SHORT REPORT

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Rec. Nat. Prod. 11:3 (2017) 318-322

records of natural products

Essential Oils of Root of *Stahlianthus campanulatus* O. Kuzt

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(Received July 30, 2016; Revised November 17, 2016; Accepted November 17, 2016)

Abstract: The chemical composition of volatiles from the root of *Stahlianthus campanulatus* O. Kuzt (Zingiberaceae) has been studied. The essential oil was obtained by hydrodistillation and analyzed by GC (FID) and GC-MS. The components by identified by MS libraries and their LRIs. The major constituents of the oil were stahlianthusone (27.6%), α-copaene (16.7%) and camphor (14.7%). The chemical compositions of the essential oil of *S. campanulatus* are being reported for the first time.

Keywords: *Stahlianthus campanulatus;* essential oil composition; stahlianthusone; α-copaene; camphor.

1. Plant Source

Roots of S. campanulatus were obtained from Sa Pa (22°20′N 104°0′E), Lao Cai Province, Vietnam, in May 2010. The plant was identified by Dr. Dai DN. A voucher specimen, BVT 357, was deposited at the Botany Museum, Vinh University, Vietnam. Plant samples were air-dried prior to hydrodistillation

2. Previous Studies

Decoction of the plant has been used in women's health care [1]. No record of the composition of the essential oil of *S. campanulatus* could be found in literature. However, cadalenequinone or

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The article was published by Academy of Chemistry of Globe Publications
www.acgpubs.org/RNP © Published 04/29/2017 EISSN: 1307-6167

stahlianthusone (which cause intense skin allergy) and dihydrocadalenequinone were previously isolated from the seed of *S. campanulatu* [2] and essential oil of a related specie, *S. involucratus* [3].

3. Present Study

The present paper reports for the first time the chemical constituents of the essential oils hydrodistilled from the root of *Stahlianthus campanulatus* growing in Vietnam. This is part of an extensive research aimed at the characterization of volatile constituents of medicinal plants growing in Vietnam.

Briefly, 500 g of the pulverized sample were carefully introduced into a 5 L flask and distilled water (5 L) was added until it covers the sample completely. Hydrodistillation was carried out with a Clevenger-type distillation unit designed according to the Vietnamese Pharmacopoeia specification [4]. The oils were kept under refrigeration until the moment of analyses. The yield of essential oil was 0.40% ±0.01 (v/w), calculated on a dry weight basis. Oil sample was light yellow. Table 1 indicates the chemical constituents present in the oil, their percentages as well as retention indices on HP-5MS column. Equal amounts of sesquiterpene hydrocarbons (33.6%) and oxygenated sesquiterpenes (33.6%) were the main classes of compounds in the leaf oil of *S. campanulatus*. The contents of monoterpene compounds are hydrocarbons (12.8%) and oxygenated (16.5%). The major compounds were stahlianthusone (27.6%), α-copaene (16.7%) and camphor (14.7%). There are significant amount of camphene (8.7%) and *allo*-aromadendrene (6.0%). Stahlianthusone, the main compound of the essential oil was previously isolated from the seed oil of the plant [2] and the essential oil of *S. involucratus* [3] whose composition was dominated by camphene (22.69%) and stahlianthusone (19.85%). However, camphor one of the main constituents of *S. campanulatus* occurred as a minor compound in *S. involucratus* [3]. In addition, dihydrostahlianthusone, a significant constituent of *S. involucratus* was conspicuously absent in *S. campanulatus*.

Relatively fewer studies could be found on the volatile and non-volatile composition of the genus *Stahlianthus*. The presence of stahlianthusone in the studied oil sample may be of taxonomic interest considering its presence in both oil samples *S. involucratus* [3] and *S. campanulatus*. This compound seems to be peculiar to Zingiberaceae family of plant [5]. The cytotoxicity effect of volatile oils of *S. involucratus* has been attributed to the large contents of stahlianthusone [6]. In addition, the compounds have also been implicated in the anti-inflammatory, antinociceptive and antipyretic of crude extracts and fractions of *S. involucratus* [7]. Essential oil containing a sizeable amount of stahlianthusone was reported to possessed phytotoxicity potential [8]. Stahlianthusone has also been used along with other compounds for inhibiting and/or preventing the formation of a biofilm [9]. Therefore, further investigation to ascertain some pharmacological activity of the essential oil of *S. campanulatus* is in progress.

