

# Chemical composition of Essential oil from *Lindera rufa* Hook. f. a New Natural Source of Camphor

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**Abstract.** The chemical composition of the leaf oil obtained by hydrodistillation of *Lindera rufa* Hook. f. were study by GC, GC/MS Thirty-two compounds were identified representing 99.65% of the oil with camphor (67.46%) as major constituent. Other thirty-two components were found with lower content. The oil yield was 0.91% on fresh leaves.

**Keywords:** *Lindera rufa*, Lauraceae, essential oil composition, camphor.

## 1. Introduction

Lauraceae family has about 45 genera and 2000-2500 species, distributed in tropical and subtropical regions of the world, but mostly in tropical southeastern Asia and neotropical America.

This family is very important in the economic use, because it contains much more economic trees, such as *Cinnamomum camphora*, *C. parthenoxylon*, *C. glanduliferum* etc., all yield camphor and essential oil which are the source for perfume and useful natural resources for terpenes. which are commercially important chemicals in the flavor, fragrances and pharmaceutical industries. The fruits of *Cinnamomum*, *Litsea*, *Lindera*, *Syndiclis*, *Cryptocarya*, *Actinodaphne* contain abundant

oil and fat which are very useful for industry. The timber of *Cinnamomum*, *Phoebe* and other genera is very valuable. The bark of *Cinnamomum cassia* and the root of *Lindera aggregata* are the famous drug in traditional medicine. The fruit of *Persea americana* is a kind of nutritious fresh fruit. The leaves of *Laurus nobilis*, *Cinnamomum subavenium* and others are the good spice for food or can [1, 2].

The major components of the leaf oil of *Lindera thomsonii* were  $\alpha$ -pinene (20.18%) and  $\beta$ -pinene (12.67%). Other components present in appreciable amounts (more than 3%) were  $\alpha$ -phellandrene (6.62%), lomonene (5.15%), p-cymene (4.17%), and camphene (4.16%). Monoterpene compounds comprised 64.89% in this oil. Except for  $\alpha$ -curcumene (3.86%) and  $\delta$ -cadinene (2.58%), the other sesquiterpenes were present only in minute quantities [3].

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(E)- $\beta$ -ocimene was the major component of the leaf oil of *L. communis* which together with (Z)- $\beta$ -ocimene (4.49%) accounted for 69.27% of the oil. In this oil, monoterpene compounds comprised 85.5%, while sesquiterpenes constituted only 6.15% of the total. Thirty-two compounds were identified in this leaf oil [3].

As a part of the research on the essential oils of Medicinal and Aromatic plants of the Vietnam flora, especially in the course of systematic study of Lauraceae in Vietnam, we report herein on the chemical constituents of the essential oils obtained by hydrodistillation of the leaves of *Lindera rufa*.

## 2. Experimental

1. Source-*Lindera rufa*. is a shrub tree up to 5-8<sup>m</sup> high, growing in Vietnam. Leaves were collected from Nghean province in December 2006. A voucher specimen (DD112) is deposited at the Herbarium of the Vinh University.

Fresh leaves were shredded and their oil was obtained by steam distillation for 3h at normal pressure, according to the Vietnamese Pharmacopoeia [5]. The yield of the fresh leaf oil is 0.91%.

2. **GC**- About 15mg of oil, which was dried with anhydrous sodium sulfate and dissolved in 1ml of n-hexane (for spectroscopy or chromatography).

GC analysis was performed on an Agilent Technologies HP 6890 Plus Gas chromatograph equipped with a FID and fitted with HP-5MS column (L=30m, ID=0.25mm, film thickness =0.25 $\mu$ m). The analytical conditions were: carrier gas H<sub>2</sub>, injector temperature (PTV)

250°C, detector temperature 260°C, column temperature programmed 60° (2 min hold) to 220° (10 min hold) at 4°C/min.

3. **GC/MS**- An Agilent Technologies HP 6890N Plus Chromatograph was fitted with a fused silica capillary column HP-5 MS column (L=30m, ID = 0.25mm, film thickness =0.25 $\mu$ m). The condition of use were the same as described above with He as carrier gas, and interface with a mass spectrometer HP 5973 MSD (70eV). The temperature was programmed as reported above. Components identification was carried out by comparing MS data with those reported in Library Wiley on Chemstation HP [5-9].

## 3. Results and discussion

Table 1 shows the compounds detected in the leaf oil of *Lindera rufa* representing 99.65% of the total components separated. The oil is dominated by camphor (67.46%), with lesser amounts of limonene (6.98%),  $\alpha$ -pinene (6.71%), camphene (4.71%),  $\beta$ -myrcene (3.79%),  $\beta$ -pinene (2.67%), and 1, 8-cineole (1.20%).

