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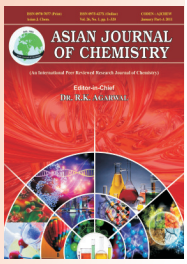

Chemical Profiles of Essential Oils of *Bauhinia* Species from South India

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Essential oils from fresh leaves of *Bauhinia tomentosa, B. scandens, B. purpurea* and *B. malabarica* from south India were isolated by hydrodistillation and characterized by GC-MS. Phytol was the major constituent in *B. purpurea* (90.38 %), *B. scandens* (88.32 %) and *B. malabarica* (62.17 %). Phytone was the major constituent in *B. tomentosa* (32.84 %), followed by β-cubebene (21.84 %) and β-caryophyllene (14.24 %). Monoterpenioids were absent in *Bauhinia* leaf oils.

Keywords: *Bauhinia*, Essential oils, GC-MS, Phytol, Phytone, β-Cubebene, β-Caryophyllene.

INTRODUCTION

Genus *Bauhinia* (Fabaceae) has over 250 species of trees and shrubs mostly distributed in the tropical areas. *Bauhinia* bark and leaves are used in traditional medicines. *B. racemosa* is used in treatment of inflammation, headache, fever, tumors, skin infection, dysentery and diarrhea[1,2]. *B. microstachya* is used for diabetics in herbal medicine[3]. *B. reticulata* and *B. refescens* are used for the treatment of round worm, conjunctivitis, anthrax, dysentery, blood poisoning, leprosy and lung diseases[4,5]. *B. purpurea* is used as a laxative and carminative drug[6]. *B. purpurea* is also used for the treatment of diarrhea in sub Himalayan areas[7]. In this study, we report the chemical profiles of leaf volatile oils of four *Bauhinia* species, *viz*., *B. tomentosa, B. scandens, B. purpurea* and *B. malabarica* from south India. Chemical profiles of these four *Bauhinia* leaf oils are also compared with *B. acuminata* [8].

EXPERIMENTAL

Fresh leaves of *B. scandens, B. purpurea* and *B. malabarica* were collected in May 2012 from the campus of Jawaharlal Nehru Tropical Botanic Garden and Research Institute, Pacha-Palode and *B. tomentosa* was collected in June 2012 from Peroorkada, Thiruvananthapuram. *Bauhinia* specimens were identified by Dr. Mathew Dan, Jawaharlal Nehru Tropical Botanic Garden and Research Institute, Palode.

Extraction of essential oils: Fresh leaves of *B. tomentosa* (650 g), *B. purpurea* (650 g), *B. malabarica* (650 g) and *B. scandens* (150 g) were separately hydrodistilled for 6 h using Clevenger-type apparatus. Pungent smelling, light greenish yellow coloured essential oils were obtained from leaves of *B. tomentosa* (0.10 mL, 0.008 %, v/w), *B. purpurea* (0.10 mL, 0.008 %, v/w) and *B. malabarica* (0.15 mL, 0.009 %, v/w). *B. scandens* yielded pungent smelling, white turbid leaf oil (0.05 mL, 0.006 %, v/w). *B. scandens* and *B. purpurea* leaves showed a white deposit along with their leaf oils on cooling of the Clevenger apparatus. Leaf oils along with the solidified portions were washed of the distillation apparatus with acetone and kept at 4 ºC until analyzed.

GC-MS analyses: *Bauhinia* leaf oils were subjected to GC-MS analysis by splitless injection of 1 µL of each oil on a Hewlett Packard 6890 gas chromatograph fitted with a cross-linked 5 % PH ME siloxane HP-5 MS capillary column (30 m × 0.32 mm, 0.25 µm coating thickness) coupled with a model 5973 mass detector. GC-MS operation conditions: injector temperature 220 ºC; transfer line 240 ºC; oven temperature programme 60-246 ºC (3 ºC/min); carrier gas helium, 1.4 mL/min; detector temperature 250 C. Mass spectra: electron impact (EI^+) mode 70 eV with a mass range of 40-450 m/z and ion source temperature 250 ºC.

Identification of oil constituents: Individual components of *Bauhinia* leaf oils were identified by Wiley 275 L database matching, comparison of retention times and comparison of mass spectra with published data[9] (Table-1).

RESULTS AND DISCUSSION

Phytol, a diterpene alcohol, was detected as the major constituent in *Bauhinia purpurea* (90.38 %), *B. scandens* (88.32 %) and *B. malabarica* (62.17 %) leaf oils (Table-1).

