

Research Journal of Pharmaceutical, Biological and Chemical Sciences

Chemical Composition of the Essential Oil of *Ononis angustissima* (Lam.) Batt. et Trab.

Mechehoud Youcef¹, Pierre Chalard², Gilles Figuéredo³, Eric Marchioni⁴, Fadila Benayache¹ and Samir Benayache^{1*}.

¹Unité de recherche Valorisation des Ressources Naturelles, Molécules Bioactives et Analyses Physicochimiques et Biologiques, Université de Constantine. Route de Ain El Bey, 25000, Constantine, Algérie.

²Laboratoire de Chimie des Hétérocycles et Glucides, Ecole Nationale Supérieure de Chimie, de Clermont-Ferrand, Ensemble Scientifique des Céseaux, BP 187- 63174.

³Laboratoire d'Analyses des Extraits Végétaux et des Arômes (LEXVA Analytique), 460 Rue du Montant, Beaumont, France.

⁴Equipe de Chimie Analytique, Molécules Bioactives-UMR 7178 IPHC-Université de Strasbourg- Faculté de Pharmacie, 74 route du Rhin 67401-Illkirch cedex.

ABSTRACT

The chemical composition of the essential oil of *Ononis angustissima* (Lam.) Batt. et Trab. was analysed by GC and GC-MS, the identified components constituting 78.8% of the oil. The main constituents were anethol (2.4%), α -copaene (2.4%), β -selinene (2.7%), tridecan-2-one (2.2%), valencene (5.0%), α -muurolene (1.2%), γ -cadinene (3.4%), δ -cadinene (5.0%), (E)-nerolidol (1.5%), 1,10-diepicubenol (3.1%), 10-epi- α -cadinol (4.1%), β -eudesmol (7.5%), Z,Z-farnesol (8.8%), 6,10,14-trimethyl-pentadecan-2-one (3.0%), trans-phytol (17.4%). This essential oil was not previously investigated.

Keywords: *Ononis angustissima*, essential oil, β -eudesmol, Z,Z-farnesol, trans-phytol.

*Corresponding author

INTRODUCTION

The genus *Ononis* from the Fabaceae family comprises 75 species distributed in the Mediterranean region, in Europe and in Central Asia [1]. Several species of this genus showed biological activities such as antibiotic, antipyretic, anti-inflammatory, antifungal, antiseptic, diuretic, healing of wounds and eczema. Decoctions have been used in the treatment of skin, rheumatic diseases and gout [2-5]. The Composition of the essential oil of several species of the genus *Ononis* have been studied. *Ononis angustissima* (Lam.) Batt. et Trab. is an endemic species of the north of the septentrional Sahara [6].

Our previous work on this species allowed us to identify several flavonoids [7-9]. The purpose of this work was to study the chemical composition of its essential oil which was not previously investigated.

MATERIAL AND METHODS

Experimental

Plant materiel

The studied sample was collected in April 2012 from flowering plants from the Daya of Mogheul at forty km from Bechar in the Southwest of Algeria and identified by M. Benabdelhakem from the National Agency of Preservation of Natural Resources of Bechar. Voucher specimens are kept in the Herbarium of The research Unity of Valorization of Natural Resources and Bioactive Molecules, University of Constantine, (ONANG-N°168-2012).

Isolation of the essential oil

The aerial parts (235g) of *Ononis angustissima* were steam distilled in a Kaiser Lang apparatus.

GC and GC-MS analysis

The essential oils were analyzed on an Agilent gas chromatograph (GC-FID) Model 6890, equipped with a HP-5 ms fused silica capillary column having (5%-phenyl) methylpolysiloxane stationary phase (25 m x 0.25 mm, film thickness 0.25 μ m), programmed from 50°C (5 mn) to 250 °C at 3°/mn and held for 10 mn. Injector and flame ionization detector temperatures were 280 and 300 °C, respectively. The essential oils were diluted in acetone 3.5% (v/v) and injected in split mode (1/60), helium was used as a carrier gas (1.0 mL/mn). Solutions of standard alkanes (C8-C20) was analyzed under the same conditions to calculate retention indices (RI) with Van del Dool and Kratz equation.

Mass spectrometry was performed on an Agilent gas chromatograph-mass spectrometer (GCMS) Model 7890/5975, equipped with HP-5 capillary column (25 m x 0.25 mm, film thickness 0.25 μ m) programmed with the same conditions as for GC-FID. The mass spectrometer (MS) was in electron impact mode at 70 eV and electron multiplier was at 2200 V. Ion source and MS quadrupole temperatures were 230°C and 180°C, respectively. Mass spectral data were acquired in the scan mode in the m/z range 33-450. The essential oil constituents were identified by matching their mass spectra and retention indices (RI) with those of reference compounds from libraries such as Adams [10] and Mc Lafferty & Stauffer [11]. The proportions of the identified compounds were calculated by internal normalization.

