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Der Pharma Chemica, 2015, 7(12):23-25
(http://derpharmachemica.com/archive.html)

ISSN 0975-413X
CODEN (USA): PCHHAX

Chemical composition of the essential oil of *Teucrium antiatlanticum* (Lamiaceae)

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ABSTRACT

The composition of the essential oil from the aerial part of Teucriumantiatlanticum (Maire) Sauvage&Vindt was determined by GC-MS. Thirty tree compounds accounting for 95.4% of the crude essential oil were identified. Sesquiterpenes (86.7%) were the predominant components with Germacrene-D (13.2%), δ-Cadinene (12.7%), α-Gurjunene (11.5%), and γ-Muurolene (8.0%) as the main constituents.

Keywords: Essential oil, *Teucriumantiatlanticum*, Germacrene-D, GC-MS.

INTRODUCTION

Teucrium is a genus of perennial plants. It belongs to the family Labiatae (Lamiaceae) and includes more than 340 species, most of them distributed in the Mediterranean basin. In the flora of Morocco, the *Teucrium* genus is represented by two endemic species: *T. maghrebinum*, and *T. antiatlanticum* that are used in traditional medicine to treat burns and fevers [1,2]. *T. antiatlanticum* also possesses potent antimicrobial properties [3,4]. *Teucrium* essential oil components could be responsible for some of their biological properties [1,2,6,7]. *T. antiatlanticum* is an aromatic plant widespread through the argan forest, a vast rural area covered with argan trees in South-western Morocco [5]. Continuing our investigation on the essential oils accessible from the argan forest [8] we report here the chemical composition of the essential oils of *T. antiatlanticum* aerial part in view of identifying new economical outputs for the argan forest-derived natural products since the argan forest sustainable development is still uncertain.

MATERIALS AND METHODS

The aerial parts of T. antiatlanticum were collected from AitBaha, Lekst Mountain, (elevation 1550 m) in June 2011. Voucher specimens are available for inspection at the herbarium of theScientific Institute of the University of Mohamed V, Rabat (Morocco).

Essential Oil extraction:
Dried plant (200 g) of *T. antiatlanticum* were hydrodistilled for 3 h in a Clevenger-type apparatus containing 1000 mL of double distilled water to yield essential oil that were dried in a desiccator over anhydrous Na_2SO_4 and stored at 4 °C before GC-MS-analysis (yield: 0.61 % (w/w)).

GC/MS:
Essential oils were analyzed by GC/MS using a Trace gas chromatograph (GC Ultra-thermo Scientific) coupled to an Agilent HP mass spectrometer. A VB-5 fused silica capillary column (30 m, 0.25 mm, 0.25 mm) was used. GC/MS operating conditions were: injector temperature 200°C; transfer line 220°C; oven temperature, from 50 to 200°C at 3°C/min; carrier gas, He at 1.4 mL/min; split ratio, 1:70. Compounds were identified by comparing their GC retention times and MS with authentic compounds, NIST MS library, and literature [9]. Quantification (expressed as percentage of total peak area of chromatogram) was carried out by peak area normalization measurements.

RESULTS AND DISCUSSION

Hydrodistillation for 3 h in a Clevenger-type apparatus of the aerial part of *T. antiatlanticum* afforded brown oil in 0.61% yield.

The chemical composition of *T. antiatlanticum*essential oil is listed in Table 1. Thirty tree compounds corresponding to 95.4% of the oil components were identified by GC/MS analysis (Table 1). Interestingly, *T. antiantlanticum* essential oil presented a highsesquiterpene content: 86.7%. Among these, sesquiterpene hydrocarbons (71.8%) prevailed on oxygen containing sesquiterpenes (14.9%). In the sesquiterpene hydrocarbon group Germacrene-D (13.17%), δ-Cadinene (12.75%), α-Gurjunene (11.52%), and γ-Muurolene (8.01%) predominated, while among the three oxygenated sesquiterpenes, Spathulenol (6.1%) and τ-Cadinol (6.9%) were the most abundant. Monoterpenes accounted only for 8.6%, oxygenated monoterpenes constituting 6.2% of the identified monoterpenes and monoterpene hydrocarbons only 2.4%.

Table 1: Essential oil composition of T. *antiatlanticum*

Compds	KI	%
Cyclic monoterpenes		
α-Phellandrene	1005	1.35
p-Cymene	1026	0.6
Limonene	1134	0.49
Oxygenated cyclic monoterpenes		
Nopinone	1137	0.44
Cis-Sabinol	1140	1.58
Sabina Ketone	1156	1.12
4-Terpineol	1161	1.3
Benihinal	1171	1.21
Myrtenal	1193	0.57
Sesquiterpenes		
Isoledene	1373	1.58
α-Copaene	1376	0.86
β-Bourbonene	1384	1.68
β-Cubebene	1390	0.68
α-Gurjunene	1409	11.52
δ-Cadinene	1424	12.75
β-Gurjunene	1432	2.27
α-Guaiene	1439	0.38
Allo-aromadendrene	1461	3.12
γ-Gurjunene	1473	2.72
10s,11s-Himachala-3(12),4-diene	1476	1.1
Germacrene-D	1480	13.17
β-Guaiene	1490	2.08
δ-Guaiene	1500	0.53
α-Bulnesene	1505	1.49
δ-Amorphene	1512	0.57
β-Cadinene	1513	0.92
Calacorene	1542	1.98
Elixene	1583	2.67
γ-Muurolene	1641	8.01
Cadalene	1674	1.71

Oxygenated sesquiterpenes

Spathulenol	1576	6.13
τ-Cadinol	1653	6.95
β-Eudesmol	1649	1.85

Germacrene-D, and δ-Cadinene have already been found to be the main components of the essential oil of several Teucrium species including *T. sandrasicum*[10], *T. maghrebinum* [11], and *T. chamaedrys*[12]. However and noteworthingly, our results seem to be somewhat different from the previously reported data on the oil composition of some Teucrium species. Our sample contained p-cymene and limonene in minor amounts and was devoid of α-pinene, sabinene, thymol, linalool, carvacrol, and α-cadinol which constitute the main compounds in the oils obtained from several Teucrium species [13-17]. However, differences in the quality or quantity of the composition of volatile oils may be due to genetical, differing chemotypes, drying conditions, mode of distillation and/or extraction and geographic or climatic factors. Therefore our results need to be further confirmed. Nevertheless, independent reported results on the analysis of the essential oils of several Teucrium species showed that the sesquiterpenes group is usually dominant, although the main components may vary [18, 19]. Our results fully concur with these findings.

CONCLUSION

The data reported in our study showed that the essential oil of *T. antiatlanticum* possessed a high content in sesquiterpene hydrocarbons. Our findings have an ecological and economic significance for the possible utilization of the species in the medicinal, cosmetic and chemical industries. They might participate to the current sustainable development of the argan forest.

Acknowledgments
We thank the women of the Cooperative Targan't in Aitbaha, Association Ibn Al Baytarand Fennane Mohamed.

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