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Volatiles of the Leaves, Stems and Flowers of Otacanthus azureus (Linden) Ronse

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Volatiles of the Leaves, Stems and Flowers of *Otacanthus azureus* (Linden) Ronse

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Abstract

The volatiles of the leaves, stems and flowers of *Otacanthus azureus* were obtained by hydrodistillation and analyzed by GC and GC/MS. The oils of *O. azureus* were terpenoid in nature. Among the monoterpenes *trans*-pinocarveol was the major component (leaves: 14.8%, stems: 7.0%, flowers: 2.2%). β-Copaen-4α-ol was the main sesquiterpene found (leaves: 15.6%, stems: 24.3%, flowers 27.4%).

Key Words Index

Otacanthus azureus, Scrophulariaceae, essential oil composition, *trans*-pinocarveol, β-copaen-4α-ol.

Plant Name

Otacanthus azureus (Linden) Ronse (Syn. *Otacanthus caeruleus* Lindl. and *Stemodia azurea* Linden); common names: "incenso" and "pendão-azul." These plants, which possess blue flowers, release agreeable odors that are intensified when crushed.

Source

The samples of *O. azureus* were collected in the campus of the Universidade Federal Rural da Amazônia (UFRA), in the city of Belém, Brazil, December 2003, where it is cultivated as an ornamental. The voucher (#172,764) specimen has been deposited in the Herbarium of Museu Paraense Emílio Goeldi (MPEG).

Plant Part

The fresh samples (leaves, stems and flowers) were separately hydrodistilled for 3 h, in a Clevenger-type apparatus (condensation water in 10°-15°C). The humidity of the leaves and stalks were determined by azeotropic distillation, using toluene, and Dean & Stark collector (1). The oils obtained were dried over anhydrous sodium sulfate. All the samples were immediately submitted to GC/FID and GC/MS analysis.

Previous Work

The taxonomic revision of the genus *Otacanthus* has been made (2). Agronomic data concerning the cultivated of *O. azureus* has also been reported (3,4). The essential oil of the aerial parts of *O. azureus* was previously reported (5).

Present Work

***GC/MS*:** Analysis was performed on a Finnigan Mat INCOS XL GC/MS system, equipped with a DB-5MS (30 m x 0.25 mm, 0.25 μm film thickness) fused silica capillary column; the carrier gas was helium adjusted to a linear velocity of 32 cm/s (measured at 100°C); split flow was adjusted to give a 20:1 ratio; septum sweep was a constant 10 mL/min; splitless injection of 1 μL, of a 2:1000 hexane solution; injector and detector temperature was 250°C; oven temperature programmed was 60°-240°C at 3°C/min; EIMS: electron energy, 70 eV; ion source temperature and connection parts: 180°C. Individual components were identified by comparison of both mass spectrum and their GC retention data with those of authentic compounds previously analyzed and stored in the data system, and by comparison of mass spectra with those in the data system libraries and cited in the literature (6).

GC: Analysis of volatile components was performed on a HP5890-II instrument, using the same column and conditions as above except that hydrogen was used as the carrier gas. The GC was equipped with FID and connected with an electronic integrator HP 3396 Series II. The percentage composition of the oil samples were computed from the GC peak areas without using correction for response factors.

Results and Discussion

The composition of the oils and retention indices are given in Table I. Oil yield was as follows: leaves, 0.4% (0.8% dried weight basis); stems: < 0.05% (0.1% dried weight basis); and

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Table I. Volatiles (%) of the leaves, stems and flowers of *Otacanthus azureus*

