

Date : 2023-07-06

CERTIFICATE OF ANALYSIS - GC PROFILING

SAMPLE IDENTIFICATION

Internal code : 23F21-NPA01

Customer Identification : Rosmarinus officinalis - South Africa - NPS00079 - Lot # NP0064

Type : Essential Oil

Source : Rosmarinus officinalis ct. Verbenone

Customer : Nature Packaged

Checked and approved by:



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

Notes: This report is digitally signed, it is only considered valid if the digital signature is intact. The results only describe the samples that were submitted to the assays.

This report is an update from the first version issued on 2023-07-05 to format it for online publication.



GAS CHROMATOGRAPHIC ANALYSIS

Method : PC-MAT-014 - Analysis of the composition of an essential oil or other volatile liquide by FAST GC-FID



Results : See analysis summary (next page)

Analyst : Amélie Simard, Analyste

Date : 2023-07-04

PHYSICOCHEMICAL DATA

Physical aspect : Faintly yellow liquid

Analyst : Cindy Caron B. Sc.

Date : 2023-06-23

Refractive index : 1.4733 ± 0.0003 (20 °C)

Method : PC-MAT-016 - Measure of the refractive index of a liquid.

Analyst : Cindy Caron B. Sc.

Date : 2023-06-23

CONCLUSION

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

ANALYSIS SUMMARY - CONSOLIDATED CONTENTS

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

Identification	%	Class
(E)-2-Methyl-1,3-pentadiene	0.05	Alkene
Isovaleral	0.01	Aliphatic aldehyde
2-Methylbutyral	tr	Aliphatic aldehyde
Isoamyl alcohol	tr	Aliphatic alcohol
Toluene	tr	Simple phenolic
Mesityl oxide	0.05	Aliphatic ketone
Unknown	0.05	Unknown
Unknown	0.03	Unknown
(3Z)-Hexenol	0.01	Aliphatic alcohol
Unknown	0.01	Unknown
Hexanol	0.01	Aliphatic alcohol
Hashishene	0.03	Monoterpene
Tricyclene	0.24	Monoterpene
α-Thujene	0.19	Monoterpene
α-Pinene	19.16	Monoterpene
Camphene	5.47	Monoterpene
α-Fenchene	0.04	Monoterpene
Thuja-2,4(10)-diene	1.26	Monoterpene
3,7,7-Trimethylcyclohepta-1,3,5-triene	0.02	Monoterpene
Sabinene	0.04	Monoterpene
β-Pinene	2.04	Monoterpene
Octan-3-one	0.04	Aliphatic ketone
Dehydro-1,8-cineole	0.04	Monoterpenic ether
6-Methyl-5-hepten-2-one	0.02	Aliphatic ketone
Unknown	0.02	Monoterpene
Unknown	0.03	Monoterpene
Pseudocumene	0.03	Simple phenolic
Myrcene	1.63	Monoterpene
Pseudolimonene	0.01	Monoterpene
α-Phellandrene	0.36	Monoterpene
ortho-Methylanisole	0.01	Simple phenolic
Δ3-Carene	0.02	Monoterpene
(3Z)-Hexenyl acetate	0.02	Aliphatic ester
α-Terpinene	0.64	Monoterpene
para-Cymene	1.00	Monoterpene
Limonene	4.30	Monoterpene
1,8-Cineole	8.32	Monoterpenic ether
ortho-Cymene	0.02	Monoterpene
(Z)-β-Ocimene	0.10	Monoterpene
(E)-β-Ocimene	0.04	Monoterpene

