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Aroma Volatile Composition of *Millingtonia hortensis* Linn. F. Flower Growing in Chiang Rai, Thailand

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First report on the study of the aroma volatile components of the fresh *Millingtonia hortensis* Linn. F. flower growing in Chiang Rai, Thailand is described. The volatiles of fresh *M. hortensis* flower were extracted by maceration in petroleum ether at room temperature for 12 h. After removing of the solvent under reduced pressure yielded light yellow semi-solid volatile crude was obtained. The crude was re-dissolved in ethanol followed by filtration and evaporation to obtain the *M. hortensis* absolute (0.02 %). The preliminary sensory evaluation showed that the scent of the obtained absolute was the closest to the fresh flower. The volatile compositions were investigated by GC-MS technique. Twenty seven compounds have been identified and accounted for 86 % of the chromatographable components, with solanesol (25.72 %), *trans*-farnesol (19.71 %), nerolidol (8.54 %), palmetic acid (6.77 %), vanillin (6.20 %), oleic acid (4.54 %), linoleic acid (3.87 %), L-linalool (3.37 %), 1-octen-3-ol (1.67 %), α-farnesene (1.22 %) and methyl salicylate (1.03 %) respectively, as the major constituents.

Keywords: *Millingtonia hortensis* Linn. F., Aroma volatile, GC-MS.

INTRODUCTION

In Thailand, *Millingtonia hortensis* Linn. F. is cultivated as an ornamental tree in yards, gardens and avenues. The plant, commonly known as "Peep" or "Kaa Sa Long" in Thai, belongs to the family Bignoniaceae. The flower of *M. hortensis* has rich and pleasant scent and been used as traditional medicine by the natives for treatment of a variety of conditions [1]. Pharmaceutical research revealed that the extract of *M. hortensis* flower has antifungal activity, larvicidal activity [2], antiproliferation activity [3] and antioxidant activity [4]. The general extraction method for the volatile of *M. hortensis* flowers is steam distillation and hydro-distillation. The disadvantage of these extractions is the scent of obtained extract is differed from the fresh flower. Our report showed the extraction of aroma volatiles from *M. hortensis* flowers using non-polar solvent, petroleum ether, gave the extract that its scent was the closest to fresh flower. Chemical composition of the extracted aroma volatiles is also described.

EXPERIMENTAL

Fresh flowers of *Millingtonia hortensis* were collected from Mae Fah Luang University, Chiang Rai, Thailand in November 2009. The plant was identified by the Chiang Mai University Herbarium, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.

Extraction of essential oil: Fresh flowers of *M. hortensis* (10 kg) were macerated in petroleum ether (5 L) for 12 h, followed by filtration and then removing of all solvent under reduced pressure to yield semi-solid petroleum ether crude. The crude was re-dissolved in ethanol (25 mL) followed by filtration and evaporation of all solvent to give a light yellow semi-solid *M. hortensis* absolute in a yield of 0.02 %. The obtained absolute was dissolved in dichlomethane and adjusted to the concentration of 1 mg/mL.

Analysis of essential oil: A chemical composition in the essential oil extract was analyzed by GC-MS techniques.

GC-MS analysis: The fragrance constituents of *M. hortensis* were analyzed using an HP model 6890 gas chromatograph equipped with an HP-5MS (5 % phenyl-polymethylsiloxane) capillary column (30 m × 0.25 mm i.d., film thickness 0.25 mm; Agilent Technologies, USA) interfaced to an HP model 5973 mass-selective detector. The oven temperature was initially held at 60 °C and then increased by 2 °C/min to 250 °C. The injector and detector temperatures were 250 and 280 °C, respectively. Purified helium was used as the carrier gas at a flow rate 1 mL/min. EI mass spectra were collected at 70 eV ionization voltages over the range of *m/z* 29-300. The electron multiplier voltage was 1150 V. The ion source and quadrupole temperatures were set at 230 and 150 °C, respectively. Identification of the volatile components was performed by comparison of their Kovat retention indices,

relative to C_8-C_{22} *n*-alkanes and comparison of the mass spectra of individual components with the reference mass spectra in the Wiley 275, NIST 98 databases and Adams 1989.