TABLE-1
CHEMICAL PROFILES OF *Bauhinia* LEAF OILS FROM SOUTH INDIA

Constituent	Retention time, HP-5 (min.)	Percentage				
		Bauhinia tomentosa	*B. scandens*	*B. purpurea*	*B. malabarica*	*B. acuminata**
α-Copaene	18.54	–	–	–	4.73	–
β-Elemene	19.23	6.91	–	–	–	–
β-Caryophyllene	20.19	14.24	–	–	–	13.87
β-Cubebene	22.63	21.84	–	–	–	–
α-Humulene	22.64	–	–	–	–	1.76
Isomethyl-α-ionone	22.89	–	–	–	–	0.17
α-Elemene	23.23	–	–	–	2.84	–
β-Ionone	23.94	–	–	–	–	0.10
β-Cadinene	24.33	6.11	–	–	–	–
δ-Cadinene	24.37	–	–	–	12.47	–
α-Farnesene	24.87	–	–	–	–	0.10
Cadala-1(10),3,8-triene	25.04	–	–	–	3.26	–
α-Elemol	25.36	–	–	1.86	–	–
1,6,10-Dodecatrien-3-ol	27.13	–	–	–	–	0.26
3-Hexen-1-ol	27.32	–	–	–	–	0.24
Caryophyllene oxide	27.68	–	–	–	–	3.15
β-Guaiene	28.24	–	–	–	6.53	–
Humulene epoxide (II)	28.53	–	–	–	–	0.35
δ-Cadinol	28.74	–	–	–	2.66	–
Caryophylla-4(12),8(13)-dien-5α-ol	29.40	–	–	–	–	0.22
Caryophylla-4(12),8(13)-dien-5β-ol	29.61	–	–	–	–	1.00
α-Muurolol	29.77	–	–	–	–	0.32
Cadalene	29.90	–	–	–	1.53	–
α-Cadinol	30.25	–	–	–	–	0.40
Isoaromadendrene epoxide	30.35	–	–	–	–	0.11
Farnesol	32.80	–	–	–	–	0.24
1-Octadecene	35.24	–	–	–	–	0.26
Phytone	36.06	32.84	2.54	1.92	–	–
Nonadecane	37.82	–	–	2.82	–	–
Phytol	44.44	10.12	88.32	90.38	62.17	65.90
Sclareolide	46.93	–	–	–	–	0.24
Octacosane	55.91	–	–	–	–	0.21
Total	92.06	90.86	96.98	96.19	88.90	–

*Chemical profile of leaf oil of *B. acuminata*[8].

The turbid leaf oil of *B. scandens* showed only two constituents, phytol (88.32 %) and phytone (2.54 %). Phytone (32.84 %), β-cubebene (21.84 %), β-caryophyllene (14.24 %) and phytol (10.12 %) were the major constituents in *B. tomentosa* leaf oil (Table-1). We recently reported 65.90 % phytol in *B. acuminata* leaf oil, with β-caryophyllene (13.87 %) as its second major constituent[8]. Phytol is used in cosmetics, fine fragrances, shampoos, toilet soaps and in non-cosmetic products such as household cleaners and detergents[10]. Phytol is also used as a precursor for the manufacture of vitamins E and K1[11,12]. It is commonly found in its esterified form in green vegetables as the side chain of chlorophyll molecule. Phytanic acid is an acid derivative of phytol and humans obtain it through the consumption of dietary sources. Free phytol, when administered orally, is readily absorbed and converted to phytanic acid in rats and humans[13]. Sumac flea beetle *Blepharida rhois* was reported to use phytol synthesized by its host plant as a deterrent against predation[14]. Phytone is used as a fragrance agent[15,16].

Sesquiterpenes and their oxygenated derivatives constituted the second major groups of compounds in *Bauhinia* leaf oils (Table-1). β-Caryophyllene is a natural bicyclic sesquiterpene with a rare cyclobutene ring. It is naturally found as a mixture with α-caryophyllene (α-humulene) and isocaryophyllene. It usually finds applications in spice blends, citrus flavors, soaps, detergents, creams and lotions and also in a variety of food products and beverages[17,18]. β-Caryophyllene is also known for its antiinflammatory and local anesthetic activities[19,20]. Previous studies identified β-elemene 56.9 %, lepidozenol 22.3 %, β-bourbonene 12.4 % (*B. aculeata*); spathulenol 15.9 %, γ-elemene 11.8 % (*B. brevipes*); α-copaene 28.8 %, β-caryophyllene 18.5 %, bicyclogermacrene 14.0 %, α-humulene 11.8 % (*B. foficata*); spathulenol 27.0 %, β-caryophyllene 17.4 %, bicyclogermacrene 12.3 %, isospathulenol 10.8 % (*B. longifolia*); β-caryophyllene 46.6 %, α-elemene 22.6 %, spathulenol 14.1 % (*B. rufa*) and germacrene D 24.7 %, α-elemene 18.7 %, spathulenol 13.3 % (*B. variegata*) the major constituents in *Bauhinia* volatile oils[21].

Conclusion

We found phytol (62.17-90.38 %) as the major constituent in leaf oils of *Bauhinia purpurea*, *B. scandens* and *B. malabarica* from south India. *B. acuminata* also showed 65.91 % of phytol in its leaf oil[8]. *B. tomentosa* showed only 10.12 % phytol in its leaf oil.

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