extract of the leaf of *Tanacetum polycephalum* subsp. *duderanum*

No.	Compound	Formula	Retention time(min)	Cont%
1	<i>p</i> -cymene	C ₁₀ H ₁₄	3.125	29.68
2	1,8-cineole	C ₁₀ H ₁₈ O	3.242	1.34
3	camphor	C ₁₀ H ₁₆ O	5.700	0.31
4	verbenol	C ₁₀ H ₁₆ O	6.442	2.48
5	epoxylinalol	C ₁₀ H ₁₈ O ₂	6.792	1.29
6	<i>β</i> -thujone	C ₁₀ H ₁₆ O	8.075	7.22
7	chrysanthenyl acetate	C ₁₂ H ₁₆ O ₂	9.700	2.70
8	isopulegol	C ₁₀ H ₁₈ O	41.383	2.02
9	<i>trans</i> -caryophyllene	C ₁₅ H ₂₄	41.467	1.50
10	<i>α</i> -humulene	C ₁₅ H ₂₄	43.550	4.20
11	viridiflorol	C ₁₅ H ₂₆ O	44.900	14.35
12	caryphyllen oxide	C ₁₅ H ₂₄ O	45.103	6.38
13	carotol	C ₁₅ H ₂₆ O	45.791	1.16
Total				74.63

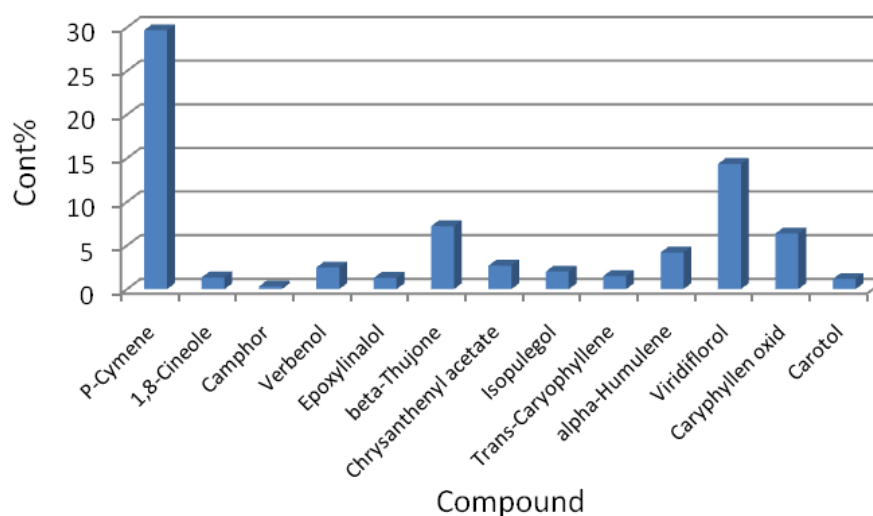


Fig. 2. The variation of indented compounds in the extract of leaf of *Tanacetum polycephalum* subsp. *duderanum*

The other major compositions were caryophyllene oxide (6.38%), alpha-humulene (4.20%), chrysanthenyl acetate (2.70%), isopulegol (2.02%), *trans*-caryophyllene (1.50%), 1,8-cineole (1.34%), epoxylinolol (1.29%), carotol (1.16%) and camphor (0.31%) in the extract, respectively. Fig.2 shows the compositions in the extract.

The leaf extraction from *Tanacetum polycephalum* subsp. *duderanum* herbal plant show that, non-oxygenated terpenes and oxygenated monoterpenes, made about 35% and 40% of the extract, respectively.

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