RESULTS AND DISCUSSION

The volatile absolute of *M. hortensis* was extracted by a maceration of the fresh flower of the plant in petroleum ether. After filtration and removing of the solvent yielded volatile crude of *M. hortensis.* The crude was re-dissolved in ethanol followed by filtration and evaporation to give semi-solid *M. hortensis* absolute in a yield of 0.02 %. This extraction procedure showed that the scent of the obtained absolute was the closest to the fresh flower of *M. hortensis*. Identification of the aroma volatile components of *M. hortensis* absolute was performed by a comparison of mass spectra with literature data (Wiley 275, NIST 98) and by comparison of their retention indices (RI) with those reported in the literature [5-7]. Table-1 lists the identified compounds in the order of their elution on capillary column. A typical GC-MS TIC profile of the aroma volatiles from *M. hortensis* flower is presented in Fig. 1. The most prominent compounds found were solanesol (25.72 %), *trans*-farnesol (19.71 %), nerolidol (8.54 %), palmetic acid (6.77 %), vanillin (6.20 %), oleic acid (4.54 %), linoleic acid (3.87 %), L-linalool (3.37 %), 1-octen-3-ol (1.67 %), α-farnesene (1.22 %) and methyl salicylate (1.03 %) respectively, with integrator raw peak areas expressed as a percentage of the total chromatographable components of the volatiles. These compounds accounted for approximately 85.84 % of total volatile components. A number of components could not be identified due to the lack of reference spectra and/or their relatively low abundance.

Conclusion

The aroma volatile components of the fresh flower of *M. hortensis* growing in Chiang Rai, Thailand have been extracted

TABLE-1
CHEMICAL COMPOSITIONS OF THE AROMA VOLATILE ABSOLUTE OF FRESH FLOWER OF *M. hortensis*

No	Compounds	RA[a] (%)	RI[b] (exp)	RI[c] (Lit)	MW	Identification[d]
1	1-Octen-3-ol	1.67	974	974[T]	128	1,2
2	3-Octanol	0.13	993	988[T]	130	1,2
3	*cis*-Linalool oxide (furanoid)	0.09	1039	1067[T]	170	1,2
4	*L*-Linalool	3.37	1043	1095[T]	154	1,2
5	Nonanal	0.13	1104	1100[T]	142	1,2
6	Phenylethyl alcohol	0.07	1112	1106[T]	122	1,2
7	*cis*-Linalool oxide (pyranoid)	0.09	1172	1170[T]	170	1,2
8	Methyl salicylate	1.03	1195	1090[T]	152	1,2
9	Geraniol	0.09	1252	1249[T]	154	1,2
10	2-Methyl naphthalene	tr	1291	1295[T]	142	1,2,3
11	1-Methyl naphthalene	tr	1308	1312[T]	142	1,2,3
12	Unidentified	tr	1391			1,2
13	Vanillin	6.20	1395	1393[T]	152	1,2
14	1,6-Dimethylnaphthalene	0.12	1414		156	1,2
15	Isoeugenol	0.21	1447	1448[T]	164	1,2
16	Unidentified	0.16	1451			
17	Unidentified	0.08	1469			
18	Unidentified	0.72	1478			
19	α-Farnesene	1.22	1507	1505[T]	204	1,2
20	Nerolidol	8.54	1563	1561[T]	222	1,2
21	*cis*-Farnesol	0.17	1694	1698[T]	222	1,2
22	*trans*-Farnesol	19.71	1740	1742[T]	222	1,2
23	Unidentified	0.10	1840			
24	Unidentified	0.19	1917			
25	*n*-Hexadecanoic acid	6.77	1967	1959[T]	256	1,2
26	Hexadecanal	0.18	2017		240	1,2
27	Methyl linoleate	0.55	2091	2095[T]	294	1,2
28	Heneicosane	0.32	2097	2100[T]	296	1,2
29	Phytol	0.75	2110	2111[T]	296	1,2,4
30	Linoleic acid	3.87	2133	2132[T]	280	1,2
31	Oleic acid	4.54	2141	2141[T]	282	1,2
32	Stearic acid	0.30	2162	2172[T]	284	1,2,5
33	Solanesol	25.72	2191		631	1
34	Unidentified	4.75	2197			
35	Unidentified	0.47	2210			
36	Unidentified	1.85	2215			

[a]RA = Relative peak area; [b]RI(exp) = Program Temperature retention indices as determined on HP-5MS column using a homologous series of *n*-alkanes (C8-C22) as internal standard and He as carrier gas; [c]RI(lit) = Value from literature data of Adams, R.P. 1995. Identification of essential oil components by gas chromatography/mass spectrometry. Allured Publishing Corporation, Carol Stream, IL, using He as carrier gas; T = Program temperature values; MW = Molecular weight; [d]1 = Based on retention index; 2 = Based on comparison of mass spectra with literature data (Wiley 275, NIST 98); 3 = J.C. Leffingwell and E.D. Alford, *J. Environ. Agric. Food Chem.* **4**, 899 (2005); 4 = T.Y. Chung, J.P. Eiserich and T. Shibamoto, *J. Agric. Food Chem.*, **41**, 1693 (1993); 5 = J.A. Pino, J. Mesa, Y. Munoz, M.P. Marti and R. Marbot, *J. Agric. Food Chem.*, **53**, 2213 (2005); tr = Trace.

