Chemistry of Natural Compounds, Vol. 43, No. 6, 2007

CHEMICAL VARIATION IN LEAF ESSENTIAL OILS OF *Rhus chinensis* FROM EIGHT LOCATIONS IN SOUTHERN AND EASTERN CHINA

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UDC 547.913

The chemical composition of *R. chinensis* and component activities have been investigated by several authors [1–5]. Essential oils of *Rhus chinensis* growing in China have not been investigated yet.

Fifty-four compounds of the leaf oils of *R. chinensis* were identified in eight samples from different locations in Southern and Eastern China, accounting for 99.17–99.86% of the oils. The oils of samples from Guilin, Nanjing, Wuhan, Kunming, Kaili, Shaoyang, Mt. Tianmu, and Shanghai showed the presence of 51, 49, 50, 47, 43, 51, 48, and 49 identified compounds accounting for 99.86, 99.79, 99.42, 99.80, 99.82, 99.56, 99.17, and 99.78% of the whole oils, respectively (Table 1).

In order to determine the variations of leaf oils of *R. chinensis* from different locations in China, the composition data were analyzed using cluster analysis. The result shows that the leaf oil from Kaili is unique in comparison with other samples. It is rich in *n*-tetradecane (12.88%), which is not found in any other samples. Moreover, hexadecanoic acid, phytol, and *n*-heptacosane are the three major compounds in all the other seven samples, while their concentration in the sample from Kaili is much lower. Among the rest of the seven samples, the difference in leaf essential oils between the two locations from Mt. Tianmu and Shanghai was relatively small.

These two locations were well clustered into a sub-group, and separated from the rest of the other five locations. They have a much higher concentration of hexadecanoic acid (39.54% and 42.39%) than all the other samples.

Our study shows the unique constituents of the leaf essential oil from Kaili, which is located in the major industrial sumac gall production area, suggesting a possible relationship between the chemical compounds of *R. chinensis* and the insect attractant. Clearly, further investigation on the chemical composition of *R. chinensis*, especially expanding to other sumac gall production regions and the regions of different ecological conditions, is still needed.

ACKNOWLEDGMENT

We would like to thank Zhiduan Chen, Dingjiang Wang, Boping Ye, Shaoqing Tang, Jimei Liu, and Fan Lu for collecting samples. This work was supported by grants from the Chinese National Key Project for Basic Research (2002CB512801), Shanghai Science and Technology Committee (07XD14025), and the National Science Foundation of China (30670361).

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0009-3130/07/4306-0741

TABLE 1. Composition of Leaf Essential Oils of *R. chinensis* from Eight Locations in Southern and Eastern China, %

