Chemistry of Natural Compounds, Vol. 47, No. 6, January, 2012 [Russian original No. 6, November–December, 2011]

CHEMICAL COMPOSITION OF ESSENTIAL OIL FROM BARK OF *Saraca indica*

Yusei Kashima and Mitsuo Miyazawa*

UDC 547.913

Saraca indica (Family Caesalpiniaceae; local names: Ashok, *Anganapriya*, etc.) have been used in both Ayurvedic and Unani system of medicine. *S. indica* is grown all over Pakistan. It occurs up to 600 meters altitudes. It is cultivated in many gardens because of its decorative orange red flowers and evergreen beautiful foliage. *S. indica* bark is used in India as a uterine sedative, and hot water extracts administered to human adult female stimulates the uterus like ergot but without producing tonic contractions. It is also used to treat uterine disorders [1], as an emmenagogue [2] and uterine sedative [3], in the treatment of uterine affections [4], and in several preparations related to female disorders. In a recent study, the bark of *S. indica* has been reported as a treatment for antidepression [5]. The isolation of tannins [6], flavonoids [7], proanthocyanidins [8], and leucoanthocyanidins [9] was previously reported from the bark.

The compositions of essential oils from bark of *S. indica* have not been reported. Herein we communicate results from a study of essential oils from *S. indica* using gas chromatography (GC) and GC-mass spectrometry (GC-MS). Raw material for the study (bark of the plant) was collected in March 2009 in India. Essential oil was obtained by hydrodistillation with a Likens-Nickerson-type apparatus for 2 h and studied by GC/MS. The analysis was carried out using a Hewlett-Packard 6890N-HP5973N gas chromatograph, an HP-5MS capillary column (30 m × 0.25 mm, film thickness 0.25 mm). The column temperature was programmed from 40–260°C at a rate of 4°C/min and held at 260°C for 5 min. The injector and detector temperatures were 270°C and 280°C, respectively, with the actual temperature in the MS source reaching approximately 230°C and the ionization voltage 70 eV. The flow rate of the carrier gas (He) was 2.2 mL/min on the HP-5MS column. The components of the volatile oil were identified by direct comparison of their mass spectral pattern and retention index (RI) with those published in the literature.

The volatile oil was obtained by hydrodistillation from *S. indica* and was produced in a yield of 0.0059%. The oil was colorless, with a sweet, spicy, and weak mint odor. The components were listed in order of their elution from the HP-5MS column amd DB-WAX column. A gas chromatogram of the essential oil from bark of *S. indica* was presented in which 89 components were separated. As shown in Table 1, 89 components were identified, amounting to 100% of the oil. They included acids (46.63%), alcohols (27.20%), hydrocarbons (8.86%), ketones (6.63%), aldehydes (4.25%), esters (2.05%), sulfur-containing compounds (1.49%), and miscellaneous compounds (2.89%).

The predominant compounds were palmitic acid (18.50%), nonanoic acid (15.78%), phenylethanol (6.89%), thymol (4.62%), and valeranone (3.08%).

Department of Applied Chemistry, Faculty of Science and Engineering, Kinki University, 3-4-1, Kowakae, Higashiosaka-shi, Osaka 577-8502, Japan, fax: 81 6 6727 2024, e-mail: miyazawa@kindai.ac.jp; yusei8072@yahoo.co.jp.
Published in Khimiya Prirodnykh Soedinenii, No. 6, pp. 869–870, November–December 2011. Original article submitted June 30, 2010.

