

Date : August 10, 2020

CERTIFICATE OF ANALYSIS – GC PROFILING

SAMPLE IDENTIFICATION

**Internal code** : 20G27-PSC02

**Customer identification** : Patchouli - Rwanda - G001092019GHR

**Type** : Essential oil

**Source** : *Pogostemon cablin*

**Customer** : Pacha Soap Co.

ANALYSIS

**Method**: PC-MAT-014  - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS.

**Analyst** : Fanny Charlier, B. Sc., chimiste à l'entraînement

**Analysis date** : July 29, 2020

Checked and approved by :

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

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#### PHYSICOCHEMICAL DATA

**Physical aspect:** Light yellow liquid

**Refractive index:** 1.5076 ± 0.0003 (20 °C; method PC-MAT-016)

**Optical rotation:** -43.2° (c = 2.2, methanol, 25 °C)

#### ISO 3757:2004 - OIL OF PATCHOULI

Compound	Min. %	Max. %	Observed %	Complies?
Pogostol	1.0	2.5	1.8	Yes
Patchoulol	27	35	26	No
Norpatchoulénol	0.35	1.00	1.31	No
δ-Guaiène	13	21	19	Yes
β-Caryophyllène	2	5	4	Yes
α-Guaiène	11	16	15	Yes
α-Copaène	tr	1.00	0.02	Yes
β-Patchoulène	1.8	3.5	1.9	Yes
<b>Optical rotation</b>	-60.0°	-40.0°	-43.2°	Yes
<b>Refractive index</b>	1.5050	1.5150	1.5076	Yes

#### CONCLUSION

No adulterant, contaminant or diluent has been detected using this method. The oil marginally does not comply with the ISO standard for patchouli oil.

## ANALYSIS SUMMARY – CONSOLIDATED CONTENTS

New readers of similar reports are encouraged to read table footnotes at least once.

Identification	%	Class
Ethanol	0.01	Aliphatic alcohol
2-Butanone	tr	Aliphatic ketone
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	0.01	Aliphatic aldehyde
$\alpha$ -Pinene	0.10	Monoterpene
$\beta$ -Pinene	0.26	Monoterpene
Sabinene	tr	Monoterpene
Octen-3-ol	0.01	Aliphatic alcohol
Octan-3-one	0.01	Aliphatic ketone
Myrcene	0.01	Monoterpene
Octan-3-ol	0.01	Aliphatic alcohol
para-Cymene	0.01	Monoterpene
Limonene	0.04	Monoterpene
Terpinolene	0.01	Monoterpene
Linalool	0.01	Monoterpenic alcohol
$\alpha$ -Terpineol	0.01	Monoterpenic alcohol
$\delta$ -Elemene	0.14	Sesquiterpene
Unknown	0.01	Sesquiterpene
$\alpha$ -Copaene	0.02	Sesquiterpene
$\beta$ -Patchoulene	1.89	Sesquiterpene
$\beta$ -Bourbonene	0.06	Sesquiterpene
<i>cis</i> - $\beta$ -Elemene	0.04	Sesquiterpene
$\beta$ -Elemene	0.74	Sesquiterpene
Cycloseychellene	0.65	Sesquiterpene
$\beta$ -Caryophyllene	3.94	Sesquiterpene
Seychellene	6.24	Sesquiterpene
$\alpha$ -Guaiene	14.60	Sesquiterpene
Unknown	0.05	Sesquiterpene
$\alpha$ -Humulene	0.14	Sesquiterpene
$\alpha$ -Patchoulene	5.05	Sesquiterpene
Patchoulene analog I	1.38	Sesquiterpene
$\gamma$ -Patchoulene	1.04	Sesquiterpene
9- <i>epi</i> - $\beta$ -Caryophyllene	0.02	Sesquiterpene
Unknown	0.44	Sesquiterpene
Selina-4,11-diene	0.08	Sesquiterpene
Unknown	0.49	Sesquiterpene
$\beta$ -Selinene	0.19	Sesquiterpene
Patchoulene analog II	0.22	Sesquiterpene
Unknown	0.31	Sesquiterpene
$\delta$ -Selinene	0.14	Sesquiterpene
Unknown	0.07	Sesquiterpene
$\alpha$ -Selinene	0.08	Sesquiterpene
Aciphyllene	3.09	Sesquiterpene
Eudesma-2,4(15),11-triene	0.06	Sesquiterpene
$\delta$ -Guaiene	18.51	Sesquiterpene