The monoterpene hydrocarbons contains about 8.0%, sesquiterpene hydrocarbon contains only 0.3%, while content of oxygenated compounds is very high (around 88%). These compounds contribute to the camphorous odor of this oil.

This study shows that this species is a new natural source of camphor. To the best of our knowledge, this is the first report on the chemical composition of the leaf oil of *Lindera rufa* Hook. f. from Vietnam.

Table 1. Chemical composition of the essential oil of *Lindera rufa* Hook. f. from Vietnam

N <sup>o</sup>	Compound	KI	%FID
1	tricyclene	926	Trace
2	$\alpha$ -thujene	931	0.49
3	$\alpha$ -pinene	939	6.71
4	camphene	953	4.71
5	sabinene	976	0.69
6	$\beta$ -pinene	980	2.67
7	$\beta$ -myrcene	990	3.79
8	$\alpha$ -phellandrene	1006	0.95
9	$\delta$ -3-carene	1011	Trace
10	$\alpha$ -terpinene	1018	0.16
11	p-cymene	1026	0.36
12	limonene	1032	6.98
13	1, 8-cineole	1034	1.20
14	(E)- $\beta$ -ocimene	1053	Trace
15	$\gamma$ -terpinene	1061	0.34
16	sabinene hydrate	1068	0.11
17	$\alpha$ -terpinolene	1090	0.87
18	linalool	1100	Trace
19	camphor	1145	67.46
20	borneol	1169	0.34
21	terpinene-4-ol	1177	0.42
22	$\alpha$ -terpineol	1189	0.49
23	bornyl acetate	1285	0.28
24	1,3,6-heptatrene,2,5,6-trimethyl	1307	Trace
25	$\beta$ -elemene	1391	Trace
26	$\beta$ -caryophyllen	1419	0.15
27	$\gamma$ -elemene	1434	Trace
28	$\alpha$ -humuulene	1454	0.29
29	germarene D	1480	0.19
30	bicyclogermacrene	1560	Trace
31	$\delta$ -cadiene	1525	Trace
32	benzyl benzoate	1760	Trace

Note: trace < 0,1; KI = Kovats index

## References

- [1] P. Hoang Ho, *Flora in Vietnam*, Montreal Pub., 1992.
- [2] Flora of China Editorial Committee, eds. In Preparation. *Flora of China*. Vol. 7 (Berberidaceae through Capparaceae). Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis, 2003.
- [3] Zhu Liangfeng et al., *Aromatic Plants and Essential Constituents*, Hai Feng Publishing Co., Hong Kong, 1993.
- [4] *Vietnamese Pharmacopoeia*, Medical Publishing House, Hanoi, 1997.
- [5] E. Stenhagen, S. Abrahamsson S, F.W. McLafferty, *Registry of Mass Spectral Data*, Wiley, New York, 1974.
- [6] A. A. Swigar, R.M. Siverstein, *Monoterpenens*, Aldrich, Milwaukee, 1981.
- [7] R.P. Adams, *Identification of Essential Oil Components by Gas Chromatography/Quadrupole Mass Spectrometry*. Allured Publishing Corp. Carol Stream, IL, 2001.
- [8] D. Joulain, W.A. Koenig, *The Atlas of Spectral Data of Sesquiterpene Hydrocarbons*. E. B. Verlag, Hamburg, 1998.
- [9] Tran Dinh Thang, Do Ngoc Dai, Do Quang Huy and Nguyen Xuan Dung, Chemical Constituents of Essential oil from *Cinnamomum longepetiolatum* A New Natural Source of Camphor, *VNU Journal of Science, Natural Sciences and Technology*, 24(3) (2008) 211.

## Thành phần hóa học tinh dầu lá cây Liên đàn (*Lindera rufa* Hook. f.) một nguồn camphor mới

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Hàm lượng tinh dầu từ lá cây Liên đàn là 0,91% theo nguyên liệu tươi. Nghiên cứu thành phần hóa học của tinh dầu lá cây Liên đàn (*Lindera rufa*) ở Nghệ An bằng phương pháp sắc ký khí (GC) và sắc ký khối phổ (GC/MS), hơn 40 hợp chất được tách ra từ tinh dầu, trong đó 32 hợp chất được xác định (chiếm 99,65% của tổng hàm lượng tinh dầu). Thành phần chính của tinh dầu là camphor (67,46%), các cấu tử ít hơn là limonen (6,98%),  $\alpha$ -pinen (6,71%), camphen (4,71%),  $\beta$ -myrcen (3,79%),  $\beta$ -pinen (2,67%), and 1, 8-cineol (1,20%).