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**Constituents of Essential Oils from the Leaves of
Paramignya trimera (Oliv.) Guillauum from Vietnam**

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Abstract: The essential oil from the leaves of *Paramignya trimera* (Oliv.) Guillauum was obtained by hydrodistillation and analysed by Gas Chromatography-coupled with Mass Spectrometry (GC/MS) for the first time. A total of forty-three components were identified accounting for 89.5 % of the oil. This oil was dominated by sesquiterpene hydrocarbons (39.6 %) and oxygenated sesquiterpenes (41.7 %). The major constituents of the *P. trimera* essential oil were determined as β -caryophyllene (10.5 %), β -caryophyllene oxide (9.9 %), 7-epi- α -eudesmol (7.6 %), and γ -muurolene (6.8 %).

Key words: *Paramignya trimera* (Oliv.) Guillauum, Rutaceae, essential oil, β -caryophyllene, β -caryophyllene oxide, 7-epi- α -eudesmol, γ -muurolene, cancer.

Introduction

Paramignya trimera (Oliv.) Guillauum is woody climbing species of the Rutaceae family and broadly distributed in Southern Vietnam¹. The stems and roots of this plant have been used in traditional folk medicine to treat liver disease² and diabetes³. Previous phyto-chemical studies of this species have led to the isolation of coumarins, chromenes, acridone alkaloids, saponins, quinoliniumolate and 2H-1,2,3-triazole derivatives^{2,4-11}. The isolated compounds and extracts having broad pharmacological spectrum including anti-inflammatory⁷, α -glucosidase inhibitory^{9,11}, cytotoxic, antioxidant^{12,13} anticancer¹⁴, and hepatoprotective activities¹⁵.

Although, the chemical constituents of *P.*

trimera have been thoroughly investigated, there are no reports on composition its essential oil. Herein, we described for the first time the chemical composition of essential oil from the leaves of *P. trimera* collected in Vietnam.

Materials and methods

Plant material

The leaves of *Paramignya trimera* (Oliv.) Guillauum (3 x 58 g) were collected from Hue city, Vietnam in October, 2017 (16°27'08.8"N 107°32'52.4"E) and were identified by Dr. Nguyen Tien Chinh, Vietnam National Museum of Nature. A voucher specimen (TTH-T110) was deposited at the Faculty of Pharmacy, Hue University of Medicine and Pharmacy, Vietnam.

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Hydrodistillation of the essential oils

Air-dried leaves of *P. trimera* were shredded and their oils obtained by hydrodistillation using a Clevenger apparatus for 4 h at normal pressure, according to the Vietnamese Pharmacopoeia¹⁶. The essential oil was then collected, dried by Na₂SO₄, and stored in sealed vials at 4°C. The experiments were performed in triplicate.

Analysis of the essential oil

The chemical composition of the essential oil was analysed using GC-MS-QP2010 system (Shimadzu, Kyoto, Japan) equipped with Inert CAP 5 column (30 m × 0.25 mm, film thickness 0.25 μm). The column oven temperature was gradually increased from 60°C to 280°C at 2°C/min. Helium was used as the carrier gas at 1.8 mL/min, and the sample (1 μL) was injected in the split ratio at 1:17; injector temperature was 280°C. The essential oil was dissolved with *n*-hexan before injection. The MS conditions were as follows: ionization voltage 70 eV; acquisitions scan mass range of 40-500 amu; ion source temperature: 230°C at a sampling rate of 1.0 scan/s. The retention indices (RI) of constituents were determined by co-injection with reference to a homologous series of *n*-alkanes (C-8, C-31) under

the same conditions.

Compounds were identified by comparing their mass spectra with those contained in the NIST08 database, and further confirmed by comparison of the retention indices (RI) of the separated constituents described in the literature¹⁷. Also some authentic compounds were used. Quantification was performed using the relative peak area percentage.

Results and discussion

The average yield of essential oil from the leaves of *P. trimera* was 0.31±0.02 % (v/w) calculated on a dry weigh basis of three samples. The essential oil was obtained as pale yellow liquid with characteristic odor as well as lighter than water. The GC/MS analysis indicated that the essential oil contained 43 constituents representing 89.5 % of the total oil content (Table 1). The main classes of compounds in this oil were sesquiterpene hydrocarbons (39.6 %) and oxygenated sesquiterpenes (41.7 %). Meanwhile, β-caryophyllene (10.5 %), β-caryophyllene oxide (9.9 %), 7-epi-α-eudesmol (7.6 %), and γ-murolene (6.8 %) were found as major constituents.

