Date : September 27, 2022

Certificate of Analysis – GC Profiling & Carrier Oil Determination

Sample identification

Internal code : 22I21-PTH03
Customer identification : Ylang Ylang Extra - Madagascar - Y20105R
Type : Essential oil
Source : *Cananga odorata* var. *genuina (Ylang-ylang)*
Customer : Plant Therapy

Analysis

Method: PC-MAT-014 ISO - Analysis of the composition of an essential oil or other volatile liquid by FAST GC-FID (in French); identifications validated by GC-MS. Carrier oil determination by PC-MAT-010 – GC-FID quantitation of fatty acid methyl esters after derivatization, against an internal standard of tridecanoic acid.
Analyst : Sylvain Mercier, M. Sc., Chimiste 2014-005
Analysis date : September 22, 2022

Checked and approved by :

Alexis St-Gelais, Ph. D., Chimiste 2013-174

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Méthode certifiée ISO 17025:2017 Certified method

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Physicochemical data

Physical aspect: Faintly yellow liquid
Refractive index: 1.4970 ± 0.0003 (20 °C; method PC-MAT-016)

Carrier oil determination

After derivatization, no fatty acids were observed (< 0.1% in equivalents of tridecanoic acid).

Conclusion

No adulterant, contaminant or diluent has been detected using this method. The essential oil is undiluted with a carrier oil.

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Analysis summary – Consolidated contents

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

Identification	%	Class
2-Methyl-3-buten-2-ol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
3-Methyl-3-butenyl acetate	0.01	Aliphatic ester
Amyl acetate	0.13	Aliphatic ester
Prenyl acetate	0.80	Aliphatic ester
α-Pinene	0.06	Monoterpene
Benzaldehyde	0.02	Simple phenolic
β-Pinene	0.02	Monoterpene
Myrcene	0.03	Monoterpene
(3*Z*)-Hexenyl acetate	0.03	Aliphatic ester
Hexyl acetate	0.07	Aliphatic ester
para-Methylanisole	8.77	Simple phenolic
(2*E*)-Hexenyl acetate	tr	Aliphatic ester
para-Cymene	0.01	Monoterpene
Limonene	0.02	Monoterpene
1,8-Cineole	0.05	Monoterpenic ether
Benzyl alcohol	0.02	Simple phenolic
(*Z*)-β-Ocimene	0.01	Monoterpene
(*E*)-β-Ocimene	0.01	Monoterpene
cis-Linalool oxide (fur.)	0.03	Monoterpenic alcohol
trans-Linalool oxide (fur.)	0.05	Monoterpenic alcohol
Methyl benzoate	5.87	Phenolic ester
Linalool	18.12	Monoterpenic alcohol
Camphor	0.01	Monoterpenic ketone
Benzyl acetate	6.79	Phenolic ester
Ethyl benzoate	0.02	Phenolic ester
Terpinen-4-ol	0.01	Monoterpenic alcohol
α-Terpineol	0.04	Monoterpenic alcohol
Methyl salicylate	0.02	Phenolic ester
Methylchavicol	0.03	Phenylpropanoid
Nerol	0.03	Monoterpenic alcohol
Phenylethyl acetate	0.07	Phenolic ester
Geraniol	1.85	Monoterpenic alcohol
Geranial	0.03	Monoterpenic aldehyde
(*E*)-Anethole	0.13	Phenylpropanoid
1-Nitro-2-phenylethane	0.02	Simple phenolic
4-Vinylguaiacol	0.02	Simple phenolic
Bicycloelemene	0.02	Sesquiterpene
Benzyl butyrate	0.06	Phenolic ester
α-Cubebene	0.11	Sesquiterpene
Eugenol	0.32	Phenylpropanoid
Neryl acetate	0.05	Monoterpenic ester
α-Ylangene	0.10	Sesquiterpene
α-Copaene	0.61	Sesquiterpene
β-Bourbonene	0.02	Sesquiterpene

