Research Journal of
Phytochemistry

ISSN 1819-3471

Academic
Journals Inc.

www.academicjournals.com

Research Journal of Phytochemistry 5 (1): 66-69, 2011
ISSN 1819-3471 / DOI: 10.3923/rjphyto.2011.66.69

Chemical Composition of the Essential Oil of *Pavetta indica* L. Leaves

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ABSTRACT

The chemical composition of the volatile oil from leaves of *Pavetta indica* Linn. growing at Thal, Distt- Pithoragarh, Uttarakhand was analyzed by GC-MS. The steam distillation of *P. indica* leaves was carried out using a Clavenger apparatus in order to obtain the volatile oil (0.25%). It indicated presence of 24 compounds. The major constituents of oil were β-pinene (25.45%), β-eudesmol (7.06%) and tricyclene (5.74%). The oxygenated monoterpenes and sesquiterpene hydrocarbons were found in the oil as a minor components. The yield of essential oil obtained from aerial parts were 0.05% (v/w). Thus it could be a better source of β-pinene, β-eudesmol and tricyclene. The study established the chemical composition of the essential oil of the plant leaves.

Key words: GC-MS, essential oil, isolation, Kovat indices, *Pavetta indica*

INTRODUCTION

Pavetta indica Linn. (Rubiaceae) is a stout bushy shrub, found in Lanka, South China and Northern India. The plant leaves are used in the treatment of liver diseases, pain of pile, urinary diseases and fever (Kritikar and Busu, 1933; Thabrew *et al*., 1987). Methanolic extract of leaves have been reported as antipyretic and anti-inflammatory activity (Mandal *et al*., 2003). The plants shoot and root biomass has been used for the preparation of important crude drug without isolation of target phytochemicals.

The composition of active principles in herbs has been the subject of many research studies. They are responsible for the wide aroma and therapeutic effects (Gherman *et al*., 2000). The curative efficiency of herbs depends on their quality, time of harvesting, drying and storage procedure and on the climatic condition (Robards and Antolovich, 1997).

Essential oils are valuable natural products used as raw materials in many fields, including perfumes, cosmetics, aromatherapy, phytotherapy, spices and nutrition (Buchbauer, 2000). The roots gave and essential oil containing isovaleric acid, isovaleraldehyde, armomadendrene, pavonene, alpha-terpenene, azulene and pavonenol (Khare, 2007).

The present study is aimed at characterizing the chemical component of the essential oil of *P. indica* leaves. Therefore, we report for the first time the separation and identification of the components of leaf essential oils with the aid of GC, GC-MS and other spectroscopic techniques.

MATERIALS AND METHODS

Plant material: The leaves of the plant (5.0 kg) were collected in May 2006 from Thal (Disst. Pithoragarh, Uttarakhand) District identified by Prof. Y.P.S. Pangtey, Department of

Botany, Kumaun University, Nainital and also from Dr. H.C. Pandey, Botanical Survey India, Dehradun. The voucher specimen was deposited in the Herbarium section at B.S.I., Dehradun (voucher No. 112174).

Oil isolation: The fresh material was steam distilled for 6 h in a Clavenger apparatus. The distillate was saturated with NaCl and the oil was extracted with hexane and dichloromethane. The organic phase was dried over anhydrous Na_2SO_4 and solvent distilled in the thin film rotary vacuum evaporator at 35°C. The yield of oil was calculated based on dried weight of plant material.

GC/MS: The GC-MS of oil was recorded on 17A-Shimatdzu interfaced with QP5050A ion mass spectrometer using Rtx.® - WAX column (30×0.25 mm i.d., 0.25 μm film coating) the oven temperature was programmed from 40°C at rise 3°C, finally at 230°C. Helium was used as carrier gas. The gas chromatogram were recorded in Nucon 5765 model, Rtx-5 columns (30×0.32 mm i.d., 0.25 μm film) under temperature programme 60 to 210°C at 3°C min^{-1} rise, N_2 was used as carrier gas and FID as detector. The component were identified by comparing the mass spectra with Willey Spectral Library. The identification of the chemical constituents was assigned on the basis of comparison of their retention indices and mass spectra with those given in the literature (Adams, 1995, 2001; Julain and Konig, 1988). Retention Indices (RI) were determined with reference to a homologous series of normal alkanes, by using the following formula (Kovats, 1958).

