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Short Communication

The essential oil composition of the roots and rhizomes of *Siphonochilus aethiopicus*

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The composition of the essential oil obtained through hydrodistillation is reported for the roots and rhizomes of *Siphonochilus aethiopicus.* The major compounds in both the roots and the rhizomes are 1,8-cineole, (*E*)-β-ocimene, *cis*-alloocimene, together with the recently reported furanoterpenoid (4aα,5β,8α)-3,5,8a-trimethyl-4,4a,9-tetrahydo-naphtho[2,3-*b*]-furan-8(5H)-one which is the major compound in both plant organs. The roots and rhizomes are virtually identical in composition and provide a chemical rationale to promote plant part substitution as a method to conserve this endangered South African medicinal plant.

Siphonochilus aethiopicus (Schweinf) B.L. Burtt (Zingiberaceae) is one of the most coveted medicinal plants in South Africa (Williams 1996). The plants are characterised by a small cone-shaped rhizome, which have a distinctive pungent smell. The tuberous roots are also aromatic. The traditional uses of the rhizomes of *Siphonochilus aethiopicus*, 'isiphephetho' include; to clear the nasal passages, as cough suppressant, to treat influenza, treatment of hysteria, as an antimalarial and to relieve menstrual pains (Van Wyk *et al.* 1997, Hutchings *et al.* 1996). Due to its popular use and the method of harvesting (removal of the entire rhizome) the plants have become extinct in certain areas.

Plant material was obtained from Parceval, Wellington (Cape Town), a supplier of raw materials used in herbal medicines. The fresh roots and rhizomes were hydrodistilled for three hours and yielded a yellow oil (0.1% wet wt. for both the rhizomes and roots).

The essential oil was analysed by capillary GC-MS using a Hewlett Packard GCD system operating under the following conditions; HP-Innowax FSC column (60m x 0.25mm ∅, with 0.25μm film thickness) was used with helium as carrier gas (0.8ml min^{-1}). The GC oven temperature was kept at 60°C for 10min and programmed to 220°C at a rate of 4°C min^{-1}, then kept constant at 220°C for 10min and programmed to 240°C at a rate of 1°C min^{-1} Alkanes were used as reference points in the calculation of relative retention indices (RRI). The split ratio was adjusted at 50:1. The injector temperature was set at 250°C. Mass spectra were recorded at 70eV. Mass range was from 35 to 425*m/z*. Library search was carried out using Wiley GC/MS Library and TBAM Library of Essential Oil Constituents.

Seventy compounds were identified in the roots (88%) and sixty compounds were identified in the rhizomes (88%) and are listed in Table 1. With the exception of minor quantitative and qualitative variation the essential oil of the roots and rhizomes are virtually identical in composition. The major compound present in both plant organs is a novel furanoterpenoid (Holzapfel *et al.* 2002) which represents *ca.*20% of the oil composition. For practical reasons we suggest the trivial name siphonochilone for this compound.

Despite the popular traditional use and pharmacological studies done on *S. aethiopicus* it is ironic that very little is known on the phytochemistry of this widely used medicinal plant. Lindsey *et al.* (1999) reported the *in vitro* anti-inflammatory and uterine relaxing activity in the apolar fractions of the rhizomes and many of the uses of *Siphonochilus aethiopicus* are associated with known therapeutic properties of essential oils (e.g. decongestant). The results reported here are congruent with the finding of Zschoche *et al.* (2000) who demonstrated through thin layer chromatography that the apolar fraction of the roots and rhizomes have similar chemical profiles. Our results are in support of the strategy of plant part substitution as a measure to protect this threatened medicinal plant from extinction. Although difficult, it will be in the interest of conservation to educate traditional healers to harvest the roots of the plant and simply to replant the rhizomes for future harvests.

Table 1: Composition of essential oil (%) identified in the roots and rhizomes of *Siphonochilus aethiopicus*

