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Variation in Xinyi Essential Oils Composition of *Yulania* Spach Seven Species

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The Xinyi essential oils extracted from seven species of *Yulania* (Spach) by steam distillation approach were comparatively analyzed using GC/MS. There were 70 components identified and the content of each compound was obviously different among the seven essential oils. Each Xinyi essential oil contained many medical and spices components which had relatively higher percentage, specially the volatile oils of *Y. liliiflora*, *Y. axilliflora*, *Y. shirenshanensis*, *Y. soulangiana* and *Y.* × *Elizabeth*. So each Xinyi essential oil had itself tendency for application in medicine and spices industries.

Keywords: *Yulania* Spach, Xinyi, Volatile oil, Chemical component.

INTRODUCTION

The plants of *Yulania* (Spach)[1-3] are the important green plants and wildely used as herb or spice materials. Ordinarily the dried flower bud of *Yulania* Spach plants are used as the traditional Chinese medicine and named as Xinyi which containes several biological activities *viz.*, anti-inflammatory, antifungal, antibacterial, *etc.*[4,5]. But the percentages of many medicine and spice compounds in the essential oils of Xinyi collected from different species of *Y.* Spach were found variable[6-8]. For providing the scientific bases for exploition and application of Xinyi essential oil, seven species of *Yulania* (Spach) *viz.*, *Y. denudate*, *Y. biondii*, *Y. liliiflora*, *Y. axilliflora*, *Y. shirenshanensis*, *Y. soulangiana* and *Y.* × *Elizabeth* were collected for comparative research on the major compounds of volatile oils.

EXPERIMENTAL

The plant materials of *Y. denudate*, *Y. liliiflora*, *Y. biondii* and *Y. axilliflora* were collected from Nanzhao city in Henan Province, the Xinyi of *Y. soulangiana* and *Y.* × *Elizabeth* were collected from Changyuan county in Henan Province and the Xinyi of *Y. shirenshanensis* was collected from Lushan County in Henan Province. The air-dried Xinyi (50 g) was hydrodistilled for 5 h to produce the oils which was dried over anhydrous sodium sulfate and stored in sealed vials at low temperature (4 °C) before analysis. All reagents were analytically pure.

GC/MS analysis was carried out on a Hewlett-packard 6890 gas chromatograph fitted with a fused silica HP-5MS capillary column (0.25 mm × 30 m × 0.25 μm). The oven temperature was programmed from 60 to 73 °C at 1.50 °C min^{-1}, 73 to 74 °C at 0.50 °C min^{-1}, 74 to 80 °C at 2 °C min^{-1}, 80 to 140 °C at °C min^{-1}, 140 to 160 °C at 1 °C min^{-1}, 160 to 170 °C at 5 °C min^{-1}. Helium was used as carrier gas at a flow rate of 1 mL min^{-1}. The chromatograph was coupled to a Hewlett-Packard 5973 mass selective detector with an ionization voltage of 70 eV and scan from 20- 400 amu. The qualitative analysis on constituents of the volatile oils were identified by comparison of their retention indices relative to C9-C21 *n*-alkanes and their mass spectral fragmentation pattern with those reported in the literature and stored in the NIST0.2L library. The quantification of the components was performed on the basis of their GC peak areas on the HP-5 MS column[9,10].

RESULTS AND DISCUSSION

All the seven essential oils were clear, yellowish and aromatic. The essential oil yields were different as shown in Table-1. The constituent analyses of volatile oils were ordered according to the results of GC/MS, the matching of database retrieval of each composition were more than 85 % (Table-2).

There were 70 compounds were identified from the essential oils and the constituent comparison of seven volatile oils showed the obvious variations among major components. Only 10 components (α-pinene, β-phellandrene, β-pinene, cymene, eucalyptol, γ-terpinen, β-caryophyllene, germacrene, α-muurolene and β-cadinene) were the common compounds and its percentages in oils were different.