The previous work indicated that β-caryophyllene exhibited selective antibacterial activity

Table 1. Chemical composition of the essential oil from the leaves of *Paramignya trimera*

No.	Compounds	RT	RI ^a	RI ^b	Percentage (%)
1	β-Pinene	6.85	974	973	0.8
2	Geijerene isomer	13.94	1138	1130	0.4
3	Geijerene	14.33	1138	1137	3.1
4	Pregeijerene	22.97	1285	1281	0.8
5	δ-Elemene	26.26	1335	1333	1.3
6	α-Copaene	28.59	1374	1370	0.6
7	8-epi-Dictamnol	28.96	1379	1376	0.4
8	β-Bourbonene	29.10	1387	1378	0.5
9	β-Cubebene	29.53	1387	1385	0.9
10	β-Elemene	29.68	1389	1387	0.9
11	β-Caryophyllene	31.28	1417	1412	10.5
12	Dictamnol	31.80	1428	1421	1.5
13	γ-Elemene	32.26	1434	1428	0.4
14	α-trans-Bergamotene	32.44	1432	1431	1.0
15	α-Humulene	33.33	1452	1445	4.2
16	(E)-β-Farnesene	33.94	1454	1455	2.2

table 1. (continued).

No.	Compounds	RT	RI ^a	RI ^b	Percentage (%)
17	γ -Muurolene	35.08	1478	1474	6.8
18	α -Curcumene	35.39	1479	1479	0.3
19	Bicyclogermacrene	36.01	1500	1489	2.7
20	β -Bisabolene	37.00	1505	1505	3.4
21	Sesquicineole	37.23	1515	1509	4.0
22	δ -Cadinene	37.76	1522	1518	2.0
23	α -Calacorene	38.80	1544	1535	0.4
24	<i>cis</i> -Sesquisabinene hydrate	39.08	1542	1540	0.8
25	Germacrene B	39.54	1559	1548	1.5
26	(<i>E</i>)-Nerolidol	40.39	1561	1562	5.2
27	Spathulenol	40.85	1577	1569	1.5
28	β -Caryophyllene oxide	41.12	1582	1574	9.9
29	Salvial-4(14)-en-1-one	41.73	1594	1584	0.3
30	Rosifoliol	42.28	1600	1593	0.4
31	Humulene epoxide II	42.62	1608	1599	2.4
32	β -Atlantol	42.92	1608	1604	0.6
33	10- <i>epi</i> - γ -Eudesmol	43.27	1622	1610	3.5
34	Camphoric acid	44.23	1634	1627	0.5
35	<i>allo</i> -Aromadendrene epoxide	44.42	1639	1630	0.4
36	<i>epi</i> - α -Cadinol	44.59	1638	1633	1.1
37	Cubenol	45.21	1645	1644	1.0
38	7- <i>epi</i> - α -Eudesmol	45.49	1662	1649	7.6
39	Khusilol	46.30	1675	1664	0.7
40	<i>epi</i> - β -Bisabolol	46.46	1670	1666	0.3
41	<i>epi</i> - α -Bisabolol	47.15	1683	1678	1.4
42	α -Bisabolol	47.29	1685	1681	1.3
43	β -Costol	51.73	1765	1761	0.3
	Monoterpene hydrocarbons				4.3
	Sesquiterpene hydrocarbons				39.6
	Oxygenated sesquiterpenes				41.7
	Others				3.9
	Total				89.5

^a Retention Indices on INERT CAP 5 column

^b Retention Indices in literature ¹⁷

against *S. aureus* and more pronounced anti-fungal activity than kanamycin. β -Caryophyllene also displayed strong antioxidant effects and selective anti-proliferative effects against colorectal cancer cells ¹⁸. The strong cytotoxicity of β -caryophyllene against three cancer cell lines (HCT-116, HT-29, colon cancer; PANC-1, pancreatic cancer) was also observed ¹⁹. β -Caryophyllene significantly increased the anticancer activity of α -

humulene and isocaryophyllene on MCF-7 cells, and it have also anticarcinogenic activity ²⁰.

Conclusions

Therefore, the *P. trimera* essential oil should be selected for further studies regarding their bio-activity, especially anticancer features. The chemical constituents of essential oil from the leaves of *P. trimera* was reported for the first time in the

present study. The main constituent (>10 %) of the oil was β -caryophyllene (10.5 %).

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