γ -Terpinene	1.35	Monoterpene
<i>cis</i> -Sabinene hydrate	0.10	Monoterpenic alcohol
Unknown	0.01	Oxygenated monoterpene
<i>cis</i> -Linalool oxide (fur.)	0.02	Monoterpenic alcohol
Unknown	0.04	Oxygenated monoterpene
Fenchone	0.05	Monoterpenic ketone
Terpinolene	1.50	Monoterpene
<i>para</i> -Cymenene	0.07	Monoterpene
α -Pinene oxide	0.02	Monoterpenic ether
<i>trans</i> -Sabinene hydrate	0.10	Monoterpenic alcohol
Filifolone	0.15	Monoterpenic ketone
Linalool	1.75	Monoterpenic alcohol
<i>iso</i> -Chrysanthene?	0.12	Monoterpenic ketone
Hotrienol	0.06	Monoterpenic alcohol
Campholenal analog I	0.01	Monoterpenic aldehyde
endo-Fenchol	0.06	Monoterpenic alcohol
Chrysanthene	0.91	Monoterpenic ketone
<i>cis</i> - <i>para</i> -Menth-2-en-1-ol	0.02	Monoterpenic alcohol
α -Campholenal	0.10	Monoterpenic aldehyde
Unknown	0.02	Unknown
Unknown	0.02	Unknown
<i>cis</i> -Verbenol	0.05	Monoterpenic alcohol
<i>trans</i> - <i>para</i> -Menth-2-en-1-ol	0.03	Monoterpenic alcohol
Camphor	14.94	Monoterpenic ketone
<i>trans</i> -Verbenol	0.50	Monoterpenic alcohol
Camphe hydrate	0.07	Monoterpenic alcohol
Menthone	0.01	Monoterpenic ketone
Pinocamphone	0.28	Monoterpenic ketone
Pinocarvone	0.32	Monoterpenic ketone
Unknown	0.09	Oxygenated monoterpene
Unknown	0.30	Unknown
Borneol	2.39	Monoterpenic alcohol
δ -Terpineol	0.10	Monoterpenic alcohol
Isopinocamphone	1.62	Monoterpenic ketone
Unknown	0.11	Unknown
Unknown	0.08	Unknown
Terpinen-4-ol	0.89	Monoterpenic alcohol
<i>para</i> -Cymen-8-ol	0.06	Monoterpenic alcohol
Myrtenal	0.03	Monoterpenic aldehyde
α -Terpineol	0.99	Monoterpenic alcohol
Methylchavicol	0.17	Phenylpropanoid
Myrtenol	0.63	Monoterpenic alcohol
Unknown	0.04	Unknown
Verbenone	10.50	Monoterpenic ketone
Pin-2-en-8-ol	0.07	Monoterpenic alcohol

<i>trans</i> -Carveol	0.08	Monoterpenic alcohol
Bornyl formate	0.01	Monoterpenic ester
Unknown	0.16	Unknown
Unknown	0.15	Unknown
Carvone	0.15	Monoterpenic ketone
Unknown	tr	Unknown
Unknown	0.14	Unknown
Neral	0.04	Monoterpenic aldehyde
Geraniol	0.04	Monoterpenic alcohol
Isopiperitenone	0.09	Monoterpenic ketone
Geranal	0.03	Monoterpenic aldehyde
Unknown	0.08	Oxygenated monoterpenes
<i>cis</i> -Verbenyl acetate	0.16	Monoterpenic ester
Bornyl acetate	9.35	Monoterpenic ester
Unknown	0.01	Unknown
Unknown	0.08	Oxygenated monoterpenes
<i>trans</i> -Pinocarvyl acetate	0.12	Monoterpenic ester
Thymol	0.03	Monoterpenic alcohol
Carvacrol	0.01	Monoterpenic alcohol
Unknown	0.02	Unknown
Unknown	0.01	Monoterpenic alcohol
Myrtenyl acetate	0.20	Monoterpenic ester
Pin-2-en-8-yl acetate analog	0.01	Monoterpenic ester
Terpinyl acetate analog	0.14	Monoterpenic ester
exo-2-Hydroxycineole acetate	0.08	Monoterpenic ester
Piperitenone	0.04	Monoterpenic ketone
PIMA 8 isomer?	0.06	Oxygenated monoterpenes
Unknown	0.14	Oxygenated monoterpenes
Geranyl acetate	0.01	Monoterpenic ester
(Z)-Jasmone	0.01	Jasmonate
Unknown	0.12	Unknown
Methyleugenol	0.02	Phenylpropanoid
β-Caryophyllene	1.40	Sesquiterpene
Caryophylla-4(12),8(13)-diene	0.01	Sesquiterpene
α-Humulene	0.17	Sesquiterpene
Unknown	0.02	Unknown
Caryophyllene oxide	0.03	Sesquiterpenic ether
Caryophyllene oxide isomer	0.01	Sesquiterpenic ether
Consolidated total		99.32

