Chemical Characterization on the Aromatic Composition of *Cedrus Atlantica* from Morocco in Two Geographical Areas will Break

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Received: 📅 February 21, 2018; Published: 📅 February 27, 2018

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Abstract

Essential oils have various properties in different fields of application. This work entitled on the chemical characterization of *Cedrus Atlantica* of Morocco in two geographical zones will break: *Cedrus Atlantica* of Ajdir (khenifra region) (CAA) and *Cedrus Atlantica* of Wiwane (Azrou region) (CAW) which belongs to the family Pinaceae. The essential oils were extracted by hydrodistillation of the aerial parts (stems, leaves and flowers) of *Atlantica Cedrus* and analyzed by gas chromatography-mass spectrometry (GC-MS). The analyzes show that *Cedrus Atlantica Ajdir* (CAA) has β -Himachalene as the major constituent of this essential oil with a content of approximately (31,24)%, followed by α -Himachalene (15,63%) and γ -Himachalene (14.46%), with a percentage of 61.33%. For *Wiwane Cedrus Atlantica* (CAW) β -Himachalene (28.85%), α -Himachalene (17.93%) and γ -Himachalene (16.52%) are the major constituent, with a percentage of 63.3%. The recorded yields are: 1.94% for *Cedrus Atlantica of Ajdir* (CAA) and (2.09%) for *Cedrus Atlantica of Wiwane* (CAW).

Keywords: Essential oil; *Cedrus Atlantica*; GC-MS; Aromatic compositions

Introduction

For centuries, humans have used plants in several fields, such as perfumery, pharmacology and food, thanks to their properties discovered by chance [1]. The genus *Cedrus* is an ancient genus known from the Tertiary with a broad distribution, it includes four species: *Atlas cedar*, *Lebanon cedar*, *Himalayan cedar* and *Cyprus cedar* [2]. The area occupied by natural *cedar* is divided into three large areas, Lebanon (160000 ha), Himalaya (500000 ha) and Morocco and Algeria [3]. Morocco has a natural variety of very diverse aromatic plants [4]. These aromatic plants are at the origin of products with very high added value which can contribute to the economic development of the country, and which could constitute an important capital for its sustainable development [5]. These many aromatic species that can provide essential oils, are used in various fields for their therapeutic and organoleptic properties, including fragrant (perfumery, cosmetic) [2,6].

Materials and Methods

Collection of samples

Samples of the aerial part (stems, leaves and flowers) *Cedar* of Ajdir (Khenifra-Morocco) and *Cedar* of Wiwane (Azrou-Morocco) were harvested in September (2017) both species were verified by a botanists at EST-Khenifra, Morocco (Professors E. Abba and S. Cherroud).

Extraction of essential oils from cedrus

The essential oils were obtained by hydrodistillation of the aerial parts (stems, leaves and flowers) in fractions of 250 g for a period of 3 h, using a Clevenger type extractor. Water vapor laden with essential oils condenses in a coolant and is collected in a separatory funnel and dried with anhydrous sodium sulphate

(Na₂SO₄) before analysis [7]. HEs were stored at 4°C for later use in the various assays [8].

Gas chromatography (GC)/mass spectrometry (MS)

The analysis of the essential oils was carried out by gas chromatography coupled with mass spectrometry (GC-MS). Coupling was performed on a Hewlett-Packard model 5970 (quadrupole detection system), equipped with a fused silica

capillary column of (2mm×0.23mm) DB1 type; temperature programming from 50° C to 200 °C with a gradient of 5°C min⁻¹. The retention indices were determined by gas chromatography on two fused silica capillary columns (25m×0.25mm) of the type OV-101 and Cabowax 20M, with temperature programming identical to that used for the coupling. (Shimadzu GC-14A equipped with a flame ionization detector and a C-R4A model integrator).

Results and Discussion

Chemical compositions

Table 1: Chemical compositions of essential oils of *Cedrus Atlantica* from Ajdir (CAA) and from Wiwane (CAW).

