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ORIGINAL ARTICLE

CHARACTERIZATION OF TWO NEW CHEMOTYPES OF WHITE WORMWOOD (*Artemisia herba-alba asso*) DOMESTICATED IN ERRACHIDIA

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Abstract:

The chemical composition of essential oils of six accessions of white Wormwood (Artemisia herba-alba asso) collected from different regions of Morocco and domesticated in the experimental station of Errachidia were analyzed by coupling Gas Chromatography with Mass Spectrometry (GC/MS). The results obtained allowed us to classify these accessions in two chemotypes: the first one is ***α-Campholene aldehyde*** *represented by four accessions with a percentage change between 32.8% and 48.2%, the second one is* ***Artemiseole chemotype*** *present in two accessions with a respective concentration of 70.4% and 54.4%. These two particular chemotypes are highlighted for the first time in the species of white Wormwood.*

KEYWORDS:

Artemisia herba-alba, domestication, chemotype, Artemiseole, α-Campholene aldehyde.

I.INTRODUCTION

As a result of its particular chemical composition, the essential oils (EO) of *Artemisia herba-alba* were the center of interest by several researchers (Benjilali, 1982; Fleisher, 2002; Salido, 2004; Paolini *et al.*, 2010...etc). Indeed, at least seven chemical races or chemotypes have been identified in Morocco, like α-Thujone, β-Thujone, Camphor, Chrysanthenone, Davanon, cis-Chrysanthenyl Acetate and the α-Terpin-7-al (Ouyahya *et al*., 1990; Lawrence., 1993; Ghanmi *et al*., 2010 ; Moumni *et al*.,2013). Other different chemotypes were found in Israel, Algeria and Egypt (Segal *et al*., 1987; Vernin *et al*., 1995). In Tunisia, ten chemicals were identified of white Wormwood EO having content greater than 10% like Eucalyptol, Borneol, Sabinyl Acetate and other derivatives of Davanon. Also in Spain, 33 major compounds have been reported and 17 of them have not been previously described in the white wormwood EO (Salido *et al*., 2004). This species is a wealth of interesting natural molecules and has a special interest. .

Aware of the noticeable chemical variability observed in *A. herba-alba*, the aim of this study was to look for the effect of the cultivation on the chemical composition of six accessions of *Artemisia herba-alba* and to characterize their chemical composition.

iI.MATERIALS AND METHODS

1.Plant material

The cultivation of *Artemisia herba-alba* was carried out by transplanting wild individuals in the experimental station of Errachidia (Morocco). These individuals were selected from a homogeneous population in six regions of Morocco [*Idelsane (A1); Boudnib (A2); Missour (A3); Zaouiat Sidi Hamza (A4); Boumeriem (A5); Taznakht (A6)*] Each accession is repeated twenty times.

2.Hydrodistillation

Samples of the aerial part (stems, leaves and flowers) of *Artemisia herba-alba* were collected and dried under shade in June *2010*. The isolation of essential oils was performed by hydrodistillation in a modified Clevenger-type apparatus (Clevenger, 1928) in the laboratory of natural substances synthesis and molecular dynamics of the Faculty of Science and Technology of Errachidia. Seven repetitions were performed for each accession. Hydrodistillation was achieved for 2 h after boiling 200 g of the plant material. Dried crushed plant material was transferred into the 2 l balloon with a flat bottom. Into the same balloon, 1l of tap water was poured and connected to the Clevenger-type apparatus for distillation (Mono-block). The distillations were organized so that the samples were treated after the same drying time. The essential oils obtained were dried over anhydrous sodium sulphate and stored in sealed glass at 4-5 °C in dark until the analysis (AFNOR, 2000).