Compound	RI	Guilin	Nanjing	Wuhan	Kunming	Kaili	Shaoyang	Mt. Tianmu	Shanghai
2-Pentenol	780	0.31	0.39	0.32	0.24	0.19	0.27	1.14	0.73
2,4-Dimethylheptane	824	-	-	-	-	3.09	-	-	-
2,4-Dimethylheptene	845	-	-	-	-	2.16	-	-	-
2-Hexenal	864	0.12	Tr.	Tr.	0.30	0.52	0.98	Tr.	0.11
3-Hexenol	867	0.35	1.54	0.58	0.32	2.53	0.49	1.19	1.56
2-Hexenol	875	2.35	1.09	1.83	0.29	-	1.76	4.34	3.87
Hexanol	878	0.24	0.64	0.73	0.69	0.21	0.31	0.23	0.55
Octen-3-ol	988	0.24	0.05	Tr.	0.45	0.1	0.19	Tr.	0.16
Hexanoic aid	1011	Tr.	0.37	0.24	-	1.55	Tr.	0.41	0.64
Benzeneacetaldehyde	1058	1.43	0.22	0.19	0.23	6.76	0.72	0.53	1.01
3,5-Dimethyloctane	1064	0.17	0.08	0.05	0.13	2.69	0.35	0.92	0.83
3,5-Dimethyloctene	1079	Tr.	0.24	0.17	-	2.48	Tr.	0.21	0.14
n-Undecane	1100	0.20	0.10	0.14	Tr.	4.82	0.11	0.35	0.42
β-Linalool	1106	0.51	0.27	0.33	0.63	2.72	0.43	1.39	0.92
n-Nonanal	1111	0.33	Tr.	0.05	0.27	-	0.14	0.71	0.62
p-Menthenol	1207	Tr.	0.80	0.54	0.32	0.25	Tr.	0.39	0.83
Dimethylundecane	1276	2.88	0.87	0.25	0.39	7.41	2.35	1.75	2.21
Tridecane	1301	0.30	0.19	Tr.	Tr.	5.76	0.69	0.38	Tr.
Trimethylundecane	1323	0.69	0.22	0.10	0.21	4.4	1.06	Tr.	0.12
Eugenol	1366	0.51	Tr.	0.11	0.43	Tr.	0.83	Tr.	0.21
n-Tetradecane	1400	-	-	-	-	12.88	-	-	-
Dihydropseudoionone	1454	Tr.	0.48	0.59	Tr.	2.83	Tr.	-	Tr.
Dimethyldodecane	1487	0.89	0.45	Tr.	0.68	6.42	1.07	1.85	0.48
Lonone	1492	Tr.	0.38	0.75	0.19	Tr.	Tr.	Tr.	Tr.
Pentadecane	1500	Tr.	1.92	3.61	-	8.4	Tr.	1.62	0.57
cis-*α*-Bisabolene	1518	0.72	-	0.84	0.35	Tr.	0.57	-	Tr.
Trimethyldodecane	1533	0.60	0.92	Tr.	1.86	5.59	0.13	1.83	0.5
trans-Nerolidol	1569	1.00	0.57	2.08	0.27	Tr.	1.37	0.58	0.99
Hexadecane	1600	0.36	2.01	1.8	0.33	Tr.	0.11	Tr.	Tr.
Tetradecanal	1620	0.54	-	0.85	Tr.	0.15	0.73	0.22	Tr.
δ-Cadinol	1664	0.94	0.69	2.23	1.32	Tr.	1.47	0.79	0.93
Epiglobulol	1683	1.36	4.53	4.57	1.94	Tr.	4.49	Tr.	0.84
Bisabolol	1702	Tr.	2.48	0.37	Tr.	6.77	0.81	Tr.	Tr.
Pentadecanal	1721	13.11	2.54	2.32	8.97	Tr.	10.94	4.92	3.17
Tetramethyltetradecane	1742	0.68	Tr.	Tr.	-	4.67	1.08	Tr.	-
Myristic acid	1775	Tr.	2.11	1.14	2.06	Tr.	Tr.	6.87	7.08
Octadecane	1800	0.74	0.15	0.94	Tr.	-	0.49	-	-
Tetramethylpentadecane	1839	1.52	1.34	0.79	1.14	Tr.	2.17	2.11	1.75
Hexahydrofarnesyl acetone	1846	2.67	3.26	6.58	1.12	Tr.	1.93	1.36	1.47
Tetramethylhexadecane	1880	2.12	0.12	0.59	2.53	0.24	1.78	2.24	2.99
Octadecatrienal	1903	4.66	1.41	1.62	0.84	Tr.	3.25	0.33	Tr.
Farnesyl acetone	1919	4.20	5.52	6.89	0.82	-	2.42	0.46	0.13
Isophytol	1951	2.09	1.84	2.12	Tr.	-	Tr.	2.48	5.67
Hexadecanoic acid	1980	15.78	10.36	11.32	22.66	1.56	12.27	39.54	42.39
Phytol		13.35	20.84	18.29	11.96	0.77	14.79	6.39	5.43
Tricosane		1.10	0.98	1.13	Tr.	Tr.	0.61	Tr.	Tr.
Tetracosane		0.76	0.32	0.62	Tr.	-	1.25	1.39	Tr.
Docosal		1.08	0.75	0.84	1.47	Tr.	0.73	Tr.	0.28
Pentacosane		1.27	3.38	2.61	2.74	-	0.91	0.72	0.39
Tetracosal		1.18	1.01	1.03	2.38	0.36	2.28	0.20	0.14
Hexacosane		2.61	4.79	4.10	4.82	0.37	2.12	2.52	2.48
Squalene		0.56	Tr.	0.49	2.25	0.12	1.69	Tr.	0.17
n-Heptacosane		12.31	15.03	12.68	20.54	1.05	13.89	5.87	6.33
n-Octacosane		1.03	2.54	-	1.66	-	3.53	0.94	0.67

RI: retention index; Tr.: trace quantities (<0.1% detected).

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