Nootkatene	0.01	Sesquiterpene
7-epi- $\alpha$ -Selinene	0.09	Sesquiterpene
$\gamma$ -Cadinene	0.84	Sesquiterpene
Unknown	0.10	Sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
Unknown	0.01	Sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Norpatchoulol	1.31	Norsesquiterpenic alcohol
Isocaryophyllene epoxide B	0.04	Sesquiterpenic ether
$\alpha$ -Elemol	0.06	Sesquiterpenic alcohol
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.05	Oxygenated sesquiterpene
Unknown	0.21	Oxygenated sesquiterpene
Caryophyllene oxide	0.26	Sesquiterpenic ether
Caryophyllene oxide isomer	0.11	Sesquiterpenic ether
Unknown	0.05	Oxygenated sesquiterpene
Unknown	0.33	Oxygenated sesquiterpene
Unknown	0.28	Oxygenated sesquiterpene
Hexadecane	0.08	Alkane
Humulene epoxide II	0.04	Sesquiterpenic ether
Unknown	0.10	Oxygenated sesquiterpene
Unknown	0.21	Oxygenated sesquiterpene
Unknown	0.25	Oxygenated sesquiterpene
Unknown	0.56	Oxygenated sesquiterpene
Hinesol	0.31	Sesquiterpenic alcohol
Patchoulol	25.67	Sesquiterpenic alcohol
Pogostol	1.80	Sesquiterpenic alcohol
Unknown	0.07	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.05	Unknown
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Rotundone	0.05	Sesquiterpenic ketone
Unknown	0.21	Oxygenated sesquiterpene
Pogostone	1.71	Terpenic lactone
Unknown	0.16	Oxygenated sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.04	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.08	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.03	Oxygenated sesquiterpene
Unknown	0.01	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Corymbolone	0.02	Sesquiterpenic alcohol

Phytol	0.05	Diterpenic alcohol
Unknown	0.06	Oxygenated sesquiterpene
Unknown	0.02	Oxygenated sesquiterpene
Unknown	0.06	Oxygenated sesquiterpene
<b>Consolidated total</b>	<b>96.04%</b>	

