SHORT REPORT

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Chemical composition of essential oil of *Syzygium guineense* (Willd.) DC. var. *guineense* (Myrtaceae) from Benin

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Abstract: Essential oils extracted from dried leaves of *Syzygium guineense* harvested at Natitingou-Centre, Péperkou, Tchaourou and Térou were analysed by gas phase chomatography coupled to mass spectrometry (GC-MS). The main constituents were: caryophyllene oxide (7%), δ-cadinene (7.5%), viridiflorol (7.5%), *epi*-α-cadinol (9.8%), α-cadinol (12.7%), *cis*-calamenen-10-ol (14%), citronellyl pentanoate (15.2%), β-caryophyllene (20.1%) and α-humulene (39.5%).

Keywords: *Syzygium guineense*, essential oil, GC-MS, caryophyllene oxide, δ-cadinene, viridiflorol, *epi*-α-cadinol, α-cadinol, *cis*-calamenen-10-ol, citronellyl pentanoate, β-caryophyllene, α-humulene.

1. Plant Source

Syzygium guineense (Myrtaceae) is an odorous species native to the wooded savannahs and tropical forests of Africa [1]. This short-trunked tree grows widely in northern Benin. Its wild, oval fruits are edible [1, 2].

It is included among the African plant species that are active against malaria [3]. The bark of *S. guineense* is used in traditional medicine to treat gasto-intestinal upsets and diarrhoea. [4, 5, 6, 7].

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In Benin, *S. guineense* is used to make brushes, for firewood, and for the treatment of mental disorders and amenorrhoea [1].

The leaves of *Syzygium guineense* were harvested before flowering in northern Benin at Natitingou-Centre, Péperkou, Tchaourou and Térou in June 2006. They were identified and certified at the National Herbarium of the University of Abomey-Calavi

2. Previous Studies

Triterpenes isolated and characterised from the plant are biologically active on bacteria [8]. Tsakala in 1996 showed an activity against strains of *Salmonella E.*, *Shigella D.*, *Shigella F.*, *E. coli* and *Enterobacter A.* [4] of dry aqueous extract obtained after decoction.

In 1987, C. Eyélé Mvé-Mba found large amounts of cis-guaiene (30%) and β-caryophyllene (15.7 %) in essential oil from leaves of *S. guineense* from Gabon [9].

3. Present Study

The leaves were stored in the laboratory at 18-20°C throughout the extraction work. The essential oils were obtained by water distillation of the leaves (250-300 g) for 6 hours in a Clevenger type apparatus. They were dried over anhydrous sodium sulphate and analysed by GC-MS. The yield of essential oil from the leaves of *S. guineense* was relatively low (Table 1).

GC/MS: The essential oil were analysed on a Hewlett-Packard gas chromatograph Model 5890, coupled to a Hewlett-Packad MS model 5871, equipped whith a DB5 MS column (30m X 0,25mm; 0,25µm), programming from 50°C (5 min) to 300°C at 5°C/mn, 5 min hold. Helium as carrier gas (1,0 ml/min) ; injection in split mode (1 : 30) ; injector and detector temperature, 250 and 280°C respectively. The MS working in electron impact mode at 70 eV; electron multiplier, 2500 V; ion source temperature, 180°C; mass spectra data were acquired in the scan mode in *m/z* range 33-450.

GC/FID: The essential oil were analysed on a Hewlett-Packard gas chromatograph Model 6890, equipped whith a DB5 MS column (30m X 0,25mm; 0,25µm), programming from 50°C (5 min) to 300°C at 5°C/mn, 5 min hold. Hydrogen as carrier gas (1.0 mL/min) ; injection in split mode (1 : 60) ; injector and detector temperature, 280 and 300°C respectively. The essential oil is diluted in hexane: 1/30.

The compounds assayed by GC in the different essential oils were identified by comparing their retention indices with those of reference compounds in the literature and confirmed by GC-MS by comparison of their mass spectra with those of reference substances [10-12].

26-46 compounds were determined in the reported essential oils, representing 71.5-96.7% of total oil content. The main constituents of the essential oils of species was determined to be different. This variation may be due to different climates, seasons, geographic and soil conditions and harves periods of the plant.

The main constituents were found to be α-cadinol (12.7%), *cis*-calamenen-10-ol (7.1%), *epi*-α-muurolol (5.7%), caryophyllene oxide (5.5%), cubenol (5.3%), viridiflorol (3.8%), spathulenol (3.6%), humulene-1,2-epoxide (3.6%) and α-muurolol (3.1%) in species collected from Natitingou-Centre, While *cis*-calamenen-10-ol (14%), *epi*-α-cadinol (9.8%), δ-cadinene (7.5%), *epi*-α-muurolol (6.2%), γ-cadinene (6%), α-humulene (4.3%), *cis*-β-guaiene (4.1%), β-sinensal (4%) and humulene-1,2-epoxide (3.8%) from Péperkou (Table 2).