0009-3130/12/4706-0998

TABLE 1. Composition of Essential Oils from Bark of *S. indica*

Compound	RI-5	Peak area, %	Compound	RI-5	Peak area, %
Ethylacetate	814	0.06	Eugenol	1356	0.16
Pentanoic acid	854	Tr.	γ-Nonalactone	1360	0.25
Hexanol	865	0.42	Biphenyl	1376	0.81
2-Methylbutanoic acid	880	0.67	(*E*)-Methylcinnamate	1381	0.76
2-Butoxyethanol	905	0.12	Decanoic acid	1384	0.96
Benzaldehyde	958	0.32	Tetradecane	1400	0.22
Heptanol	968	0.11	1,7-Dimethylnaphthalene	1401	1.84
3-Methoxy-1-butylacetate	978	Tr.	2,6-Dimethylnaphthalene	1416	0.34
Hexanoic acid	1015	1.83	Massoia lactone	1476	0.57
2-Ethyl-1-hexanol	1028	2.06	β-Selinene	1485	0.23
Benzeneacetaldehyde	1042	0.08	2,4-*bis*(1,1-Dimethylethyl)phenol	1511	0.96
Acetophenone	1064	0.20	Ethyl-4-ethoxybenzoate	1527	Tr.
1-Octanol	1069	Tr.	Undecanoic acid	1532	Tr.
(*Z*)-Linalool oxide	1070	0.53	Calamenene	1540	Tr.
Heptanoic acid	1073	Tr.	(*E*)-Nerolidol	1560	0.38
p-Cresol	1080	0.17	Dodecanoic acid	1573	2.23
(*E*)-Linalool oxide	1086	0.56	Fluorene	1582	Tr.
Linalool	1098	0.98	Hexadecane	1600	Tr.
Nonanal	1101	0.42	β-Atlantol	1609	0.30
Phenylethyl alcohol	1116	6.89	Dillapiole	1622	0.27
Terpineol	1134	0.08	γ-Eudesmol	1632	1.21
Camphor	1143	0.56	*epi*-α-Muurolol	1642	0.76
(*Z*)-3-Nonen-1-ol	1157	0.19	β-Eudesmol	1652	0.29
Borneol	1166	0.52	α-Cadinol	1655	0.69
Menthol	1172	1.35	*ar*-Turmerone	1663	0.86
Terpinen-4-ol	1176	0.19	Cadalene	1667	Tr.
Naphthalene	1181	1.67	Valeranone	1675	3.08
α-Terpineol	1190	1.17	Precocene II	1683	Tr.
Dodecane	1200	1.16	α-Bisabolol	1686	Tr.
Octanoic acid	1203	0.81	Dibenzothiophene	1748	Tr.
Decanal	1207	0.72	Tetradecanoic acid	1767	2.49
4-Methylene-isophorone	1218	0.11	Phenanthrene	1774	0.44
Benzothiazole	1223	0.13	Hexahydrofarnesyl acetone	1837	0.29
2-Undecanone	1294	Tr.	4-Methyldibenzothiophene	1847	1.36
Cuminaldehyde	1239	2.21	3-Methyldibenzothiophene	1867	0.23
Carvone	1243	0.71	Hexadecanol	1874	0.19
2-Phenylethylacetate	1255	1.02	4-Methylphenanthrene	1911	0.27
3,5-Dimethoxytoluene	1264	0.26	Methylhexadecanoate	1917	0.21
(*E*)-Anethole	1284	1.22	(*Z*)-11-Hexadecenoic acid	1953	Tr.
Safrole	1287	1.14	Hexadecanoic acid	1980	18.50
Thymol	1292	4.62	4,9-Dimethylnaphtho[2,3-*b*]thiophene	1993	Tr.
Carvacrol	1302	2.04	Oleic acid	2141	2.97
Nonanoic acid	1305	15.78	(*Z*)-6-Octadecenoic acid	2159	0.39
1-Methylnaphthalene	1308	0.78	Squalene	2829	1.10
4-Methoxysalicylaldehyde	1326	0.50	Total		100.00

RI-5: Retention index on HP-5 column, Peak areas were expressed as GC peak areas. Tr: trace (< 0.01%).

REFERENCES

1. G. V. Satyavati, D. N. Prasad, S. P. Sen, and P. K. Das, *Indian J. Med. Res*., **58** (7), 947 (1970).
2. J. C. Saha, E.C. Savini, and S. Kasinathan, *Indian J. Med. Res*., **49**, 130 (1961).
3. S. K. Gupta, *Indian Med. Rec*., **59**, 5112 (1939).
4. C. R. Karnick, *Acta Phytother.*, **59**, 112 (1939).

5. P. Shetty, M. Krishnamoorthy, K. Vijayanarayana, E. V. S. Subramanyam, and D. S. Satyanarayana, *Asian J. Chem.*, **20** (2), 1075 (2008).
6. N. Indrani and K. Balasubramanian, *Leather Sci.*, **32**, 12 (1985).
7. N. Indrani and K. Balasubramanian, *Leather Sci.*, **31**, 349 (1985).
8. T. B. Middelkoop and R. P. Labadie, *Z. Naturforsch.,* **40B**, 855 (1980).
9. J. K. Duggal and K. Misra, *J. Indian Chem. Soc.*, **57**, 1243 (1980).