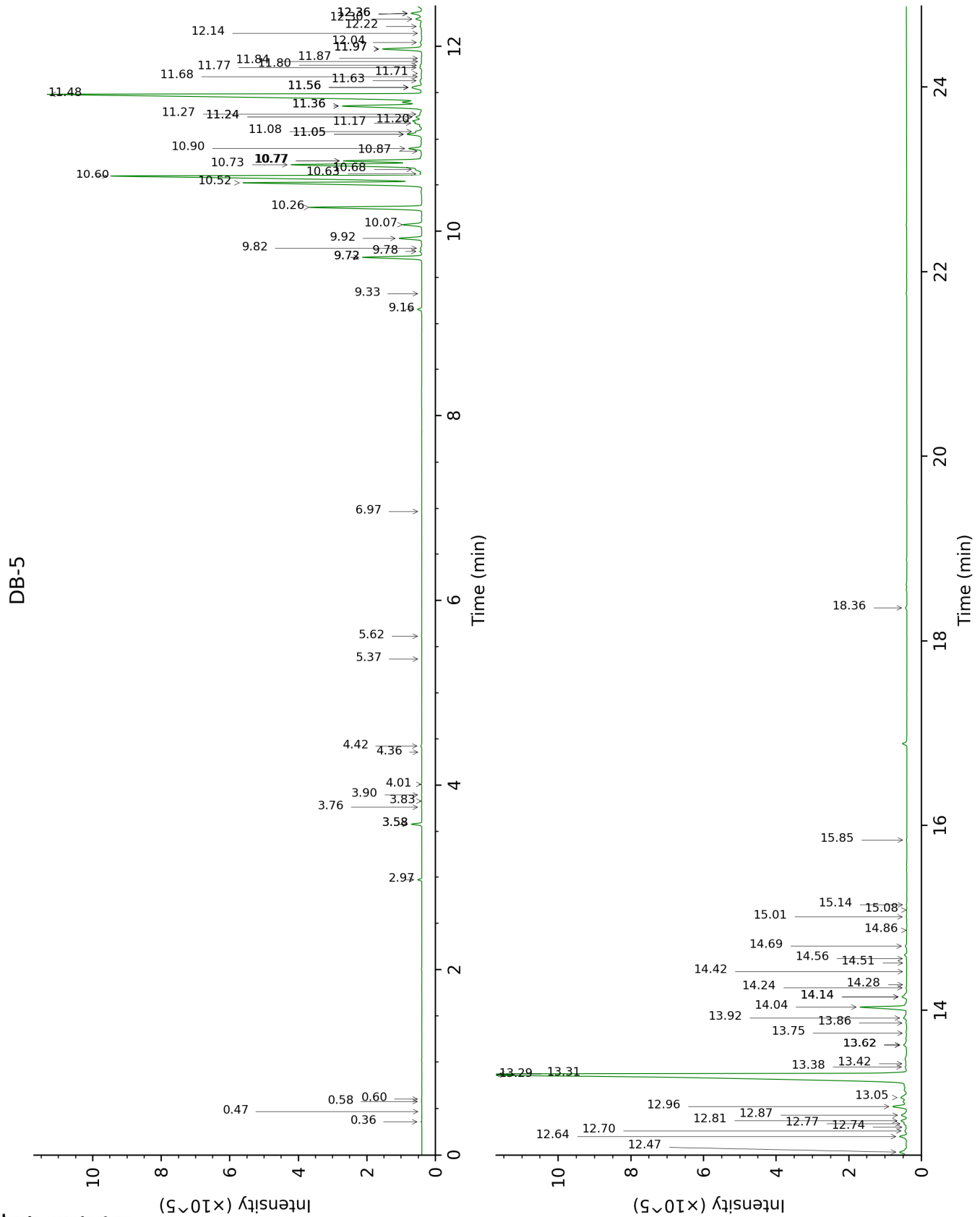
tr: The compound has been detected below 0.005% of total signal.