RRI[1]	Compound	Plant Part Roots %	Plant Part Rhiz. %	RRI[1]	Compound	Plant Part Roots %	Plant Part Rhiz. %
				1638	*Cis-p*-menth-2-en-1-ol	0.10	0.11
1020	methyl-2-methyl butyrate	–	0.03	1650	γ-elemene	0.65	–
1014	tricyclene	0.04	–	1668	(Z)-β-farnesene	0.07	0.01
1032	α-pinene	0.84	0.72	1682	δ-terpineol	0.06	0.12
1035	α-thujene	0.22	0.15	1687	α-humulene	0.05	0.01
1076	Camphene	1.85	0.02	1689	*Trans*-piperitol	0.08	0.06
1118	β-pinene	1.96	1.86	1706	α-terpineol	1.01	1.71
1132	Sabinene	5.52	4.52	1709	α-terpinyl acetate	0.55	0.50
1159	δ-3-carene	2.42	0.96	1726	Germacrene-D	0.28	0.12
1174	Myrcene	1.80	1.15	1733	Neryl acetate	–	0.04
1176	α-phellandrene	Tr	–	1744	α-selinene	0.06	–
1183	*p*-mentha-1(7),8-diene (=*Pseudolimonene*)	0.06	–	1748	Piperitone	0.04	0.01
1188	α-terpinene	0.44	0.25	1758	*Cis*-piperitol	0.04	0.07
1195	Dehydro-1,8-cineole	–	0.01	1758	(*E,E*)-α-farnesene	0.06	–
1203	Limonene	1.68	1.17	1773	δ-cadinene	0.03	–
1213	1,8-cineole	9.63	16.11	1783	β-sesquiphellandrene	0.20	–
1218	β-phellandrene	2.00	–	1786	Kessane	2.98	1.86
1246	(*Z*)-β-ocimene	1.03	0.75	1796	Selina-3,7(11)-diene	0.25	0.07
1255	γ-terpinene	0.91	0.47	1804	Isokessane	0.23	0.13
1266	(*E*)-β-ocimene	7.61	6.11	1830	2,6-dimethyl-3(*E*),5(*E*),7-octatriene-2-ol	0.04	0.07
1278	*m*-cymene	0.05	0.02	1854	Germacrene-B	2.31	0.77
1280	*p*-cymene	0.43	0.22	1864	*p*-cymen-8-ol	0.03	0.01
1286	Isoterpinolene	0.02	0.01	1878	2,5-dimethoxy-*p*-cymene	0.03	–
1290	Terpinolene	0.58	0.22	1886	Isofuranogermacrene	0.18	0.08
1382	*cis*-alloocimene	10.27	7.63	2008	Caryophyllene oxide	0.10	0.03
1409	*Trans*-alloocimene	1.29	0.83	2033	Epiglobulol	–	0.01
1460	2,6-dimethyl-1,3(*E*),5(*E*),7-octatetraene	0.02	0.02	2050	(*E*)-nerolidol	0.09	0.05
1474	*Trans*-sabinene hydrate	0.31	0.26	2073	*p*-mentha-1,4-diene-7-ol	–	0.01
1479	δ-elemene	0.08	–	2096	Elemol	0.56	0.38
1498	(*E*)-β-ocimene epoxide	0.01	–	2104	Dimethyl anthranilate	0.09	0.65
1532	Camphor	0.03	–	2185	γ-eudesmol	0.08	0.21
1553	Linalool	0.40	0.84	2250	α-eudesmol	0.04	0.01
1556	*cis*-sabinene hydrate	0.28	0.26	2257	β-eudesmol	0.34	0.24
1562	Isopinocamphone	0.01	0.02	2273	Selin-11-en-4-α-ol	0.24	–
1571	*Trans-p*-menth-2-en-1-ol	0.16	0.16	2320	Juniper camphor	0.16	0.05
1594	*Trans*-β-bergamotene	0.13	–	2373	*Trans*-isoeugenol	–	0.08
1597	Bornyl acetate	0.08	–	2471	Indole	–	0.04
1600	β-elemene	0.69	0.25	2698	(4aα,5β,8α)-3,5,8a-trimethyl-4,4a,9-tetrahydo-naphtho[2,3-*b*]-furan-8(5H)-one (siphonochilone)	21.23	32.37
1602	6-methyl-3,5-heptadien-2-one	0.21	–				
1611	Terpinen-4-ol	3.05	3.47				
						88.37	**88.36**

RRI[1] Relative Retention Indices calculated against n-alkanes

References

Holzapfel CW, Marais W, Wessels PL, Van Wyk BE (2002) Furanoterpenoids from *Siphonochilus aethiopicus*. Phytochemistry **59**: 405–407

Hutchings A, Scott AH, Lewis G, Cunningham AB (1996) Zulu Medicinal Plants — an inventory. University of Natal Press, Pietermaritzburg. ISBN 0869809237

Lindsey K, Jäger AK, Raidoo DM, Van Staden J (1999) Screening of plants used by South African traditional healers in the treatment of dysmenorrhoea for prostaglandin-synthesis inhibitors and uterine relaxing activity. Journal of Ethnopharmacology **64**: 9–14

Van Wyk BE, Van Oudtshoorn B, Gericke N (1997) Medicinal Plants of South Africa. Briza, Pretoria, South Africa. ISBN 1875093095

Williams VL (1996) The Witwatersrand Muthi Trade. Veld & Flora March: 12–14

Zschocke S, Rabe T, Taylor JLS, Jäger AK, Van Staden J (2000) Plant part substitution — a way to conserve endangered medicinal plants? Journal of Ethnopharmacology **71**: 281–292

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