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

Essential Oil, *Rosmarinus officinalis* ct. Verbenone

Internal code: 23F21-NPA01

Rosmarinus officinalis - South Africa - NPS00079 - Lot # NP0064

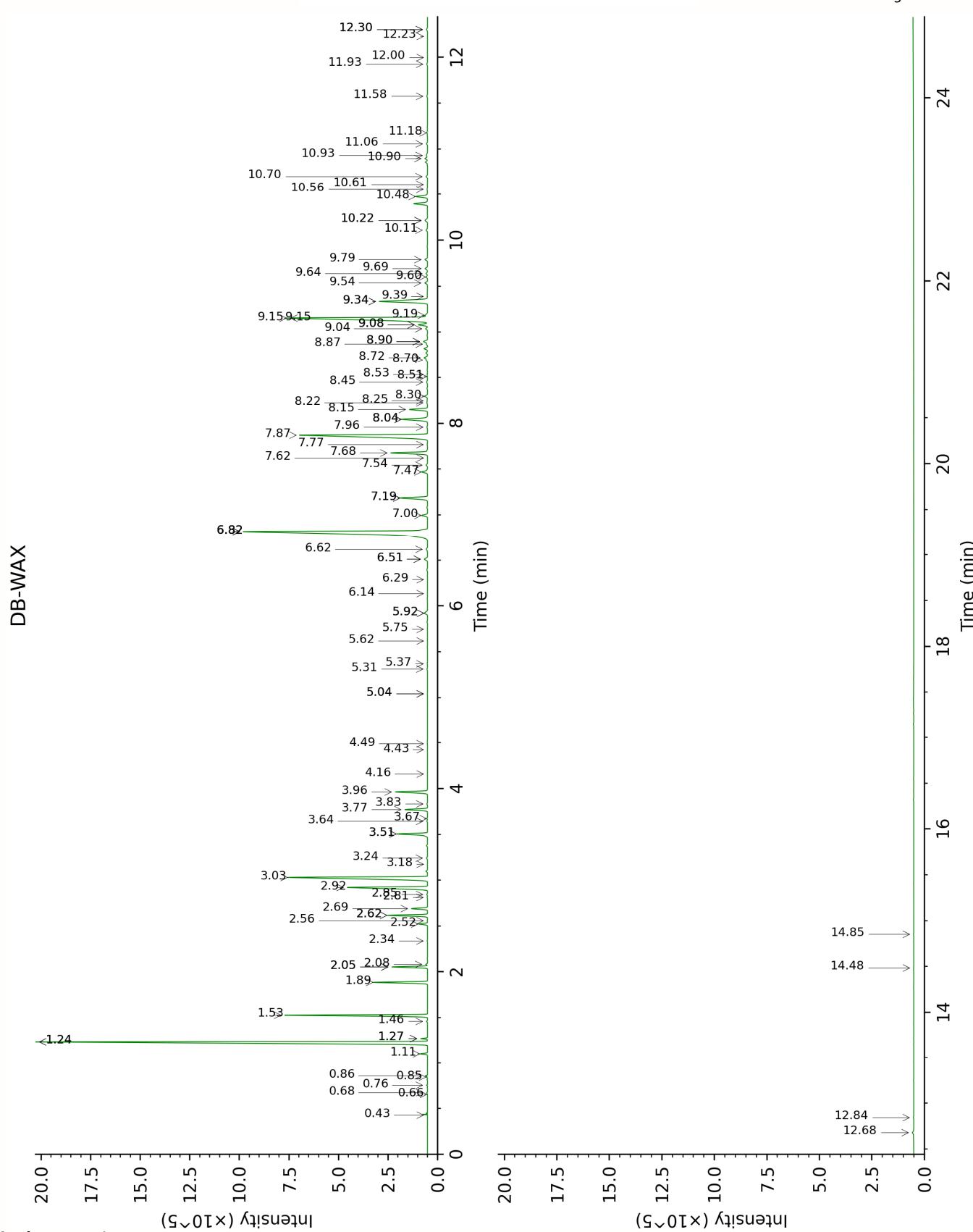
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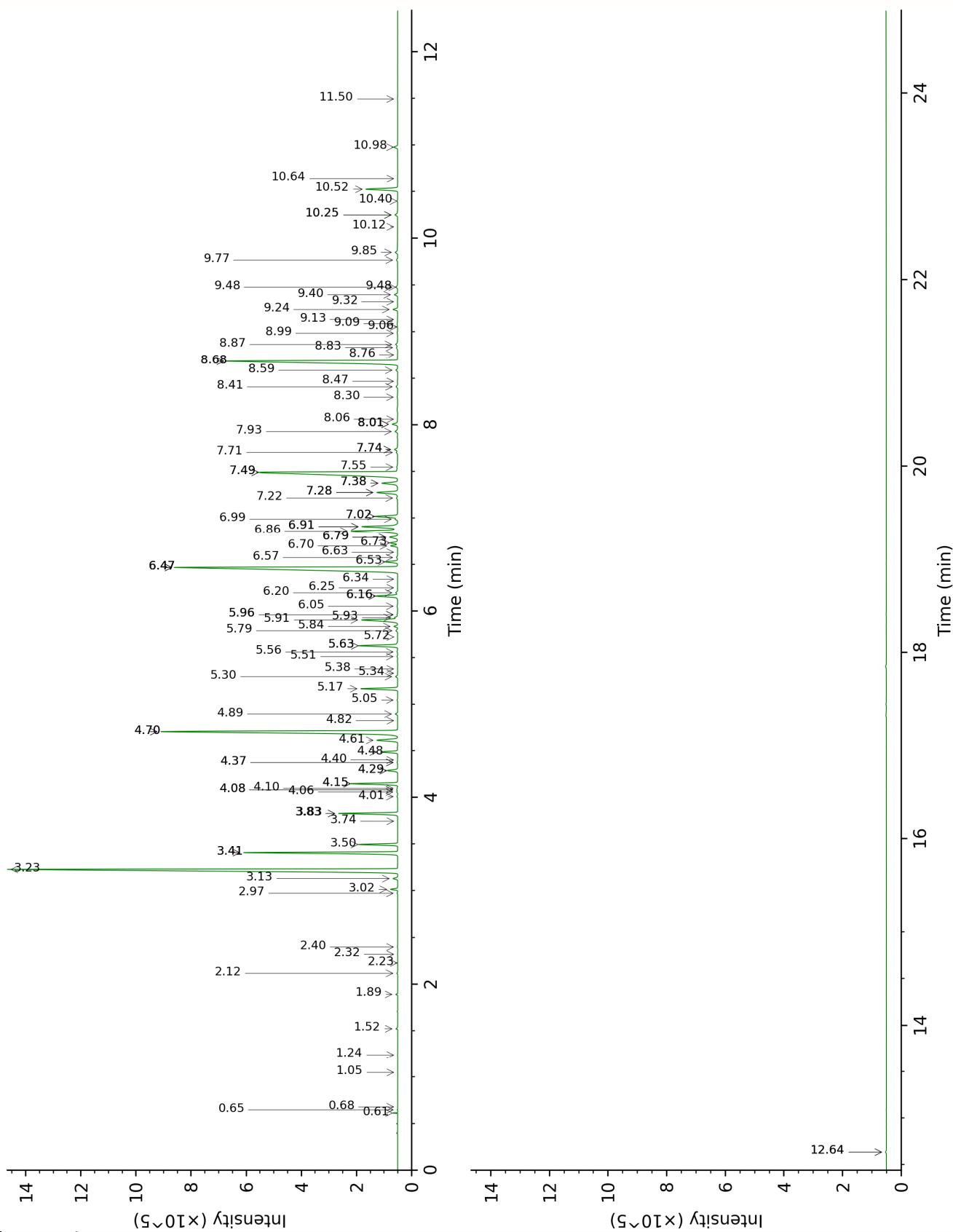
Unknowns: Unknown compounds' mass spectral data is presented in the "Full analysis data" table. The occurrence of unknown compounds is to be expected in many samples, and does not denote particular problems unless noted otherwise in the conclusion.

