

CHEMICAL COMPOSITION OF THE ESSENTIAL OIL FROM FLOWER-HEAD OF OTANTHUS MARITIMUS HOFFM. ET LINK.

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ABSTRACT

The essential oil from the flower-heads of *Otanthus marilimus* Hoffm. et Link was investigated by GC and GC-MS. The main constituents were: camphor, yomogi alcohol, artemisia alcohol and its acetate ester, chrysanthenyl acetate, camphene and chamazulene. This is the first report indicating the occurrence of the non-head-to-tail monoterpenoids in the genus *Otanthus*.

INTRODUCTION

Otanthus maritimus Hoffm. et Link, (tribe *Anthemideae*, family *Compositae*) is known as cotton weed, also, known locally as Hashishet El-Rih or Gaadeh. This plant is a perennial herb growing widely in maritimal sandy dunes and is widespread in the costal areas of the Mediterranean⁽¹⁾. It is used by the bedouins for treating asthmatic bronchitis⁽²⁾. It is also used for the treatment of dysentery and inflammation of the urinary bladder⁽³⁾.

Otanthus maritimus has been studied chemically by several authors. The roots have yielded acetylenes, highly unsaturated amides⁽⁴⁾ and several sesquiterpenoids^(5,6). The aerial parts have been shown to contain

guaianolides^(7,8), a flavone glycoside and sesamin-like compound (2) as well as terpenoids, steroids and an aliphatic ester⁽⁹⁾. In addition the macro-and micromorphological study of the leaf, stem and flower-head of this species was reported⁽¹⁰⁾. Although, the latter reference described the plant as having a characteristic strong aroma, the literature indicated no report concerning the chemical nature of the odouriferous constituents. Thus, the present study was centered and concerned with the analysis of the essential oil of the flower-head of this plant.

EXPERIMENTAL

Plant material:

Fresh flowering plants of *Otanthus maritimus* Hoffm. et Link. growing wild in sandy costal strips, west of Alexandria were collected in May 1992. The plant was identified by Dr. A. Fayed, Prof. of Taxonomy, Faculty of Science, Assiut University. A voucher specimen is on deposit at the Dept. of Pharmacognosy, Faculty of Pharmacy, Mansoura University.

Preparation of the oil:

Fresh flower-heads (100 g) were subjected to hydrodistillation and the percentage of the oil was simultaneously determined following the E.P. 1984 procedure.

Analysis and identification:

GC analyses were performed with a Varian 3700 instrument, equipped with a DB-1FSOT capillary column (30 m x 0.53 mm; coating thickness 1.2 μ m) and an FID.

Analytical conditions were: on column injection, injector and detector temperatures were 150°C and 220°C, respectively; oven temperature was programmed 30°-220°C at 3°/min., then isothermal at 220°C for 10 min.; carrier gas (helium) 3.5 ml/min. Relative percent concentrations were calculated using peak areas as given by NELSON software, without correlation for response factors. Kovats indices were obtained by co-injection of the homologous hydrocarbon series C₆-C₂₀ in a temperature programmed run⁽¹¹⁾.

GC-MS analyses were performed with a HP 5980 gas chromatograph equipped with a DB-1 FSOT capillary column (60 m x 0.32 mm; coating thickness 0.2 µm) and a HP 5970A mass selective detector. Analytical conditions were: injector temperature 220°C; oven temperature was programmed 30°-220°C at 2°/min., then isothermal at 220°C for 10 min.; carrier gas (helium) 1 ml/min.; source 70 eV.

Identification of the compounds was achieved by comparing their spectra with those given in the literature (12-15) and further confirmed by their GC retention indices⁽¹⁶⁾.

RESULTS AND DISCUSSION

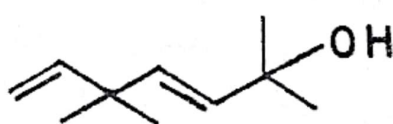
The fresh flower-heads of Otanthus maritimus gave by hydrodistillation an essential oil (yield 5% w/v) which is lighter than water, possessing an intense blue colour and a strong agreeable rather camphoraceous aroma. The results of qualitative and quantitative analysis (GC-FID and GC-MS) are shown in Table 1.