In conclusion, for the first time, the compositions of the root essential oil of the Vietnamese specie of *S. campanulatus* were elucidated. Due to the very limited amount of published data on the essential oil of this plant, comparison of the present results with other studies from Vietnam or other countries was limited.

Table 1. Volatile constituents of *S. campanulatus* from Vietnam

Compounds[b]	RI[c]	RI[d]	Percentage composition (±SD[a]) *S. campanulatus*
(Z)-3-Hexenol	860	850	t
1-Hexanol	871	863	t
Heptanal	900	901	t
2-Heptanol	904	894	0.1
Tricyclene	927	921	0.2
α-Pinene	939	932	1.4
Camphene	953	946	8.7
β-Pinene	980	976	t
2-Octanol	995	994	t
α-Phellandrene	1006	1004	t
δ-3-Carene	1011	1008	1.6
α-Terpinene	1017	1014	t
p-Cymene	1026	1020	0.2
Limonene	1028	1024	0.7
1,8-Cineole	1034	1032	0.1
γ-Terpinene	1061	1056	t
1-Octanol	1068	1064	t
α-Terpinolene	1090	1086	t
p-Cymenene	1091	1089	t
2-Nonanol	1098	1097	0.4
endo-Fenchol	1117	1114	t
Camphor	1145	1141	14.7
Camphene hydrate	1152	1145	0.2
Isoborneol	1162	1155	0.1
Borneol	1169	1167	0.6
Terpinen-4-ol	1177	1175	0.2
p-Cymen-8-ol	1182	1179	t
α-Terpineol	1189	1186	0.1
Verbenone	1207	1204	t
Bornyl acetate	1289	1287	0.1
α-Terpinyl acetate	1349	1346	0.4
α-Longipinene	1355	1350	0.1
Cyclosativene	1371	1373	0.1
α-Copaene	1377	1374	16.7
β-Cubebene	1388	1387	t
Sativene	1394	1390	t
α-Gurjunene	1412	1409	0.1
α-Santalene	1415	1416	1.6
β-Caryophyllene	1419	1417	1.0
trans-α-Bergamotene	1435	1431	0.5
Aromadendrene	1441	1439	t
epi-β-Santalene	1446	1445	0.1
α-Himachalene	1451	1449	0.1
α-Humulene	1454	1452	0.6
β-Santalene	1460	1457	t
allo-Aromadendrene	1464	1460	6.0
γ-Muurolene	1477	1475	1.3
ar-Curcumene	1480	1479	0.1
β-Selinene	1486	1486	0.5
α-Selinene	1497	1496	0.9
β-Bisabolene	1506	1505	0.4
γ-Cadinene	1511	1513	0.4
Cubebol	1515	1514	0.3
δ-Cadinene	1525	1522	2.3

trans-Calamenene	1529	1521	t
trans-Cadina-1(2),4-diene	1534	1532	0.1
α-Cadinene	1539	1537	0.1
α-Calacorene	1546	1544	0.5
(*E*)-Nerolidol	1563	1561	0.1
β-Calacorene	1566	1564	0.1
Spathulenol	1578	1577	0.2
Caryophyllene oxide	1583	1582	2.4
Salvial-4(14)-en-1-one	1591	1594	0.1
Humulene epoxide I	1600	1593	0.1
Humulene epoxide II	1609	1608	0.3
1-*epi*-Cubenol	1629	1627	0.8
Cubenol	1646	1645	0.2
α-Cadinol	1654	1652	0.8
epi-β-Bisabolol	1670	1670	0.3
Khusinol	1683	1674	0.4
Stahlianthusone	1821	1830	27.6
7-Hydroxycadalene	1973	1986	1.8
	Total		**96.7**
Monoterpene hydrocarbons			**12.8**
Oxygenated monoterpenes			**16.5**
Sesquiterpene hydrocarbons			**33.6**
Oxygenated sesquiterpenes			**33.6**
Non-terpenes			**0.5**

[a] Standard deviation were insignificant and were excluded from the Table except where stated; [b] Elution order on HP-5MS column; [c] Retention indices on HP-5MS column; [d] Literature retention indices [10-11].

Supporting Information

Supporting Information accompanies this paper on http://www.acgpubs.org/RNP

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