Essential Oil Components of Leaves and Rhizome of *Zingiber ottensii* Val. from Bandung, Indonesia

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Abstract
Bangle hantu (Zingiber ottensii Val.) *is one of Indonesian traditional medicine as postpartum medicine and also to treat itching, pain, fever, gout, and cough. The essential oil is one of chemical compound of Zingiber ottensii* Val. *that has pharmacological activity such as antibacterial and cytotoxic activity. The aim of this study was to determine the essential oil component of Zingiber ottensii* Val *leaves and rhizome which originated from Bandung, Indonesia. The essential oil was distilled by water and steam distillation method and its component compounds were analyzed by GC-MS (Gas Chromatography - Mass Spectrometer).*

The result showed that the essential oil of Zingiber ottensii Val. *leaves contains 37 components with five highest compounds respectively as trans-caryophyllene, β–elemene, zerumbone, 1,5-cyclodecadiene, (-)-caryophyllene while essential oil of rhizome contains 64 components with five highest compounds respectively as 1-4-terpineol, zerumbone, sabinene, 1,8-cineole, and γ-terpinene.*

Keywords: Essential oil, distillation, GC-MS, *Zingiber ottensii.*

Introduction

Zingiber ottensii Val. (Genus Zingiber, family Zingiberaceae) is one of Indonesian medicinal plant that traditionally has been used as postpartum medicine and also to treat itching, pain, fever, gout, and cough. Study *in vitro* of *Zingiber ottensii* Val. rhizome and its compounds showed pharmacological activities including α-glucosidase inhibitor, ACE inhibitor, antibacterial, antifungal, inhibitor of nitric oxide production, antioxidant, cytotoxic, and antiproliferation.[4,7,9,11,17,18]

Zingiber ottensii Val. rhizomes are pungent and contain essential oil that has moderate cytotoxic activity[16]. The essential oil of *Z. ottensii* Val. rhizome contains a mixture of zerumbone, terpinen-4-ol, p-cymene, sabinene, humulene[13,16].

Essential oils are complex mixture of volatile compounds, mainly represented by mono- and sesquiterpene and their oxygenated (hydroxyl and carbonyl) derivatives, aliphatic aldehydes, alcohols, and esters. The composition of essential oil often differs between different plant organs, time of harvest or environmental condition[2]. Essentials oils of Zingiberaceae family including *Zingiber ottensii* Val. are produced by rhizome and leaves.

Altough there are several reports on the component of essential oil from *Zingiber ottensii* Val. rhizome (cultivated in Thailand and Malaysia), the objective of this study was to determine the main components of essential oil from different organs of *Zingiber ottensii* Val. cultivated in Bandung, West Java, Indonesia.

Material and Methods

Plant material: Fresh leaves and rhizomes were collected from Manoko research garden, Bandung, West Java, Indonesia in the month of February, 2017. The plant was identified and determined at Herbarium Bandungense, Departemen of Biology, Institut Teknologi Bandung (Document no. 1567/I1.CO2.2/PL/2017).

Isolation of essential oils: Fresh rhizome and leaves were distilled by water-steam distillation methods using water-steam distiller for 2 hours until no more oil was distilled. The oils obtained were dried over anhydrous sodium sulphate. The essential oils of leaves and rhizome respectively were 0.03% and 0.26% on fresh weight basis.

GC-MS analysis: The essential oils were analysed by Shimadzu GCMS-QP2010 Ultra using DB-5 column (30 m, ID 0.25 mm, 0.25 µm film thickness), temperature column 60^0C, injection temperature 280^0C, split mode (split ratio 1:200), linear velocity 41.7 cm/sec, pressure 80.2 kPa; column flow 1.31 mL/min. Carrier gas was Helium. Compounds were identified by comparing MS spectra of each peak with Wiley7.LIB library.

Results and Discussion

The essential oils obtained by water-steam distillation of leaves and rhizome respectively were 0.03% and 0.26% on fresh weight basis. Both oils have characteristics pale yellow colour and pungent aromatic odour. The low percentage yield of leaves showed that essential oil production of *Zingiber ottensii* Val. is concentrated in rhizome.

The chromatogram of leaves and rhizome oil are shown in figure 1 and figure 2. The chromatograms showed that leaves of oil contain 37 components and rhizome oil contains 64 components.

Table 1 describes the component comparison of leaves and rhizome oil of *Zingiber ottensii* Val. from Bandung, Indonesia. According to GC-MS analysis, trans-caryophyllene (19.6%) was detected as the main component of leaves oil and other component including β–elemene (12.3%), zerumbone (11.4%), 1,5-cyclodecadiene (7.74%), (-)-caryophyllene (6.93%), α-humulene (4.87%), α-copaene (3.6%), 2-β-pinene (3.15%), γ-gurjunene (2.91%), and sabinene (2.76%) while essential oil of rhizome was rich in 1-4-terpineol (16.55%), zerumbone (14.23%), sabinene (8.6%), 1,8-cineole (5.84%), and γ-terpinene (4.75%). Figure 3 and figure 4 showed MS-spectra of trans-caryophyllene and 1-4-terpineol.