Ordinarily, the quality of Xinyi was evaluated based on the pharmacological active components (eucalyptol, terpineol, linalool, *etc.*) and the flavor components (pinene, sabinene,

TABLE-1
CONSTITUENT COMPARISON OF SEVEN XINYI ESSENTIAL OILS

Species	a	b	c	d	e	f	g
Characters	Clear, yellowish, aromatic						
Yields (%)	2.5	4.7	3.0	6.5	3.0	1.5	2.5

[a]*Y. denudata*; [b]*Y. biondii*; [c]*Y. liliiflora*; [d]*Y. axilliflora*; [e]*Y. shirenshanensis*; [f]*Y. soulangiana*; [g]*Y.* × *Elizabeth*

TABLE-2
CONSTITUENT COMPARISON OF SEVEN XINYI ESSENTIAL OILS

Compounds	Percentage (%)						
	a	b	c	d	e	f	g
Tricyclnene	-	0.17	-	0.10	-	-	-
α-Thujene	0.24	0.21	0.94	0.28	0.39	0.78	-
α -Pinene	2.68	3.17	5.46	4.91	7.14	6.40	5.87
Camphene	0.44	7.28	0.37	5.00	0.48	-	-
β-Phellandrene	10.18	5.02	33.03	12.22	8.74	16.03	13.22
β-Pinene	8.27	4.22	7.63	8.27	16.56	33.27	17.49
β-Myrcene	-	1.06	-	1.28	1.62	-	8.79
α-Phellandrene	1.02	0.09	1.69	-	-	-	-
δ-4-Carene	0.38	0.52	0.82	0.41	0.76	-	0.60
Cymene	0.88	1.27	1.26	0.55	2.64	2.62	1.97
D-Limonene	-	-	8.68	-	-	4.21	3.55
Eucalyptol	16.27	15.75	2.14	29.79	35.98	17.72	18.67
t-Ocimene	-	0.14	-	-	-	-	-
γ-Terpinen	0.78	1.30	1.44	0.85	1.71	1.03	0.97
cis-β-terpineol	0.38	0.51	0.61	0.66	-	-	-
Fenchone	-	0.21	-	-	-	-	-
Terpinolen	0.32	1.00	0.53	0.74	-	-	-
Linalol	0.61	3.15	0.77	2.58	4.37	-	-
Camphor	0.24	24.58	-	15.25	-	-	-
L-4-Terpineol	0.78	0.68	1.99	6.84	0.95	-	-
α-Terpineol	2.73	2.97	-	-	4.43	-	-
Botanoic acid	-	-	0.25	-	-	-	-
Geranial	-	0.14	-	-	-	-	-
3,7-dimethyl-2-octen-1-ol	-	0.26	-	-	-	-	-
Bornyl acetate	1.83	1.47	1.29	0.70	-	0.60	0.44
Methyl geranate	0.28	-	-	-	-	-	-
Carveyl acetate	-	-	0.10	-	-	-	-
(+)-4-Carene	0.13	0.11	1.29	0.18	-	-	-
(+)-Cycloisosativene	0.11	-	-	-	-	-	-
α-Cubenene	0.35	0.09	0.22	0.09	-	-	-
β-Cubenene	0.16	-	0.13	-	-	-	-
β-Elemene	0.59	-	0.12	-	-	-	0.44
β-Caryophyllene	8.64	0.76	4.96	0.14	0.40	2.56	3.48
(+)-Epi-bicyclosesquiphel-landrene	0.08	0.06	-	-	-	-	-
α-Caryophyllene	3.07	0.26	1.54	-	-	0.58	0.81
β-Farsenene	-	0.19	7.36	0.14	-	-	-
Aromadendrene	0.08	0.10	-	-	-	-	-
γ-Muurolene	0.35	0.23	0.17	0.17	0.30	-	-
Germacrene	4.72	1.10	2.68	1.68	0.88	4.69	8.73
β-Selinene	1.07	-	-	-	-	-	-
β-Maaliene	0.29	-	-	-	-	-	-
α-Bergamotene	-	0.13	-	-	-	-	-
α-Selinene	1.13	-	-	-	-	-	-
γ-Elemene	-	-	-	0.17	-	-	0.70
Bicyclogermacrene	-	0.14	0.30	-	-	-	-
α-Muurolene	0.77	0.86	0.36	0.37	0.71	0.86	0.65
eremophilene	0.45	-	-	-	-	-	-
α-Farnesene	-	0.19	1.39	0.39	-	1.52	-
α-Amorphene	0.40	0.56	-	-	-	-	-
γ-Cadinene	0.22	0.71	-	0.21	0.39	-	-
δ-Cadinene	4.46	2.89	0.46	1.32	3.16	2.01	2.40
1,4-Cadinadiene	0.14	-	-	-	-	-	-