Geranyl acetate	8.13	Monoterpenic ester
β-Cubebene	0.08	Sesquiterpene
β-Elemene	0.23	Sesquiterpene
Vanillin	0.03	Simple phenolic
Cyperene	0.01	Sesquiterpene
Sibirene	0.02	Sesquiterpene
Methyleugenol	0.02	Phenylpropanoid
β-Ylangene	0.16	Sesquiterpene
β-Caryophyllene	7.40	Sesquiterpene
Caryophylla-4(12),8(13)-diene	0.05	Sesquiterpene
β-Copaene	0.23	Sesquiterpene
Aromadendrene	0.03	Sesquiterpene
Isogermacrene D	0.01	Sesquiterpene
9-epi-Isocaryophyllene	0.01	Sesquiterpene
(*E*)-Cinnamyl acetate	1.30	Phenylpropanoid ester
trans-Muurola-3,5-diene	0.12	Sesquiterpene
(*E*)-Isoeugenol	0.04	Phenylpropanoid
α-Humulene	1.92	Sesquiterpene
allo-Aromadendrene	0.03	Sesquiterpene
cis-Cadina-1(6),4-diene	0.06	Sesquiterpene
cis-Muurola-4(15),5-diene	0.07	Sesquiterpene
trans-Cadina-1(6),4-diene	0.15	Sesquiterpene
γ-Muurolene	1.18	Sesquiterpene
Germacrene D	8.95	Sesquiterpene
trans-Muurola-4(15),5-diene	0.08	Sesquiterpene
Prenyl benzoate	0.04	Phenolic ester
epi-Cubebol	0.02	Sesquiterpenic alcohol
Bicyclogermacrene	0.61	Sesquiterpene
α-Muurolene	0.53	Sesquiterpene
(3*Z*,6*E*)-α-Farnesene	0.03	Sesquiterpene
δ-Amorphene	0.33	Sesquiterpene
Unknown	1.02	Sesquiterpene
(3*E*,6*E*)-α-Farnesene	4.47	Sesquiterpene
γ-Cadinene	0.44	Sesquiterpene
Cubebol	0.02	Sesquiterpenic alcohol
Zonarene	0.16	Sesquiterpene
trans-Calamenene	0.05	Sesquiterpene
δ-Cadinene	1.86	Sesquiterpene
trans-Cadina-1,4-diene	0.14	Sesquiterpene
α-Cadinene	0.16	Sesquiterpene
α-Calacorene	0.02	Sesquiterpene
cis-Dracunculifoliol	0.01	Sesquiterpenic alcohol
α-Elemol	0.05	Sesquiterpenic alcohol
Germacrene B	0.02	Sesquiterpene
(*E*)-Nerolidol	0.16	Sesquiterpenic alcohol
(3*Z*)-Hexenyl benzoate	0.01	Phenolic ester
Spathulenol	0.04	Sesquiterpenic alcohol
Caryophyllene oxide	0.09	Sesquiterpenic ether
Unknown	0.06	Sesquiterpenic alcohol
Unknown	0.06	Oxygenated sesquiterpene
Viridiflorol	0.02	Sesquiterpenic alcohol
Guaiol	0.03	Sesquiterpenic alcohol

Copaborneol	0.04	Sesquiterpenic alcohol
Humulene epoxide II	0.02	Sesquiterpenic ether
10-epi-Cubenol	0.02	Sesquiterpenic alcohol
(*E*)-Isoeugenyl acetate	0.01	Phenylpropanoid ester
Junenol	0.24	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
1-epi-Cubenol	0.15	Sesquiterpenic alcohol
γ-Eudesmol	0.08	Sesquiterpenic alcohol
Unknown	0.03	Oxygenated sesquiterpene
τ-Cadinol	0.23	Sesquiterpenic alcohol
Cubenol	0.10	Sesquiterpenic alcohol
τ-Muurolol	0.45	Sesquiterpenic alcohol
α-Muurolol	0.23	Sesquiterpenic alcohol
Unknown	0.14	Sesquiterpenic alcohol
α-Cadinol	0.84	Sesquiterpenic alcohol
cis-Calamenen-10-ol	0.02	Sesquiterpenic alcohol
trans-Calamenen-10-ol	0.02	Sesquiterpenic alcohol
Bulnesol	0.01	Sesquiterpenic alcohol
Unknown	0.09	Oxygenated sesquiterpene
Eudesma-4(15),7-dien-1β-ol	0.01	Sesquiterpenic alcohol
(2*E*,6*E*)-Farnesol	1.15	Sesquiterpenic alcohol
(2*E*,6*E*)-Farnesal	0.02	Sesquiterpenic aldehyde
Benzyl benzoate	6.02	Phenolic ester
Unknown	0.01	Unknown
(2*E*,6*E*)-Farnesyl acetate	0.87	Sesquiterpenic ester
Benzyl salicylate	2.72	Phenolic ester
Geranyl benzoate	0.07	Phenolic ester
Unknown	0.04	Unknown
Unknown	0.01	Unknown
Consolidated total	**98.86%**	

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.