Identification	Cedrus Atlantica (CAA)	Cedrus Atlantica (CAW)
Limona ketone	0.55	0.84
(-)-camphor	0.02	-
α-Bisabolol	0.04	0.05
β-sinensal	0.04	0.01
endo-Borneol	0.02	-
p-Methylacetophenone	0.1	0.05
α-Terpineol	0.05	0.1
2,3,6-Trimethylphenol	0.02	0.01
Dec-5-ene-3,7-diyne, 2,9-dimethyl-	0.01	0.01
Tridecane	0.02	-
α-Longipinene	0.16	-
γ-Amorphene	0.02	0.13
β-Maaliene	0.04	0.01
Ylangene	0.09	-
α-Copaene	0.08	0.01
1,3-Dimethylindane	0.31	0.25
Aromandendrene	1.55	1.02
Isodene	1.19	0.74
β-Santalol	0.1	-
Himachala-2,4-diene	0.79	1.02
α-Himachalene	15.63	17.93
ar-Himachalene	0.51	-
γ-Himachalene	14.46	16.52
β-Himachalene	31.24	28.85
α-Dehydro-ar-himachalene	2.06	1.67
γ-Dehydro-ar-himachalene	3.67	2.49
δ-Cadinene	1.93	1.1
trans-Calamene	0.99	0.93
α-Calacorene	1.25	2.11
Pyrazole, 5-methyl-3-(5-nitro-2-furyl)-	0.11	-
α-Bisabolene	1.08	2.02
himachalene oxide	1.24	0.84
Longiborneol	0.75	0.77
(+)-β-Himachalene oxide	2.3	3.96
β-Acoradiene	0.58	0.71

Di-epi-1,10-cubenol	1.44	2.7
δ-Cadinol	1.09	0.71
allo-Himachalol	1.62	1.03
Cadalene	0.38	0.01
2,4-Diisopropylphenol	0.7	0.05
Deodarone	2.75	1.99
(Z)- γ-Atlantone	0.85	0.65
(-)-Aristolene	0.12	0.09
(E)- γ-Atlantone	1.2	1.11
(Z)- α-Atlantone	1.24	0.89
Dehydroaromadendrene	0.11	0.16
(-)-Eudesma-1,4(15),11-triene	0.16	0.09
β-Atlantol	0.13	0.03
5-Isopropylidene-6-methyldeca-3,6,9-trien-2-one	0.1	-
(E)-Atlantone	4.3	6.21
Vestitenone	0.36	0.06
1,3,5-Trimethylpyrazole	0.03	0.05
(E)- γ-Atlantone	0.07	-
Total	99.65	99.98

The gas chromatographic analysis results coupled with the mass spectrometry of the essential oils of the plants studied are shown in (Tables 1). Chromatographic analyzes of essential oils identified 53 compounds that represent approximately (99.65%) for *Cedrus Atlantica* (CAA) and for *Cedrus Atlantica* (CAW) 43 compounds which represent approximately (99.98%). The analysis of the results given in Table 1 showed the following results: for *Cedrus Atlantica* d'Ajdir (CAA) β-Himachalene is the major constituent of this essential oil with a content of approximately 31.24 %, followed by α-Himachalene 15.63% and γ-Himachalene 14.46%. The other constituents are detected as an average percentage: (E)-Atlantone 4, 30%; γ-Dehydro-ar-himachalene 3.67%; Deodarone 2.75%; (+) - β-Himachalene oxide 2.30%; α-Dehydro-ar-himachalene 2.06%; allo-Himachalol 1.66%; Aromadendrene 1.55%. For Wiwane's *Cedrus Atlantica* (CAW) β-Himachalene (28.85%), α-Himachalene (17.93%) and γ-Hemachalene (16.52%) are the major constituent of this essential oil, the other constituents are detected as an average percentage: (E)-Atlantone (6.21%), (+) - β-Himachalene oxide (3.96%), γ-Dehydro-ar-himachalene (2.49%), α-Calacorene (2.11%). The content of the rest of the constituents is often less than 1% is considered minor constituents.

The results of (SARTANI, B, 2005) [9], indicate that E-a-atlantone 28.75% and β-Himachalene 14.62% are the major constituents of the essential oil of *Cedrus Atlantica* sawdust. ; in this study (DERWICH, E, 2009) [10], reported that E-a-atlantone is absent in the essential oil of the leaves of this plant; which has as major constituents α-pinene (14.85%), followed by himachalene (10.14%), β-himachalene (9.89%) and σ-himachalene (7.62%). Other studies show that Wiwane's *Cedrus Atlantica* (CAW) is rich

in terpenols (26.40%) and ketones (32.74%) and has the highest activity against germs [11].

It can therefore be concluded that the chemical composition or the percentage of the constituents of the essential oils differs according to the part of the plant subjected to the extraction. Other studies [12] have also shown that the chemical composition of the essential oils of *Cedrus atlantica* varies considerably according to the geographical zones the period of harvest and the age of the plant.

Conclusion

In the present work, we have characterized the chemical composition of *Cedrus Atlantica* essential oil from Morocco in two geographic areas will defer, *Cedrus Atlantica* of Ajdir (Khenifra) and *Cedrus Atlantica* of Wiwane (Azrou region). The identification of the chemical constituents was carried out on the basis of a GC-MS analysis. It can therefore be concluded that the chemical composition or percentage of the constituents of the essential oils differs according to the part of the plant subjected to the extraction, according to the geographical areas the harvest period and the age of the plant.

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DOI: [10.32474/AOICS.2018.02.000126](https://doi.org/10.32474/AOICS.2018.02.000126)

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