PLANT THERAPY
100% PURE ESSENTIAL OILS

GC/MS BATCH NUMBER: V30106

ESSENTIAL OIL: VETIVER
BOTANICAL NAME: VETIVERIA ZIZANIOIDES
ORIGIN: HAITI

KEY CONSTITUENTS PRESENT IN THIS BATCH OF VETIVER OIL	%
KHUSIMOL	11.2
(E)-ISOVALENCENOL	9.2
β-VETIVENENE	4.1
VETISELINENOL	3.5
α-VETIVONE	2.8
β-VETIVONE	2.1
KHUSIOL	2.1
CYCLOCOPACAMPHAN-12-OL, EPIMER B	1.8
β-VETISPIRENE	1.8
α-AMORPHENE	1.7
CYCLOCOPACAMPHAN-12-OL, EPIMER A	1.6
ZIZANOL	1.3
ZIZANOIC ACID	1.1
δ-AMORPHENE	1.1
(Z)-ISOVALENCENAL	1.0

Date : July 05, 2018

Certificate of Analysis – GC Profiling

Sample identification

Internal code : 18G04-PTH5-1-CC
Customer identification : Vetiver - Haiti - V3010685R
Type : Essential oil
Source : *Vetiveria zizanioides* ct. Haiti
Customer : Plant Therapy

Analysis

Method: PC-PA-014-17J19 - Analysis of the composition of an essential oil, or other volatile liquid, by FAST GC-FID (in French); identifications validated by GC-MS.
Analyst : Sylvain Mercier, M. Sc., Chimiste
Analysis date : July 04, 2018

Checked and approved by :

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

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PHYSICOCHEMICAL DATA

Physical aspect: Light orange viscous liquid
Refractive index: 1.5243 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent has been detected using this method.

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ANALYSIS SUMMARY

Identification	DB-5 (%)	DB-WAX (%)	Classe
α-Pinene	0.01	0.01	Monoterpene
Limonene	0.01	0.01	Monoterpene
Coumaran	0.03	0.90	Simple phenolic
4-Vinylguaiacol	0.03	0.10	Simple phenolic
α-Cubebene	0.02	0.02	Sesquiterpene
12-Norisoziza-5-ene	0.14*	0.05	Norsesquiterpene
Cyclosativene I	[0.14]*	0.06	Sesquiterpene
Unknown	[0.14]*		Norsesquiterpene
α-Ylangene	0.13	0.12	Sesquiterpene
2-Norzizaene?	0.05		Norsesquiterpene
6-epi-Nigritene	0.06	0.07	Norsesquiterpene
Nigritene	0.05	0.08	Norsesquiterpene
β-Elemene	0.05	0.10	Sesquiterpene
Cyperene	0.02	0.01	Sesquiterpene
Acora-3,7(14)-diene	0.12	0.14	Sesquiterpene
β-Funebrene	0.02	0.01	Sesquiterpene
Aristolene	0.19	0.19	Sesquiterpene
β-Caryophyllene	0.05	0.03	Sesquiterpene
β-Copaene	0.08	0.14	Sesquiterpene
6,9-Guaiadiene	0.48*	0.13	Sesquiterpene
Prezizaene	[0.48]*	0.34	Sesquiterpene
Khusimene	0.46	0.44	Sesquiterpene
Unknown	0.34	0.36	Sesquiterpene
Unknown	0.17		Sesquiterpene
Unknown	0.31		Sesquiterpene
Unknown	0.38		Sesquiterpene
α-Amorphene	1.73	2.12*	Sesquiterpene
α-Vetispirene	0.55	1.18*	Sesquiterpene
β-Vetispirene	1.79	1.69	Sesquiterpene
γ-Amorphene	0.60	0.64	Sesquiterpene
δ-Selinene	0.58	[2.12]*	Sesquiterpene
δ-Amorphene	1.08	1.08	Sesquiterpene
Nootkatene	0.35	0.29	Sesquiterpene
γ-Cadinene	0.11	0.19	Sesquiterpene
Spirovetiva-1(10),7(11)-diene	0.95	[1.18]*	Sesquiterpene
δ-Cadinene	0.52	0.25	Sesquiterpene
γ-Vetivenene	0.35	0.40	Sesquiterpene
(6S,10R)-Dimethylbicyclo[4.4.0]decan-1-en-3-one?	0.17		Terpenic ketone
α-Calacorene	0.37	1.14*	Sesquiterpene
β-Vetivenene	4.55*	4.13	Sesquiterpene
α-Elemol	[4.55]*	0.56	Sesquiterpenic alcohol
Eudesma-5,7(11)-diene	1.35*	0.18	Sesquiterpene
cis-Eudesm-6-en-11-ol	[1.35]*		Sesquiterpenic alcohol
Unknown	0.56		Oxygenated sesquiterpene
Unknown	0.84		Oxygenated sesquiterpene
Unknown	1.11	[1.14]*	Sesquiterpene
Unknown	0.36	0.28	Oxygenated sesquiterpene

