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ANALYSIS ON CHEMICAL COMPONENTS OF XINYI VOLATILE OILS OF *YULANIA AXILLIFLORA* DIFFERENT SPECIES

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ABSTRACT
Xinyi, flower bud of *Yulania* (Spach) plants, is a kind of traditional chinese herbal medicine for treating rhinitis. To investigate the effect of species on chemical components and curative effect of Xinyi, hydrodistilled volatile oils from Xinyi of five cultivated species of *Y. axilliflora* grown in Nanzhao County of Henan (China) were analyzed by GC-MS. There are 53 compounds were identified from the essential oils, and the components and percentage of each compound were obviously different among these essential oils. The yield of volatile oil of *Y. axilliflora* Xinyi (6.5%) was remarkably higher than the average of 5 species. Each Xinyi essential oil contained many medical and spices components which had relatively higher percentage, special *Y. axilliflora* (T. B. Zhao, T. X. Zhang et J. T. Gao) D. L. Fu 'Xuhua'. For example, the percentage of eucalyptol was highest 39.66%. So each Xinyi of *Y. axilliflora* had itself tendency for application in medicine and spices industries.

KEYWORDS: Chinese Herbal Medicine, Xinyi, Volatile Oils, *Yulania Axilliflora*.

INTRODUCTION

Yulania Spach plants are important landscaping trees, and also are important economic plants used as herb or spice.[1,2] Usually, *Y. biondii* (*Magnolia biondii*), *Y. denudate* and *Y. sprengeri* were considered as source plants of traditional chinese herbal medicine Xinyi (flower bud) which had many functions as anti-inflammatory, antifungal, antibacterial, and so on.[3-5] But *Y. Spach* has many species, and the percentages of many medicine and spice compounds in Xinyi essential oils collected from different species of *Y.* Spach were found obviously different according with the researching progress of *Y.* Spach classification and chemical analysis.[6-8] In order to further understand the differences in chemical constituents of Xinyi volatile oil of various species, and provide scientific basis for the development and utilization of Xinyi, the systematic study on volatile oil constituents of Xinyi is necessary. *Y. axilliflora* (T. B. Zhao, T. X. Zhang et J. T. Gao) D. L. Fu and it's four cultivated species, that are *Y.* axilliflora (T. B. Zhao, T. X. Zhang et J. T. Gao) D. L. Fu 'Multialabastra', *Y.* axilliflora 'Houbeizi', *Y.* axilliflora (T. B. Zhao, T. X. Zhang et J. T. Gao) D. L. Fu 'Juanyehua', and *Y.* axilliflora (T. B. Zhao, T. X. Zhang et J. T. Gao) D. L. Fu 'Xuhua',[9,10] were selected to analysis the chemical compositions of Xinyi essential oils by GC/MS, and promote the development and utilization of Xinyi.

MATERIALS AND METHODS

Materials: The plant materials were collected from Nanzhao County in Henan Province of China. Air-dried Xinyi (50 g) was subjected to hydrodistill for 5 h, and produce the volatile oil. The oils were dried over anhydrous sodium sulfate and stored in sealed vials at low temperature (4˚C) before analysis.

GC/MS Analysis: GC/MS analysis was carried out on an Agilent 6890 GC/5973MS fitted with a fused silica HP-5MS capillary column (30 m × 0.25 mm × 0.25 µm). The oven temperature was programmed at 60 ˚C for 4 min, heating to 73 ˚C at 1.50 ˚C/min and keeping 1 min, from 73 to 74 ˚C at 0.50 ˚C /min and keeping 2.5 min, from 74 ˚C to 160 ˚C at 2.00 °C/min and keeping 1 min, and then from 160 ˚C to 170 ˚C at 5.00 ˚C /min. Helium was used as carrier gas at a flow rate of 1 $ml \cdot min^{-1}$. The Hewlett-Packard 5973 mass selective detector operated with an ionization voltage of 70 eV. Mass range was from m/z: 20~400 amu.

Qualitative and Quantitative Analyses: The 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 NSI0.2L library.[11-13] The component quantification was performed on the basis of their GC peak areas on the HP-5 MS column.

