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Hanjing Zhang Department of Chemistry, University of Alabama in Huntsville Huntsville, AL 35899, USA

William N. Setzer Department of Chemistry, University of Alabama in Huntsville Huntsville, AL 35899, USA

Correspondence:

William N. Setzer Department of Chemistry, University of Alabama in Huntsville Huntsville, AL 35899, USA Email: wsetzer@chemistry.uah.edu

The floral essential oil composition of *Albizia julibrissin* growing in Northern Alabama

Hanjing Zhang, William N. Setzer

Abstract

The floral essential oil of *Albizia julibrissin*, "silktree", growing in Huntsville, Alabama, was obtained by hydrodistillation and analyzed by gas chromatography – mass spectrometry. The oil was dominated by palmitic acid (23.3%), *trans*-linalool oxide (both furanoid and pyranoid forms, 6.6% and 7.0%, respectively), pentacosane (7.2%), methyl salicylate (6.2%), eugenol (6.1%), and 1-octanol (5.2%).

Keywords: palmitic acid, trans-linalool oxide, methyl salicylate, eugenol.

1. Introduction

Albizia julibrissin Durazz. (Fabaceae, Mimosoideae), known as "silktree" or "mimosa", is native to Asia, ranging naturally from Iran to Japan^[1]. The plant was introduced to North America as an ornamental and has become naturalized along roadsides and woodland borders throughout the southeastern United States^[2]. The tree produces fragrant showy flowerheads May through August. Because of our interest in fragrant floral essential oils^[3-6], we investigated *A. julibrissin*. The floral fragrance volatiles of *A. julibrissin* growing in China has been previously reported^[7].

2. Materials and Methods

2.1 Plant Material

Flowers of *A. julibrissin* were collected in July, 2012, from several treelets growing wild in Huntsville, Alabama (34°43'N, 86°39'W, 196 m elevation), and stored at 20 °C. The flowers (29.5 g) were hydrodistilled using a Likens-Nickerson apparatus to give a clear colorless essential oil (18.2 mg).

2.2 Gas Chromatography – Mass Spectrometry

The floral essential oil of *A. julibrissin* was analyzed by GC-MS using an Agilent 6890 GC with Agilent 5973 mass selective detector, an HP-5ms fused silica capillary column, and an Agilent ChemStation data system as described previously^[8]. Identification of the oil components was based on their retention indices (RI) and by comparison of their mass spectral fragmentation patterns with those reported in the literature^[9]. The *A. julibrissin* floral essential oil composition is summarized in Table 1.

3. Results and Discussion

The major components from the hydrodistilled floral essential oil of *A. julibrissin* in this study were palmitic acid (23.3%), *trans*-linalool oxide (furanoid form, 6.6%), *trans*-linalool oxide (pyranoid form, 7.0%), pentacosane (7.2%), methyl salicylate (6.2%), eugenol (6.1%), and 1-octanol (5.2%). Other compounds likely contributing to the fragrance were linalool (3.1%), and *cis*-linalool oxides (furanoid and pyranoid forms, 0.9% and 0.5%, respectively). The volatile floral components previously reported from China were obtained by headspace techniques and contained mostly *trans*-linalool oxide (furanoid form, 44.0%), *cis*-linalool oxide (furanoid form, 5.2%),

RI ^a	Compound	% ^b	RI	Compound	%
801	Hexanal	1.3	1252	Geraniol	0.2
835	2-Furaldehyde	0.1	1273	Nonanoic acid	0.8
855	(2E)-Hexenal	1.7	1292	Indole	0.5
857	(3Z)-Hexenol	3.1	1300	Tridecane	tr
868	(2Z)-Hexenol	1.7	1315	(2E,4E)-Decadienal	0.7
870	1-Hexanol	3.7	1357	Eugenol	6.1
904	Heptanal	0.6	1454	Geranyl acetone	0.8
988	3-Octanone	0.2	1487	(<i>E</i>)-β-Ionone	tr
989	6-Methyl-5-hepten-2-one	0.1	1500	Pentadecane	0.2
1072	1-Octanol	5.2	1510	α-Bulnesene	tr
1072	cis-Linalool oxide (furanoid)	0.9	1700	Heptadecane	0.1
1089	trans-Linalool oxide (furanoid)	6.6	1716	Pentadecanal	1.3
1101	Linalool	3.1	1765	Myristic acid	0.2
1105	Nonanal	2.5	1815	Hexadecanal	1.2
1113	2-Phenylethyl alcohol	0.2	1844	(2E,6E)-Farnesyl acetate	0.2
1139	Benzeneacetonitrile	0.2	1846	Unidentified ^d	1.3
1154	(2E,6Z)-Nonadienal	0.1	1912	Farnesyl acetone	0.6
1160	(2E)-Nonenal	0.2	1963	Palmitic acid	23.3
1169	cis-Linalool oxide (pyranoid)	0.5	2130	Linoleic acid	1.3
1174	trans-Linalool oxide (pyranoid)	7.0	2135	Oleic acid	0.5
1190	α-Terpineol	0.5	2300	Tricosane	4.0
1193	Methyl salicylate	6.2	2500	Pentacosane	7.2
1205	Decanal	tr ^c	2700	Heptacosane	1.7
				Total Identified	96.7

Table 1: Floral essential oil composition of Albizia julibrissin.

^a RI = "Retention Index" determined in reference to a homologous series of *n*-alkanes on an HP-5ms column.

^b The percentages of each component are reported as raw percentages based on total ion current without standardization.

^c tr = "trace" (< 0.05%).

^d MS, m/z(%): 124(4), 113(3), 110(7), 109(13), 95(12), 85(14), 83(9), 81(8), 71(28), 69(15), 59(20), 58(50), 57(24), 55(29), 43(100), 41(32).

linalool (4.4%), isoamyl alcohol (17.2%), 4-penten-2-one (5.1%), 2,2,4trimethyloxetane (3.9%) and isoamyl acetate (3.2%)^[7]. Thus, while there are similarities in the content of linalool derivatives, there are also some notable differences, in particular, the absence of methyl salicylate and eugenol in the sample from China as well as the absence of isoamyl alcohol and isoamyl acetate in the sample from Alabama. The absence of higher boiling components from the sample from China can be attributed to headspace collection as opposed to hydrodistillation.

Interestingly, the floral oil compositions of *A. julibrissin* are very different from other floral essential oils of the Fabaceae, such as clover (*Trifolium* spp., dominated by maltol and linalool)^[10], alfalfa (*Medicago sativa*, dominated by (2*E*)-hexenal)^[11], or sweet pea (*Lathyrus odoratus*, dominated by (*E*)- β -ocimene and linalool)^[12].

4. Conclusions

The presence of linalool, *trans*-linalool oxide, methyl salicylate, and eugenol are likely responsible for the fragrant odor of silktree blossoms.

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