



## NOTE

### Chemical Composition of Essential Oil of *Bauhinia acuminata* Leaves

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Essential oil isolated by hydrodistillation of the fresh leaves of *Bauhinia acuminata* was analyzed by GC-MS. Nineteen compounds comprising 89.9 % of the leaf oil were identified. The leaf oil was characterized by absence of monoterpenoids. Phytol (65.90 %) was identified as major constituent in *B. acuminata* leaf oil. Sesquiterpenoids,  $\beta$ -caryophyllene (13.87 %) and caryophyllene oxide (3.15 %), were the other major constituents.

**Key Words:** *Bauhinia acuminata*, Essential oil, GC-MS, Phytol,  $\beta$ -Caryophyllene.

Genus *Bauhinia* belonging to the family Caesalpiniaceae consists of over 250 species of trees and shrubs<sup>1</sup>. They are distributed in various geographic locations in tropical climates. Plants in genus *Bauhinia* have characteristic butterfly shaped leaves. Most *Bauhinia* spp. have applications in traditional medicines. *Bauhinia microstachya* is used for diabetics in herbal medicine. *B. reticulata* and *B. refescens* are used for treatment round worm, conjunctivitis, anthrax, dysentery, blood-poisoning, leprosy and lung diseases<sup>2,3</sup>. *B. variegata* is used for skin diseases and ulcerations in Africa. *B. variegata* bark extracts are used for treatment of cancer in India<sup>4</sup>. *Bauhinia acuminata* is an ornamental tree with white flowers bearing tropical shade and it is distributed throughout India in warm climates. Previous studies showed juvenomimetic activity of *B. acuminata* against *Dysdercus cingulatus*<sup>5</sup>. Its bark is used for the treatment of leucorrhoea and shyphilis<sup>6</sup>. Further, *B. acuminata* crude extract showed hemolytic activity against human erythrocytes in a dose-dependent manner<sup>7</sup>. GC-MS analysis of the essential oil obtained from *B. acuminata* leaves is reported in the present study.

Fresh leaves of *B. acuminata* were collected from Thiruvananthapuram, Kerala and the specimen was identified by Dr. Mathew Dan, Tropical Botanic Garden and Research Institute, Pacha-Palode, Thiruvananthapuram.

**Extraction of essential oil:** Fresh leaves (650 g) were subjected to hydrodistillation for 6 h using a Clevenger-type apparatus. Pungent smelling, light greenish yellow coloured essential oil (0.05 mL, 0.008 %, v/w) was obtained. The oil

was dried over anhydrous sodium sulphate and kept at 4 °C until analyzed.

**GC-MS analysis:** The essential oil of *Bauhinia acuminata* leaves was subjected to GC-MS analysis by splitless injection of 1.0  $\mu$ L of the oil on a Hewlett Packard 6890 gas chromatograph fitted with a cross-linked 5 % PH ME siloxane HP-5 MS capillary column (30 m  $\times$  0.32 mm, 0.25  $\mu$ m coating thickness) coupled with a model 5973 mass detector. GC-MS operation conditions: injector temperature 220 °C; transfer line 240 °C; oven temperature programme 60-246 °C (3 °C/min); carrier gas helium, 1.4 mL/min; detector temperature 250 °C. Mass spectra: Electron impact (EI<sup>+</sup>) mode 70 eV with a mass range of 40-450 m/z, ion source temperature 250 °C. Linear retention indices (LRI) of constituents were determined using *n*-alkanes as standards<sup>8</sup>. Individual components were identified by Wiley 275.L database matching, comparison of retention times and comparison of mass spectra of constituents with published data (Table-1).

GC-MS analysis resulted in identification of 19 compounds comprising 89.9 % of *B. acuminata* leaf oil. Phytol (65.90 %) was the major constituent in the leaf oil. Phytol (3,7,11,15-tetramethyl-2-hexadecen-1-ol) is a diterpene alcohol. It is used as a precursor for the manufacture of vitamins E and K<sup>9,10</sup>. Phytol in esterified form is commonly found in green vegetables as the side chain of chlorophyll molecule. Phytanic acid (3,7,11,15-tetramethyl hexadecanoic acid) is an acid derivative of phytol and human obtain it through the consumption of dietary sources. Free phytol, when administered orally, is

TABLE-1  
CHEMICAL COMPOSITION OF THE  
LEAF OIL OF *Bauhinia acuminata*

RT	Compound	LRI <sub>cal</sub>	%
21.54	β-Caryophyllene	1422	13.87
22.64	α-Humulene	1449	1.76
22.89	Isomethyl-α-ionone	1455	0.17
23.94	β-Ionone	1482	0.10
24.87	α-Farnesene	1506	0.10
27.13	1,6,10-Dodecatrien-3-ol	1566	0.26
27.32	3-Hexen-1-ol	1571	0.24
27.68	Caryophyllene oxide	1580	3.15
28.53	Humulene epoxide (II)	1502	0.35
29.40	Caryophylla-4(12),8(13)-dien-5α-ol	1626	0.22
29.61	Caryophylla-4(12),8(13)-dien-5β-ol	1631	1.00
29.77	α-Murolol	1636	0.32
30.25	α-Cadinol	1648	0.40
30.35	Isoaromadendrene epoxide	1651	0.11
32.80	Farnesol	1717	0.24
35.24	1-Octadecene	1788	0.26
46.33	Phytol	2143	65.90
46.93	Sclareolide	2163	0.24
55.91	Octacosane	2496	0.21

readily absorbed and converted to phytanic acid in rats and humans<sup>11</sup>. Sumac flea beetle *Blepharida rhois* was reported to use phytol synthesized by its host plant as a deterrent against predation<sup>12</sup>.

Sesquiterpenes and their oxygenated derivatives constituted the second major class of compounds in *B. acuminata* leaf oil. β-Caryophyllene (13.87%), caryophyllene oxide (3.15%) and α-caryophyllene (1.76%) were the major sesquiterpene components. β-Caryophyllene is a natural bicyclic sesquiterpene with a rare cyclobutene ring. It is usually found in nature as a mixture with α-humulene (α-caryophyllene) and isocaryophyllene. It is used in spice blends, citrus flavors, soaps, detergents, creams and lotions and also in a variety of food products and beverages<sup>13,14</sup>. β-Caryophyllene is known for its antiinflammatory and local anesthetic activities<sup>15,16</sup>. β-Caryophyllene is also responsible for the spiciness of black pepper<sup>17</sup>.

Previous studies identified the major constituents in volatile oils of *Bauhinia* species as, 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%), γ-elemene (18.7%), spathulenol (13.3%) (*B. variegata*)<sup>18</sup>. Essential oil of *B. acuminata* with phytol and caryophyllenes as its major constituents has a unique chemical profile compared to previously reported *Bauhinia* species.

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