Bracketed value ([xx]): A bracketed percent value indicate that two or more compound percentage could not be solved due to coelution.

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



DB-5



FULL ANALYSIS DATA

(E)-2-Methyl-1,3-pentadiene	Column DB-WAX			Column DB-5		
	0.43	765.3	tr	0.61	629.5	0.05
Isovaleral	0.68	887.9	0.02	0.65	640.8	0.01
2-Methylbutyral	0.66	880.4	tr	0.68	651.3	tr
Isoamyl alcohol	3.18	1180.5	0.01	1.05	733.0	tr
Toluene	1.27*	1002.8	[0.18]	1.24	759.1	tr
Mesityl oxide	2.08	1087.4	0.06	1.52	797.5	0.05
Unknown ROOF I [m/z 107, 91 (58), 122 (35), 105 (20), 79 (16)...]	0.86	931.4	0.05	1.89	830.4	0.05
Unknown ROOF II [m/z 107, 91 (67), 79 (34), 122 (32), 105 (26), 77 (16)...]	0.85	929.0	0.02	2.12	848.9	0.03
(3Z)-Hexenol	5.37	1343.9	0.02	2.23	857.9	0.01
Unknown ROOF III [m/z 67, 81 (70), 66 (53), 68 (41), 82 (38), 109 (38)...]	0.76	913.8	0.02	2.32	865.5	0.01
Hexanol	5.04*	1320.1	[0.01]	2.40	871.9	0.01
Hashishene	1.24*	996.6	[19.28]	2.97	916.1	0.03
Tricyclene	1.11	973.8	0.23	3.02	918.8	0.24
α -Thujene	1.27*	1002.8	[0.18]	3.13	926.4	0.19
α -Pinene	1.24*	996.6	[19.28]	3.23	932.9	19.16
Camphene	1.53	1030.2	5.47	3.41*	944.6	[5.50]
α -Fenchene	1.46	1023.3	0.03	3.41*	944.6	[5.50]
Thuja-2,4(10)-diene	2.05*	1084.4	[1.32]	3.50	950.4	1.26
3,7,7-Trimethylcyclohepta-1,3,5-triene	2.62*	1134.8	[1.60]	3.74	966.7	0.02
Sabinene	2.05*	1084.4	[1.32]	3.83*	972.2	[2.09]
β -Pinene	1.89	1067.1	2.04	3.83*	972.2	[2.09]
Octan-3-one	3.67	1220.7	0.03	4.01	984.0	0.04
Dehydro-1,8-cineole	2.85	1153.4	0.04	4.06	987.3	0.04
6-Methyl-5-hepten-2-one				4.08*	988.7	[0.04]
Unknown ABBA II [m/z 91, 119 (65), 109 (51), 134 (47)]	2.81	1150.7	0.02	4.08*	988.7	[0.04]
Unknown CAIN I [m/z 107, 91 (75), 122 (47), 79 (33), 105 (26), 77 (19)... 134 (2)]	3.24	1186.0	0.05	4.10	989.8	0.03