$$KI = 100\ [n + (N-n) \times \frac{\log t^1_R\ (\text{unknown}) - \log t^1_R\ (C_n)}{\log t^1_R\ (C_N) - \log t^1_R\ (C_n)}$$

t^1_R = The net retention time (t_R-t_0)
t_0 = The retention time of solvent (dead time)
t_R = The retention time of the compound.
C_N = No. of carbons in longer chain of alkane
C_n = No. of carbons in shorter chain of alkane
n = The number of carbon atoms in the smaller alkane
N = The number of carbon atoms in the larger alkane

RESULTS AND DISCUSSION

The gas chromatogram of oil shows (Table 1) the presence of 24 compounds and 74.00% of essential oil has been identified (Table 1). The yield of essential oil obtained from aerial part of plants were 0.05% (v/w). The major constituents of oil were β-pinene (25.45%), β-eudesmol (7.06%) and tricyclene (5.74%). The oxygenated monoterpenes and sesquiterpene hydrocarbons found in the oil as minor components.

The oxygenated monoterpenes were 4.99, monoterpene hydrocarbons were 33.58, oxygenated sesquiterpenes were 8.93 and sesquiterpene hydrocarbons were 6.79% of the total identified compounds. The objective of present study was to analyse the volatile component of the leaves of *Pavetta indica* by GC-MS. It is concluded that the oxygenated monoterpenes and sesquiterpene hydrocarbons found in the oil as minor components.

Essential oils are valuable natural products, which are used as raw materials in many fields including perfumes, cosmetics, aromatherapy, phytotherapy, spices and nutrition (Buchbauer, 2000). Aromatherapy is the therapeutic use of fragrances or at least mere volatiles to cure diseases,

Table 1: Composition of essential oil from leaves of *Pavetta indica*

Compound	Area (%)	Mol. formula	Mol. wt.	R.I.	Mode of identification
Tricyclene	5.74	$C_{10}H_{16}$	136	928	a, b
α-thujene	1.23	$C_{10}H_{16}$	136	933	a, b
Benzaldehyde	0.68	C_7H_6O	106	943	a, b
Sabinine	2.23	$C_{10}H_{16}$	136	970	a, b
β- pinene	25.45	$C_{10}H_{16}$	136	976	a, b
Trans-meta-mentha-2,8-diene	0.88	$C_{10}H_{16}$	136	985	a, b
α-terpinene	3.93	$C_{10}H_{16}$	136	1015	a, b
o-cymene	1.23	$C_{10}H_{14}$	134	976	a, b
Limonene	2.14	$C_{10}H_{16}$	136	1025	a, b
γ-terpinene	2.36	$C_{10}H_{16}$	136	1051	a, b
Acetophenone	0.56	C_8H_8O	120	1036	a, b
Linalool	3.68	$C_{10}H_{18}O$	154	1086	a, b
Perillene	2.09	$C_{10}H_{14}O$	150	1090	a, b
Cis-pinan-2-ol	0.25	$C_{10}H_{18}O$	154	1130	a, b
3-hexenyl isobutyrate	0.23	$C_{10}H_{18}O_2$	170	1298	a, b
Piperitone	0.46	$C_{10}H_{16}O$	152	1226	a, b
β-caryophyllene	1.56	$C_{15}H_{24}$	204	1421	a, b
α-Guaiene	2.26	$C_{15}H_{24}$	204	1437	a, b
α-humulene	3.69	$C_{15}H_{24}$	204	1455	a, b
germacrene D	0.84	$C_{15}H_{24}$	204	1479	a, b
γ-cadinene	1.78	$C_{15}H_{24}$	204	1507	a, b
δ-cadinene	1.89	$C_{15}H_{24}$	204	1520	a, b
β-eudesmol	7.06	$C_{15}H_{26}O$	222	1641	a, b
Thujopsa-3-one	2.08	$C_{15}H_{24}O$	220	1645	a, b
Total %	74.30				

a: Retention index of gas chromatogram; b: GC-MS

infections and indispositions by means of inhalation (Buchbauer *et al.*, 1993). This has recently attracted the attention of many scientists and encouraged them to screen plants to study the biological activities of their oils from chemical and pharmacological investigations to therapeutic aspects. Hopefully, this will lead to a new information on plant applications and new perspective on the potential use of these natural products.

CONCLUSION

Thus the study concludes that the leaves of *Pavetta indica* are good source of aromatic oil. The distribution of these compounds in common wild plants has important application for the pharmaceutical companies. There is a great need to further research.

ACKNOWLEDGMENT

The authors are thankful to Prof. C.S. Mathela, Head Chemistry department, Kumaun University, Nainital for encouragement and necessary laboratory facilities especially for the G.C. analysis (DST). The authors are grateful to Dr. Jagdeesh Singh, Principal Scientist, IIVR-Varanasi for GC-MS analysis.

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