Khusimone?	0.76		Norsesquiterpenic ketone
Unknown	3.62*	0.82	Sesquiterpene
Selin-6-en-4α-ol?	[3.62]*	1.80	Sesquiterpenic alcohol
Unknown	[3.62]*	0.59	Oxygenated sesquiterpene
Unknown	1.21		Unknown
Unknown	1.28		Unknown
Unknown	1.15	1.96	Sesquiterpenic alcohol
Cyclocopacamphan-12-ol, epimer A	4.47*	1.60	Sesquiterpenic alcohol
Unknown	[4.47]*		Oxygenated sesquiterpene
Cyclocopacamphan-12-ol, epimer B	1.83	1.95	Sesquiterpenic alcohol
Zizanol	1.27	1.26	Sesquiterpenic alcohol
Khusiol	2.52*	2.09	Sesquiterpenic alcohol
epi-Zizanone	[2.52]*	0.25	Sesquiterpenic ketone
Zizanal?	0.79	1.23*	Sesquiterpenic aldehyde
Unknown	0.50		Oxygenated sesquiterpene
Vetiselinenol	3.49	3.44	Sesquiterpenic alcohol
α-Vetivol?	0.84	2.52*	Sesquiterpenic alcohol
Unknown	0.28		Oxygenated sesquiterpene
Unknown	14.18*		Oxygenated sesquiterpene
Khusimol	[14.18]*	11.16*	Sesquiterpenic alcohol
10-epi-Acora-3,11-dien-15-al?	0.78		Sesquiterpenic aldehyde
Unknown	0.19		Oxygenated sesquiterpene
β-Costol	0.58	0.60	Sesquiterpenic alcohol
(*E*)-Isovalencenol	9.22	9.32	Sesquiterpenic alcohol
Unknown	1.52	1.62	Oxygenated sesquiterpene
Nootkatone	1.09*	[11.16]*	Sesquiterpenic ketone
Unknown	[1.09]*		Oxygenated sesquiterpene
(*Z*)-Isovalencenal	1.04	0.54	Sesquiterpenic aldehyde
β-Vetivone	3.18	[2.52]*	Sesquiterpenic ketone
Zizanoic acid	[3.18]	1.09	Sesquiterpenic acid
(*E*)-Isovalencenal	0.85	[1.23]*	Sesquiterpenic aldehyde
α-Vetivone	2.79	2.88	Sesquiterpenic ketone
β-Cyclodihydrocostunolide?	0.07		Sesquiterpenic lactone
Total identified	**70.38%**	**58.52%**	