The species collected from Tchaourou was found to be reach for viridiflorol (7.5%), caryophyllene oxide (7%), humulene-1,2-epoxide (6.4%), *trans*-sabinene hydrate (6.1%), α-humulene (6%), α-cadinol (3.4%), cadalene (3.2%) and caryophylla-4(14),8(15)-dien-5-α-ol (3.1%). Finally, α-

humulene (39.5%), β-caryophyllene (20.1%) and citronellyl pentanoate (15.2%) were determined from the species collected from Térou (Table 2).

We note that only the essential oil from Térou contained β-caryophyllene (20.1%) and citronellyl pentanoate (15.2%). This pattern was observed for other highly representative compounds in the other volatile extracts: *syn-syn-syn*-heliofen-12-al-D (2.2%) and cubenol (5.3%) at Natitingou-Centre, *epi*-α-cadinol (9.8%), *cis*-β-guaiene (4.1%) and β-sensal (4%) at Péperkou, and *trans*-sabinene hydrate (6.1%), cadalene (3.2%), caryophylla-4(14),8(15)-dien-5-α-ol (3.1%) and ischwarone (2.6%) at Tchaourou.

We also note that none of the chemical compositions in our study comes close to that reported by C. Eyélé Mvé-Mba in Gabon, in which δ-guaiene was preponderant (30%).

This work emphasises the diversity in the chemical composition of essential oils extracted from the leaves of *Syzygium guineense.* At this stage it is premature to infer chemotypes. A larger number of samples from different locations and harvested at different times need to be studied to help gain a better understanding of the different observed chemical composition patterns in essential oils of *Syzygium guineense.*

Table 1. Yields of essential oil of *Syzygium guineense* from different locations.

Essential oil	*Syzygium guineense*			
Place of harvest	Natitingou-Centre	Péperkou	Tchaourou	Térou
Yield ($\times 10^{-2}$%)	9.2 ± 1.0	11.0 ± 1.0	10.5 ± 0.2	10.0 ± 0.1

Table 2. Essential oil composition of *Syzygium guineense* collected from different locations (%)

RI	Compounds	Natitingou-Centre	Péperkou	Tchaourou	Térou
929	α-thujene	-	0.4	-	-
972	sabinene		0.2	-	-
978	1-octen-3-ol	-	-	-	t
983	(2)-dihydro-apofarnesal	-	-	-	t
986	β-pinene	-	0.1	-	-
991	myrcene	-	-	-	0.5
1021	ortho-cymene	-	0.2	0.9	t
1028	**sylvestrene**	**-**	**4.0**	1.4	0.2
1033	(Z)-β-ocimene	-	-	-	t
1044	(E)-β-ocimene	-	-	-	t
1054	γ-terpinene	-	-	-	t
1069	n-octanol	-	-	-	t
1079	para-mentha-2,4(8)-diene	-	-	-	t
1096	linalool	-	0.2	-	0.2
1101	n-nonanal	-	-	-	0.1
1178	naphtalene	0.6	-	0.2	-
1183	para-cymen-8-ol	-	-	0.9	-

