Ethnobotany and chemical compositions of essential oil from different parts of *Tanacetum parthenium* L. in Deraznoo mountain in south west of Golestan province

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Abstract

This survey was undertaken in Golestan province in order to inventory of *Tanacetum parthenium* L. in traditional medicine for treatment of headache, cold, fever, menstrual, arthritis, anti infection and rheumatic pain. Flowers and leaves were collected in August 2006 from Deraznoo Mountain in south west of Golestan province and were water distilled to produce the oils in the yields of 0.66% (v/w) in flowers and 0.12 % (v/w) in leaves, respectively. The oils were analyzed by GC and GC/MS. In two regions, the major components in flower essential oil were camphor, alpha- pinene and alpha- bissabolol oxid-B, but camphor, alpha-pinene and piperiton were the major components in leaves of this plant.

Key words: *Tanacetum parthenium* L., ethno pharmacology, essential oil, Deraznoo in Golestan province.

Introduction

Essential oils, volatile secondary metabolites responsible for the odors of aromatic plants, are used in perfumery, as aroma products, flavoring agents in foods and beverages, in cosmetic products and as drugs. There is an increasing global trend in the consumption of self-prescribed herbal and natural products for treating (Blumenthal, 1998).

Tanacetum species, belongs to Asteraceae family totaling over 200 and distributed over Europe and West Asia and growing up to altitudes of 2000 meters contains several strongly scented annual and perennial species, and now grows in North and South America, Europe, North Africa, China, Japan and Australia (Jaime and Teixeira., 2004).

They have also been cultured in gardens (Heywood, 1976 and Mitich, 1992) and used in salads, omelets and cakes (Hussey, 1974 and Grieve, 1984). Some members of this family have traditionally been used in balsams, cosmetics, dyes, insecticides, medicines and preservatives as herbal remedy (for example, *T. vulgare*) (Hussey, 1974, Millspaugh, 1974 and Grieve, 1984). They have also been used as anti-helmintic for migraine, neuralgia, rheumatism and loss of appetite (Blumenthal, 1998). According to recent studies, essential oils and extracts of members of the genus *Tanacetum* exhibit anti-inflammatory (Mordujovich-Buschiazzo et al., 1996 and Brown et al., 1997), antibacterial (Stefanovic et al., 1988, Holopainen and Kauppinen, 1989, Hethelyi et al., 1991 and Neszmelyi et al., 1992), antifungal (Hethelyi et al., 1991 and Neszmelyi et al., 1992), insecticidal effects (Panasiuk, 1984, Schearer, 1984, Suomi et al., 1986, Nottingham et al., 1991 and Hough-Golstein and Hahn, 1992), antimicrobial and allergic contact dermatitis (Tiumen et al., 2006). Antibacterial activity by sivasinolide, a sesquiterpene lactone from

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T. densum is effective against *Bacillus subtilis* and *Klebsiella pneumoniae* and antioxidants (G?ren et al., 1992). The falvonoid glycosides have vasodilating and anti-inflammatory effects, and pinenes have mild sedative characteristics (Askin Akpulat et al., 2005; Susurluk et al., 2007).

The terpenes in the essential oil are thought to associate with the biological activity of *Tanacetum*. Some earlier works have been reported on the essential oils of various *Tanacetum* species (Nori-Shargh et al., 1999, Baser et al., 2001, Goren et al., 2001 and Beauchamp et al., 2001). The volatile compounds from *T. vulgare* have been examined in detail (Keskitalo et al., 2001). In the case of *T. argyrophyllum*, *α*-thujone is reported to predominate in its essential oil (Goren et al., 2001). With respect to *T. parthenium*, many studies have been found that relate to the sesquiterpene lactone parthenolide and flavonoids, which exhibit strong biological activity (Smith and Burford, 1992, Awang, 1998, Jain and Kulkarni, 1999, Williams et al., 1999 and Long et al., 2003). Camphor and chrysanthenyl acetate were the main components of the essential oil of *T. parthenium* originated from England and Netherlands, it is aromatic perennial plants, widely distributed in the northern hemisphere (Hulten, 1968, Hussey, 1974 and Heywood, 1976).

Whereas camphene, *p*-cymene and (*E*)-chrysanthenol were found together with the previous compounds to predominate the volatiles emitted from the plant by the dynamic headspace technique (Hendriks et al., 1996 ; Christensen et al., 1999). Golestan province is fortunate to have such varied climate and heterogeneous ecological condition, that almost many medicinal herb, especially *Tanacetum parthenium* L. can wild grow and wide distribution in south east mountain of this region. This work presents the chemical composition of the hydrodistilled oils of *T. parthenium* of northern Iran, in Deraznoo mountainous habitat (2200 m) and the results are compared to those reported in the literature.

