

# Analysis by GC/FID and GC/MS of Essential Oil of Leaflets of *Steganotaenia araliacea* Hochst from Cameroon

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## Abstract

The essential oil from the leaflets of *Steganotaenia araliacea* Hochst from the Adamaoua region of North Cameroon was analyzed by GC(FID) and GC/MS. More than 20 compounds have been identified. Monoterpenes (60.3%) are mainly represented by limonene (31.9%) and  $\alpha$ -pinene (17.8%); the main sesquiterpenes were  $\gamma$ -elemene (9.6%) and  $\alpha$ -curcumene (6.6%).

## Key Word Index

*Steganotaenia araliacea*, Apiaceae, essential oil composition,  $\alpha$ -pinene, limonene.

## Introduction

*Steganotaenia araliacea* Hochst [syn. *Peucedanum araliaceum* (Hochst.) Benth., *Peucedanum fraxinifolium* Hiern ex. Oliv.] is found in the tropical regions of West Africa (1). It is locally named "Coli djeuil" or "sabadje nyiwa" in fulfulde (2).

Plant material of *S. araliacea* was collected at Ngaoundere (Adamaoua plateau of Cameroon) during the rainy season (November 2003). A voucher specimen was deposited at the Herbarium of the Agricultural Research and Development Centre Wakwa-Ngaoundere.

Moudachirou et al. (3) investigated the whole leaf oils of *S. araliacea* from Benin and Togo. The main compounds identified were limonene +  $\beta$ -phellandrene (12-36%), sabinene (9-25%), and  $\beta$ -caryophyllene (2-15%). Other investigations have been done by Lavaud et al. (1992), (4) who isolated saponins from the leaves. Wickramatne et al. (1993) (5) investigated dibenzocyclo-octadiene lignans from stem bark, which were studied as potential anticancer agents by Kinghorn et al. (1996) (6).

To the best of our knowledge, which is based on the available literature, the essential oil from this Cameroonian *S. araliacea* species has not been investigated. The aim of the

present work is to analyze the volatiles of the oil responsible for the significant odor impression.

## Experimental

Dried leaflets (4 g) were subjected to hydrodistillation and solvent extraction using a Likens-Nikerson apparatus for 2 h from which a yield of 0.13% of oil was obtained. The solvent used was peroxide free diethyl ether.

For quantitation (area %), the GC analyses were performed on an Agilent 6890 series apparatus fitted with a FID detector. The operating conditions were as follows: 30 m x 0.25 mm HP 5MS (crosslinked 5% phenyl dimethylsiloxane), film thickness: 0.25  $\mu$ m, temperature program: from 40° - 230°C at 5°C/min with a final hold of 5 min at 280°C. He at 49.9 KPa was used as carrier gas and the FID detector was maintained at 250°C.

The oil constituents were identified on the basis of their retention data and by using GC/MS analytical conditions similar to that of GC/FID. The mass spectra were recorded on a Agilent 5973 mass spectrometer coupled to a Agilent gas chromatograph (EI mode 70 eV, source temperature 230°C, scanned mass ranged 35 - 350 amu). The characteristic fragmentation patterns have been analyzed and compared to those of Wiley

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**Table I. Percentage composition of *Stegonotaenia araliacea* oil from Cameroon**

Compounds	RI	Area %
$\alpha$ -pinene	933	17.8
$\beta$ -pinene	975	7.7
myrcene	992	0.9
limonene	1031	31.9
$\delta$ -3-carene	1055	1.0
terpinolene	1089	0.2
linalyl acetate	1258	trace
$\alpha$ -copaene	1377	0.3
$\beta$ -caryophyllene	1421	4.6
$\gamma$ -elemene	1425	9.6
<i>trans</i> - $\alpha$ -bergamotene	1436	1.5
$\alpha$ -gualene	1440	1.3
$\alpha$ -humulene	1455	0.5
(E)- $\beta$ -farnesene	1459	0.8
ar-curcumene	1485	6.6
zingiberene	1501	4.1
$\beta$ -bisabolene	1511	0.4
$\beta$ -sesquiphellandrene	1527	2.6
(E)- $\gamma$ -bisabolene	1533	trace
caryophyllene oxide	1583	1.6
tetracosane	2404	0.5
sesquiterpenes		38.1

RI = retention index on HP-5MS

275.L database. The retention data (retention indices) were compared to those of Adams (7) and Joulain and König (8).