RESULTS AND DISCUSSION

The five volatile oils all were clear, yellowish and aromatic liquid. The yields of volatile oils were shown as following: *Y. axilliflora* (T. B. Zhao, T. X. Zhang et J. T. Gao) D. L. Fu (1) 6.5 %, *Y. axilliflora* (T. B. Zhao, T. X. Zhang et J. T. Gao) D. L. Fu 'Multialabastra' (2) 3.5 %, *Y. axilliflora* (T. B. Zhao, T. X. Zhang et J. T. Gao) D. L. Fu 'Houbeizi' (3) 3.0%, *Y. axilliflora* (T. B. Zhao, T. X. Zhang et J. T. Gao) D. L. Fu 'Juanyehua' (4) 3.0 %, and *Y. axilliflora* (T. B. Zhao, T. X. Zhang et J. T. Gao) D. L. Fu 'Xuhua' (5) 2.5 %. The constituent analysis of volatile oils were ordered according to results of GC/MS, the matching of database retrieval of each composition were more than 85% and shown in Table 1.

Table 1: Constituent comparison of five volatile oils of Xinyi.

No.	Retention time (min)	Chemical components	Percentage (%)				
			1	2	3	4	5
1	6.68	Tricyclnene	0.10	---	---	---	---
2	6.86	α-Thujene	0.28	0.42	0.13	0.26	0.41
3	7.15	α-Pinene	4.91	4.44	3.06	2.97	4.81
4	7.73	Camphene	5.00	0.24	1.75	0.73	0.31
5	8.90	β-Phellandrene	12.22	11.26	5.23	8.25	10.03
6	9.06	β-Pinene	8.27	9.04	6.38	6.05	10.39
7	9.07	β-Thujene	---	---	0.77	---	---
8	9.77	β-Myrcene	1.28	1.62	---	1.15	1.52
9	10.44	α-Phellandrene	---	0.21	---	0.10	---
10	11.10	δ-4-Carene	0.41	1.27	---	0.76	0.75
11	11.61	Cymene	0.55	2.38	0.71	---	3.82
12	12.03	Eucalyptol	29.79	31.73	20.29	28.38	39.66
13	13.70	γ-Terpinen	0.85	3.60	---	1.77	2.10
14	14.44	Cis-β-terpineol	0.66	0.59	0.52	0.49	0.70
15	15.84	Terpinolen	0.74	0.32	---	0.39	---
16	17.12	Linalol	2.58	3.48	3.44	4.06	5.22
17	20.87	Camphor	15.25	---	6.72	2.53	---
18	24.06	L-4-Terpineol	1.06	0.86	0.41	1.56	1.11
19	25.86	α-Terpineol	5.78	4.30	3.71	7.46	5.21
20	29.34	β-Citral	---	---	0.19	---	---
21	30.51	α-Citral	---	---	0.28	0.33	---
22	30.52	Cephrol	---	1.46	---	---	---
23	30.52	Geranial	---	---	---	0.98	---
24	30.90	Bornyl acetate	0.70	0.35	0.10	1.94	---
25	31.25	Geraniol	---	0.82	---	---	---
26	32.62	(+)-4-Carene	0.18	0.31	---	0.24	0.22
27	33.28	Copaene	0.09	0.12	0.24	0.17	---
28	33.68	β-Cubenene	---	---	0.09	0.04	---
29	33.74	β-Elemene	---	---	0.10	---	---
30	34.50	β-Caryophyllene	0.14	1.29	1.22	0.58	1.41
31	35.55	α-Caryophyllene	---	0.27	0.35	0.15	0.28
32	35.63	Farsenene	0.14	0.32	0.28	0.23	---
33	35.78	Aromadendrene	---	---	0.27	0.11	---
34	36.20	γ-Cadinene	---	---	---	---	---
35	36.29	γ-Muurolene	0.17	0.28	0.82	0.38	0.28
36	36.44	Germacrene	1.68	2.25	1.20	2.04	1.54
37	36.89	α-Bergamotene	---	---	0.12	---	---
38	36.96	γ-Elemene	0.17	---	---	---	---
39	36.98	Bicyclogermacrene	---	0.36	---	0.39	0.27
40	37.10	α-Muurolene	0.37	0.60	2.07	1.13	0.55
41	37.35	α-Farnesene	0.39	---	---	0.34	---
42	37.60	α-Amorphene	---	0.41	1.84	---	0.41
43	37.59	γ-Cadinene	0.21	---	---	0.77	---
44	37.93	δ-Cadinene	1.32	2.10	6.64	4.78	1.87
45	38.47	α-Cadinene	---	---	0.54	0.21	---
46	39.58	Nerolidol	---	---	---	0.73	---
47	40.08	Germacrenol	2.11	3.11	9.25	4.88	3.37

