Phytochemical characterization of essential oils from shoots, mature leaves and branchlets of *Litsea elliptica* (Lauraceae) collected in Brunei Darussalam

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Abstract

Essential oils from shoots, mature leaves and branchlets of *Litsea elliptica* were analyzed for their phytochemical compositions by GC-MS. A total of 12 compounds were identified from all three essential oils of *L. elliptica*.7-Decen-2-one (44.60%), 9-decen-2-ol (23.65%) and 2,7-octadienyl acetate (13.80%) were the major constituents of the essential oil from the shoots. *p*-Menthan-8-ol, (18.57%), 7-decen-2-one (10.62%), 9-decen-2-ol (25.09%) and α-terpineol (34.54%) were the major constituents of the essential oil from the mature leaves. Geranyl acetate (58.51%) and α-terpineol (20.95%) were the major constituents of the essential oil from the branchlets. *L. elliptica* has therapeutic applications in traditional medicine. Essential oils and/or extracts from various parts of this plant are reported to have promising biological and pharmacological activities.

Index Terms: Litsea elliptica, *Litsea*, Lauraceae, essential oils, GC-MS analysis, phytochemical compositions

1. Introduction

The species *Litsea elliptica* belongs to the Lauraceae family of the genus *Litsea*. *L. elliptica* is widely distributed in Southeast Asia.[1] This plant has therapeutic applications in traditional medicine.[2-5] In Brunei Darussalam, the leaves of *L. elliptica* are often mixed in salad and consumed. Essential oils, extracts and/or pure compounds from *L. elliptica* showed larvicidal,[6] adulticidal,[7] insecticidal,[8] anti-diarrheal,[9] anti-microbial,[10,11] phytopesticidal,[12] antimutagenicity[13] and anti-HIV activities.[14,15] *L. elliptica* has also been evaluated for its toxic effect on red blood cells of Sprague-Dawley rats[5] and acute and sub-acute oral toxicities in female Sprague-Dawley rats.[16] To date, the phytochemical compositions of the essential oils from *L. elliptica* have not been reported. The aim of the present study is to determine the phytochemical compositions of essential oils from shoots, mature leaves and branchlets of *L. elliptica* collected in Brunei Darussalam by GC-MS analysis. The results thus obtained are communicated in this article.

2. Experimental Method

2.1 Plant materials

Samples of shoots, mature fresh leaves (75 g each) and branchlets (53 g) of *L. elliptica* were collected in December 2013 near Kuala Lurah (Brunei Darussalam). The plant material was identified by Prof. Dato Hj. Mohamed bin Hj. Abdul Majid, Department of Biological Sciences, Universiti Brunei Darussalam. Voucher specimens for the shoots (UBD/BRC/6/LE-SHOOTS), mature leaves (UBD/BRC/6/LE-LEAF-M) and branchlets (UBD/BRC/6/LE-STEM) were deposited at the Herbal Drug Discovery Laboratory, Universiti Brunei Darussalam.

2.2 Processing plant materials

The shoots and mature fresh leaf samples of *L. elliptica* were cut into small pieces using scissors. The branchlets of *L. elliptica* were first chopped into small pieces and then ground into coarse powder using a blender equipped with a mill attachment (HR2116, Philips, Amsterdam, Netherlands).

2.3 Preparation of essential oils

The prepared shoots, mature leaves and branchlet samples were placed in separate 250 mL round-bottom flasks containing 200 mL water and subjected for steam distillation at 110–120°C for 3 hours. 0.87, 0.87 and 0.08 g of essential oils were obtained from shoots, mature leaves and branchlets, respectively. The essential oils were dried over anhydrous Na_2SO_4 and then used for GC-MS analysis.

2.4 Analysis of essential oils

GC-MS analysis of the essential oils was carried out on GC-2010 (Shimadzu, Kyoto, Japan) equipped with a MS-QP2010 mass spectrometer and a DB-5 column (30 m × 0.25 mm, i.d., 0.25 µm film thickness). The following temperature program was used: 50°C, held for 1 minute; increased to 140°C at 20° C/minute; increased to 300°C at 10°C/minute and held for 10 minutes. The total run time was 31.5 minutes. Helium was used as the carrier gas at a flow rate of 1.69 mL/minutes. The injector port temperature was 250ºC. For sample preparation, 0.05 mL of the essential oil sample was diluted in 5 mL of hexane and 1.0 µL was injected in split less mode. The MS operating parameters were as follows: interface temp. 250ºC; ion source temp. 200º C; electron energy for electron ionization, 70 eV; accelerating voltage relative to the tuning result, −0.10 kV gain; scan range, *m/z* 0–250; and scan rate, 526/sec. The solvent cutoff was at 3 minutes.