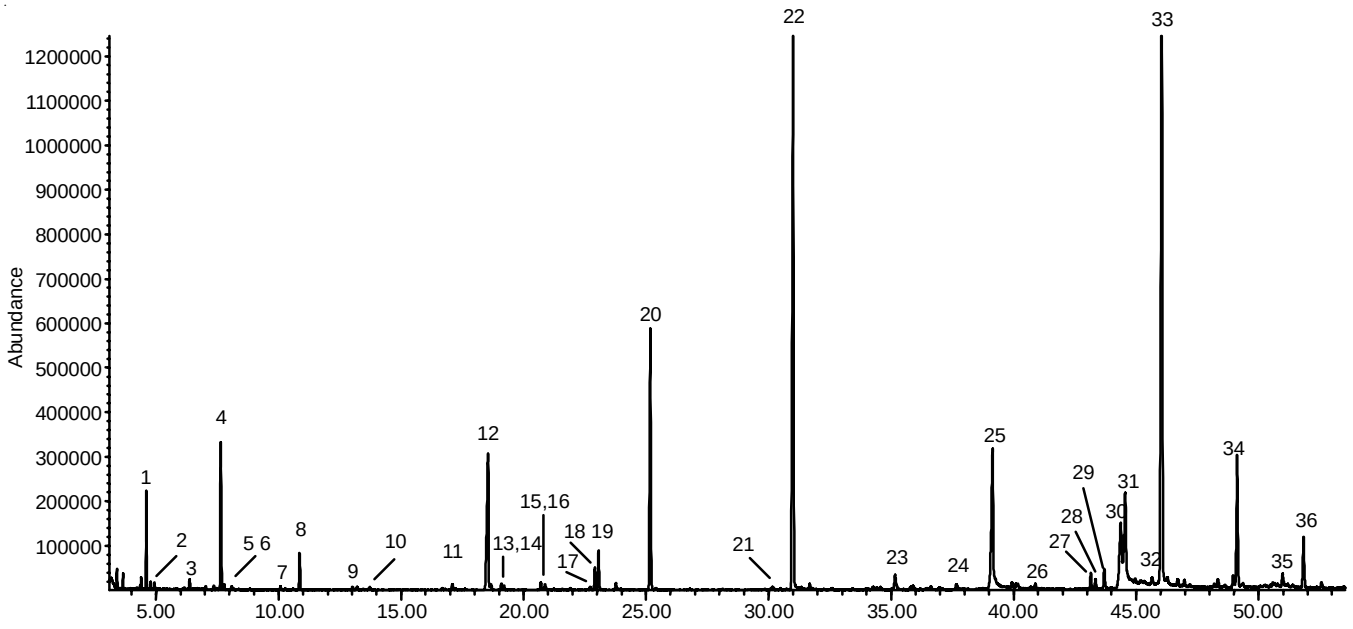

Fig. 1. GC-MS TIC profile of the of the aroma volatile absolute of fresh flower of *M. hortensis.* See experimental for GC-MS condition and Table-1 for peak identifications

by using the non-polar organic solvent, petroleum ether followed by the polar organic solvent ethanol to yield volatile absolute (0.02 %) and analyzed by GC-MS. 27/36 components have been identified. The first three major components were solanesol (25.72 %), *trans*-farnesol (19.71 %) and nerolidol (8.54 %), repectively.

REFERENCES

1. R. Ramasubramaniaraja, *Int. J. Pharm. Sci. Rev. Res.*, **4**, 123 (2010).
2. P.D. Sharma, M. Sharma and S. Puri, *Indian J. Pharm. Sci.*, **69**, 599 (2007).
3. S. Tansuwanwong, Y. Hiroyuki, I. Kohzoh and U. Vinitketkumnuen, *Asian Pac. J. Cancer Prev.*, **7**, 641 (2006).
4. P. Leelapornpisid, S. Chansakaow, C. Chaiyasut and N. Wongwattananukul, in eds.: N. Chomchalow and V. Chantrasmi, International Workshop on Medicinal and Aromatic Plants Acta Horticulturae 786, (2008).
5. J.C. Leffingwell and E.D. Alford, *Electron. J. Environ. Agric. Food Chem.*, **4**, 899 (2005).
6. T.Y. Chung, J.P. Eiserich and T. Shibamoto, *J. Agric. Food Chem.*, **41**, 1693 (1993).
7. J.A. Pino, J. Mesa, Y. Munoz, M.P. Marti and R. Marbot, *J. Agric. Food Chem.*, **53**, 2213 (2005).