3.Characterization of the chemical composition of the essential oil:

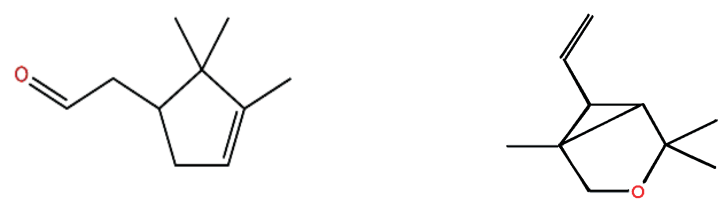
The chemical composition of Artemisia herba-alba essential oils were analyzed using a Gas Chromatography (TRACE GC Ultra system) fitted to a mass spectrometer (Polaris Q-Ion Trap MS). The conditions for sample analysis were as follows:

Column : vb-5 (5%-phenyl)-methylpolysiloxane (30 m length, 0.25 mm i.d., 0.25-µm film thickness; J&W Scientific, Folsom, CA, USA)
Carrier gas : Helium
Mode : Split 1 :10
Flow rate: 1.4 ml/min
Temperature of the injector: 220°C
Temperature of the detector : 300°C
Temperature programmed conditions : 40°C (2mn)- 4°C /mn - 180°C

For the identification of molecules, we used a commercially mass spectral library: NIST/EPA/NIH Version 2.0 jull. 1 2002 ((US National Institute of Standards and Technology, the Environmental Protection Agency and the National Institutes of Health; 2002).

iII.RESULTS AND DISCUSSION

This study allowed us to classify the different accessions studied in two new chemotypes: α-Campholene aldehyde and Artemiseole chemotypes.



α -Campholene aldehyde *Artemiseole (Arthole)*

Figure 1: chemical formula of the two chemotypes identified

The chemotype of α-Campholene aldehyde was present in the essential oils of four accessions of *Artemisia herba-alba* grown in Errachidia station (Table 1), its concentration varies according to accessions. Indeed, the highest percentage was recorded for the essential oil A6 (48.2%) followed by A4 (46.8%) and A3 (41.1%). However, the essential oil A5 presented the lower concentration (32.8%) in α-Campholene aldehyde.

Table 1: Main components of essential oils of α-aldehyde Campholene chemotypes identified in four accessions of white Wormwood grown at Errachidia station (southeast of Morocco).

compounds	CAS N°	A6	A4	A3	A5
α-Pinene	80-56-8	2.85%	2,70%	2,22%	2,37%
1-Terpineol	586-82-3	1.93%	7,83%	**10,28%**	**13,99%**
Artemiseole	60485-46-3	4,22%	1,37%	1,39%	4,23%
Chrysanthenone	473-06-3	4,37%	6,66%	**10,07%**	**14,22%**
α- Campholene aldehyde	4501-58-0	**48,20%**	**46,77%**	**41,09%**	**32,77%**
α -Santoline alcool	90823-36-2	2,06%	4,98%	**12,09%**	6,38%
Verbenol	473-67-6	-	-	-	6,64%
Spathulenol	6750-60-3	5,52%	4,06%	2,06%	2,41%
Davanone	20482-11-5	4,91%	9,67%	-	1,45%
Caryophyllene oxide	1139-30-6	3,44%	-	-	-
cis-Z-α-Bisabolene epoxide	-	2,5%	-	-	-

Essential oils corresponding to the second chemotype (Table 2) are characterized by a high content in Artemiseole; they are of 54.41% and 70.41% respectively for the accessions A1 and A2

Table 2: main components of essential oil of Artemiseole chemotypes identified in two accessions of white Wormwood in Errachidia station (southeast of Morocco)

compounds	CAS N°	A1	A2
Artemiseole (Arthole)	60485-46-3	**54.41%**	**70,41%**
3,5-Dimethyl-1-Cyclohexene	823-17-6	**12.06%**	**11,37%**
α- Campholene aldehyde	4501-58-0	**18,91%**	**9,29%**
α-Santoline alcohol	60485-45-2	2,22%	1,40%

The α-Campholene aldehyde and Artemiseole compound are mentioned as major compounds of the essential oil of white Wormwood for the first time in this experiment.

Moreover, it has been reported that α- Campholene aldehyde was present with a low content in other species of Artemisia. This is the case of *Artemisia sieberi* in the region of Kashan (Iran) with a percentage ranging from 2.1% to 6.6% depending on the plant organ (Reza *et al*., 2012).