2.5 Identification of chemical compositions

The chemical compositions in the essential oils were identified using their retention indices with reference to a homologous series of n-alkanes (C8–C14, PolyScience, Niles.IL) and by comparison of their MS spectra with NIST/EPA/NIH/NIST08 library data. Additionally, their retention indices were also compared with literature values.[31-35]

3. Results and Discussion

The phytochemical compositions of essential oils from shoots, mature leaves and branchlets of *L. elliptica* were determined by GC-MS. A total of 12 compounds were identified in all three essential oils from *L. elliptica* and they are *p*-menthan-8-ol (**1**), citronellal (**2**), 7-decen-2-one (**3**), 9-decen-2-ol (**4**), α-terpineol (**5**), 2-decanol (**6**), 2,7-octadienyl acetate (**7**), *trans*-dihydrocarvone (**8**), 8-methylnonanane-1,8-diol (**9**), 2-methylundecanal (**10**), geranyl acetate (**11**) and 2-dodecanone (**12**). All these compounds are listed in ***Table 1*** in the order of their elution along with the relative percentage and retention time. The chromatograms of the essential oils are also given in ***Figure 1(A)**, **(B)**,* and ***(C)*** for the shoots, mature leaves and the branchlets, respectively.

The major components in the essential oil from shoots were **3** (44.60 %), **4** (23.65%) and **7** (23.65%) and together they accounted more than 82% of the total essential oil. The major components identified in the essential oil from mature leaves were **1** (18.57%), **3** (10.62%), **4** (25.09%) and **5** (34.54%) and together they accounted more than 88% of the total essential oil.**11** (58.51%) and **5** (20.95%) were the main components identified in the essential oil from the branchlets and together they accounted about 80% of the total essential oil. Although **11** was a major component identified in the essential oil from branchlets, it was either absent or present in a negligibly small quantity in the essential oils from shoots and mature leaves (refer to ***Table 1***). Similarly, **3** was identified as a major component (44.60%) in the essential oil from shoots but it was present only at low levels (10%) in the essential oil from mature leaves. The essential oil from branchlets has no trace of **3** (refer to ***Table 1***). Compound **4** was one of the major components in the essential oils from both the shoots and mature leaves (23.65% and 25.09%, respectively) but it was present only at low levels (3.15%) in the essential oil from branchlets. Compound **11** is one of the most frequently encountered compounds in many essential oils from various plants and those essential oils with **11** as one of the components exhibited significant antioxidant activity in the DPPH radical scavenging assay.[22-24]Our literature search showed that *L. elliptica* has not been investigated extensively for its phytochemical constituents. Undec-10-en-12-one, tridec-12-en-2-one and (+)-reticuline have previously been reported from the bark of *L. elliptica*.[25]However, alkaloids,[26-29] terpenes,[28-31] flavonoids,[26,28 29] steroids,[28,29,32,33] lactones,[28,29,34,35] amides,[28,29,36,37] fatty acids,[28, 29,38,39] etc. classes of compounds have been reported from many other species of the genus *Litsea*.

Table 1.Phytochemical compositions of essential oils extracted from shoots, mature leaves and branchlets of *L. elliptica*.

Compound No.	$RI_{Exp.}$	RI_{Lit}	New leaves (%) & (Rt)	Mature leaves (%) & (Rt)	Branchlets (%) & (Rt)
1	1145	1144	1.10 (6.601)	18.57 (6.602)	3.83 (6.601)
2	1154	1153	-	1.08 (6.676)	1.91 (6.675)
3	1160	1159	44.60 (6.739)	10.62 (6.734)	-
4	1170	1168	23.65 (6.808)	25.09 (6.811)	3.15 (6.813)
5	1176	1174	8.44 (6.857)	34.54 (6.858)	20.95 (6.857)
6	1179	1178	0.92 (6.883)	3.94 (6.883)	1.58 (6.883)
7	1192	1181	13.80 (7.001)	1.59 (7.000)	-
8	1201	1201	5.58 (7.079)	1.03 (7.077)	-
9	1346	1350	-	-	3.76 (8.492)
10	1365	1366	-	1.18 (8.674)	4.57 (8.675)
11	1376	1383	-	0.81 (8.781)	58.51 (8.784)
12	1395	1396	1.92 (8.972)	1.56 (8.971)	1.74 (8.973)

Numbers in brackets are retention times (Rt) (minutes); $RI_{Exp.}$= experimental retention indices; $RI_{Lit.}$= literature retention indices.[17-21]

4. Conclusion

We identified the phytochemical compositions present in essential oils of shoots, mature leaves and branchlets of *L. elliptica* collected in Brunei Darussalam by GC-MS analysis. To the best of our knowledge this is the first report of this kind on essential oils from shoots, mature leaves and branchlets of *L. elliptica*.

