

Gas Chromatographic-Mass Spectrometry Study of the Essential Oils of *Pimenta racemosa* var. *terebinthina* and *P. racemosa* var. *grisea*

Dolores García*, Antonio Alvarez, Paz Tornos, Angeles Fernandez and Teresa Sáenz

Departamento de Farmacología, Facultad de Farmacia, Universidad de Sevilla, C/ Profesor García González s/n, 41012- Sevilla, Spain. Fax: 0734-54233765. E-mail: gimenez@fafar.us.es

* Author for correspondence and reprint requests

Z. Naturforsch. **57c**, 449–451 (2002); received January 29/February 27, 2002

Pimenta racemosa, α -Terpineol Acetate, 4-Methoxy-isoeugenol

The essential oil of the leaves of *P. racemosa* var. *terebinthina* and *P. racemosa* var. *grisea* were examined by GC and GC/MS. The major constituents were α -terpineol acetate (27%), α -terpineol (20%) and 4-methoxy eugenol (12.6%) for *P. racemosa* var. *terebinthina* and 4-methoxy-isoeugenol (75.2%) and 4-methoxy-eugenol (4.5%) for *P. racemosa* var. *grisea*.

Introduction

The genus *Pimenta* (Myrtaceae) is widely represented in the Caribbean region and includes a large number of species and variety which are traditionally used in local folk medicine.

Pimenta racemosa var. *terebinthina* is an aromatic plant from tropical American, known in Dominican Republic by the popular name of “canelilla” (Duke, 1986; Liogier, 1989; Robineau, 1991). This species is used in folk medicine of the Caribbean basin for different afflictions. In the Dominican Republic, the essential oil extracted from its leaves is used for the local treatment of rheumatism or for toothache. *P. racemosa* var. *grisea*, commonly known as “ozua” (Germosen Robineau, 1995) are used for their anti-inflammatory and analgesic properties (Duke, 1986; Robineau, 1991). The medicinal properties attributed to the essential oils of other species of this genus prompted us to investigate the oil of *Pimenta racemosa* var. *terebinthina* and var. *grisea* for its chemical constituents.

Material and Methods

General experimental procedures

The MS were recorded at 70 eV on a Kratos MS 80 mass spectrometer connected to an NBSLIB2 computer system. GC was recorded on a Fisons GC-8000 gas chromatograph with a flame ionization detector using a capillary column (HP-5,

50 m $\times$ 0.20 mm film thickness 0.33 μ m). Temperature programme 50° (2 min) + 5 °C/min to 150 °C, 150 °C + 10 °C/min to 250 °C (30 min), inj. temp. 250 °C. The carrier gas was He at a flow rate of 1 ml/min.

Plant material

The leaves of *Pimenta racemosa* var. *terebinthina* (Burret) Landrum L. and *P. racemosa* var. *grisea* (Kierskou) Fosberg were collected in June 1998 at The Natural Park of “Los Haitises” (Dominican Republic). The authenticity of this material was confirmed by the National Botanic Garden of Santo Domingo. A voucher specimen was deposited in this herbarium (JBSD).

Extraction of essential oils

The samples of *P. racemosa* var. *terebinthina* (250 g) and *P. racemosa* var. *grisea* (250 g) consisting of mostly dry leaves were subjected to hydrodistillation using a Clevenger type apparatus for 3 h and the obtained yellowish oils ($0.75 \pm 0.032\%$ v/w and $0.23 \pm 0.003\%$ v/w, respectively) were dried over anhydrous sodium sulfate and stored at 4–6 °C. The physical properties were: *P. racemosa* var. *terebinthina*: $d^{20}_D = 0.947$, $n^{28}_D = 1.4568$, $[\alpha]^{25}_D = +12.3^\circ$; *P. racemosa* var. *grisea*: $d^{20}_D = 0.936$, $n^{28}_D = 1.4379$, $[\alpha]^{25}_D = +12.1^\circ$.

After preparation the oil was submitted to GC and GC/MS analysis.

The oil components were identified by comparison of their retention indices (Van den Dool *et al.*, 1966) with retention times of known compounds and also by comparison of the mass spectra published in the literature (Stenhagen *et al.*, 1974; Masada, 1976; Jennings *et al.*, 1980).

Copies of the original GC and CG/MS chromatographs and spectra can be obtained from the corresponding author.

Results and Discussion

The analysis of the essential oils of two variety of *Pimenta racemosa* shows differences in physical characteristics and chemical compounds.

In *P. racemosa* var. *terebinthina* the monoterpene fraction was the most abundant of the oil, twenty-three compounds were identified and the major constituents were α -terpineol acetate (27%), α -terpineol (20%) and 4-methoxy eugenol (12.6%) (Table I and Table II).

Table II. Percentage composition of grouped components of essential oils of *Pimenta racemosa* var. *terebinthina* (A) and *P. racemosa* var. *grisea* (B).

Grouped components	A (%)	B (%)
Monoterpene hydrocarbons	40.91	2.82
Diterpene hydrocarbons	2.42	—
Sesquiterpene hydrocarbons	8.60	4.42
Aromatic components	13.74	80.19
Esters	27.68	0.34
Aldehydes	0.70	0.55
Aliphatic hydrocarbons	—	2.82
Aliphatic ketones	0.75	2.11
Aliphatic alcohols	—	0.55
Epoxides	—	0.91

In contrast in the essential oil of *P. racemosa* var. *grisea* the aromatic hydrocarbon fraction was the most abundant, twenty-five compounds were identified and the major constituent was 4-methoxy-isoeugenol (75.2%) (Table I and Table II).