Also, we noted that the α-Campholene aldehyde is not an essential compound of *Artemisia plants*. Indeed, it has been identified in the EO of *Satureja calamintha* (Ech-Chahad, 2013), *Xylopia aethiopica*

(Noudogbessi, 2011) and *Boswellia rivae* (Beneberu *et al*, 2012), with a respective rates of 14.3, 2.0 and 1.6%.

Regarding the Artemiseole, it has already been found in the EO of *Artemisia arbuscula* in Nevada (USA) with a percentage of 29% (Epstein and Gaudioso, 1984), *Artemisia mendozana* with a lower concentration of 11.1% (Beatriz *et al*., 2008) and also in essential oil of *Artemisia tridentata* from Oregon in the USA (13% - 9%) (Kelsey *et al*., 1983).

On the other hand, the chemical composition of the different accessions studied has also shown the presence of other compounds with percentages ranging from 1.3 to 14.2%like : the Chrysanthenone (14.22%), 1-Terpineol (13 99%), the α-Santoline alcohol (12.09%), Cyclohexene, 3,5-Dimethyl (12%), the Davanon (9.67%), the Verbenol (6.64%) and the Spathulenol (5.52%), the α-Caryophyllene oxide (3.44%), α-Pinene 2.85%, and the cis-Z-a-Bisabolene epoxide (2.5%).

However, the chemical compositions identified in these two new chemotypes are remarkably different from the other compositions studied and reported by several authors. Thus, the most common compounds found in the essential oils of *Artemisia herba-alba* are: the α and β-Thujon (Ouyahya *et al*., 1990; Fleisher, 2002 & Kadri *et al*., 2011), the Chrysanthenone (Vernin *et al*., 1995 ; Ghanmi *et al*., 2010), the cis-Chrysanthenyl (Salido *et al*., 2004) the cis-Chrysanthenyl Acetate (Fleisher, 2002), the Camphor and the 1,8-Cineole (Salido *et al*., 2004; Paolini *et al*., 2010)

This qualitative and quantitative changes in the chemical composition of essential oils, may be caused by certain environmental factors, the part of the plant used, the age of the plant and the period of the vegetative cycle or even to genetic factors (Kokkini *et al*., 1997; Karousou *et al*., 2005)

IV.CONCLUSIONS:

Our study confirms the extraordinary chemical polymorphism for *Artemisia herba-alba* reported in the literature.

Although the selected accessions of *Artemisia herba-alba* were domesticated in the same climatic conditions, (soil and water), the chemical composition of EO vary from one accession to another. This brings us to think that this variability may be due to the result of genetic determinism in the plant.

The white Wormwood domestication from different regions of Morocco at Errachidia station caused a very significant effect on the chemical composition of the EO, it caused the emergence of two new chemotypes: α-Campholene aldehyde and Artemiseole. Thus, climatic conditions, soil and geography have an important effect on the chemical polymorphism of the essential oil.

The results of this work can be exploited in different sectors. Indeed, it may be destined directly to the industry production depending on the desired chemotypes or compound.

Finally, these results are of great importance because they pave the way for the future researches in order to identify the environmental and genetic factors responsible of the disparity in the composition of essential oils of white Wormwood.

REFERENCES:

1.AFNOR (Association Française de Normalisation), 2000a. Recueil de normes: les huiles essentielles. Échantillonnage et méthodes d'analyse. Tome 1. Paris: AFNOR.

2.AFNOR (Association Française de Normalisation), 2000b. Recueil de normes: les huiles essentielles. Monographies relatives aux huiles essentielles (H à Y). Tome 2.Paris: AFNOR.

3.BELLAKHDAR J. (1997) La pharmacopée marocaine traditionnelle. Médecine arabe ancienne et savoirs populaires, Paris - Rabat, Ibis Press -Eds Le Fennec, 764 p.

4.Benjilali, B., Sarris, & J., Richard, H., 1982. Nouveaux chémotypes d'Artemisia herba alba. Sci. Aliment., 2, 515-527

5.Clevenger, J.F., 1928. Determination of volatile oil. J. Ann. Pharm. Assoc. 17(4), 346-351.

6.Ech-chahad, A., FARAH, H. & BOUYAZZA, L., 2013. «Composition chimique d'huile essentielle de Satureja calamintha (L.) Scheele du Maroc». Afrique Science, 9(3), 77-81.