*: 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

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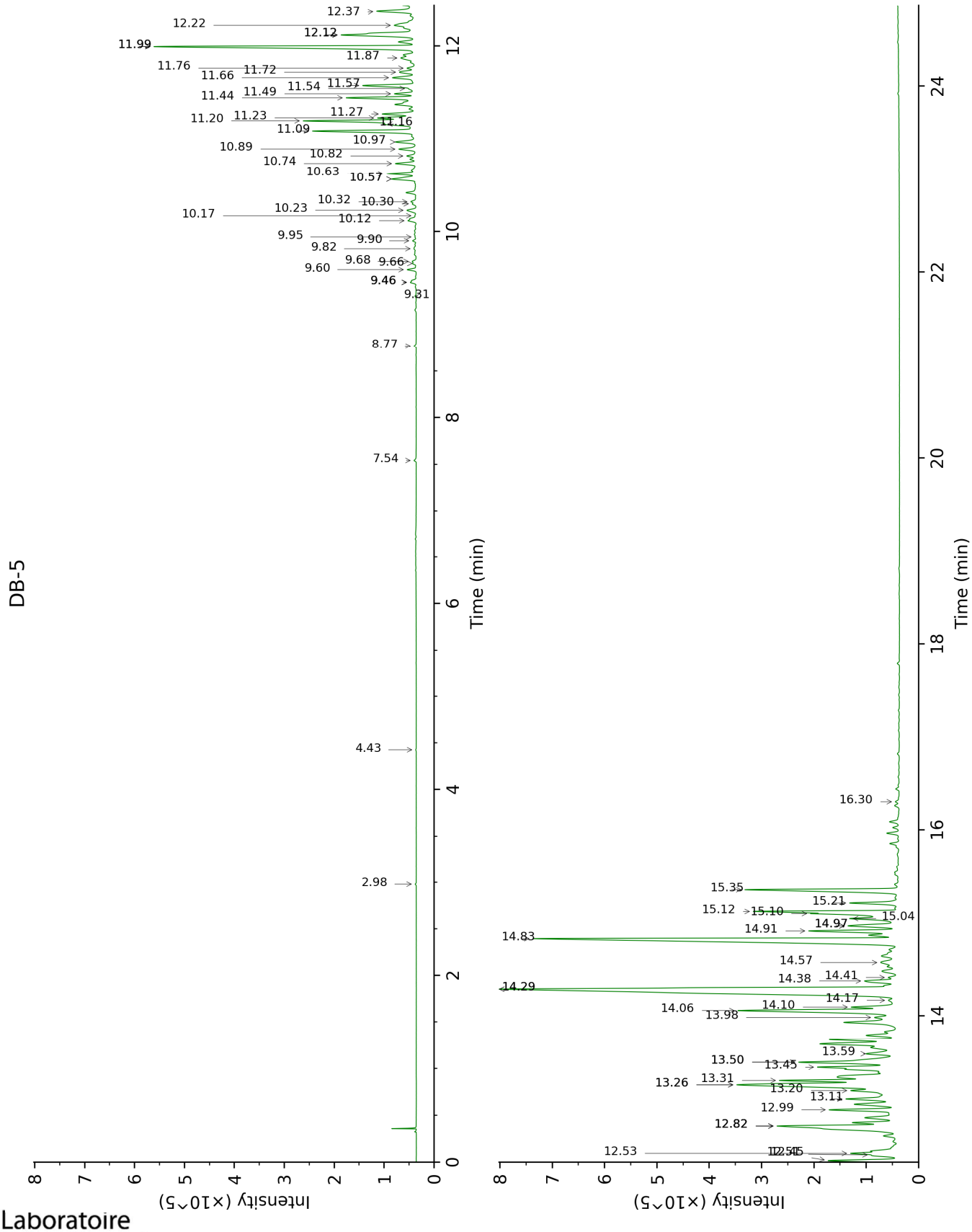
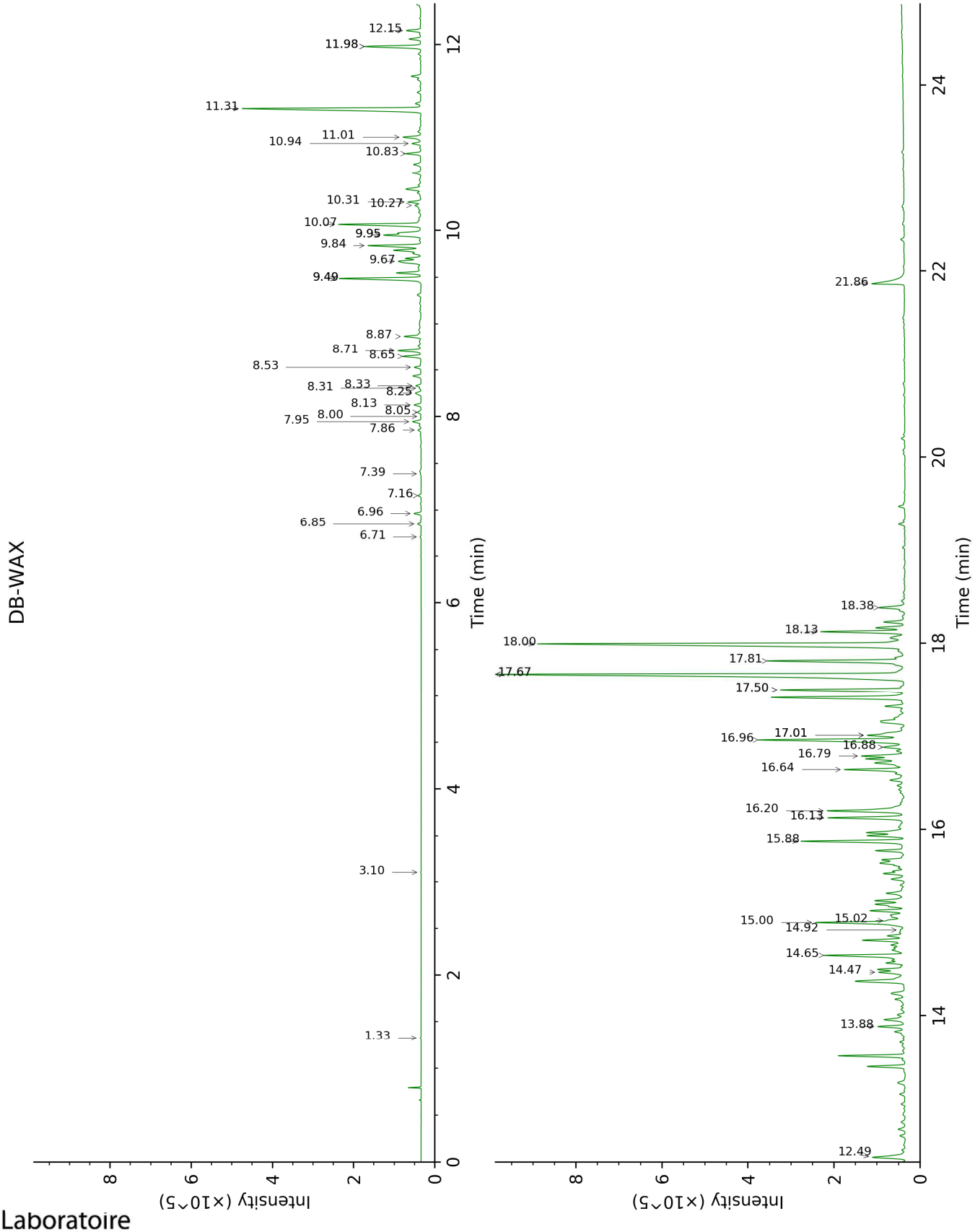