The most abundant component of rhizome oil of *Zingiber ottensii* Val. from Bandung (1-4-terpineol) is different from Sabah, Malaysia[13] and Phetchaburi province, Thailand[16] which is Zerumbone as the most abundant component (37% and 40.1%). Zerumbone content of rhizome oil of *Zingiber ottensii* Val. from Bandung is lower than them. The different composition of essential oil could be due to different organs, time of harvest, or environment condition.

Trans-caryophyllene has been reported to have some pharmacological activity such as anti-inflammatory, antimicrobial, and analgesic[1,3,5] while 1-4-terpeniol also has anti-inflammatory and antimicrobial activity[8,12]. The other major compound of rhizome oil, Zerumbone, has antiproliferative activity.[10,14,15,19] This study reveals that essential oils of leaves and rhizome of *Zingiber ottensii* Val. from Bandung, Indonesia are potentially anti-inflammation, antimicrobial, or antiproliferative. However, further study has to be conducted.

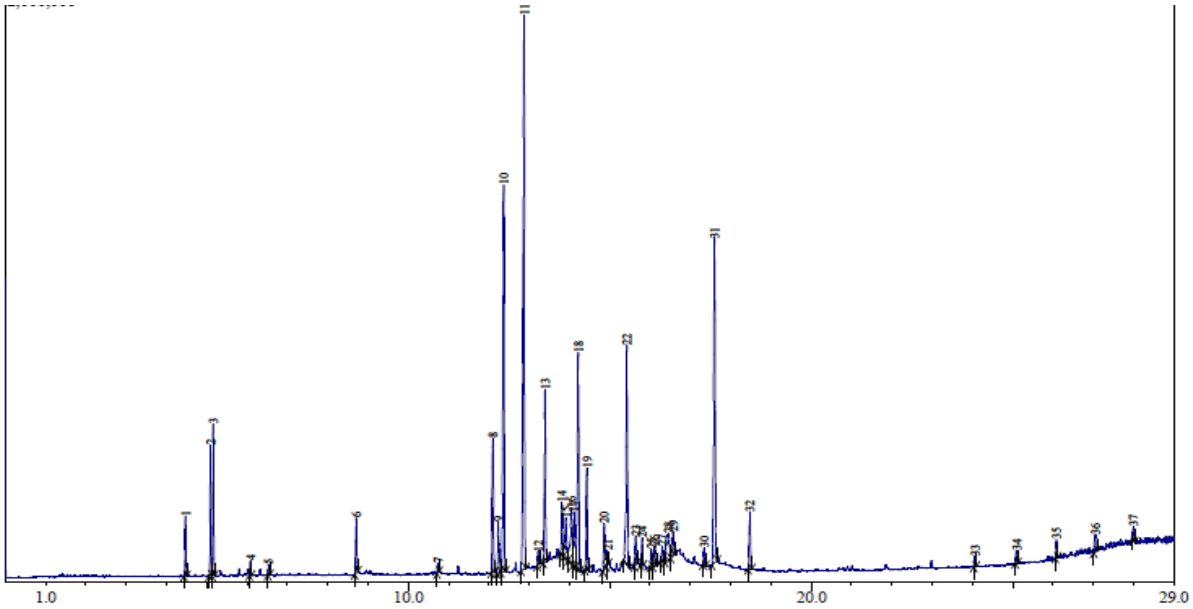

Figure 1: The chromatogram of leaves oil

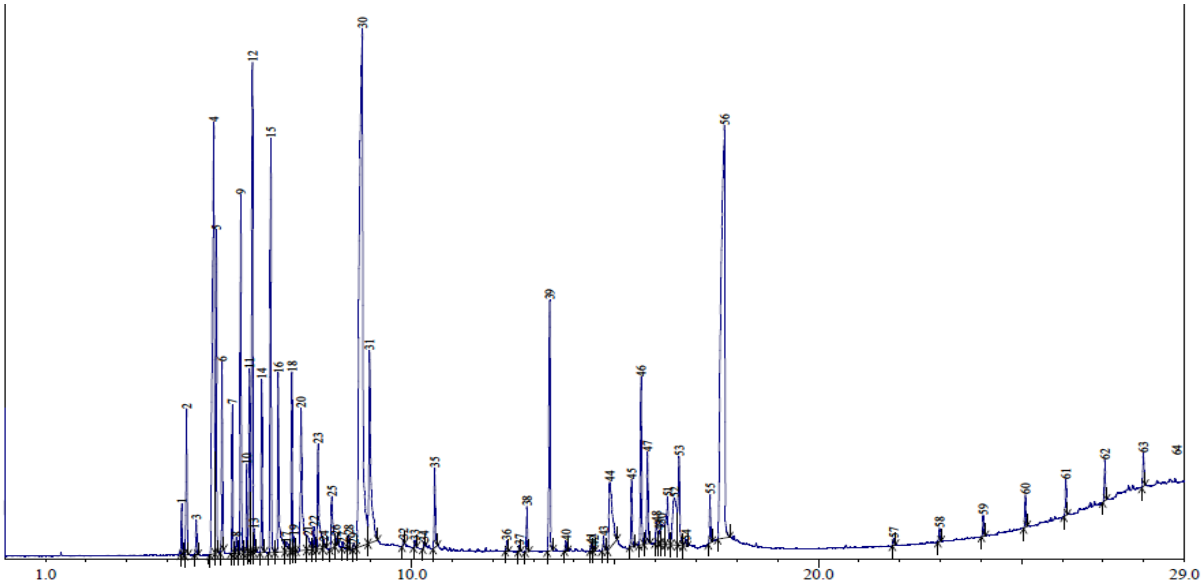

Figure 2: The chromatogram of rhizome oil

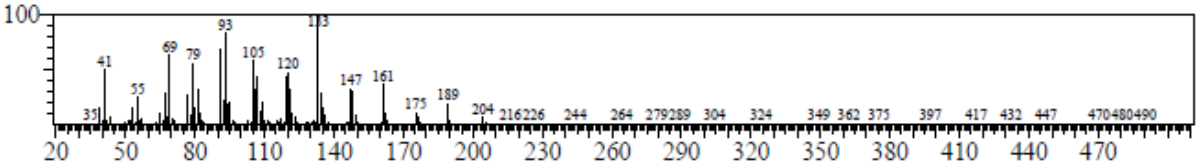

Figure 3: MS spectra of trans-caryophyllene from *Zingiber ottensii* Val. Leaves

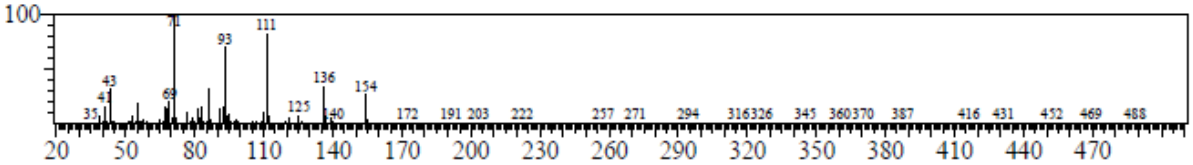

Figure 4: MS spectra of 1-4-terpineol from *Zingiber ottensii* Val. rhizome

Table 1