Laboratoire
PhytoChemia

Plus que des analyses... des conseils

Pseudocumene	3.83	1232.9	0.03	4.15*	993.1	[1.66]
Myrcene	2.62*	1134.8	[1.60]	4.15*	993.1	[1.66]
Pseudolimonene	2.56	1130.1	0.01	4.29*	1002.3	[0.45]
α -Phellandrene	2.52	1127.1	0.36	4.29*	1002.3	[0.45]
<i>ortho</i> -Methylanisole	5.62	1362.1	0.01	4.37*	1007.9	[0.03]
Δ^3 -Carene	2.34	1112.1	0.02	4.37*	1007.9	[0.03]
(3Z)-Hexenyl acetate	4.49	1283.7	0.01	4.40	1009.5	0.02
α -Terpinene	2.69	1140.8	0.64	4.48	1014.8	0.64
<i>para</i> -Cymene	3.77	1228.2	1.00	4.61	1022.7	1.00
Limonene	2.92	1159.7	4.30	4.70*	1028.5	[12.59]
1,8-Cineole	3.03	1168.6	8.32	4.70*	1028.5	[12.59]
<i>ortho</i> -Cymene	4.16	1258.1	0.01	4.82	1035.8	0.01
(Z)- β -Ocimene	3.51*	1207.8	[1.46]	4.89	1040.3	0.10
(E)- β -Ocimene	3.64	1218.5	0.03	5.05	1050.0	0.04
γ -Terpinene	3.51*	1207.8	[1.46]	5.17	1057.7	1.35
<i>cis</i> -Sabinene hydrate	6.51*	1427.8	[0.20]	5.30	1065.7	0.10
Unknown PIMA I [m/z 79, 93 (60), 43 (40), 94 (35), 137 (33), 77 (26), 91 (20), 152 (18)]	4.43	1278.7	0.01	5.34	1068.0	0.01
<i>cis</i> -Linalool oxide (fur.)	6.14	1399.8	0.01	5.38	1070.9	0.02
Unknown BODA VI [m/z 43, 94 (63), 109 (61), 59 (55), 79 (51)...152 (2)]	6.82*	1450.9	[15.79]	5.51	1079.2	0.04
Fenchone	5.31	1339.8	0.03	5.56	1082.3	0.05
Terpinolene	3.96	1243.0	1.50	5.63*	1086.4	[1.56]
<i>para</i> -Cymenene	5.92*	1384.2	[0.22]	5.63*	1086.4	[1.56]
α -Pinene oxide	5.04*	1320.1	[0.01]	5.72	1092.3	0.02
<i>trans</i> -Sabinene hydrate	7.54	1505.5	0.08	5.79	1096.5	0.10
Filifolone	5.92*	1384.2	[0.22]	5.84	1099.3	0.15
Linalool	7.68	1515.9	1.79	5.91	1103.6	1.75
iso-Chrysanthenone?	6.51*	1427.8	[0.20]	5.93	1105.2	0.12
Hotrienol	8.45	1576.7	0.06	5.96*	1107.2	[0.05]
Campholenal analog I	5.75	1371.4	0.01	5.96*	1107.2	[0.05]
endo-Fenchol	7.96	1538.0	0.04	6.05	1113.0	0.06
Chrysanthenone	6.82*	1450.9	[15.79]	6.16*	1119.9	[0.94]
<i>cis-para</i> -Menth-2-en- 1-ol	7.77	1523.0	0.03	6.16*	1119.9	[0.94]
α -Campholenal	6.62	1435.9	0.09	6.20	1122.1	0.10
Unknown CILA X				6.25	1125.5	0.02