## Results and Discussion

More than 20 major compounds have been identified by GC/MS analysis (Table I). The oil of the leaflets was found to contain a high percentage of monoterpenes hydrocarbons

(60.3%), mainly represented by limonene (31.9%),  $\alpha$ -pinene (17.8%) and  $\beta$ -pinene (7.7%). The sesquiterpene hydrocarbons in the leaflets oil were identified as  $\gamma$ -elemene (9.6%), ar-curcumene (6.6%) and  $\beta$ -caryophyllene (4.6%).

The reported composition differed qualitatively and quantitatively from those obtained by Moudachirou et al. (1995). Limonene and  $\alpha$ -pinene were the main components in the oil from Cameroon, while sabinene and limonene +  $\beta$ -phellandrene (11.8 - 35.9%) were the main components in the oil of Togo and Benin. The present investigation revealed  $\gamma$ -elemene (9.6%) and ar-curcumene (6.6%) in high percentages, while they were not detected by Moudachirou et al. (3). They also found cryptone (3.6 - 16.6%), which was not present in our results.

The chemical composition of the oil differed according to the geographic origin of the plants. If different chemotypes of *S. araliacea* exist, then ar-curcumene or  $\gamma$ -elemene could possibly be used for differentiation. However, more analyses would be needed to prove the existence of more than one chemotype.

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**Table II. Unidentified compounds**

	RI	Area percent	m/z (%)
1	908	0.3	136(4), 93(100), 91(87), 79(96), 77(76), 67(71), 41(81), 39(93)
2	1006	0.5	136(16), 119(12), 91(39), 84(35), 77(27), 67(28), 57(61), 56(36), 55(79), 44(59), 43(81), 42(29), 41(100), 39(92)
3	1595	0.3	222(3), 200(9), 175(10), 145(16), 135(14), 123(10), 118(13), 117(22), 80(11), 77(11), 71(100), 55(13), 43(92), 41(29)
4	1606	0.4	204(6), 161(18), 133(36), 122(45), 107(47), 105(41), 95(48), 91(41), 81(82), 77(38), 67(47), 59(77), 43(100), 41(40), 39(35)
5	1609	0.4	207(7), 138(31), 109(47), 96(67), 95(34), 91(57), 81(30), 79(39), 68(48), 67(100), 65(23), 55(21), 53(46), 43(61), 39(53)
6	1628	0.4	220(13), 204(52), 161(70), 145(34), 107(39), 81(49), 79(83), 77(38), 69(50), 67(62), 59(54), 55(50), 43(100), 41(62), 39(36)
7	1659	0.4	220(3), 175(36), 134(36), 121(48), 107(52), 93(64), 91(91), 82(50), 79(73), 77(61), 67(87), 55(61), 53(51), 41(100), 39(50)
8	1664	0.6	216(29), 201(45), 173(30), 138(32), 131(37), 105(42), 94(50), 79(64), 78(46), 71(24), 67(85), 53(37), 43(70), 39(100)
9	1688	0.3	220(6), 109(36), 107(39), 105(31), 95(52), 93(54), 91(93), 79(88), 77(74), 67(84), 55(72), 53(58), 43(76), 41(100), 39(36)
10	1727	0.3	220(18), 132(47), 123(57), 121(54), 119(56), 115(35), 109(32), 93(50), 69(53), 53(37), 51(44), 43(100), 41(58), 41(100), 39(33)
11	1752	0.3	220(7), 119(33), 109(31), 107(26), 93(26), 91(47), 81(42), 79(42), 77(36), 69(84), 55(27), 53(43), 43(39), 41(100), 39(33)
12	1824	0.3	220(8), 219(10), 123(27), 110(21), 107(21), 91(26), 71(59), 69(24), 58(74), 57(41), 55(54), 43(100), 42(31), 41(79), 39(37)

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