

## GC/MS BATCH NUMBER: V30102

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**ESSENTIAL OIL:** VETIVER  
**BOTANICAL NAME:** VETIVERIA ZIZANOIDES  
**ORIGIN:** INDONESIA

KEY CONSTITUENTS PRESENT IN THIS BATCH OF VETIVER OIL	%
β-VETIVENENE	7.0
KHUSIMOL	6.9
ZIZANOIC ACID	4.3
γ-VETIVENENE	3.7
β-VETISPIRENE	3.6
NIGRITENE	2.4
β-VETIVENENE ISOMER I	2.4
α-AMORPHENE	2.2
EPIZIZANOIC ACID	2.1
β-VETIVONE	2.0
α-VETIVONE	2.0
PREZIZAENE	1.8
CYCLOCOPACAMPHA-12-OL (EPIMER A)	1.8
ZIZANOL	1.7
KHUSIOL	1.7
α-VETISPIRENE	1.6
δ-AMORPHENE	1.6
VETISELINENOL	1.4

$\beta$ -VETIVENENE ISOMER II	1.3
KHUSIMENE	1.3
6-epi-NIGRITENE	1.2
ISOVALENCENOL	1.2

Comments from Robert Tisserand: The deep, rich odor profile contains notes of leather, tobacco, raisins and malt. Four of five key constituents conform to the ISO standard for Indonesian Vetiver oil, with one marginal - not an issue.

**Date :** December 22, 2016

*SAMPLE IDENTIFICATION*

**Internal code :** 16L15-PTH19-1-DM

**Customer identification :** Vetiver - V3010267R

**Type :** Essential oil

**Source :** *Vetiveria zizanoides*

**Customer :** Plant Therapy

*ANALYSIS*

**Method :** PC-PA-001-15E06, "Analysis of the composition of a liquid essential oil by GC-FID" (in French).

Identifications double-checked by GC-MS

**Analyst :** Alexis St-Gelais, M. Sc., chimiste

**Analysis date :** 2016-12-19

Checked and approved by :

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Alexis St-Gelais, M. Sc., chimiste 2013-174

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IDENTIFIED COMPOUNDS

Identification	Column: BP5			Column: WAX			Molecular Class
	R.T.	R.I.	%	%	R.I.	R.T.	
Furfural	2.20	842	0.30	0.27	1372	5.35	Furane
5-Methylfurfural	4.26	979	0.03				Furane
Furfurylfuran	6.28	1091	0.02				Furane
o-Guaiacol	6.58	1104	0.03	0.05	1758	17.21	Simple phenolic
para-Vinylguaiacol	15.50	1326	0.12	0.08	2125	37.76	Phenylpropanoid
2-Norprezizene	15.67	1329	0.07				Norsesquiterpene
12-Norisoziza-5-ene	16.79	1346	0.87	0.92	1449	6.58	Norsesquiterpene
Unknown (m/z = 119, 147 (97), 91 (87), 105 (76), 161 (74), 134 (61), 175 (58), 190 (55))	17.40	1355	0.28				Norsesquiterpene
diepi- $\alpha$ -Cedrene	17.78	1361	0.13	0.16	1429	6.21	Sesquiterpene
6-epi-Nigritene	18.16	1367	1.23	1.24	1490	7.37	Norsesquiterpene
Nigritene	18.72	1376	2.42	2.94	1506	7.66*	Norsesquiterpene
2-epi- $\alpha$ -Cedrene	20.05	1396	0.38	[2.94]	1506	7.66*	Sesquiterpene
$\beta$ -Cedrene	20.65	1403	0.22	0.16	1532	8.24	Sesquiterpene
Aristolene	20.95	1407	0.43	0.26	1470	7.00	Sesquiterpene
Prezizaene	22.70	1428	1.77	1.94	1625	11.05	Sesquiterpene
Khusimene	23.04	1432	1.25	1.23	1650	12.14	Sesquiterpene
(E)-Isoeugenol	24.86	1454	0.38	0.37	2258	41.41	Phenylpropanoid
Unknown (m/z = 145, 159 (66), 202 (64), 187 (43), 91 (34), 128 (31))	25.15	1458	0.56				Sesquiterpene
$\alpha$ -Amorphene	25.76	1465	2.24	2.16	1620	10.88	Sesquiterpene
$\alpha$ -Vetispirene	26.18	1470	1.64	0.94	1637	11.53	Sesquiterpene
$\beta$ -Vetispirene	26.33*	1471	4.35	3.59	1655	12.35	Sesquiterpene
Unknown (m/z = 189, 161 (100), 204 (86), 91 (71), 105 (64), 108 (54), 133 (51), 119 (50))	26.33*	1471	[4.35]				Sesquiterpene
Eudesma-2,4(15),11-triene	26.84	1477	0.37	0.73	1640	11.67	Sesquiterpene
$\delta$ -Amorphene	27.75*	1488	1.99	1.57	1646	11.96	Sesquiterpene
4-epi-Cubebol	27.75*	1488	[1.99]	0.56	1809	20.24	Sesquiterp. alcohol
Nootkatene	28.55*	1498	1.84	0.33	1699	14.31	Sesquiterpene
Eremophila-1(10),7(11)-diene	28.55*	1498	[1.84]				Sesquiterpene
Spirovetiva-1(10),7(11)-diene	28.55*	1498	[1.84]				Sesquiterpene
$\delta$ -Cadinene	29.29	1508	0.25	0.46	1680	13.46	Sesquiterpene
$\gamma$ -Vetivenene	30.22	1521	3.68	3.23	1732	15.72	Sesquiterpene
$\alpha$ -Calacorene	30.69	1527	0.34	0.40	1803	19.86	Sesquiterpene