DB-5
12.37
12.22
12.12
11.99
11.87
11.76
11.72
11.66
11.57
11.54
11.49
11.44
11.27
11.23
11.20
11.16
11.09
10.97
10.89
10.82
10.74
10.63
10.57
10.32
10.30
10.23
10.17
10.12
9.95
9.90
9.82
9.68
9.66
9.60
9.46
9.31
8.77
7.54
4.43
2.98
Intensity (×10^5)
Time (min)
16.30
15.35
15.21
15.12
15.10
15.04
14.97
14.91
14.83
14.57
14.41
14.38
14.29
14.17
14.10
14.06
13.98
13.59
13.50
13.45
13.31
13.26
13.20
13.11
12.99
12.82
12.53
12.45
Intensity (×10^5)
Time (min)


DB-WAX
Intensity (×10^5)
Time (min)
12.15
11.98
11.31
11.01
10.94
10.83
10.31
10.27
10.07
9.95
9.84
9.67
9.49
8.87
8.71
8.65
8.53
8.33
8.31
8.25
8.13
8.05
8.00
7.95
7.86
7.39
7.16
6.96
6.85
6.71
3.10
1.33
21.86
18.38
18.13
18.00
17.81
17.67
17.50
17.01
16.96
16.88
16.79
16.64
16.20
16.13
15.88
15.02
15.00
14.92
14.65
14.47
13.88
12.49