3,7(11)-Selinadiene	0.18	-	-	-	-	-	-
α-Cadinene	-	0.15	-	-	-	-	-
Elemol	1.53	-	0.31	-	-	-	0.77
Nerolidol	0.17	-	-	-	-	-	-
Germacrenol	2.51	3.74	-	2.11	4.54	-	2.32
Caryophyllene oxide	0.77	-	0.46	-	-	-	-
β-Gurjunene	0.50	-	-	-	-	-	-
γ- Eudesmol	0.67	-	-	-	-	-	-
γ-Selinene	0.51	-	-	-	-	-	-
Cadinol	0.71	-	0.23	0.52	-	-	-
Copaene	-	1.46	-	-	-	-	-
Guaiol	-	-	-	-	-	-	0.86
β-Eudesmol	5.71	-	1.03	-	-	2.96	2.79
α-Eudesmol	-	-	0.64	-	-	2.16	-
α-Cadinol	-	-	-	-	-	-	3.10
Bulnesol	-	-	-	-	-	-	1.36
Farnesol	-	5.95	-	-	-	-	-
Total	88.78	94.79	92.65	97.92	97.15	100.0	99.98

[a]*Y. denudata*; [b]*Y. biondii*; [c]*Y. liliiflora*; [d]*Y. axilliflora*; [e]*Y. shirenshanensis*; [f]*Y. soulangiana*; [g]*Y.* × *Elizabeth*

myrcene, farnesol, *etc*.). The percentages of pinene in *Y. shirenshanensis*, *Y. soulangiana* and *Y.* × *Elizabeth* oils all were more than 20 %, specially that of in *Y. soulangeana* oil was highest 39.67 % and the percentage of myrcene in *Y.* × *Elizabeth* oil was highest 8.79 %. Otherwise, phellandrene, camphene and caryophyllene *etc*. were vegetal perfume and also were broadly applied in spice, cosmetic and food industries[6-12]. The percentages of phellandrene in seven kinds of oils all were high and in *Y. liliiflora* oil was more than 30 %. Camphene in *Y. biondii* and *Y. axilliflora* oils, caryophyllene in *Y. denudate* oil were rich.

Eucalyptol and β-eudesmol were major medical ingredients in Xinyi volatile oil. Eucalyptol in *Y. axilliflora* and *Y. shirenshanensis* were more than in others and in *Y. liliiflora* was less than others. Eucalyptol was usually used for the treatment of some respiratory ailments, could reduces inflammation and pain, but some researched showed that eucalyptol could kill leukaemia cells *in vitro*[13-16]. And eucalyptol was listed as one of the 599 additives to cigarettes for improving the flavor, or sometimes eucalyptol was used as an insecticide and repellent[17,18]. The percentages of eudesmol in *Y. denudate* and *Y. soulangeana* were abundment and more than 5.0 %.

Another point needed concerns was some compounds in oils of *Y. denudate*, *Y. biondii*, *Y. liliiflora* and *Y.* × *Elizabeth* were special, namely, the Xinyi of *Y. denudate*, *Y. biondii*, *Y. liliiflora* and *Y.* × *Elizabeth* had itself components. For example, Farnesol was only found in *Y. biondii* oil, which was used in perfumery to emphasize the odors of sweet floral perfumes through regulating the volatility of the odorants, or used as a deodorant in cosmetic products because of its anti-bacterial activity[19]. It also was been suggested to function as a chemopreventative and antitumor agent[20].

Conclusion

Though each Xinyi essential oil contained many medicinal and spice components and could be used in medicine and spices industries, the differences among constituents showed that the Xinyi of different species should have different development and application value and have itself tendency for development application.

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