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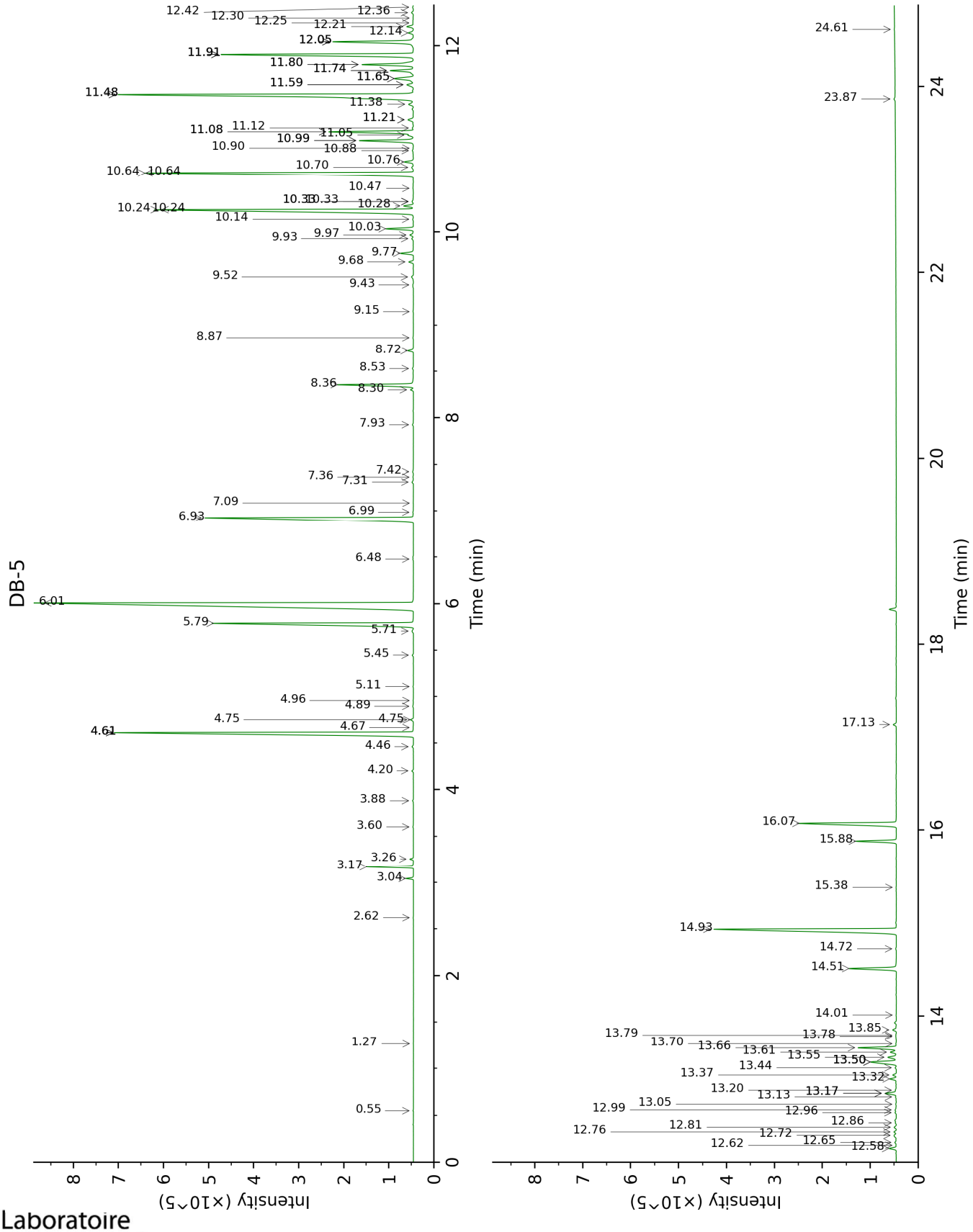
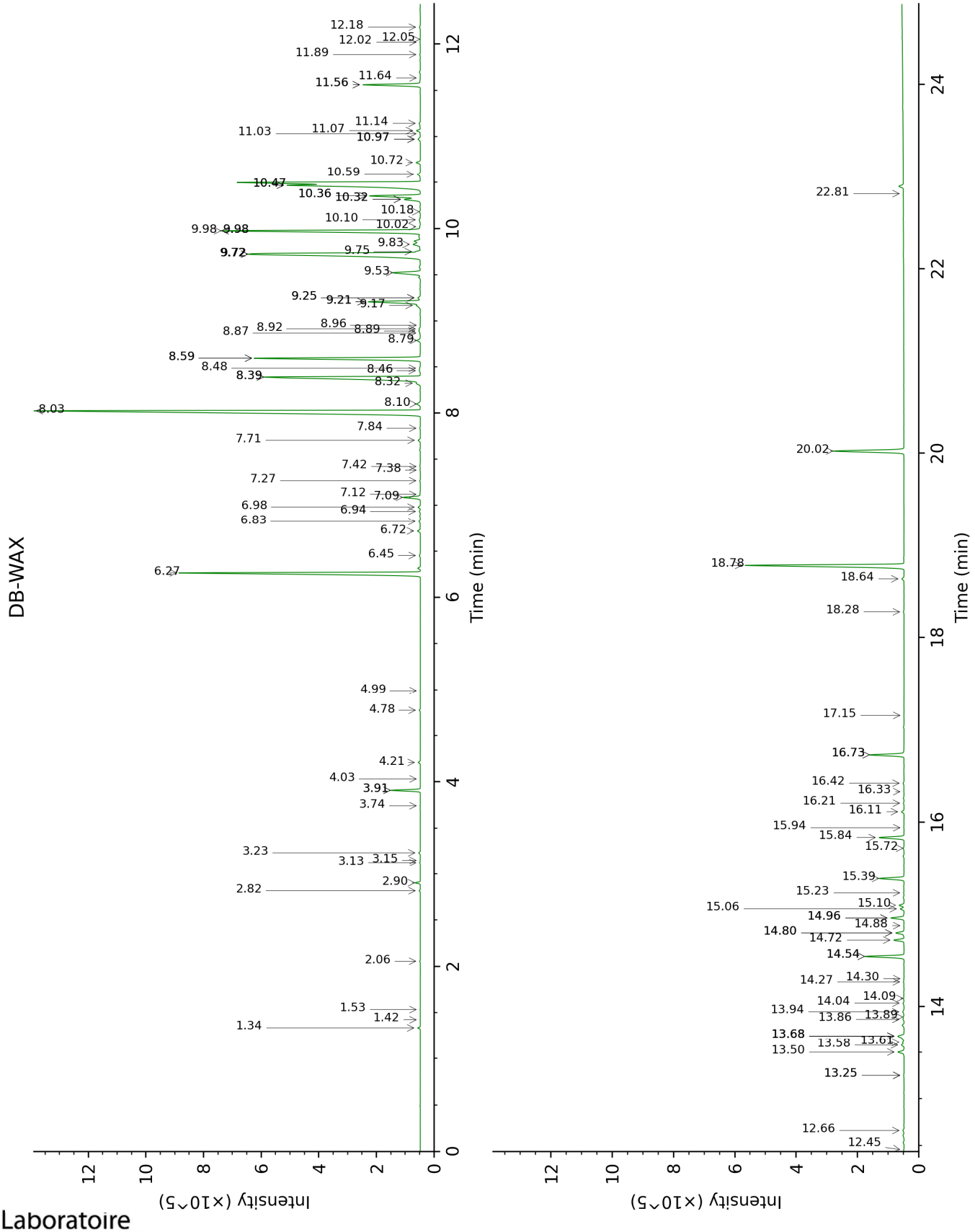