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
α-Pinene	2.98	928	0.01	1.33	994	0.01
Limonene	4.43	1024	0.01	3.10	1161	0.01
Coumaran	7.54	1224	0.03	16.79	2326	0.90
4-Vinylguaiacol	8.77	1307	0.03	14.92	2132	0.10
α-Cubebene	9.31	1345	0.02	6.71	1426	0.02
12-Norisoziza-5-ene	9.46*	1356	0.14	7.16	1460	0.05
Cyclosativene I	9.46*	1356	[0.14]	6.85	1437	0.06
Unknown [m/z 145, 188 (95), 117 (91), 173 (80), 91 (65), 131 (64)]	9.46*	1356	[0.14]			
α-Ylangene	9.60	1365	0.13	6.96	1446	0.12
2-Norzizaene?	9.66	1370	0.05			
6-epi-Nigritene	9.68	1372	0.06	7.86	1513	0.07
Nigritene	9.82	1381	0.05	8.05	1528	0.08
β-Elemene	9.90	1387	0.05	8.33	1550	0.10
Cyperene	9.94	1390	0.02	7.39	1477	0.01
Acora-3,7(14)-diene	10.12	1402	0.12	8.13	1534	0.14
β-Funebrene	10.17	1406	0.02	8.00	1524	0.01
Aristolene	10.23	1411	0.19	7.95	1520	0.19
β-Caryophyllene	10.30	1416	0.05	8.31	1548	0.03
β-Copaene	10.32	1418	0.08	8.25	1544	0.14
6,9-Guaiadiene	10.57*	1436	0.48	8.53	1565	0.13
Prezizaene	10.57*	1436	[0.48]	8.65	1574	0.34
Khusimene	10.63	1440	0.46	8.71	1579	0.44
Unknown [m/z 105, 161 (78), 93 (70), 133 (67), 91 (66), 204 (63), 119 (41)]	10.74	1449	0.34	8.87	1592	0.36
Unknown [m/z 119, 190 (99), 175 (95), 105 (71), 91 (59), 120 (57)... 204 (2)]	10.82	1455	0.17			
Unknown [m/z 119, 120 (31), 83 (23), 105 (22), 91 (21), 81 (18)... 202 (9)]	10.89	1460	0.31			
Unknown [m/z 145, 202 (85), 159 (64), 187 (39), 131 (35), 117 (34)]	10.97	1466	0.38			
α-Amorphene	11.09	1475	1.73	9.49*†	1642	2.12
α-Vetispirene	11.16	1480	0.55	9.95*†	1680	1.18
β-Vetispirene	11.20	1483	1.79	10.07	1689	1.69
γ-Amorphene	11.23	1485	0.60	9.67	1657	0.64
δ-Selinene	11.27	1488	0.58	9.49*†	1642	[2.12]
δ-Amorphene	11.44	1501	1.08	9.84	1671	1.08
Nootkatene	11.49	1505	0.35	10.83	1754	0.29
γ-Cadinene	11.54	1509	0.11	10.27	1706	0.19
Spirovetiva-1(10),7(11)-diene	11.58	1512	0.95	9.95*†	1680	[1.18]
δ-Cadinene	11.66	1518	0.52	10.31	1709	0.25
γ-Vetivenene	11.72	1523	0.35	11.01	1769	0.40
(6S,10R)-	11.76	1526	0.17			