7.Epstein, W.W., & Gaudioso, L.A., 1984. Volatile oil constituents of sagebrush. Phytochem. 23, 2257-2262.

8.Fleisher, Z., Fleisher, A., & Nachbar, R.B., 2002. Chemovariation of Artemisia herba-alba Asso. aromatic plants of the Holy Land and the Sinai. Part XVI. J. Essent. Oil Res, 14, 156-160.

9.Ghanmi M., Satrani, B., Aafi, A., Isamili, M.R., Houti, H., El Monfalouti, H., Bencheqroun, K.H., Aberchane, M., Harki, L., Boukir, A., Chaouch, A., & Charrouf, Z., 2010. Effet de la date de récolte sur le rendement, la composition chimique et la bioactivité des huiles essentielles de l'armoise blanche (Artemisia herba-alba) de la région de Guercif (Maroc oriental). Phytothérapie . 8(5), 295-30.

10.Kadri A., Zarai Z., Békir A., Gharsallah N., Damak M. & Gdoura R., 2011. Chemical constituents and antioxidant activity of the essential oil from aerial parts of Artemisia herba-alba grown in Tunisian semi-arid region. Afr. J. Biotechnol., 10(15), 2923-2929.
11.Karousou R., Koureas, D. N., Kokkini, S., 2005. Essential oil composition is related to the natural habitats: Coridothymus capitatus and Satureja thymbra in NATURA 2000 sites of Crete – Phytochemistry 66, 2668-2673.
12.Kelsey, R.G., W.E. Wright, F. Sneva, A. Winward, and C. B&ton. 1983. The concentration and composition of big sagebrush essential oils from Oregon. Biochem. Syst. Ecol., 11, :353-360.
13. Lima, B., Lampasona, M. P., Schuff, C. Tapia, A.,Bomben, R., Duschatzky C., & Feresin G.F., 2008. Chemical Composition and Antibacterial Activity of Artemisia mendozana D.C. Essential Oil. Journal of Essential Oil Bearing Plants, 11(5),
14.Moumni, M., Elwatik, L., Kassimi, A. & Homrani Bakali, A., 2013. Induction du chemotype à davone de l'huile essentielle d'armoise blanche (Artemisia herba alba) par domestication à Errachidia (sud-est du maroc) ScienceLib Editions Mersenne : Volume 5 , N ° 130506 ISSN 2111-4706
15.Noudogbessi, J.P., Natta, A.K., Avlessi, F., Sohounhloué, D.C.K., Figueredo, G., & Chalchat, J.C., 2011. Chemical Composition of the Essential Oils Extracted from Two Annonaceae Required in Beninese Pharmacopeia. Australian Journal of Basic and Applied Sciences, 5(2), 34-40
16.Ouyahya, A., Nègre, R., Viano, J., Lozano, Y.F. & Gaydou, E.M., 1990. Essential oils from Moroccan Artemisia negrei, A. mesatlantica and A. herba-alba. Lebensm. Wiss. u.-Technol, 23, 528-530.
17.Paolini, J., El Ouariachi, M., Bouyanzer, A.H., Hammouti, B., Desjobert, J.M., Costa, J. & Muselli, A., 2010. Chemical variability of Artemisia herba-alba Asso essential oils from East Morocco. Chem. and Materials Sci., 64,(5), 550-556.
18.Salido, S., Valenzuela, L.R., Altarejos, J., Nogueras, M., Sanchez, A. & Cano, E., 2004. « Composition and infraspecific variability of Artemisia herba-alba from southern Spain", Biochem. Syst. Ecol. 32, 265-277
19.Segal, R., Feuerstein, I., Danin, A., 1987. Chemotypes of Artemisia herba-alba in Israel based on their sesquiterpene lactone and essential oil constitution. Biochem. Syst. Ecol., 15, 411–416.
20.Vernin, G. & Parkanyi, C. 2001, GC/MS analysis of Artemisia herba-alba Asso from Algeria: Nonpolar and polar extracts. Rivista. Ital. EPPOS, 32, 3-16

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