DB-5
Time (min)
Intensity (×10^5)
12.42
12.30
12.25
12.21
12.14
12.36
12.05
11.91
11.80
11.74
11.65
11.59
11.48
11.38
11.21
11.08
11.12
11.05
10.99
10.90
10.88
10.76
10.70
10.64
10.64
10.47
10.33
10.28
10.24
10.24
10.14
10.03
9.93
9.97
9.77
9.68
9.52
9.43
9.15
8.87
8.72
8.53
8.36
8.30
7.93
7.36
7.31
7.42
7.09
6.93
6.99
6.48
6.01
5.79
5.71
5.45
5.11
4.96
4.89
4.75
4.75
4.67
4.61
4.46
4.20
3.88
3.60
3.26
3.17
3.04
2.62
1.27
0.55
24.61
23.87
17.13
16.07
15.88
15.38
14.93
14.72
14.51
14.01
13.85
13.79
13.78
13.70
13.66
13.61
13.55
13.50
13.44
13.37
13.32
13.20
13.17
13.13
13.05
12.99
12.96
12.86
12.81
12.76
12.72
12.65
12.62
12.58


DB-WAX
Time (min)
Intensity (×10^5)
12.18
12.02
12.05
11.89
11.64
11.56
11.14
11.03
11.07
10.97
10.72
10.59
10.47
10.36
10.32
10.18
10.10
10.02
9.98
9.98
9.83
9.72
9.75
9.53
9.25
9.21
9.17
8.87
8.92
8.96
8.89
8.79
8.59
8.48
8.46
8.39
8.32
8.10
8.03
7.84
7.71
7.42
7.38
7.27
7.12
7.09
6.98
6.94
6.83
6.72
6.45
6.27
4.99
4.78
4.21
4.03
3.91
3.74
3.23
3.13
3.15
2.90
2.82
2.06
1.53
1.42
1.34
22.81
20.02
18.78
18.64
18.28
17.15
16.73
16.42
16.33
16.21
16.11
15.94
15.84
15.72
15.39
15.23
15.06
15.10
14.96
14.88
14.80
14.72
14.54
14.27
14.30
14.04
14.09
13.94
13.86
13.89
13.68
13.58
13.61
13.50
13.25
12.66
12.45

FULL ANALYSIS DATA

Identification	Column DB-5			Column DB-WAX		
	R.T	R.I	%	R.T	R.I	%
2-Methyl-3-buten-2-ol	0.55	609	tr	1.53	1014	0.01
Toluene	1.27	758	tr	1.42	1003	0.01
3-Methyl-3-butenyl acetate	2.62	886	0.01	3.15	1160	0.01
Amyl acetate	3.04	917	0.13	2.90	1140	0.14
Prenyl acetate	3.17	926	0.80	3.91*	1217	0.83
α-Pinene	3.26	931	0.06	1.34	994	0.06
Benzaldehyde	3.60	954	0.02	7.27	1463	0.02
β-Pinene	3.88	972	0.02	2.06	1067	0.02
Myrcene	4.20	994	0.03	2.82	1133	0.04
(3*Z*)-Hexenyl acetate	4.46	1010	0.03	4.78	1280	0.03
Hexyl acetate	4.61*	1020	8.82	4.21	1239	0.07
para-Methylanisole	4.61*	1020	[8.82]	6.27	1388	8.77
(2*E*)-Hexenyl acetate	4.61*	1020	[8.82]	4.99	1296	tr
para-Cymene	4.67	1023	0.01	4.03	1226	0.01
Limonene	4.75*	1028	0.06	3.13	1158	0.02
1,8-Cineole	4.75*	1028	[0.06]	3.24	1166	0.05
Benzyl alcohol	4.89	1037	0.02	11.64	1816	0.01
(*Z*)-β-Ocimene	4.96	1041	0.01	3.74	1205	0.01
(*E*)-β-Ocimene	5.11	1051	0.01	3.91*	1217	[0.83]
cis-Linalool oxide (fur.)	5.45	1072	0.03	6.45	1402	0.04
trans-Linalool oxide (fur.)	5.71	1088	0.05	6.82	1429	0.05
Methyl benzoate	5.79	1093	5.87	8.59*	1564	5.90
Linalool	6.01	1107	18.12	8.02	1520	18.13
Camphor	6.48	1137	0.01	7.12	1452	0.01
Benzyl acetate	6.93	1166	6.79	9.98*	1675	7.55
Ethyl benzoate	6.99	1170	0.02	9.21*	1613	1.93
Terpinen-4-ol	7.09	1176	0.01	8.48	1556	0.04
α-Terpineol	7.31	1190	0.04	9.72*	1655	10.03
Methyl salicylate	7.36	1194	0.02	10.36*	1706	1.88
Methylchavicol	7.42	1197	0.03	9.25*	1616	0.10
Nerol	7.93	1231	0.03	10.97*	1759	0.10
Phenylethyl acetate	8.30	1256	0.07	10.97*	1759	[0.10]
Geraniol	8.36	1259	1.85	11.56*	1810	1.90
Geranial	8.53	1271	0.03	10.02	1679	0.02
(*E*)-Anethole	8.72	1284	0.13	11.07	1767	0.13
1-Nitro-2-phenylethane	8.86	1293	0.02	14.09	2040	0.03
4-Vinylguaiacol	9.15	1310	0.02	14.96*	2124	0.46
Bicycloelemene	9.43	1330	0.02	6.94	1438	0.04
Benzyl butyrate	9.52	1336	0.06	11.56*	1810	[1.90]