RESULTS AND DISCUSSION

The yield of steam distillation was 0.73% (w/w) in relation to the dry weight of the plant. A total of twenty four constituents were determined which account for about 78.8% of the essential oil of *Ononis angustissima*. The components identified in the essential oil are listed in table 1 in order of their experimental retention times and retention indices.

The major constituents of the oil were phytol (17.4%), valencene (5.0%), δ -cadinene (5.1%), β -eudesmol (7.5%) and (Z,Z)-farnesol (8.8%). At less extent the other main constituents were E-anethol (2.4%), α -copaene (2.4%), β -selinene (2.7%), tridecan-2-one (2.7%), α -muurolene (1.2%), γ -cadinene (3.4%), cis-

calamenene (2.5%), (E)-nerolidol (1.5%), 1,10-diepicubenol (3.1%), epi- α -cadinene (4.1%) and 6,10,14-trimethyl-pentadecan-2-one (3.0%).

Monoterpenic hydrocarbons were present at low proportion (1.0%) while the sesquiterpenic fraction represented (49,9%). Phytol (18%) which constituted the diterpenic fraction was present at relatively high level. The oxygenated fraction represented 54.8% of the total oil composition.

Table 1: Volatile oil composition of *Ononis angustissima*

RI	RT	Compounds	%
1067	14.676	acetophenone	1.4
1183	18.286	terpinene-4-ol	0.9
1288	21.272	(E)-anethol	2.4
1379	23.685	α -copaene	2.4
1449	25.443	pentadecan-2-one	1.0
1493	26.547	β -selinene	2.7
1495	26.589	tridecan-2-one	2.2
1500	26.708	valencene	5.0
1503	26.791	α -muurolene	1.2
1516	27.093	g-cadinene	3.4
1520	27.192	δ -cadinene	5.1
1524	27.275	cis calamenene	2.5
1535	27.543	trans- cadina-1,4-diene	0.9
1539	27.639	a-cadinene	0.7
1545	27.760	a-calacorene	1.0
1561	28.150	E-nerolidol	1.5
1619	29.478	1,10-diepicubenol	3.1
1646	30.063	epi- α -cadinol	4.1
1660	30.375	β -eudesmol	7.5
1715	31.583	(Z,Z)-farnesol	8.8
1840	34.203	6,10,14-trimethyl-pentadecan-2-one	3.0
2106	39.280	phytol	17.4
2298	42.606	neophytadiène	0.6

CONCLUSION

This study reported for the first time the chemical composition of the essential oil of *Ononis angustissima* (Lam.) Batt et Trab. Our results showed that the oil was rich in oxygenated compounds. The oil was also characterised by a high level of the sesquiterpenic fraction. The major compounds were phytol (17.4%), valencene (5%), δ -cadinene (5.0%), β -eudesmol (7.5%) and Z,Z-farnesol (8.8%).

ACKNOWLEDGEMENT

This research was supported by FNR program of Algerian MESRS and ATRSS.

REFERENCES

- [1] Willis JC, (1973), A dictionary of the flowering plants and ferns, 8. Ed. Cambridge University Press.
- [2] Liebezeit G. Senckenbergiana maritima 2008; 38 : 1-30.
- [3] Erdemgil FZ, Kürkçüoğlu M, Baser KHC. Chem Nat Comp 2002; 38: 565-567
- [4] Yılmaz B, Ozbek HC, Itoglu G, Ugras S, Bayram I, Erdogan E. Phytother Res 2006; 20:500–503.
- [5] Süntar I, Baldemir A, Coşkun M, Keleş H, Akkol EK. J Ethnopharm 2011; 135: 63-70.
- [6] Ozenda P "Flore du Sahara septentrional" 1958, edition du CNRS p 296.
- [7] M. Bouheroum M, Zaiter L, Benayache S, Benayache F, Bermejo J, León F, Garcia VP. Chem Nat Compd 2009; 45(6): 874-875.
- [8] Mezrag A, Bouheroum M, Beghidja N, Khalifaoui A, Zaiter L, Benayache S, Benayache F. Chem Nat Compd 2013; , 49(4): 749-750.



- [9] Benabderahmane W, Mezrag A, Bouheroum M, Benayache F, Mosset P. *Der Pharm Lett* 2014; 6(3): 88-91.
- [10] Adams RP. *Identification of essential oil components by gas chromatography /mass spec troscopy*. Allured Publishing Co. Carol Stream, Illinois. 1995.
- [11] Mc Lafferty FW, Stauffer DB. *The Wiley/NBS registry of mass spectral data*. 5th Edition, J. Wiley and Sons, New York, 1991.