Conflict of interest

The authors declare no conflict of interest, financial or otherwise.

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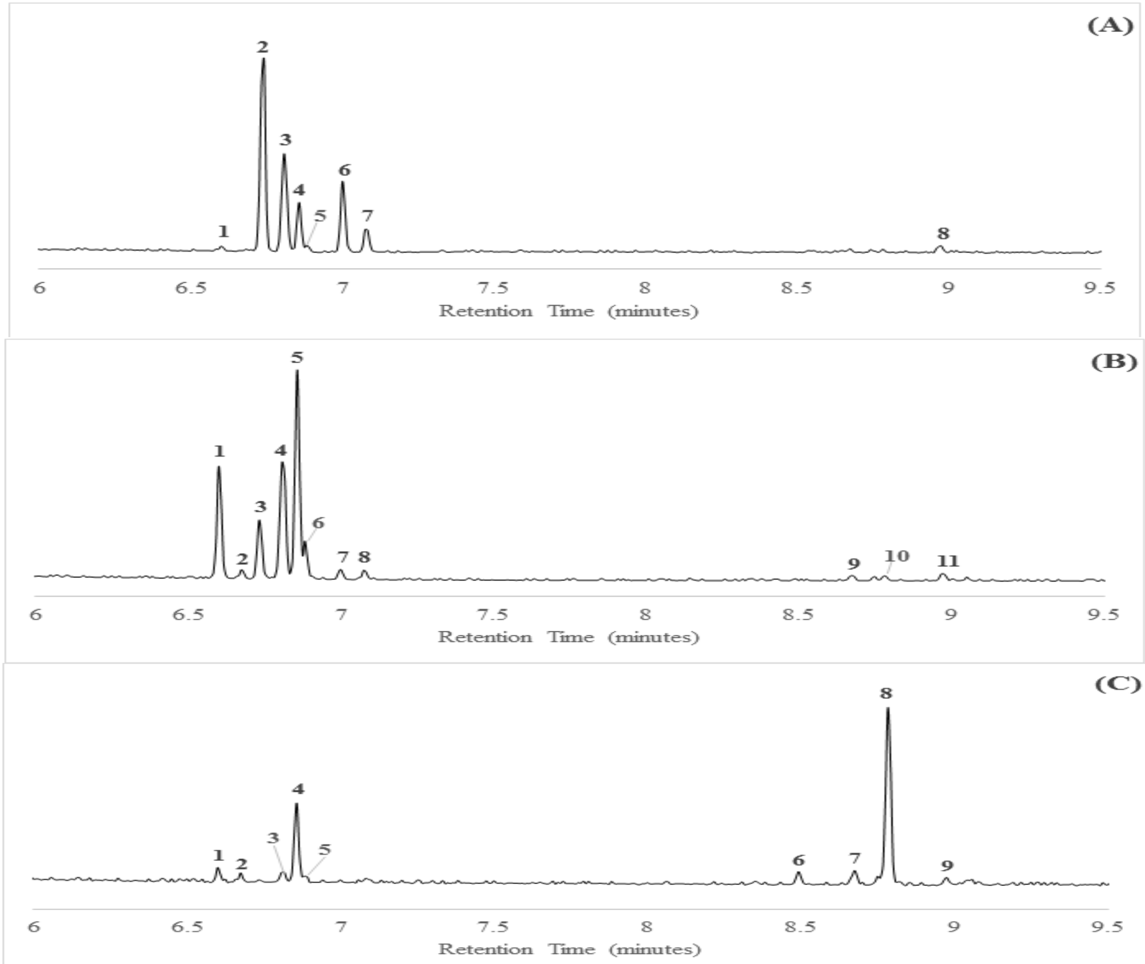

Figure 1. Chromatograms of essential oils from the shoots, mature leaves and branchlets of *L. elliptica*. Chromatogram (**A**) for shoots, (**B**) for mature leaves and (**C**) for branchlets.

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