α-Cubebene	9.68	1348	0.11	6.72	1422	0.10
Eugenol	9.77	1354	0.32	14.72	2101	0.33
Neryl acetate	9.93	1366	0.05	10.10	1685	0.05
α-Ylangene	9.97	1368	0.10	6.98	1441	0.08
α-Copaene	10.03	1373	0.61	7.09	1449	0.60
β-Bourbonene	10.14	1380	0.02	7.38	1471	0.01
Geranyl acetate	10.24*	1387	8.21	10.47*†	1716	12.60
β-Cubebene	10.24*	1387	[8.21]	7.71	1495	0.08
β-Elemene	10.28	1390	0.23	8.39*	1548	7.67
Vanillin	10.33*	1394	0.05	18.28	2475	0.03
Cyperene	10.33*	1394	[0.05]	7.42	1474	0.01
Sibirene	10.33*	1394	[0.05]	7.84	1505	0.02
Methyleugenol	10.47	1404	0.02	13.25*	1962	0.02
β-Ylangene	10.64*	1416	7.56	8.10	1526	0.16
β-Caryophyllene	10.64*	1416	[7.56]	8.39*	1548	[7.67]
Caryophylla-4(12),8(13)-diene	10.70	1421	0.05	8.59*	1564	[5.90]
β-Copaene	10.76	1425	0.23	8.32	1543	0.15
Aromadendrene	10.88	1434	0.03	8.46	1554	0.04
Isogermacrene D	10.90	1436	0.01	8.87	1586	0.02
9-epi-Isocaryophyllene	10.99*	1442	1.31	8.96	1592	0.01
(*E*)-Cinnamyl acetate	10.99*	1442	[1.31]	14.54*	2083	1.33
trans-Muurola-3,5-diene	11.05	1447	0.12	8.79	1580	0.14
(*E*)-Isoeugenol	11.08*	1449	2.01	16.42	2273	0.04
α-Humulene	11.08*	1449	[2.01]	9.21*	1613	[1.93]
allo-Aromadendrene	11.12	1452	0.03	8.92	1589	0.04
cis-Cadina-1(6),4-diene	11.21*	1459	0.17	8.90	1588	0.06
cis-Muurola-4(15),5-diene	11.21*	1459	[0.17]	9.25*	1616	[0.10]
trans-Cadina-1(6),4-diene	11.38	1471	0.15	9.17	1610	0.17
γ-Muurolene	11.48*	1479	10.12	9.52	1638	1.18
Germacrene D	11.48*	1479	[10.12]	9.72*	1655	[10.03]
trans-Muurola-4(15),5-diene	11.58*	1487	0.20	9.75	1657	0.08
Prenyl benzoate	11.58*	1487	[0.20]	13.68*†	2002	0.34
epi-Cubebol	11.65*	1492	0.64	11.89	1838	0.02
Bicyclogermacrene	11.65*	1492	[0.64]	9.98*	1675	[7.55]
α-Muurolene	11.74*	1498	0.56	9.98*	1675	[7.55]
(3*Z*,6*E*)-α-Farnesene	11.74*	1498	[0.56]	10.18	1692	0.03
δ-Amorphene	11.80*	1503	1.34	9.83	1663	0.33
Unknown [m/z 119, 41 (95), 123 (53), 80 (49), 161 (44), 105 (42)... 204 (2)]	11.80*	1503	[1.34]			

