

Microbiological activities of volatile constituents of *Leucas aspera* (Willd.) Link from Nepal

Leucas aspera (Willd.) Link [Synonym *Leucas plukenetii* (Roth) Spreng.] is a species of annual branched herb belonging to the Lamiaceae, and distributed throughout South Asia (India, Bangladesh, Nepal), Malaysia, and Mauritius.^[1] *L. aspera* has been traditionally used as an antipyretic, insecticide,^[2] and as a remedy for toothache;^[3] its flowers are used as an expectorant, stimulant, diaphoretic, antirheumatic, and antipsoriatic, while its leaves are useful in treating snake bites.^[4,5]

L. aspera was collected in Biratnagar, Nepal (26°28' N, 87°16' E, 72 m a.s.l.) on 17 May 2011, and identified by Tilak Gautam. A voucher specimen (1245) has been deposited in the herbarium of Tribhuvan University, Biratnagar. Fresh aerial parts (100 g) were hydrodistilled using a Clevenger type apparatus for 4 h to give a clear, pale yellow essential oil (0.012 g), which was stored at 4°C until analysis.

The essential oil of *L. aspera* was analyzed by GC-MS, and screened for antimicrobial activity against *Bacillus cereus*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Candida albicans*, and *Aspergillus niger* as described previously.^[6]

L. aspera essential oil was obtained in 0.012% yield. Chemical compositions of *L. aspera* essential oils revealed 11 components, 100% of which were identified [Table 1]. Nepalese *L. aspera* oil was dominated by 1-octen-3-ol

(30.6%), (*E*)-caryophyllene (23.4%), caryophyllene oxide (24.4%), (*E*)-nerolidol (9.4%), α -humulene (6.4%), and β -eudesmol (5.6%).

The *L. aspera* essential oil composition revealed in this study are very different in comparison with previous reports from India.^[7,8] The Indian *L. aspera* leaf oil chemotype was dominated by α -farnesene (23.1–26.4%),^[7,8] while the floral essential oil from India was comprised largely of amyl propionate (15.2%) and isoamyl propionate (14.4%).^[7] These components were not observed in the Nepalese sample. Geographical location, time of harvesting, environmental, climatic, ecological, genotypic, ontogenic development and growing conditions of India and Nepal can all influence variations in qualitative and quantitative chemical compositions of the essential oils of the same plant species.

The essential oil of *L. aspera* showed no activity against *E. coli*, *P. aeruginosa*, and *C. albicans* (MIC \geq 1250 μ g/mL). *L. aspera* oil did exhibit good activity against *S. aureus* (MIC = 625 μ g/mL), *B. cereus* (MIC = 313 μ g/mL), and *A. niger* (MIC = 313 μ g/mL), most likely attributable to the sesquiterpenes present in the oil. Both (*E*)-caryophyllene and α -humulene have shown antibacterial activity against *B. cereus* and *S. aureus*, and α -humulene was antifungal to *A. niger*.^[6]

Prabodh Satyal, Prajwal Paudel, Ambika Poudel¹, William N. Setzer

Department of Chemistry, University of Alabama in Huntsville, Huntsville, AL 35899, USA, ¹Department of Chemistry, MMAMC Campus, Tribhuvan University, Biratnagar, Nepal

Address for correspondence to: Prof. William N. Setzer, Department of Chemistry, University of Alabama in Huntsville, Huntsville, AL 35899, USA. E-mail: wsetzer@chemistry.uah.edu

Table 1: Chemical compositions of *Leucas aspera* essential oils from Nepal

RI ^a	Compound	%
981	1-Octen-3-ol	30.6
996	3-Octanol	tr ^b
1100	Linalool	tr
1356	Eugenol	tr
1407	(Z)-Caryophyllene	tr
1418	(E)-Caryophyllene	23.4
1453	α -Humulene	6.4
1566	(E)-Nerolidol	9.4
1583	Caryophyllene oxide	24.4
1610	Humulene epoxide II	tr
1650	β -Eudesmol	5.7
	Total identified	100.0

^aRI = "Retention Index", determined with reference to a homologous series of normal alkanes on an HP-5 ms column, ^btr = "trace" (<0.05%).

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