Dimethylbicyclo[4.4.0]decan-1-en-3-one?						
α-Calacorene	11.87	1535	0.37	11.98*	1854	1.14
β-Vetivenene	11.99*	1545	4.55	11.31	1795	4.13
α-Elemol	11.99*	1545	[4.55]	13.88	2030	0.56
Eudesma-5,7(11)-diene	12.12*	1554	1.35	10.94	1763	0.18
cis-Eudesm-6-en-11-ol	12.12*	1554	[1.35]			
Unknown [m/z 81, 200 (55), 143 (36), 93 (33), 91 (32), 185 (31), 129 (27), 128 (21)...]	12.22	1562	0.56			
Unknown [m/z 59, 43 (56), 205 (47), 91 (41), 220 (32), 105 (30), 147 (21)]	12.37	1574	0.84			
Unknown [m/z 202, 187 (63), 145 (43), 159 (34), 131 (29), 91 (22), 117 (20)]	12.45	1581	1.11	11.98*	1854	[1.14]
Unknown [m/z 161, 119 (78), 105 (75), 120 (72), 43 (64)... 218 (4)]	12.51	1586	0.36	12.15	1869	0.28
Khusimone?	12.53	1587	0.76			
Unknown [m/z 187, 202 (86), 145 (25), 131 (19), 105 (16), 188 (15)]	12.82*	1610	3.62	12.49	1899	0.82
Selin-6-en-4α-ol?	12.82*	1610	[3.62]	14.65	2104	1.80
Unknown [m/z 179, 161 (66), 119 (44), 95 (38), 105 (35)... 204 (24), 222 (1)]	12.82*	1610	[3.62]	14.47	2087	0.59
Unknown [m/z 145, 59 (97), 161 (87), 218 (76), 43 (76), 179 (63)...]	12.99	1624	1.21			
Unknown [m/z 43, 91 (87), 71 (83), 93 (77), 95 (75), 135 (74)...]	13.11	1634	1.28			
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109)40)... 204 (35), 222 (2)]	13.20	1641	1.15	15.00	2140	1.96
Cyclocopacamphan-12-ol, epimer A	13.26*	1646	4.47	16.13	2256	1.60
Unknown [m/z 161, 59 (67), 95 (45), 93 (40), 105 (40), 149 (39), 81 (39), 43 (38), 204 (37)... 220 (5)]	13.26*	1646	[4.47]			
Cyclocopacamphan-12-ol, epimer B	13.31	1650	1.83	16.20	2264	1.95
Zizanol	13.45	1662	1.27	16.64	2310	1.26
Khusiol	13.50*	1666	2.52	15.88	2229	2.09
epi-Zizanone	13.50*	1666	[2.52]	15.02	2142	0.25
Zizanal?	13.59	1674	0.79	17.01*†	2350	1.23
Unknown [m/z 204, 189 (99), 43 (83), 161 (75), 105 (55), 91 (44), 119 (33)... 220 (13)]	13.98	1707	0.50			

Vetiselinenol	14.06	1713	3.49	16.96	2345	3.44
α-Vetivol?	14.10	1716	0.84	17.50*	2404	2.52
Unknown [m/z 136, 121 (98), 137 (90), 119 (68), 107 (55), 135 (55)... 202 (30), 220 (27)]	14.17	1723	0.28			
Unknown [m/z 189, 187 (29), 159 (23), 43 (20), 133 (16)...]	14.29*†	1733	14.18			
Khusimol	14.29*†	1733	[14.18]	17.67*	2422	11.16
10-epi-Acora-3,11-dien-15-al?	14.38	1741	0.78			
Unknown [m/z 91, 105 (89), 79 (84), 93 (77), 107 (67), 189 (64), 145 (62), 119 (61)... 220 (16)...]	14.41	1744	0.19			
β-Costol	14.57	1758	0.58	18.38	2503	0.60
(*E*)-Isovalencenol	14.83	1780	9.22	18.00	2460	9.32
Unknown [m/z 120, 121 (93), 93 (85), 105 (74), 119 (68), 91 (58), 123 (49)... 220 (8)]	14.91	1788	1.52	18.13	2474	1.62
Nootkatone	14.97*	1792	1.09	17.67*	2422	[11.16]
Unknown [m/z 202, 187 (91), 93 (70), 91 (69), 105 (67)...]	14.97*	1792	[1.09]			
(*Z*)-Isovalencenal	15.04	1799	1.04	16.88	2336	0.54
β-Vetivone	15.10†	1804	3.18	17.50*	2404	[2.52]
Zizanoic acid	15.12†	1806	[3.18]	21.86	2932	1.09
(*E*)-Isovalencenal	15.21	1814	0.85	17.01*†	2350	[1.23]
α-Vetivone	15.35	1827	2.79	17.81	2439	2.88
β-Cyclodihydrocostunolide?	16.30	1914	0.07			
Total identified		**70.38%**			**58.52%**	
Total reported		**80.59%**			**64.15%**	

*: Two or more compounds are coeluting on this column
[xx]: Duplicate percentage due to coelutions, not taken account in the identified total
†: Peaks apexes were resolved, but peaks overlapped and were summed for analysis

Note: no correction factor was applied
R.T.: Retention time (minutes)
R.I.: Retention index