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COMPOSITION AND ANTIOXIDANT ACTIVITY OF LEAF ESSENTIAL OIL OF TWO *Litsea* SPECIES FROM VIETNAM

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Litsea, a genus belonging to family Lauraceae, consists of 400 species distributed throughout the tropical and subtropical Asia, the Pacific, and Australia [1]. Essential oils from several *Litsea* species have been traditionally and/or commercially used for human need due to their antioxidant, antibacterial, antifungal and insecticidal activities. To date, 45 *Litsea* species in Vietnam [2] have been recorded, some of which were preliminarily studied for their essential oil, e.g., *L. cubeba*, *L. glutinosa, L. helferi*, *L. ferruginea*, *L. verticillata* [3], *L. euosma* [4], and *L. acutivena* [5].

As objectives of present study, *Litsea umbellata* (Lour.) Merr. is commonly recognized from India through Southeast Asia towards Northern Australia, while *L. khasyana* Meisn. species is locally found in Vietnam rainforest [2]. To date, there has been a lack of documentation on the essential oil of *L. umbellata* and *L. khasyana* plants; therefore, it is worthwhile to investigate their chemical composition and antioxidant activity for the first time from Vietnam.

Fresh leaves of *L. umbellata* and *L. khasyana* were collected from plants at an altitude of 800–850 m in Pu Hoat Nature Reserve (Nghe An province, Vietnam) in December 2019. Voucher specimens (numbered as NTC.NN07 and NTC.NN10, respectively) were identified and deposited in the herbarium of Vinh University. Essential oils were extracted by hydrodistillation and analyzed by GC and GC-MS methods [3]. Antioxidant activity was measured by different methods such as DPPH [6], ABTS [7], and FRAP assays [8].

Results showed that no significant difference in both yield and chemical diversity was found between *L. umbellata* and *L. khasyana* oils (Table 1). Hydrodistillation of leaves gave light yellow oils of two *Litsea* species in 0.21% and 0.19%, respectively. *L. umbellata* essential oil contains 24 terpene compounds (made up 90.64% of total oil) with major components as patchoulene (23.03%), β-caryophyllene (15.72%), aromadendrene (14.96%), and germacrene D (12.76%). The essential oil from *L. khasyana* leaves consists of 27 terpenes (accounting for 87.13% of the chromatographical components), of which patchoulene (21.25%) and β-caryophyllene (11.64%) were the main constituents. Being different from previous studies that introduced monoterpenes as the major fraction in essential oils of some *Litsea* species in Vietnam [3–5], our results recorded the basic components of *L. umbellata* and *L. khasyana* essential oils as sesquiterpene hydrocarbons.

It is interesting that patchoulene and β-caryophyllene are the most abundant constituents in both oils. No previous study introduced the presence and activity of patchoulene in *Litsea* plants, although it is known to characterize the aroma and biological activity of patchouli oil [9]. β-Caryophyllene was known as the major compound in Vietnam *L. helferi* [3], Indian *L. quinqueflora* and *L. deccanensis* [10], and Taiwan *L. acuminate* [11] plants and contributed to antioxidant, antibiotic, anticarcinogenic, and anti-inflammatory activities of oils [12, 13]. The high content of patchoulene and β-caryophyllene in the essential oil from both *L. umbellata* and *L. khasyana* plants may contribute to their biological activities.

The antioxidant activity of leaf essential oils from *L. umbellata* and *L. khasyana* plants was evaluated and compared to that of Trolox, an antioxidant standard (Table 2). Both oils expressed strong activity in DPPH and ABTS free radical scavenging, which were 1.61–1.83-fold higher than standard Trolox, while the highest activity was their antioxidant power, which were 2.59 mg TEAC·g^{-1} dw (of *L. umbellata* oil) and 2.43 mg TEAC·g^{-1} dw (of *L. khasyana* oil). No significant difference in antioxidant activity was found between the two oils; however, all DPPH, ABTS, and FRAP values of *L. umbellata* essential oil were always higher than that of *L. khasyana*; the difference was probably due to certain components presented in each oil.

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TABLE 1. Chemical Composition of Leaf Essential Oil of *Litsea* Species from Vietnam, %

Compound	RI[a]	*L. umbellata*	*L. khasyana*
α-Pinene	939	0.05	1.24
Camphene	953	–	0.52
β-Pinene	979	–	1.06
β-Myrcene	991	–	1.04
Limonene	1031	0.04	0.58
1.8-Cineole	1034	0.13	3.44
β-Ocimene	1040	–	0.65
Linalool	1101	–	1.92
β-Bourbonene	1385	0.85	2.87
α-Cubebene	1387	5.47	2.85
β-Elemene	1391	1.38	–
β-Caryophyllene	1422	15.72	11.64
Copaene	1435	8.66	2.66
γ-Elemene	1438	2.68	3.01
Aromadendrene	1443	14.96	5.79
Humulene	1445	1.06	2.52
Patchoulene	1455	23.03	21.25
Valerena-4,7(11)-diene	1457	1.16	–
γ-Muurolene	1478	0.22	3.29
Germacrene D	1482	12.76	9.81
β-Panasinsene	1489	–	2.17
α-Farnesene	1505	0.88	1.91
Zonarene	1532	0.20	–
Germacrene B	1548	–	0.64
Nerolidol	1563	0.12	1.43
Spathulenol	1578	–	0.60
Globulol	1580	0.63	0.72
Caryophyllene oxide	1584	0.05	–
Junenol	1621	0.05	–
Isospathulenol	1638	0.18	0.53
τ-Cadinol	1641	0.24	–
τ-Muurolol	1646	–	0.29
α-Cadinol	1652	–	1.03
Spirojatamol	1657	0.22	–
Monoterpene hydrocarbons		1.47	11.52
Oxygen-containing monoterpenes		0.13	3.36
Sesquiterpene hydrocarbons		87.45	67.98
Oxygen-containing sesquiterpenes		1.59	3.27
Total		90.64	87.13

[a] RI: Retention indices calculated from retention times in relation to those of a series of C8–C40 *n*-alkanes on HP-5MS capillary column. Method of identification: RI, GC-MS (gas chromatography-mass spectroscopy); –: not applicable.

TABLE 2. Antioxidant Activity of Leaf Essential Oil of *Litsea* Species from Vietnam (mg TEAC·g^{-1} dw)*

Assay	*L. umbellata*	*L. khasyana*
DPPH	1.83 ± 0.21	1.75 ± 0.15
ABTS	1.72 ± 0.19	1.61 ± 0.17
FRAP	2.59 ± 0.28	2.43 ± 0.22

* TEAC: Trolox equivalent antioxidant capacity (the equivalent activity of Trolox per g of dry weight based on a standard curve). Unit of antioxidant activity was expressed as mg TEAC·g^{-1} dw.

It should be emphasized that the antioxidant activity of leaf essential oil from the two *Litsea* species is positively connected to the dominance of terpenes in their chemical composition (Table 1), which was previously suggested as the main reason for the plant's antioxidant activity [14]. In conclusion, the essential oil of *L. umbellata* and *L. khasyana* plants expressed high antioxidant activity, suggesting that it is probably a promising source of natural antioxidant.

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