J. Essent. Oil Res., **11**, 27-30 (Jan/Feb 1999)

Rosmarinus officinalis L. (Labiatae) Essential Oils from the South of Brazil and Uruguay

Eduardo Dellacassa,* Daniel Lorenzo and Patrick Moyna
Cáedra de Farmacognosia y Productos Naturales, Facultad de Química
Universidad de la República Oriental del Uruguay, Montevideo, Uruguay

Caren D. Frizzo and Luciana Atti Serafini
Instituto de Biotecnologia, Universidade de Caxias do Sul, Caxias do Sul, Rio Grande do Sul, Brazil

Paola Dugo
Dipartimento di Chimica Organica e Biologica, Facoltà di Scienze FF. MM. NN.
Università di Messina, Italy

Abstract

Rosemary oils from cultivars of *Rosmarinus officinalis* L. growing in different areas of Uruguay and South of Brazil (Rio Grande do Sul State) were analyzed by GC and GC/MS. The oils from Uruguay were found to be rich in α-pinene (37.8-46.2%) and 1,8-cineole (13.4-13.8%). The oil from *R. officinalis* which was cultivated in Brazil contained α-pinene (32.2%) and 1,8-cineole (14.7%), while the oil from wild plants found in Brazil contained α-pinene (12.4%), myrcene (22.7%) and 1,8-cineole (15.3%).

Key word Index

Rosmarinus officinalis, Labiatae, essential oil composition, α-pinene, myrcene, 1,8-cineole.

Introduction

Rosmarinus officinalis from the Labiatae family comes from the South of Europe. It is cultivated in the South of Spain, Morocco, Tunsia, Dalmacia (ex. Yugoeslavia), Portugal, Israel and Turkey (1-4). In South America its cultivation has been started in different countries, but without continuity in time for the oil production (5). It grows as a small shrub with perennial foliage and small leaves.

R. officinalis oil is known for its antioxidants properties (6-9) and it is used in food industry, mainly meat derivates, and in the perfumery and cosmetic industries. Most of its therapeutic applications are related to stimulant, antiseptic, diaphoretic, antispasmodic and anesthesic properties (2,8).

Significative variations in the chemical composition of the *R. officinalis* oil has been reported with relation to the geographic origin (10,11).

This work studies the chemical composition of the Rosemary oils for samples collected in Uruguay and the South of Brazil, regions with similar phytogeographic characteristics. The results of the chemical composition analysis were compared with those from the literature for Argentina oils (5).