Main components of leaves and rhizome oil

S.N.	Compound	Percentage (%)	
		Rhizome oil	Leaves oil
1	1-4-terpineol	16.55	1.41
2	Zerumbone	14.23	11.4
3	Sabinene	8.6	2.76
4	1,8-cineole	5.84	t
5	γ-terpinene	4.75	t
6	α –terpinene	3.58	-
7	2- β –pinene	3.49	3.15
8	α –terpineol	3.47	-
9	α –humulene	3.32	4.87
10	Trans sabinene hydrate	2.53	-
11	dl-Limonene	2.31	-
12	Elemol	2.02	1.63
13	β –selinene	1.96	t
14	β –eudesmol	1.8	-
15	α –terpinolene	1.71	-
16	1-terpineol	1.61	-
17	Trans β ocimene	1.56	-
18	α –pinene	1.37	1.04
19	Longifolenaldehyde	1.33	-
20	L-Phellandrene	1.28	-
21	2,5,9-trimethyl-cycloundeca-4,8-dienone	1.00	t
22	Trans-Caryophyllene	T	19.62
23	β-elemene	T	12.34
24	1,5-cyclodecadiene	-	7.74
25	(-)-Caryophyllene	T	6.93
26	α-copaene	T	3.6
27	γ-gurjunene	-	2.91
28	δ-cadinene	-	2.54
29	Veridiflorol	-	2.13
30	E,e- α –farnesene	-	1.9
31	KW3 AUS epiglobulol	-	1.67
32	Albicanol	-	1.62
33	Germacrene-d	-	1.39

t : trace, < 1%

Conclusion

Essential oils of leaves and rhizome of *Zingiber ottensii* Val. from Bandung, Indonesia have different main components. The essential oil of *Zingiber ottensii* Val. leaves contains 37 components with main component respectively as trans-caryophyllene, β–elemene, zerumbone, 1,5-cyclodecadiene, (-)-caryophyllene while essential oil of rhizome contains 64 components with main component respectively as 1-4-terpineol, zerumbone, sabinene, 1,8-cineole, and γ-terpinene.

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