Others essential oils of *Pimenta racemosa* have been described. In the essential oil of *P. racemosa*

Table I. The chemical constituents of the essential oil of *Pimenta racemosa* var. *terebinthina* and *P. racemosa* var. *grisea*.

Compound <i>P. racemosa</i> var. <i>terebinthina</i>	RI	GC%	Compound <i>P. racemosa</i> var. <i>grisea</i>	RI	GC%
α -Pinene	938	2.85	9-Methyl-2-undecene	802	0.49
Benzaldehyde	944	0.70	3-Octanone	859	2.10
3-Heptanone, 5 methyl	962	0.70	3-Octanol	990	0.35
2,3 Dehydro-1,8 cineole	970	0.30	Isobutyl tiglate	1003	0.34
β -Myrcen	988	t	<i>m</i> -Cymene	1010	0.24
<i>p</i> -Cymene	1016	0.20	<i>p</i> -Cymene	1022	0.23
Eucalyptol	1033	t	Eucalyptol	1031	2.33
3-Carene	1040	2.25	Linolool	1088	t
Linalool	1082	1.10	Verbenol	1130	t
d-Verbenl	1098	1.25	Terpinen-4-ol	1174	t
Terpinen-4-ol	1175	5.95	Octyl-oxirane	1230	0.91
α -Terpineol	1188	20.00	Neral	1235	0.20
β -Citral	1202	2.50	Geranial	1260	0.30
Geraniol	1240	4.50	Anethole	1271	t
α -Terpineol acetate	1260	27.00	4-Methoxy Eugenol	1400	4.52
Methyl cynamate	1313	0.60	Caryophyllene	1418	3.59
4-Methoxy eugenol	1400	12.60	4-Methoxy Isoeugenol	1480	75.23
Caryophyllene	1418	2.40	α -Muurolene	1496	0.49
4-Methoxy isoeugenol	1480	1.10	γ -Cadinene	1511	t
α -Muurolene	1498	5.20	δ -Cadinene	1540	t
(-)-Spathulenol	1572	0.60	Caryophyllene oxide	1575	0.32
Caryophyllene oxide	1580	0.40	γ -Eudesmol	1587	t
Manool	2050	2.40	α -Muurolol	1630	t
			γ -Bulgarene	1714	t
			Elemicine	1580	t

Trace (t), concentration less than 0.05%.

RI = Retention Index, determined according to Van den Dool and Kratz (1966); identification was done by GC/MS. Only MS was used for benzaldehyde, 3-heptanone, 5 methyl, 2,3 dehydro-1,8 cineole and methyl cynamate.

var. *hispanoliensis* eucalyptol is the major constituent (38%) and *P. racemosa* var. *racemosa* shows a higher percentage in eugenol (57.7%) and myrcene (26.6%) (Tucker *et al.*, 1991; Ayedoun *et al.*, 1996).

A marked variability in the chemical composition of the essential oils of different varieties of

this species has been reported. This variability may be attributed to the origin or the vegetative stage and this such a study might be interesting from a taxonomically point of view.

Further experiments, are planned to establish the influence of the components of these mixtures on the pharmacological activity.

- Ayedoun A. M., Adeoti B. S., Setondji J., Menut Ch., Lamaty G. and Bessiere J. M. (1996), Aromatic plants from tropical west Africa. IV. Chemical composition of leaf oil of *Pimenta racemosa* (Miller) J. W. Moore var. *racemosa* from Benin. J. Ess. Oil Res. **8**, 207–210.
- Duke J. A. (1986), Handbook of Medicinal Herbs. CRC Press, Florida, pp. 134–147.
- Germosen-Robineau, L. (ed.) (1995), Hacia una farmacopea caribeña (Tramil 7). Enda Caribe, Santo Domingo, pp. 481–485.
- Jennings W. and Shibamoto T. (1980), Qualitative Analysis of Flavor and Fragrance Volatiles by Glass Capillary Gas Chromatography. Academic Press, New York, pp. 97–131.
- Liogier A. L. (1989), La Flora de la Española IV. Universidad Central del Este, San Pedro de Macoris, Republica Dominicana, pp. 86–91.
- Massada Y. (1976), Analysis of Essential Oil by Gas Chromatography and Mass Spectrometry. John Wiley & Sons, New York, pp. 157–180.
- Robineau L. (1991), Towards a Caribbean Pharmacopeia (Tramil 4). Enda Caribe, Santo Domingo, pp. 287–295.
- Stenhagen E., Abrahamson S. and McLafferty E. W. (1974), Atlas of Mass Spectral Data. Wiley-Interscience, New York.
- Tucker A., Maciarelo M., Adams R., Landrum L. and Zaroni T. (1991), Volatile leaf of Caribbean Myrtaceae. I. Three varieties of *Pimenta racemosa* (Miller) I. Moore of the Dominican Republic and the commercial Bay oil. J. Ess. Oil Res. 323–329.
- Van Den Dool H. and Kratz P. D. (1966), A generalization of the retention index system including linear temperature programmed gas-liquid partition chromatography. J. Chromatogr. A **11**, 463–466.