Material and method

Plant Part

Flowering aerial parts (leaves and flowers) were collected in August 2006 and to separation water-distillation using a Clevenger–type system. The oil yields obtained were leaves 0.12% and flowers 0.66% on a fresh weight basis.

Ethno pharmacological assay

In our study, all information was gathered through ethno botanical questionnaire, using participant observation with 3 famous elderly members of selected communities and who still retain traditional knowledge about medicinal plants in small mountainous village Derazno in 2200m in south west of Golestan province which they are female (average age: 76 years) and whom still retain considerable knowledge about these practices. During the first phase of this field study, the required information about identified the plant, such as locally name, plant part used, the culinary process and other medicinal application (orally or topically) was asked and recorded.

Gas Chromatography

GC analyses were performed using a shimadzu–9A gas chromatograph equipped with a flame ionization detector and quantitation was carried out on Euro Chrom 2000 from KNAUER by area normalization method and neglecting response factors. The analysis was carried out using a DB – 1 fused-silica column (60 m x 0.25 mm, film thickness 0.25 µ m, J & W Scientific Inc., Rancho Cordova, CA). The operating conditions were as follows: injector and detector temperature 250^{o}C and 265 ^{o}C, respectively; carrier gas, helium. Oven tem- perature programme was 40 ^{o}- 250 ^{o}C at a rate of 4^{o}C/min.

Gas Chromatography/Mass Spectrometry

The GC/MS unit consisted of a varian Model 3400 gas chromatograph coupled to a Saturn II ion trap detector was used. The column was same as GC, and the GC conditions were as above. Mass spectrometer conditions were: ionization potential 70 eV; electron multiplier energy 2000V.

The identity of the oil components was established from their GC retention indices, relative to C_7–C_{25} n–alkanes, by comparison of their MS spectra eith those reported in the literature (Davies, N.W., 1990), and by computer matching with the Wiley 5 mass spectra library, whenever possible, by co–injection with standards available in the laboratories.

Results

Ethno botanical data showed that *Tanacetum parthenium* L. is a perennial aromatic herb with

locally name "Davoody". The leaves have a refreshing aromatic aroma. Growing to 90 cm the stem is upright, erect, hairy, finely furrowed and branching. Strongly aromatic leaves are alternate, hairless, toothed, light green, and divided into broad, lobed segments. Its aerial parts (flower and leaves) have been used by the rural healers of this village alone or combination with other medicine herbs such as: *Hypericum perforatum, Cuminum cyminum, Achillea millefolium, Mentha longifolia, Mentha aquatica, Echium amoenum, Thymus carmanicus, Artemisia annua, Artemisia absinthium* and *Salix alba* traditionally for sedative of spasm, headache, fever, cold, arthritis, gastro intestinal infection, anti inflammation, healing wounds and menstrual pain. Many daisy-like flower heads and leaves were collected by the rural healers in blooming (June to August) and dry for later use. They believed if this plant grows more than of 1000 m, should not be used internally, especially during pregnancy because due to stimulant action on the womb and The fresh leaves may cause mouth ulcers in sensitive people.

The essential oil yields (v/w, on dried mass basis) of *T. parthenium* parts grown in Deraznoo,was 0.66% in flowers and 0.12% in leaves, respectively. Close to those reported for *T. argyrophyllum* (0.96–1.03%) and *T. parthenium* (0.30–0.83%) (Hendriks et al., 1996 and Goren et al., 2001).

The results of the analysis of two essential oil from *T. parthenium* L. are present in Table 1. In the case of *T. parthenium*, 23 compounds were identified representing of the oil. Camphor and alpha terpinyle acetate were the major component of the leaves essential oils. A comparison of the data presented in this paper with those in the literature for other species of *Tanacetum* show that there are qualitative differences in the levels of some of the compounds present in minor amounts, although similar levels of camphor and terpinyl acetate were found in the species studied. The oil obtained from the dried leaves of *T. argyrophyllum* is reported to contain a high percentage of 1,8-cineole (Goren et al., 2001). Other species of the genus *Tanacetum*, rich in *cis*-thujone include *T. praeteritum* subsp. *massicyticum*, and the trans-thujone chemotype *T. vulgare* (Goren et al., 2001; Keskitalo et al., 2001). Considerable amounts of cis-thujone (about 12%) have been found in the essential oils of *T. argenteum* subsp. *canum* var. *canum* and *T. balsamita* (Goren et al., 2001 ; Baser et al., 2001).