48	42.34	1,4-Cadinadiene	---	---	0.51	0.31	---
49	43.06	(+)-Epi-bicyclosesquiphellandrene	---	0.45	2.39	1.21	---
50	43.21	τ-Muurolol	0.52	0.64	3.22	1.67	0.97
51	43.40	Cedreanol	---	---	0.91	---	---
52	46.78	Trans-Farnesal	---	---	---	---	0.58
53	48.40	Farnesol	---	7.02	2.79	5.32	---
Total			97.92	97.92	88.54	95.84	97.79

There were 53 compounds were identified from the essential oils, and the constituent comparison of five volatile oils showed the obvious variations among major components. Only 17 components (α-thujene, α-pinene, camphene, β-phellandrene, β-pinene, eucalyptol, cis-β-terpineol, linalool, L-4-terpineol, α-terpineol, β-caryophyllene, γ-muurolene, germacrene, α-muurolene, δ-cadinene, germacrenol and τ-muurolol) were the common compounds, and its percentages in oils were different.

The main components with more than 5% in the Xinyi essential oil of 1 were six, that were camphene (5.00%), β-phellandrene (12.22%), β-pinene (8.27%), eucalyptol (29.79%), camphor (15.25%) and α-terpineol (5.78%), and their total percentage was 76.31%. The main components in 2 were β-phellandrene (11.26%), β-pinene (9.04%), eucalyptol (31.73%) and farnesol (7.02%), and their total percentage was 59.05%. The main components in 3 were β-phellandrene (5.23%), β-pinene (6.38%), eucalyptol (20.29%), camphor (6.72%), δ-cadinene (6.64%) and germacrenol (9.25%), and their total percentage was 54.51%. The total percentage of main components in 4 was 55.46% (β-phellandrene 8.25%, β-pinene 6.05%, eucalyptol 28.38%, α-terpineol 7.46% and farnesol 5.32%). And in 5 they were β-phellandrene (10.03%), β-pinene (10.39%), eucalyptol (39.66%), linalol (5.22%) and α-terpineol (5.21%), and their total percentage was 70.51%.

Ordinarily, the quality of Xinyi was evaluated based on the pharmacological active components (eucalyptol, terpineol and linalol etc.) and the flavor components (pinene, sabinene, myrcene and farnesol etc.). Eucalyptol was a major medical ingredient in Xinyi volatile oil, usually used for the treatment of some respiratory ailments, and also reducing inflammation and pain.[14] Otherwise, eucalyptol was listed as one of the 599 additives to cigarettes for improving the flavor, or sometimes eucalyptol is used in insecticide and repellent.[15] Pinene and myrcene, the basic materials of spice, were classical monoterpene compounds in natural spices, and could synthesize many important catenulate monoterpene compounds, for example, geraniol and nerol in spice industry. And phellandrene, camphene etc. are common plant spices widely used in perfumery, cosmetics and food industry.[16-18]

The comparison of chemical composition on volatile oils showed variation of the major components. The percentages of eucalyptols in five cultivated species of *Y. axilliflora* were more than 20%, especially in 5 (39.66%). The percentages of phellandrene and pinene in five oils were all more than 5%. Some compounds in Xinyi essential oils were special, for example linalol in 5 and germacrenol in 3. And the percentages of farnesol in Xinyi of 2 and 4 were more than 5%. Besides farnesol can be used in perfumery to emphasize the odors of sweet floral perfumes through regulating the volatility of odorants, or used as a deodorant in cosmetic products because of its anti-bacterial activity. It also has been suggested to function as a chemopreventative and antitumor agent.[19] These special constituents in Xinyi volatile oil of each species whether can be used as the chemical base for plant classification of *Y.* Spach, which will depend on an extensive study in the future.

