

Date : April 18, 2016

SAMPLE IDENTIFICATION

Internal code : 16C30-NGA5-1-DM

Customer identification : Spikenard - Nepal - Batch #NE-58539

Type : Essential oil

Source : *Nardostachys jatamansi*

Customer : Nature Gifts

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 : 2016-04-02

Checked and approved by :

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.	
Valeric acid	2.52	881	0.15				Aliphatic acid
α -Thujene	3.08	921	0.04	0.09	962	0.95	Monoterpene
α -Pinene	3.18	927	1.07	1.05	954	0.92	Monoterpene
Camphene	3.46	944	0.03	0.03	1007	1.15	Monoterpene
Sabinene	3.88	970	0.04	0.07	1063	1.59	Monoterpene
β -Pinene	3.94	973	2.81	2.92	1046	1.46	Monoterpene
α -Terpinene	4.66	1016	0.03	0.03	1126	2.17	Monoterpene
para-Cymene	4.84	1026	0.04	0.04	1214	3.21	Monoterpene
Limonene	4.88	1029	0.10	0.09	1144	2.38*	Monoterpene
β -Phellandrene	4.91	1030	0.03	[0.09]	1144	2.38*	Monoterpene
1,8-Cineole	4.97	1033	0.13	0.15	1150	2.46	Monoterp. ether
γ -Terpinene	5.43	1059	0.05	0.05	1194	2.96	Monoterpene
Terpinolene	5.90	1086	0.03	0.03	1229	3.41	Monoterpene
Linalool	6.32	1107	0.06	0.06	1518	8.08	Monoterp. alcohol
Terpinen-4-ol	8.22	1182	0.06	0.96	1534	8.56*	Monoterp. alcohol
Thymol methyl ether	9.90	1230	0.11				Monoterp. ether
Unknown (m/z = 85, 57 (58), 41 (26), 43 (19), 98 (18), 103 (16)... 160? (3))	11.26	1262	0.25				Oxygenated monoterp.
Methyl myrtenate	12.82	1298	0.50				Monoterp. ester
Myrtenyl acetate	14.22	1323	0.19	0.69	1615	11.01*	Monoterp. ester
β -Patchoulene	16.84*	1365	2.18	1.95	1426	6.30	Sesquiterpene
Daucene	16.84*	1365	[2.18]	0.12	1436	6.48	Sesquiterpene
β -Elemene	17.71	1379	0.44	[0.96]	1534	8.56*	Sesquiterpene
α -Gurjunene	18.24	1387	0.70	0.79	1471	7.16	Sesquiterpene
β -Maaliene	18.64	1394	1.40				Sesquiterpene
Unknown (m/z = 147, 105 (66), 162 (43), 204 (38))	18.77	1396	0.57				Sesquiterpene
Aristolene	19.09	1401	1.52	1.46	1480	7.31	Sesquiterpene
β -Gurjunene	20.01*	1412	8.23	6.76	1527	8.33	Sesquiterpene
Aristolene-1(10),8-diene	20.01*	1412	[8.23]	0.43	1536	8.64	Sesquiterpene
α -Guaiane	20.43*	1418	1.08	0.78	1531	8.47	Sesquiterpene
α -Maaliene	20.43*	1418	[1.08]				Sesquiterpene
Seychellene	20.81	1422	1.26	7.74	1549	9.02*	Sesquiterpene
Nardosina-7,9,11-triene	21.11	1426	3.36	5.79	1554	9.18*	Sesquiterpene
6,9-Guaiadene	21.34	1429	6.97	[7.74]	1549	9.02*	Sesquiterpene
α -Patchoulene	22.01	1437	3.23	[5.79]	1554	9.18*	Sesquiterpene
allo-Aromadendrene	22.24	1440	1.87				Sesquiterpene
Valerena-4,7(11)-diene	22.50	1443	6.55	8.09	1574	9.77	Sesquiterpene
δ -Patchoulene	22.72	1446	0.54	0.52	1565	9.49	Sesquiterpene
Germacrene D	23.45	1455	0.41	0.47	1625	11.43*	Sesquiterpene