Components	RI*	Leaves	Stems	Flowers	Leaves + stems
α-pinene	938	6.2	4.3	2.5	8.6
camphene	954	0.8	0.8	2.8	0.8
sabinene	975	2.7	2.3	0.6	3.4
β-pinene	980	3.3	2.8	0.4	4.6
myrcene	990	0.3	0.3		0.3
α-terpinene	1004	0.6	1.2	0.3	0.7
p-cymene	1027	0.7	0.5	0.3	0.8
limonene	1030	1.2	1.4	0.3	1.5
γ-terpinene	1062	1.1	2.2	0.9	1.2
linalool	1100	0.5	1.7	0.4	0.8
cis-limonene oxide	1134	0.8	0.2		0.7
trans-pinocarveol	1140	14.8	7.0	2.2	14.7
pinocarvone	1163	9.6	6.0	3.5	8.6
terpinen-4-ol	1178	2.1	1.3	0.6	2.3
cis-pinocarveol	1184	1.3	0.6		1.3
myrtenal	1194	11.8	7.5	3.6	11.3
myrtenol	1196	0.5	0.2		0.6
cuminaldehyde	1240	0.7	0.4		0.7
cyclosativene	1369	0.3	0.4	0.6	0.3
α-copaene	1377	3.3	3.4	5.5	3.4
β-caryophyllene	1442	0.3	0.3	0.4	0.3
α-humulene	1455	5.0	5.3	4.8	4.7
1,11-calamenene oxide	1490	0.3	0.5	0.5	0.3
epi-cubebol	1494	0.7	1.3	1.4	0.6
δ-cadinene	1525	0.2	2.6	1.8	1.1
caryophyllene oxide	1582	0.8	1.0	1.9	0.8
β-copaen-4α-ol	1586	15.6	24.3	27.4	13.2
viridiflorol	1592	3.3	4.6	6.9	3.0
β-oplopenone	1596	3.3	4.2	5.8	3.0
M = 222	1614	1.3	1.8	2.2	1.1
M = 218	1640	4.0	5.2	18.4	3.0
cubenol	1643	0.7	1.4	1.0	0.6
M = (?)	1678	0.7	1.0	1.6	0.5
(Z)-α-santalol acetate	1784	1.3	1.8	1.5	0.9

*retention indices on DB-5MS, RI = 1614, m/z (rel. int.): 222[M+](2), 204(11), 191(12), 179(15), 161(70), 138(22), 119(42), 109(100), 105(43), 95(77), 81(44), 67(42), 55(35), 43(65), 41(63); RI = 1640, m/z (rel. int.): 218[M+](4), 203(5), 175(93), 161(16), 147(33), 134(100), 119(39), 105(60), 91(84), 79(49), 69(33), 55(34), 41(70); RI = 1678, m/z (rel. int.): ?[M+], 177(4), 159(7), 137(53), 121(40), 107(27), 93(100), 80(37), 67(11), 55(18), 41(27)

flowers: < 0.05% (fresh weight basis). The oil obtained from leaves + stems yielded 0.3% (fresh weight basis). The oil of *O. azureus* was terpenoid in nature. In leaf oil the major monoterpenes were *trans*-pinocarveol, myrtenal, pinocarvone and α-pinene. Among the sesquiterpenes the principal components were β-copaen-4α-ol, viridiflorol, β-oplopenone and α-copaene. In the stems and flowers the total monoterpenes were less than the total of sesquiterpenes, nevertheless, in the leaves the total monoterpenes was more than that of the sesquiterpenes. The oil of *O. azureus* from Belgium showed the same profile (*trans*-pinocarveol, β-copaen-4α-ol, myrtenal and myrtenol). Besides the known identified components, the oil contained an important unknown constituent with molecular weight of 218 (RI = 164). This constituent showed a similar mass spectrum to that of β-cedren-9-one, but we can not guarantee the identification.

Acknowledgments

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References

1. WHO, Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva (1998).
2. A. Ronse**,** *A revision of* Otacanthus *Lindl. (Scrophulariaceae).* Brittonia, **53,** 137-153 (2001).
3. H. Lorenzi, *Plantas Ornamentais no Brasil, 2. ed. rev. e ampl.* Instituto Plantarum, Nova Odessa, SP (1999).
4. R.G. Anderson, *Brazilian Snapdragon (*Otacanthus azureus*) for the Cut Flower Market.* Foriculture Research Report 15-04 (http://www.uky.edu/Ag/horticulture) (2004).
5. A. Ronse, H. De Pooter and M. De Proft, *Essential Oils of* Otacanthus. Phytochemistry, **46**, 1365-1368 (1997).
6. R.P. Adams, *Identification of Essential oil Components by Gas Chromatography/Mass Spectrometry.* Allured Publ Corp., Carol Stream, IL (1995).