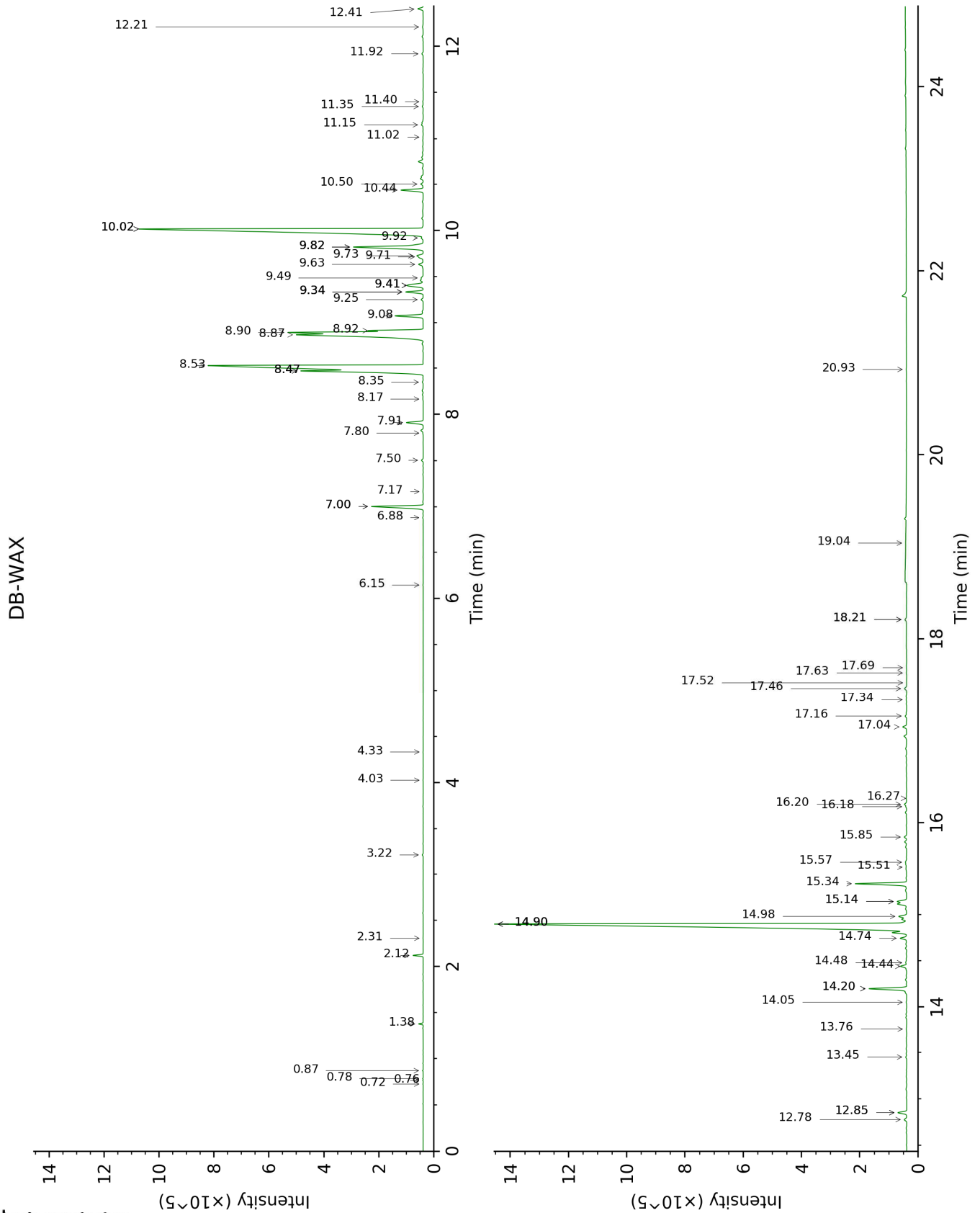
Note: no correction factor was applied

**About "consolidated" data:** The table above presents the breakdown of the sample volatile constituents after applying an algorithm to collapse data acquired from the multi-columns system of PhytoChemia into a single set of consolidated contents. In case of discrepancies between columns, the algorithm is set to prioritize data from the most standard DB-5 column, and smallest values so as to avoid overestimating individual content. This process is semi-automatic. Advanced users are invited to consult the "Full analysis data" table after the chromatograms in this report to access the full untreated data and perform their own calculations if needed.

**Unknowns:** Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

This page was intentionally left blank. The following pages present the complete data of the analysis.







FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
Ethanol	0.36	508	0.01	0.87	904	0.01
2-Butanone	0.47	592	tr	0.72	866	tr
Isovaleral	0.58	642	0.01	0.78	887	0.01
2-Methylbutyral	0.60	653	0.01	0.76	880	tr
α-Pinene	2.97	930	0.10	1.38	989	0.10
β-Pinene	3.58*	970	0.27	2.12	1065	0.26
Sabinene	3.58*	970	[0.27]	2.31	1083	tr
Octen-3-ol	3.76	982	0.01	6.88	1422	0.02
Octan-3-one	3.83	987	0.01	4.03	1217	0.01
Myrcene	3.90	991	0.01			
Octan-3-ol	4.01	999	0.01	6.15	1369	0.01
para-Cymene	4.36	1021	0.01			
Limonene	4.42	1026	0.04	3.22	1156	0.03
Terpinolene	5.37	1086	0.01	4.33	1239	0.01
Linalool	5.62	1101	0.01	8.17	1519	0.02
α-Terpineol	6.97	1189	0.01	9.82*	1649	3.32
δ-Elemene	9.16	1335	0.14	7.00*	1431	2.05
Unknown [m/z 145, 91 (67), 105 (57), 131 (56), 119 (52), 159 (49), 202 (45)]	9.33	1347	0.01	7.80	1491	0.01
α-Copaene	9.72*	1374	1.91	7.17	1443	0.02
β-Patchoulene	9.72*	1374	[1.91]	7.00*	1431	[2.05]
β-Bourbonene	9.78	1379	0.06	7.50	1468	0.06
cis-β-Elemene	9.82	1381	0.04	8.35	1533	0.03
β-Elemene	9.92	1389	0.74	8.47*†	1543	19.28
Cycloseychellene	10.07	1399	0.65	7.91	1500	0.63
β-Caryophyllene	10.26	1413	3.94	8.47*†	1543	[19.28]
Seychellene	10.52†	1433	21.25	8.87†	1573	11.70
α-Guaiene	10.60†	1438	[21.25]	8.53†	1547	[19.28]
Unknown [m/z 91, 93 (98), 79 (82), 81 (82), 105 (71), 107 (70)... 204 (38)]	10.63	1440	0.05	9.34*	1610	0.63
α-Humulene	10.68†	1444	5.59	9.34*	1610	[0.63]
α-Patchoulene	10.73†	1448	[5.59]	8.90†	1575	[11.70]
Patchoulene analog I	10.77*	1451	2.61	8.92	1577	1.38
γ-Patchoulene	10.77*	1451	[2.61]	9.08	1589	1.04
9-epi-β- Caryophyllene	10.87	1459	0.02	9.41*	1615	0.89
Unknown [m/z 159, 91 (88), 93 (72), 79 (69), 105 (68), 41 (66), 81 (54), 202? (50)...]	10.90	1461	0.44	9.34*	1610	[0.63]

Selina-4,11-diene	11.05*	1472	0.57	9.49	1622	0.08
Unknown [m/z 147, 93 (87), 107 (77), 105 (77), 91 (73), 79 (63)... 204 (21)]	11.05*	1472	[0.57]	9.41*	1615	[0.89]
β-Selinene	11.08	1474	0.19	10.02*	1664	19.42
Patchoulene analog II	11.17	1481	0.22	9.82*	1649	[3.32]
Unknown [m/z 79, 107 (99), 91 (88), 93 (86), 81 (78), 105 (73), 41 (73)... 204? (12)]	11.20	1483	0.31	9.73	1641	0.23
δ-Selinene	11.24*	1486	0.25	9.72	1640	0.14
Unknown [m/z 161, 189 (96), 91 (74), 204 (73), 105 (69), 41 (52)]	11.24*	1486	[0.25]	9.92	1656	0.07
α-Selinene	11.27	1488	0.08	10.02*	1664	[19.42]
Aciphyllene	11.36*†	1495	3.92	9.82*	1649	[3.32]
Eudesma-2,4(15),11-triene	11.36*†	1495	[3.92]	11.15	1758	0.06
δ-Guaiene	11.48†	1504	19.46	10.02*	1664	[19.42]
Nootkatene	11.56*†	1510	[19.46]	11.02	1747	0.01
7-epi-α-Selinene	11.56*†	1510	[19.46]	10.50	1704	0.09
γ-Cadinene	11.56*†	1510	[19.46]	10.44	1698	0.84
Unknown [m/z 159, 91 (81), 117 (68), 131 (51), 105 (46)... 202 (37)]	11.63	1516	0.10	9.63	1634	0.20
Unknown [m/z 41, 67 (95), 93 (92), 107 (91), 55 (77), 81 (77), 79 (73)... 205 (17)...]	11.68	1519	0.02	11.40	1779	0.02
Unknown [m/z 161, 119 (92), 91 (69), 105 (52), 145 (49)... 218 (6)]	11.71	1522	0.02	11.35	1775	0.03
Unknown [m/z 91, 105 (98), 108 (83), 93 (82), 133 (79), 77 (64), 79 (57), 41 (56), 145 (55)... 218? (5)]	11.77	1527	0.06			
Unknown [m/z 91, 105 (78), 93 (77), 107 (71), 79	11.80	1529	0.05			