CONCLUSION

In summary, each Xinyi essential oil of *Y. axilliflora* contained many pharmaceutical ingredients and spice components with high content, and can 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 application tendency. And based on these differences, some criterion may be established for the classification and breeding of *Y.* Spach plants.

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REFERENCES

1. Chinese pharmacopoeia commission. Chinese pharmacopoeis. Beijing; Chemical Industry Press, 2005.
2. Callaway DJ. The world of Magnolias. Portland; Timber press, 1994.
3. Pyo MK, Lee YY, Yun-Choi HS. Anti-platelet effect of the constituents isolated from the barks and fruits of *Magnolia obovate*. Arch Pharm Res, 2002; 25: 325-8.
4. Park JB, Lee CK, Park HJ. Anti-helicobacter pyroli effect of constunolide isolated from the stem bark of *Magnolia sieboldii*. Arch Pharm Res, 2000; 23: 266-9.
5. Kivcak B, Mert T, Saglam H, Ozturk T, Kurkcuoglu M, Baser KHC. Chemical composition and antimicrobial activity of the essential oil of *Anthemis wiedemanniana* from Turkey. Chem Nat Compd, 2007; 43: 47-51.

6. Fu DL, Zhao DX, Sun JH, Du LY. Study on the variability of Xinyi from the flower bud of Yulania species of Magnoliaceae and criterious for Xinyi breading. J Henan Agr Univ, 2004; 38: 178-83.
7. Zhao DX, Lu K, Hou JH. Variation in Xinyi essential oils composition of *Yulania Spach* 7 species. Asian J Chem, 2015; 27: 1739-41.
8. Jin GS, Guo F. Analysis of chemical constituents in essential oil of *Magnolia biondii* Pamp. Flower buds. Chinese J Anal Chem, 2003; 31: 1535.
9. Zhao TB, Tian GH, Fu DL, Zhao DX. Resources, cultivation and utilization of World Yulania spach. Beijing; Science Press, 2013.
10. Fu DL, Zhao DX, Sun JH, Xv JW, Wang J. Components of volatile oils in 10 chinese species of Yulania Genus and its phylogenetic implication. Sci Silvae Sin, 2005; 41: 68-74.
11. Pino V, Ayala JH, Afonso AM, Gonzalez V. Micellar microwave-assisted extraction combined with solid-phase microextraction for the determination of polycyclic aromatic hydrocarboons in a certified marine sediment. Anal Chim Acta, 2003; 477: 81.
12. Ozel MZ, Kaymaz H. Superheated water extraction, steam distillation and soxhlet extraction of essential oils of Origanum onites. Anal Bioanal Chem, 2004; 379: 1127-33.
13. Sajjadi SE, Shahpiri Z. Chemical composition of the essential oil of Salvia Limbata C.A.MEY. Daru, 2004; 12: 94-7.
14. Ji YB. Pharmacology and application of effective components in natural drugs. Beijing; Science press, 2007.
15. Ahmed A, Choudhary MI, Farooq A, Demirci B, Demirci F, Baser KHC. Essential oil constituents of the spice Cinnamomum tamala (Ham.) Nees & Eberm. Flavour Fragrance J, 2000; 15: 388-90.
16. Lv JS, Guo F. Analysis of chemical constituents of volatile oil from the flower buds of Magnolia biondii. Chinese J Anal Chem, 2003; 31: 1535.
17. Liu YQ. Analysis of the volatile oils from the flowers of Magnolia liliflora Desr. By GC-MS. Lishizhen Medicine and Materia Medica Research, 2008; 19: 1911-2.
18. Liu CM, You H. Seperation and application of effective components in natural products. Beijing; Chemical Industry Press, 2003.
19. Joo JH, Jetten AM. Molecular mechanisms involved in farnesol-induced apoptosis. Cancer Lett, 2010; 287: 123-35.