(3*E*,6*E*)-α-Farnesene	11.91*	1512	5.04	10.47*†	1716	[12.60]
γ-Cadinene	11.91*	1512	[5.04]	10.32*	1703	0.60
Cubebol	11.91*	1512	[5.04]	12.45	1888	0.02
Zonarene	12.05*	1522	2.07	10.32*	1703	[0.60]
trans-Calamenene	12.05*	1522	[2.07]	11.14	1773	0.05
δ-Cadinene	12.05*	1522	[2.07]	10.36*	1706	[1.88]
trans-Cadina-1,4-diene	12.14	1530	0.14	10.59	1726	0.14
α-Cadinene	12.21	1535	0.16	10.72	1737	0.14
α-Calacorene	12.25	1538	0.02	12.02	1850	0.02
cis-Dracunculifoliol	12.30	1542	0.01	12.05	1853	0.01
α-Elemol	12.36	1547	0.05	13.94	2027	0.07
Germacrene B	12.42	1551	0.02	11.03	1764	0.01
(*E*)-Nerolidol	12.58	1564	0.16	13.68*†	2002	[0.34]
(3*Z*)-Hexenyl benzoate	12.62	1567	0.01	14.27	2057	0.02
Spathulenol	12.65	1569	0.04	14.30	2061	0.01
Caryophyllene oxide	12.72	1575	0.09	12.66	1909	0.05
Unknown cadinol or muurolol analog [m/z 161, 119 (77), 120 (76), 105 (73), 93 (57)... 204 (36)]	12.76	1578	0.06	12.18	1864	0.04
Unknown [m/z 161, 105 (84), 43 (80), 119 (72), 93 (62), 121 (54)... 204 (38), 222 (2)]	12.81	1582	0.06	13.86	2019	0.04
Viridiflorol	12.86	1586	0.02	13.89	2021	0.03
Guaiol	12.96	1594	0.03	14.04	2036	0.04
Copaborneol	12.99	1596	0.04	14.88	2116	0.01
Humulene epoxide II	13.05	1601	0.02	13.25*	1962	[0.02]
10-epi-Cubenol	13.13	1608	0.02	13.61	1995	0.04
(*E*)-Isoeugenyl acetate	13.17*	1611	0.28	17.15	2351	0.01
Junenol	13.17*	1611	[0.28]	13.50	1985	0.24
Unknown [m/z 179, 161 (66), 119 (44), 95 (38), 105 (35)... 204 (24), 222 (1)]	13.20	1613	0.03	14.54*	2083	[1.33]
1-epi-Cubenol	13.32	1623	0.15	13.68*†	2002	[0.34]
γ-Eudesmol	13.37	1627	0.08	14.80*	2108	0.32
Unknown [m/z 161, 119 (63), 105 (52), 179 (52), 107 (51), 82 (51), 95	13.44	1633	0.03	16.21	2250	0.02

(50), 81 (41)... 204 (35), 220 (6)]						
τ-Cadinol	13.50*	1638	0.79	14.80*	2108	[0.32]
Cubenol	13.50*	1638	[0.79]	13.58	1992	0.10
τ-Muurolol	13.50*	1638	[0.79]	14.96*	2124	[0.46]
α-Muurolol	13.56	1642	0.23	15.10	2138	0.17
Unknown cadinol analog II [m/z 95, 121 (73), 43 (57), 79 (43), 161 (43), 109 (40)... 204 (35), 222 (2)]	13.61	1647	0.14	15.06	2134	0.12
α-Cadinol	13.66	1651	0.84	15.39	2167	0.84
cis-Calamenen-10-ol	13.70	1654	0.02	16.33	2263	0.01
trans-Calamenen-10-ol	13.78	1661	0.02	16.73*	2305	1.17
Bulnesol	13.80	1662	0.01	15.23	2151	0.02
Unknown [m/z 123, 95 (31), 81 (29), 105 (27)... 222 (5)]	13.85	1667	0.09	16.11	2241	0.09
Eudesma-4(15),7-dien-1β-ol	14.01	1680	0.01	15.94	2223	0.01
(2*E*,6*E*)-Farnesol	14.51	1722	1.15	16.73*	2305	[1.17]
(2*E*,6*E*)-Farnesal	14.72	1740	0.02	15.72	2200	0.03
Benzyl benzoate	14.93	1758	6.02	18.78	2533	6.02
Unknown [m/z 121, 107 (86), 81 (71), 93 (71), 59 (68), 43 (67)...]	15.38	1797	0.01			
(2*E*,6*E*)-Farnesyl acetate	15.88	1842	0.87	15.84	2212	0.86
Benzyl salicylate	16.08	1860	2.72	20.02	2681	2.68
Geranyl benzoate	17.13	1958	0.07	18.64	2516	0.08
Unknown [m/z 326, 327 (22), 311 (17), 137 (8), 202 (7)...]	23.87	2692	0.04			
Unknown [m/z 69, 81 (42), 147 (26), 119 (25), 93 (25), 41 (24)...]	24.61	2786	0.01	22.81	3045	0.01
Total identified		**98.69%**			**98.01%**	
Total reported		**99.15%**			**98.33%**	

*: 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