$\beta$ -Vetivenene	31.82	1543	7.04	6.35	1751	16.89	Sesquiterpene
$\beta$ -Vetivenene isomer I	32.86	1557	2.41	1.99	1785	18.79	Sesquiterpene
Unknown (m/z = 202, 187 (75), 145 (56), 159 (41), 131 (48), 91 (38))	33.66	1568	0.44				Sesquiterpene
$\beta$ -Vetivenene isomer II	34.00	1573	1.26	1.13	1798	19.57	Sesquiterpene
Khusimone	34.35	1578	0.64	0.52	2091	36.62	Norsesquiterp. ketone
Unknown (m/z = 187, 202 (69), 145 (28), 131 (23), 91 (20), 105 (20))	35.80	1600	1.76				Sesquiterpene
Cyclocopacampha-12-ol (epimer A)	37.92	1651	1.76				Sesquiterp. alcohol
epi-Zizanone	38.02*	1654	1.16				Sesquiterp. ketone
Cyclocopacampha-12-ol (epimer B)	38.02*	1654	[1.16]				Sesquiterp. alcohol
Zizanol	38.19	1658	1.72				Sesquiterp. alcohol
Zizanal	38.33	1661	0.96				Sesquiterp. aldehyde
Khusiol	38.93	1675	1.69				Sesquiterp. alcohol
Unknown (m/z = 189, 91 (48), 105 (48), 95 (39), 147 (31)... 218 (20))	39.18	1681	1.35				Oxygenated sesquiterp.
Unknown (m/z = 189, 159 (93), 133 (38), 205 (27), 131 (27), 91 (26), 105 (22), 220 (20))	40.21	1709	2.36				Oxygenated sesquiterp.
Vetiselinenol	40.58	1721	1.41	1.77	2282	41.96	Sesquiterp. alcohol
Khusimol	41.41	1747	6.94	6.40	2358	43.65	Sesquiterp. alcohol
Isovalencenol	42.56	1783	1.22	1.27	2401	44.54	Sesquiterp. alcohol
(E)-Isovalencenal	43.08	1801	0.74				Sesquiterp. aldehyde
$\beta$ -Vetivone	43.31	1809	2.04	2.15	2336	43.15	Sesquiterp. ketone
(Z)-Isovalencenal	43.55	1818	0.72				Sesquiterp. aldehyde
$\alpha$ -Vetivone	43.83	1828	2.02	2.08	2364	43.80	Sesquiterp. ketone
Epizizanoic acid	43.97	1833	2.12	2.28	2795	51.76	Sesquiterp. acid
Zizanoic acid	44.63	1857	4.26	5.07	2868	52.98	Sesquiterp. acid
<b>Total identified</b>			<b>66.46%</b>	<b>54.60%</b>			

\*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, not taken account in the identified total

Note: no correction factor was applied

*OTHER DATA*

**Physical aspect :** Brownish orange liquid

**Refractive index :**  $1.5225 \pm 0.0003$  (20 °C)

*CONCLUSION*

No adulterant, contaminant or diluent were detected using this method.