(64), 41 (63), 77 (63), 145 (60)... 218 (17)]						
Unknown [m/z 133, 105 (70), 146 (69), 145 (61), 91 (55), 131 (45), 187 (42), 159 (39), 119 (33), 202 (30)...]	11.84	1532	0.01			
Unknown [m/z 145, 131 (91), 91 (86), 105 (68), 146 (66), 43 (54)... 220? (5)]	11.87	1535	0.02			
Norpatchoulenol	11.97*	1543	1.35	14.20*	2031	1.37
Isocaryophyllene epoxide B	11.97*	1543	[1.35]	12.21	1850	0.04
$\alpha$ -Elemol	12.04	1548	0.06	14.20*	2031	[1.37]
Unknown [m/z 191, 159 (66), 133 (53), 91 (45), 41 (42), 177 (35), 105 (33), 220 (32)]	12.14	1556	0.01	13.76	1989	0.02
Unknown [m/z 41, 67 (90), 55 (87), 79 (85), 107 (84), 81 (84), 93 (84), 121 (77), 91 (74)... 220 (7)]	12.22	1562	0.05			
Unknown [m/z 43, 107 (94), 81 (71), 41 (63), 67 (58), 111 (58), 93 (55), 83 (54)... 205 (8), 220 (1)]	12.30	1568	0.21	12.41	1867	0.19
Caryophyllene oxide	12.36*	1573	0.42	12.85*	1906	0.32
Caryophyllene oxide isomer	12.36*	1573	[0.42]	12.78	1900	0.11
Unknown isomer	12.36*	1573	[0.42]	14.48	2057	0.05
Unknown [m/z 43, 79 (44), 81 (41), 93 (40), 91 (40)... 220 (5)]	12.47	1582	0.33	14.44	2054	0.26
Unknown [m/z 43, 105 (77), 91 (71), 93 (68), 41 (62), 107 (6)... 205 (41), 220 (7)]	12.64	1595	0.28	14.74	2082	0.25
Hexadecane	12.70	1600	0.08	9.25	1603	0.07

Humulene epoxide II	12.74	1603	0.04	13.45	1961	0.04
Unknown [m/z 43, 161 (73), 91 (53), 95 (52), 79 (46), 119 (45)... 205 (29), 220? (1)]	12.77	1606	0.10	14.90*	2098	26.33
Unknown [m/z 41, 91 (92), 55 (81), 93 (81), 79 (74), 43 (71), 95 (68), 123 (65)... 220 (17)]	12.81	1608	0.21	14.98	2106	0.31
Unknown [m/z 43, 79 (41), 93 (39), 41 (39), 91 (38), 81 (36)... 220 (3)]	12.87	1613	0.25			
Unknown [m/z 41, 55 (92), 95 (80), 81 (76), 109 (76), 67 (66), 125 (65)... 220 (12)]	12.96	1621	0.56	14.90*	2098	[26.33]
Hinesol	13.06	1629	0.31	15.14*	2122	0.36
Patchoulol	13.30†	1649	27.84	14.90*	2098	[26.33]
Pogostol	13.31†	1650	[27.84]	15.34	2141	1.80
Unknown [m/z 175, 218 (59), 133 (49), 91 (43), 41 (38), 147 (36)]	13.38	1656	0.07	15.14*	2122	[0.36]
Unknown [m/z 43, 41 (87), 91 (64), 55 (63), 81 (58), 95 (54), 107 (52)... 222 (12)]	13.42	1659	0.02			
Unknown [m/z 91, 41 (100), 107 (98), 108 (95), 95 (87), 93 (87), 105 (85), 79 (77), 119 (72)... 220? (15)]	13.62*	1675	0.12	16.18	2225	0.03
Unknown [m/z 111, 250 (38), 126 (27), 139 (26), 43 (16), 41 (15), 166 (15)]	13.62*	1675	[0.12]	11.92	1824	0.05
Unknown [m/z 95, 107 (99), 41 (85), 93 (82), 91 (82), 109 (71), 105 (71), 105	13.62*	1675	[0.12]	16.27	2235	0.02