*Address for correspondence

Received: October 1997
Accepted: January 1998

1041-2905/99/0001-0027$04.00/0—

Table I. Chemical composition of *Rosmarinus officinalis* oils

Component	Uruguay		Brazil		Argentina (Ref. 5)	
	Population 1	Population 2	cultivated	wild	Castelar	Sumalao
α-thujene	0.2	0.3	6.0	0.3	1.9	1.2
α-pinene	46.2	37.8	32.2	12.4	7.9	10.9
camphene	4.4	5.1	3.7	5.0	5.1	4.1
thuja-2,4(10)-diene	0.4	0.4	0.3	0.3	nd	nd
sabinene	0.1	0.2	0.5	0.1	nd	nd
β-pinene	3.4	5.1	2.9	5.0	4.8	2.1
myrcene	1.9	1.9	1.8	22.7	17.9	20.4
α-phellandrene	0.3	0.3	0.3	0.3	nd	nd
α-terpinene	0.8	0.6	0.6	0.9	0.4	0.3
p-cymene	0.5	0.4	0.3	2.5	nd	nd
limonene	5.0	6.6	6.3	3.9	2.9	4.8
1,8-cineole	13.8	13.4	14.7	15.3	14.5	15.3
(Z)-β-ocimene	t	t	t	2.6	nd	nd
(E)-β-ocimene	t	t	t	0.2	nd	nd
γ-terpinene	1.2	1.8	1.3	2.8	3.2	2.9
cis-sabinene hydrate	0.3	0.3	0.4	0.2	nd	nd
terpinolene	1.0	1.1	1.8	0.6	1.4	1.4
linalool	1.6	1.2	2.3	0.4	0.9	1.5
camphor	1.4	1.4	2.3	7.9	9	9.3
pinocamphone	0.2	0.2	0.3	0.2	nd	nd
borneol	1.5	1.6	3.2	0.3	1.1	0.7
terpinen-4-ol	0.3	0.3	0.6	1.5	nd	nd
α-terpineol	0.7	0.5	1.4	1.8	0.8	1.1
verbenone	1.2	0.7	3.3	4.2	0.3	0.7
neral	0.2	0.2	0.4	0.1	nd	nd
geraniol	2.3	1.6	4.3	0.3	nd	nd
geranial	0.2	0.2	0.4	0.1	nd	nd
bornyl acetate	1.9	4.4	2.6	0.2	0.9	0.5
geranyl acetate	0.3	0.4	0.4	nd	nd	nd
methyl eugenol	0.3	0.2	0.4	0.2	nd	nd
β-caryophyllene	2.8	4.9	0.7	0.7	8.3	4.4
α-humulene	0.4	0.7	0.1	0.3	2.9	1.6
hydrocarbons	68.7	67.2	60.5	58.8	56.7	54.1
monoterpenes	65.5	61.6	59.5	58.0	45.5	48.1
sesquiterpenes	3.2	5.6	1.0	0.8	11.2	6.0
oxygenated compounds	26.4	26.6	32.9	37.0	27.5	29.1
ketones	2.8	2.3	12.3	5.9	9.3	10.0
esters	2.2	4.8	0.2	3.0	0.9	0.5
alcohols	6.7	5.5	4.5	12.2	2.8	3.3
ethers	13.8	13.4	15.3	14.7	14.5	15.3
aldehydes	0.5	0.4	0.2	0.8	nd	nd
phenols and derivates	0.3	0.2	0.2	0.4	nd	nd
Total	95.0	93.8	95.7	93.4	84.2	83.2

nd = not detected; t = trace

Experimental

The fresh foliage of the analyzed plants were collected in April-May 1996. The samples from Brazil were collected from wild and cultivated populations in Campestre da Serra (Rio Grande do Sul state). Those from Uruguay represent two populations of introduced plants in an experimental field by SESAR S.A. as a part of an introduction garden to propagate this species. Voucher specimens (MVFQ 3542, 3543, 3544, 3545) have been preserved in the Herbarium of Institute of Botanica, Faculty of Chemistry, University of Montevideo, Uruguay. The oils were isolated by hydrodistillation of the fresh plant material using a modified Clevenger-type apparatus. The oils were analyzed by GC and GC/MS.

GC: Shimadzu cromatograph 14B equipped with a Shimadzu data processor EZ-Chrom; silica fused capillary column, 30 m x 0.32 mm, coated with SE-52, 0.40-0.45 µm film thickness (Mega, Legnano, Italy); column temperature, 60°C (8 min) to 100°C at 3°C/min, to 130°C at 2.5°C/min, to 180°C (10 min) at 3°C/min, to 210°C at 20°C/min; injector temperature 280°C; detector temperature 280°C; injection mode, split; split ratio, 1:30; volume injected, 0.2 µL of the oil; carrier gas, H_2, 55 KPa.

GC/MS: Shimadzu QP 1100 equipped with Adams library (12), silica fused capillary column, 30 m x 0.25 mm, coated with DB-5, 0.25 µm film tickness (J&W, Folson, California, USA); column temperature, 60°-240°C at 3°C/min; injector temperature, 250°C; injection mode, split; split ratio, 1:20; volume injected, 0.2 µL of the oil; carrier gas, He, 50 KPa; interface temperature 250°C; ionization energy 70 eV, acquisition mass range 40-300; solvent cut, 2 min.