β -Chamigrene	23.63	1457	0.10	[0.47]	1625	11.43*	Sesquiterpene
<i>cis</i> -Muurolo-4(14),5-diene	24.45	1467	0.91	[0.69]	1615	11.01*	Sesquiterpene
Unknown (m/z = 177, 43 (27), 91 (26), 105 (17), 133 (16)... 204 (6))	24.64	1469	0.65				Sesquiterpene
β -Selinene	24.88	1472	1.05	1.01	1634	11.83	Sesquiterpene
Valencene isomer?	25.06	1474	1.59	3.42	1640	12.14*	Sesquiterpene
α -Selinene	25.28	1477	1.50	[3.42]	1640	12.14*	Sesquiterpene
δ -Guaiane	25.68	1482	0.46	[3.42]	1640	12.14*	Sesquiterpene
7-epi- α -Selinene	27.08	1499	2.60	2.37	1670	13.46	Sesquiterpene
Unknown (m/z = 131, 145 (47), 202 (47), 187 (37), 91 (28), 117 (25))	28.21	1513	2.47				Sesquiterpene
β -Sesquiphellandrene	28.53	1518	0.14	0.35	1702	14.90	Sesquiterpene
Unknown (m/z = 125, 43 (19), 95 (13), 109 (10), 123 (10), 81 (10)... 179 (7), 222 (4))	30.08	1538	0.24				Oxygenated sesquiterp.
Unknown (m/z = 185, 200 (82), 143 (68), 129 (59), 128 (56), 157 (40))	30.30	1541	0.55				Sesquiterpene
Norpatchoulanol	30.72	1546	0.19	0.24	1988	32.76	Norsesquiterp. alcohol
Maaliol	31.58	1558	0.51	0.46	1895	26.88	Sesquiterp. alcohol
Spathulenol	32.53*	1570	0.96	0.79	2024	34.96	Sesquiterp. alcohol
Globulol	32.53*	1570	[0.96]	0.28	1982	32.41	Sesquiterp. alcohol
Unknown (m/z = 121, 161 (95), 164 (83), 43 (64), 109 (47), 93 (45), 105 (34), 79 (43), 91 (40)... 204 (8), 222 (10))	32.98	1576	4.32	4.57	1978	32.19	Oxygenated sesquiterp.
Viridiflorol	33.51	1583	0.30	0.39	1981	32.35	Sesquiterp. alcohol
Unknown (m/z = 161, 105 (52), 107 (47), 59 (44), 91 (43), 93 (42), 189 (41)... 222 (6))	33.97	1589	1.98	1.73	2031	35.25	Oxygenated sesquiterp.
Rosifoliol analog?	34.42	1595	0.16	0.34	2015	34.40	Sesquiterp. alcohol
Unknown (m/z = 121, 164 (89), 105 (42), 79 (40), 93 (40), 43 (48), 91 (31)... 204 (18), 222 (4))	35.43	1612	1.62				Oxygenated sesquiterp.
τ -Cadinol	36.51	1637	0.13	0.17	2070	36.59	Sesquiterp. alcohol
τ -Muurolool	36.63	1640	0.10	0.07	2094	37.46	Sesquiterp. alcohol
α -Cadinol	37.01*	1649	2.20	0.51	2132	38.74	Sesquiterp. alcohol
Patchoulol	37.01*	1649	[2.20]	0.23	2035	35.40	Sesquiterp. alcohol

1(10)-Aristolen-9β-ol	37.19	1653	1.35	1.21	2214	40.96	Sesquiterp. alcohol
Valeranone	37.51	1660	5.53	7.33	1974	31.91	Sesquiterp. ketone
Valerenal	39.30	1702	4.39	4.69	2083	37.06	Sesquiterp. aldehyde
Unknown (m/z = 173, 159 (78), 174 (47), 201 (47), 216 (36))	39.80	1718	0.55				Oxygenated sesquiterp.
Eremophilone	39.88	1720	0.22				Sesquiterp. ketone
Unknown (m/z = 159, 161 (91), 91 (88), 176 (65), 105 (62), 145 (58), 131 (51)... 218? (20))	40.62	1743	0.84				Oxygenated sesquiterp.
Unknown (m/z = 161, 176 (97), 119 (78), 91 (60), 105 (49), 175 (44), 133 (42)... 218 (33))	40.91	1752	1.43				Oxygenated sesquiterp.
Unknown (m/z = 43, 109 (97), 84 (78), 111 (76), 161 (73), 121 (65), 197 (65), 179 (57), 41 (53), 95 (52)... 222 (16))	41.44	1769	2.31				Oxygenated sesquiterp.
Methyl valerenate	42.76	1812	1.75	1.75	2181	40.07	Sesquiterp. ester
Unknown (m/z = 159, 117 (46), 202 (40), 131 (38), 91 (31), 187 (31)...)	43.64	1843	0.65				Oxygenated terpene
Unknown (m/z = 187, 145 (51), 202 (42), 160 (41), 105 (31), 131 (30)...)	44.52	1875	0.73				Oxygenated terpene
Total identified			71.36%	66.78%			

*: 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 : Green liquid

Refractive index : 1.5040 ± 0.0003 (20 °C)

CONCLUSION

No adulterant, contaminant or diluent were detected using this method. Please note that reliable botanical identifications of the *Nardostachys* genus are unreliable in literature, and that formal comparison with published papers is not readily possible as far as species identification is concerned.