Table 2. Continued

1191	α-terpineol	-	0.7	-	t
1193	methyl chavicol	-	-	-	0.3
1214	trans-carveol	-	0.2	1.3	-
1239	carvone	-	0.1	-	-
1278	neo-iso-3-thujyl acetate	-	0.2	-	-
1340	α-cubebene	-	0.2	-	-
1354	α-longipinene	-	-	-	0.3
1359	clovene	-	-	-	0.1
1368	α-ylangene	0.4	-	0.4	0.4
1376	α-bourbonene	0.3	0.9	2.2	-
1377	α-copaene	-	1.1	-	0.2
1382	β-panasinsene	1.3	-	-	-
1383	β-elemene	-	0.6	0.8	-
1414	α-cis-bergamotene	-	1.8	-	-
1417	sesquithujene	-	-	0.3	0.1
1423	β-cedrene	-	0.3	-	
1425	**β-caryophyllene**	-	-	-	2**0.1**
1451	**α-humulene**	-	**4.3**	**6.0**	**39.5**
1452	α-neo-clovene	0.6	-		-
1454	allo-aromadendrene	-	-	0.3	-
1456	selina-4(15),7-diene	-	1.9	-	-
1467	sesquisabinene	1.4	-	-	-
1468	γ-gurjunene	-	-	1.1	-
1469	α-acoradiene	-	1.9	-	-
1472	9-epi-(E)-caryophyllene	-	0.2	-	0.1
1475	β-germacrene	-	-	-	0.1
1481	oxydo calamemene 1,11	-	-	0.3	-
1482	γ-himachalene	1.1	-	-	-
1483	β-selinene	-	-	0.6	0.4
1484	β-chamigrene	-	0.7	-	-
1490	α-muurolene	1.1	-	0.7	-
1494	**cis-β-guaïene**	-	**4.1**	-	-
1498	α-selinene	-	-	-	0.4
1500	germacrene A	-	-	-	0.1
1504	(E, E)-α-farnesene	-	-	-	0.1
1505	**γ-cadinene**	**2.1**	**6.0**	1.0	0.3
1508	α-farnesene	-	-	-	0.1
1513	trans-calamenene	0.6	-	1.2	
1517	**δ-cadinene**	-	**7.5**	1.7	0.1
1520	cis-calamenene	-	1.6	0.8	-
1524	cis-myrtanyle isobutyrate	0.7	-	-	1.8
1528	zonarene	-	0.6	-	-
1532	α-cadinene	-	1.1	-	-
1534	cis-nerolidol	-	-	-	0.1
1537	α-calacorene	-	0.6	1.6	-
1552	cis-dracunculifolol	-	-	-	0.3
1556	γ-calacorene	-	0.2	-	-
1560	germacrene B	1.8	-	-	-

Table 2. Continued

1563	ledol	-	0.4	2.9	-
1567	perillyle isobutyrate	0.9	-	-	-
1572	**spathulenol**	**3.6**	1.6	-	-
1576	**trans-sabinene hydrate**	-	-	**6.1**	-
1577	**caryophyllene oxide**	**5.5**	-	**7.0**	0.1
1580	globulol	-	-	-	3.6
1584	thujopsan-2-α-ol	-	2.6	-	1.8
1586	thujopsan-2-β-ol	-	-	-	0.4
1589	β-copaen-4-α-ol	1.2	0.7	-	-
1598	**viridiflorol**	**3.8**	-	**7.5**	-
1603	**humulene-1,2-epoxide**	**3.6**	**3.8**	**6.4**	**1.4**
1610	1,10-di-epi-cubenol	**-**	1.1	-	
1616	**citronellyle pentanoate**	**-**	-	-	**15.23**
1621	**syn-syn-syn-heliofen-12-al-D**	**2.2**	-	-	-
1625	1-epi-cubenol	**-**	1.7	2.0	-
1630	daucol	**-**	-	-	2.2
1631	**caryophylla-4(14),8(15)-dien-5-α-ol**	**-**	-	**3.1**	-
1636	caryophylla-4(14),8(15)-dien-5-β-ol	**-**	-	**-**	1.5
1638	**cubenol**	**5.3**	-	-	-
1640	**epi-α-cadinol**	**-**	**9.8**	-	-
1642	**epi-α-muurolol**	**5.7**	**6.2**	1.4	-
1644	selina-3,11-dien-6-α-ol	-	-	-	1.7
1646	**α-muurolol**	**3.1**	2.5	-	-
1650	**α-cadinol**	**12.7**	-	**3.4**	0.9
1654	selin-11-en-4-α-ol	2.2	-	-	0.6
1657	14-hydroxy-9-epi-(E)-caryophyllene	-	-	-	0.6
1662	neo-intermedeol	-	-	0.9	-
1665	**cis-calamenen-10-ol**	**7.1**	**14.0**	-	-
1668	trans-calamenen-10-ol	**-**	0.6	-	-
1672	daucalene	**-**	0.5	-	-
1677	**cadalene**	**-**	-	**3.2**	-
1679	**elemol acetate**	**-**	-	**-**	0.2
1682	**ischwarone**	**-**	-	**2.6**	-
1687	**2-nerolidol acetate**	**2.6**	-	-	0.4
1694	**β-sinensal**	**-**	**4.0**	-	-
1700	10-nor-calamenen-10-one	-	0.2	2.1	-
1705	(E)-aprotone	-	0.1	-	-
1707	(E)-3-butylidene phthalide	-	-	0.5	-
1723	cedr-8(15)-en-9-α-ol acetate	-	-	0.4	-
1761	benzyle benzoate	-	-	1.5	-
1802	nookatone	-	0.1	-	-
2094	methyle linoleate	-	-	-	0.2
	Total	**71.5**	**91.8**	**74.7**	**96.73**

t= trace (<0, 05 %)

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