Twenty two components constituting more than 83% of the oil were identified. The oil is characterized by the high content (total 74.8%) of the following types of compounds:

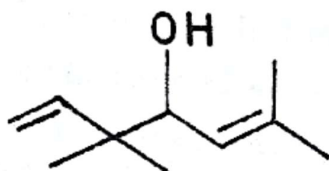
- a- Bornane-type viz. (total: 25.35) camphor (19.3%), camphene (4.7%), borneol (1.3%) and bornyl acetate (tr.).
- b- Pinane-type viz. (total : 11.0%) cis-chrysanthenyl acetate (10.5%), α -pinene (0.3%) and β -pinene (0.2%).
- c- Irregular monoterpenoids viz. (total : 39.0%) yomogi alcohol (18.6%), artemisia alcohol (10.1%), artemisyl acetate (10.1%) and santolina triene (0.2%).

These non head-to-tail irregular terpenoids are genetically related in that they are only reported to occur in the Anthemidaea tribe of the Compositae especially in the genera Artemisia, Santolina, Crysanthemum⁽¹⁷⁾ and Achillea⁽¹⁸⁾. The present study represents the first report that indicates their occurrence in the volatile oil of the genus Otanthus which also belongs to the same tribe.

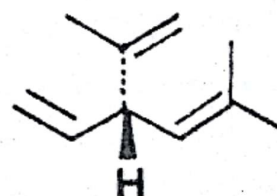
Moreover, the oil is also characterized by the presence of the aromatic compound chamazulene, in a fair amount (2.7%) enough to impart its intense blue colour to the whole oil.



yomogi alcohol



artemisia alcohol



santolina triene

Table (1): Composition of the Essential Oil of the Flower-heads of Otanthus maritimus.

Identified components ⁽¹²⁻¹⁶⁾	Retention Index	Content (%)	M ⁺	Base peak
Santolina triene.	900	0.2	136	93
Tricyclene.	920	0.8	136	93
α -Pinene.	931	0.3	136	93
Camphene.	944	4.7	136	93
Sabinene.	967	0.1	136	93
β -Pinene.	971	0.2	136	93
Myrcene.	983	0.1	136	41
Yomgi alcohol.	989	18.6	n.d.**	43
Artemisia alcohol.	1072	10.1	n.d.	85
Camphor.	1125	19.3	152	95
Pinocarvone.	1141	0.1	150	53
Borneol.	1148	1.3	n.d.	95
Artemisyl acetate.	1157	10.1	n.d.	85
Terpinen-4-ol.	1164	0.3	154	71
Trans-carveol.	1200	0.6	152	109
Cis-chrysanthenyl acetate.	1248	10.5	n.d.	43
Bornyl acetate.	1265	tr.*	196	95
Trans-carvyl acetate.	1317	1.8	n.d.	43
Cis-carvyl acetate.	1344	0.9	n.d.	43
Zingiberene.	1488	0.1	204	93
β -Sesquipellandrene.	1516	0.2	204	69
Chamazulene.	1711	2.7	184	169

* tr. = trace = < 0.04%.

n.d.** = not detectable.

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المحتويات الكيميائية للزيت الطيار من الهامات الزهرية لنبات أوتانثاس ماريتيماس

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يعرف نبات أوتانثاس ماريتيماس ، الذي ينمو بریا على طول الساحل الشمالي ، باسم الجعده أو حشيشه الريح ، ويشتهر باستعماله بين البدول لعلاج الألتهايات الشعبيه والدوستناريا والتهايات المثانه .

وقد تم تحليل الزيت الطيار المفصول من الرؤوس الزهرية وذلك باستخدام كروماتوجرافيا الغاز الشعري ذو الكفاءة العاليه وكذا كروماتوجرافيا الغاز المزدوج مع مطياف الكتله ، وتم التعرف على اثنين وعشرين مركبا يمثلون أكثر من ٨٣٪ من الزيت ، وثبت أن المكونات الرئيسيه على التوالي هي : كامفور ، كحول يوموجى ، كحول ارتيميزيلى ، اسيتات كحول ارتيميزيلى ، اسيتات الكريزانثيل ، كامفين ، كامازولين والأخير هو المسئول عن اعطاء الزيت لونه الشديد الزرقه .

ومن النتائج المهمه هي اضافته جنس الاوتانثاس الى القائمه القليله نسبيا من الأجناس الأخرى التابعه لصنف "الانشيميدي" والحاويه فى نفس الوقت على الكحولين النادرين نسبيا وهما : اليوموجى والارتيميزيلى .