Results and Discussion

Table I reports the chemical composition of all the oil analyzed, together with that reported in the literature for Rosemary oils from Argentina (5).

As can be seen from Table I, 32 components were identified, representing about 93-96% of the whole oils. For Argentinian oils, the identified components constitued 84.2% and 83.2% of the whole oils from Castelar and Sumalao, respectively (5). All the samples analyzed and those from Argentina presented a similar 1,8-cineole content, which ranges between 13.4% and 15.3%.

The Uruguayan oils presented the highest values for monotepene hydrocarbons and esters, and the lowest values for ketones.

α-Pinene was the main component for the samples from Uruguay and for the Brazilian oil from cultivated plants (46.2%, 37.8% and 32.2% respectively). These three oils showed very similar chemical composition, but the Brazilian sample showed higher values for alcohols (linalool, borneol, α-terpineol and geraniol) and for verbenone than the Uruguayan oils.

Myrcene was the main component for the Brazilian oil from wild plants (22.7%), and this value was very similar to those found for myrcene in the Argentina oils (17.9% and 20.4%). These three oils showed similar percentages for some of their main components (α-pinene, camphor, camphene and γ-terpinene). However the Brazilian oil can be distinguished from those from Argentina by its higher content of verbenone and lower content of sesquiterpene hydrocarbon.

Acknowledgments

Research supported by Ministero per gli Affari Esteri, Direzione Generale per la Cooperazione e lo Sviluppo; Special Project: "Valorizzazione degli olii essenziali e dei derivati agrumari uruguaiani," under Istituto Italo Latino Americano; Scientific Director Prof. Giovanni Dugo, and by Comision Sectorial de Investigacion Cientifica de la Universidad de la Repœblica del Uruguay (CSIC 149).

References

1. A. F. Costa, *Farmacognosia*, Fundação Calouste Gulbenkian, Lisboa, Portugal (1994).
2. L. Manfred, *Siete mil recetas botanicas a base de mil trescientas plantas medicinales Americanas.* Editorial Kier SA, Buenos Aires, Argentina (1992).
3. W. C. Evans, "Farmacognosia." Editora Interamericana/McGraw-Hill, México City, México (1991).
4. B. M. Lawrence, *Essential Oils 1992-1994.* Allured Publ. Corp., Carol Stream, IL, USA(1993).

5. I. Mizrahi, M. A. Juarez and A. L. Bandoni, *The essential oil of Rosmarinus officinalis growing in Argentina*. J. Essent. Oil Res., **3**, 11-15 (1991).
6. S. M. Beckstrom-Stemberg and J. A. Duke, *Potential for synergistic action of phytochemicals in spices*. Dev. Food Sci., **34**, 201-223 (1994.).
7. S. G. Deans and K. P. Svoboda, *Volatile oil crops: their biology, biochemistry and production*. Edits., R.K.H. Hay, P. G. Waterman, pp 113-136, Longman, Harlow, UK (1993).
8. E. De Vincenzi, E. Mancini and M. R. Dessi, *Monographs on botanical flavouring substances used in foods. Part V.* Fitoterapia, **67**(3), 241-251 (1996).
9. F. Moreira, *As plantas que curam: a prevenção e cura das doenças pelas plantas*. Libra-Empresa Editorial Ltda, São Paulo, Brasil (1994).
10. J. Granger, J. Passet and G. Arbouset, *L'essence de Rosmarinus officinalis L. II. Influence des facteurs écologiques et individuels*. Parfum. Cosmet. Savons France, **3**, 307-312 (1973).
11. M. Boelens, *The essential oil from Rosmarinus officinalis L.* Perfum. Flavor., **10**(5), 21-37 (1985).
12. R. P. Adams, *Identification of essential oil components by gas chromatography/mass spectroscopy*. Allured Publ. Corp., Carol Stream, IL, USA (1995).