Discussion

In another reaserch, bornyl acetate, pinocarvone, camphor and terpineole were the major constituents of *T.balsamita*.(Jaimand and Rezaee, 2005).another showed the camphor, chrysanthenyl acetate and chrysanthenol were the most components of *T. parthenium* essemtial oil (Jaimand and Rezaee, 2001). Another showed the camphor,camphene, p-cymene and bornyl acetate were the most components of *T. parthenium* (Askin Akpulat et al., 2005)

Camphor and bornyl acetate were the most active repellants against potato beetles (Schearer, 1984), while other *Tanacetum* var. *argyrophyllum* or *praeteritum* had antibacterial and antifungal activity, probably attributed to the action of the sesquiterpene lactones (G?ren et al., 1996b). *T. parthenium* (feverfew) has a high camphor (44%) and trans-chrysanthemyl acetate (23%) content, while *T. vulgare* (chemotype-dependent) contains lyratyl acetate, thujone and germacrene. One *T. vulgare* contained 95% davanone (Appendino et al., 1984). Other *Tanacetum* extracts, chamazulene and dihydrochamazulenes, of blue color are used in the perfumery (cosmetic) and pharmaceutical industries.

The above data display numerous oil chemo types, which strongly correlate with a different geographical origin. Constituents of Feverfew are Volatile oils, containing pinene and several pinene derivatives, bornylacetate and angel ate, costic acid, b-farnesine, spiroketalenol ethers. Flavonoid glycosides and costic acid should be taken regularly to receive maximum benefit and protection from migraines. The leaves and flowering heads are anti-inflammatory, antispasmodic, aperients, bitter, carminative, emmenagogue, sedative, stimulant, stomachic, vasodilator and vermifuge (Susurluk et al., 2007). In traditional uses of this region an infusion made from the whole plant is used in the treatment of arthritis, colds, and fevers, as a sedative and to regulate menses. Also used as a foot bath for swollen feet. Applied externally as a tincture, the plant is used in the treatment of bruises. Chewing

several leaves a day has proven to be effective in preventing some migraine headaches

In conclusion, this study demonstrates the occurrence of camphor/camphene chemo type of *T. parthenium* in south eastern Golestan province of Iran.

Table 1: comparative of essential oil components of plant (flowers and leaves) in Deraznoo (2200m)

PK NO	Chemical Constituent	Deraznoo (2200m)			
		Flower	RT	Leave	RT
1	tricyclene	1.36	5.03	---	---
2	α- thujene	2.86	5.28	0.81	5.31
3	α-Pinene	2.10	5.67	1.65	5.72
4	β -Pinene	1.06	6.83	0.51	6.94
5	α-phellanderen	0.99	7.98	2.45	8.06
6	p- cymene	0.71	8.13	1.21	8.29
7	limonene	0.25	8.8	---	---
8	1,8-cineole	0.82	9.21	0.38	9.29
9	γ- terpinene	0.22	10.35	---	---
10	camphor	11.57	12.78	36.04	13.07
11	-cis- α- terpineol	0.66	13.16	1.37	13.31
12	pinocarvone	2.06	13.55	0.69	13.67
13	piperitone	23.44	19.25	0.68	19.09
14	α-terpinylacetate	28.28	22.92	19.89	22.97
15	α- copaeae	2.64	23.58	2.49	23.65
16	β- bourbonene	5.62	24.64	0.61	24.23
17	-(E)-β- farnesene	1.03	27.99	4.09	28.09
18	germacrene D	0.58	29.30	1.45	29.35
19	β- bisabolol	0.22	30.09	---	---
20	spathulenol	0.20	32.09	0.96	32.13
21	α-bisabolol oxide B	2.43	34.13	9.09	34.29
22	α-bisabolol	1.01	34.89	1.87	35,02
23	α-bisabolol oxide A	0.50	38.58	---	---

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اتنوبوتانی و بررسی ترکیبات شیمیایی اسانس اندام‌های مختلف گیاه دارویی *Tanacetum parthenium* L. در منطقه کوهستانی درازنو واقع در جنوب غرب استان گلستان

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چکیده

یافته‌های این تحقیق نشان داد که گیاه دارویی داوودی وحشی *T. parthenium* L. یکی از گونه‌های ارزشمند و بومی استان گلستان است که در طب سنتی مردم بومی منطقه از آن در درمان سردرد، سرماخوردگی، تب، ضدعفونی و مسکن دردهای ورم مفاصل، رماتیسم و دیسموزه استفاده می‌شود. لذا در مردادماه ۱۳۸۵، گل‌ها و برگ‌های گیاه از رویشگاه طبیعی خود واقع در ۲۲۰۰ متری کوهستان درازنو در جنوب غرب استان گلستان جمع‌آوری شدند و به روش تقطیر با آب اسانس‌گیری و آنالیز مواد موثره اسانس اندام‌های مختلف گیاه توسط دستگاه GC/MS انجام گرفت. نتایج نشان داد که مهمترین مواد موثره اسانس گل‌ها شامل: کامفور، آلفا ـ پینن و آلفا ـ بیزابولول اکسید B ولی در اسانس برگ‌ها شامل کامفور، آلفا ـ پینن، و پیپریتون بودند.

کلمات کلیدی: اتنوفارماکولوژی، روغن اسانس برگ و گل، داوودی وحشی (*Tanacetum parthenium* L.)، کوهستان درازنو