[m/z 91, 92 (86), 109 (32), 43 (31), 108 (23), 107 (21)...]						
Unknown MISC XLIV [m/z 123, 86 (100), 91 (65), 119 (58), 73 (55), 41 (33), 93 (32)...]				6.34	1131.4	0.02
<i>cis</i> -Verbenol	8.87	1609.8	0.05	6.47*	1139.4	[15.01]
<i>trans-para</i> -Menth-2-en-1-ol	8.53	1583.2	0.03	6.47*	1139.4	[15.01]
Camphor	6.82*	1450.9	[15.79]	6.47*	1139.4	[15.01]
<i>trans</i> -Verbenol	9.08*	1627.1	[0.47]	6.53	1143.2	0.50
Camphe hydrate	8.04*	1544.7	[1.51]	6.57	1146.2	0.07
Menthone	6.29	1411.1	0.01	6.63	1149.8	0.01
Pinocamphone	6.82*	1450.9	[15.79]	6.70	1154.1	0.28
Pinocarvone	7.47	1500.0	0.34	6.73	1156.2	0.32
Unknown CYWI I [m/z 93, 108 (98), 95 (50), 91 (49), 79 (40), 94 (40)... 166 (1)]	10.22*	1721.1	[0.18]	6.79*	1160.1	[0.39]
Unknown PIMA 4 [m/z 109, 108 (48), 67 (41), 81 (40), 41 (28)...]	7.00	1464.3	0.30	6.79*	1160.1	[0.39]
Borneol	9.34*	1648.0	[3.24]	6.86	1164.5	2.39
δ -Terpineol	9.04	1623.6	0.10	6.91*	1167.6	[1.72]
Isopinocamphone	7.19*	1478.6	[1.51]	6.91*	1167.6	[1.72]
Unknown ROOF VIII [m/z 95, 139 (52), 93 (45), 121 (40), 91 (33), 79 (31)...]	9.79	1685.5	0.15	6.99	1172.7	0.11
Unknown CYNA I [m/z 85, 108 (67), 109 (63), 79 (42), 67 (39), 93 (35)...]	7.19*	1478.6	[1.51]	7.02*	1174.6	[0.97]
Terpinen-4-ol	8.15	1553.2	0.89	7.02*	1174.6	[0.97]
<i>para</i> -Cymen-8-ol	11.06	1793.8	0.06	7.22	1187.1	0.06
Myrtenal	8.25	1560.6	0.03	7.28*	1190.9	[1.02]
α -Terpineol	9.34*	1648.0	[3.24]	7.28*	1190.9	[1.02]
Methylchavicol	8.90*	1612.1	[0.23]	7.38*	1197.3	[0.80]
Myrtenol	10.48	1743.6	0.63	7.38*	1197.3	[0.80]
Unknown PIMA 7 [m/z 95, 93 (32), 121 (24), 79 (22), 91 (21), 105 (16)... 154 (2)]	10.56	1750.4	0.04	7.49*	1204.7	[10.54]