(71), 108 (66)... 220 (29)]						
Unknown [m/z 43, 41 (95), 97 (89), 109 (71), 55 (71), 107 (70), 95 (69), 110 (65)... 222 (5)]	13.75	1686	0.02	15.51	2158	0.02
Rotundone	13.86	1695	0.05	15.85	2192	0.10
Unknown [m/z 43, 41 (82), 137 (78), 109 (76), 95 (75), 91 (72), 55 (67)... 220? (14)]	13.92	1700	0.21			
Pogostone	14.04	1710	1.71	19.04†	2534	[0.29]
Unknown [m/z 107, 93 (87), 41 (83), 81 (82), 67 (80), 55 (76)... 204 (53), 207 (34), 222 (9)]	14.14*	1720	0.27	17.04	2315	0.16
Unknown [m/z 83, 43 (85), 55 (39), 41 (29), 121 (27), 120 (25)... 218 (3)]	14.14*	1720	[0.27]	17.16	2328	0.06
Unknown [m/z 133, 148 (68), 147 (59), 91 (56), 79 (45), 105 (44)... 218 (8)]	14.24	1728	0.04	17.34	2346	0.02
Unknown [m/z 91, 108 (86), 107 (85), 93 (80), 120 (75), 105 (71), 95 (72)... 218 (37)]	14.28	1731	0.01	16.20	2228	0.10
Unknown [m/z 43, 83 (93), 55 (42), 41 (37), 121 (34), 111 (28)... 222? (1)]	14.42	1743	0.02	17.63	2378	0.01
Unknown [m/z 134, 107 (96), 91 (84), 93 (78), 79 (77), 41 (74), 43 (66), 77 (65)...]	14.51	1751	0.02	17.52	2367	0.01
Unknown [m/z 43, 191 (68), 41 (62), 91 (51), 95 (49), 110 (44)... 234 (22)]	14.56	1755	0.02			
Unknown [m/z	14.69	1767	0.08	17.46	2360	0.10

149, 131 (54), 105 (48), 91 (46), 41 (30), 93 (27)... 218 (23)]						
Unknown [m/z 43, 95 (58), 67 (50), 41 (47), 55 (38), 109 (37)... 221 (9)... 236? (3)]	14.86	1782	0.02	18.21*	2442	0.07
Unknown [m/z 219, 43 (67), 91 (46), 79 (42), 41 (41), 55 (36)... 234 (6)]	15.01	1794	0.03	18.21*	2442	[0.07]
Unknown [m/z 43, 91 (77), 79 (74), 109 (73), 110 (71)... 218 (52), 234? (1)]	15.08	1801	0.01	17.69	2384	0.01
Unknown [m/z 43, 91 (43), 41 (37), 79 (32), 219 (31)... 234 (14)]	15.14	1806	0.02	20.92	2758	0.02
Corymbolone	15.84	1870	0.02			
Phytol	18.36	2113	0.05			
Unknown [m/z 43, 41 (59), 109 (57), 79 (54), 95 (53), 107 (49), 93 (48), 67 (48)... 205 (18), 220 (4)]				12.85*	1906	[0.32]
Unknown [m/z 41, 79 (97), 43 (97), 69 (72), 93 (70), 91 (62), 95 (58)... 220 (2)]				14.05	2017	0.02
Unknown [m/z 163, 119 (50), 91 (48), 95 (47), 41 (44), 105 (41)... 220 (18)]				15.58	2164	0.06
<b>Total identified</b>		<b>94.48%</b>			<b>93.04%</b>	
<b>Total reported</b>		<b>98.17%</b>			<b>95.39%</b>	

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

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

†: Peaks apexes were resolved, but peaks overlapped and were summed for analysis

tr: The compound has been detected below 0.005% of total signal.

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index