Verbenone	9.15*	1633.1	[10.18]	7.49*	1204.7	[10.54]
Pin-2-en-8-ol	10.61	1755.4	0.02	7.55	1208.4	0.07
<i>trans</i> -Carveol	10.93	1782.8	0.10	7.71	1218.8	0.08
Bornyl formate	7.62	1511.6	0.01	7.74*	1221.0	[0.17]
Unknown CICA IX [m/z 83, 55 (23), 43 (15), 71 (14), 82 (13), 98 (11), ... 153 (4)]	10.22*	1721.1	[0.18]	7.74*	1221.0	[0.17]
Unknown ACMI XII [m/z 93, 82 (84), 67 (73), 41 (47), 108 (42), 107 (36) ...]				7.93	1233.8	0.15
Carvone	9.54	1664.6	0.15	8.01*	1239.0	[0.27]
Unknown CILA XIV [m/z 69, 41 (67), 82 (29), 110 (24), 68 (22), 109 (20) ...]				8.01*	1239.0	[0.27]
Unknown ROOF IV [m/z 93, 67 (80), 41 (48), 43 (44), 91 (43), 111 (42) ...]	10.90	1779.9	0.14	8.01*	1239.0	[0.27]
Neral	9.08*	1627.1	[0.47]	8.06	1242.6	0.04
Geraniol	11.18	1804.1	0.04	8.30	1258.3	0.04
Isopiperitenone	10.70	1762.8	0.08	8.41	1265.8	0.09
Geranial	9.69	1677.5	0.15	8.47	1269.7	0.03
Unknown CIAU V [m/z 95, 67 (45), 41 (42), 110 (42), 43 (41), 59 (36)]	11.93	1871.4	0.05	8.59	1277.7	0.09
<i>cis</i> -Verbenyl acetate	8.30	1564.5	0.16	8.68*	1284.2	[9.54]
Bornyl acetate	7.87	1531.1	9.35	8.68*	1284.2	[9.54]
Unknown PIMA 13 [m/z 119, 43 (87), 91 (78), 92 (70), 134 (50) ...]	8.51	1581.5	0.02	8.76	1289.0	0.01
Unknown ANAR IV [m/z 107, 43 (98), 91 (94), 92 (46), 150 (41) ... 194 (2)]	8.70	1596.2	0.08	8.83	1294.2	0.07
<i>trans</i> -Pinocarvyl acetate	8.72	1598.1	0.19	8.87	1296.5	0.12
Thymol				8.99	1304.4	0.03
Carvacrol	14.85	2153.1	0.01	9.06	1309.2	0.01
Unknown CHIN VI [m/z 107, 91 (43), 105]	12.30*	1905.5	[0.07]	9.09	1311.6	0.02

(17), 122 (16), 79 (15), 41 (11)...					
Unknown MEAL I [m/z 97, 112 (92), 83 (62), 43 (44), 41 (25)... 170? (4)]	14.48	2115.4	0.01	9.13	1314.8
Myrtenyl acetate	9.19	1635.7	0.14	9.24	1322.3
Pin-2-en-8-yl acetate analog	9.39	1652.6	0.02	9.32	1328.1
Terpinyl acetate analog	9.15*	1633.1	[10.18]	9.40	1333.3
exo-2-Hydroxycineole acetate	9.64	1673.0	0.08	9.48*	1339.0
Piperitenone	11.58	1839.8	0.04	9.48*	1339.0
PIMA 8 isomer?				9.77	1359.3
Unknown PIMA 8 [m/z 93, 121 (68), 43 (67), 67 (44), 136 (36), 107 (34)... 180 (4)]	9.60	1669.9	0.08	9.85	1365.2
Geranyl acetate	10.11	1712.0	0.10	10.12	1384.3
(Z)-Jasmone	12.00	1878.0	0.01	10.25*	1393.2
Unknown CHIN VII [m/z 150, 91 (88), 107 (74), 135 (70), 79 (50), 77 (38)...]	12.68	1940.6	0.12	10.25*	1393.2
Methyleugenol	12.84	1956.1	0.02	10.40	1403.7
β-Caryophyllene	8.04*	1544.7	[1.51]	10.52	1413.0
Caryophylla-4(12),8(13)-diene	8.22	1558.9	0.05	10.64	1422.0
α-Humulene	8.90*	1612.1	[0.23]	10.98	1447.0
Unknown MISC XVIII [m/z 95, 43 (59), 107 (38), 59 (37), 110 (31), 41 (21)...]				11.50	1485.4
Caryophyllene oxide	12.30*	1905.5	[0.07]	12.64*	1573.8
Caryophyllene oxide isomer	12.23	1898.8	0.01	12.64*	1573.8
Total reported		97.75%			99.34%

*: Two or more compounds are coeluting on this column

[xx]: Duplicate percentage due to coelutions, only the first one is 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.

Essential Oil, *Rosmarinus officinalis* ct. Verbenone

Internal code: 23F21-NPA01

Rosmarinus officinalis - South Africa - NPS00079 - Lot # NP0064

Report prepared for:

Nature Packaged

Note: no correction factor was applied

R.T.: Retention time (minutes)

R.I.: Retention index