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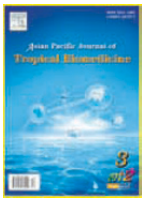

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Comparison of Essential oil Composition of Three Ginger Cultivars from Sub Himalayan Region

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ABSTRACT

Objective: To investigate and compare the essential oil constituents of three most popular cultivars from sub Himalayan region namely, gorubathane, shingboi and thingria. **Methods:** Volatile oils were isolated using Clevenger trap and characterized by analytical gas chromatography and gas chromatography-mass spectroscopy. **Results:** Eighty one constituents accounting for 95.24%, 97.1% and 97.03% of the gorubathane, shingboi and thingria oils respectively, were identified. **Conclusions:** The major compounds of gorubathane oil were zingiberene (32.2%) and β-sequiphellandrene (10.9%). The main constituents in thingria oil were zingiberene (12.58%) and ar-curcumene (9.89%) and of shingboi oil were geranial (20.07%) and neral (9.44%). This is the first report on the essential oils composition of three Sub Himalayan ginger cultivars.

1. Introduction

The Ginger (*Zingiber officinale* Rosc) is an herbaceous perennial aromatic plant belongs to the family Zingiberaceae, mostly distributed in East Asia and tropical Australia, the rhizomes of which are used as a spice [1]. Dried and fresh ginger has been used in Indian traditional medicine for relief from arthritis, rheumatism, sprains, muscular aches and pains, congestion, coughs, sinusitis, sore throats, diarrhoea, indigestion, loss of appetite, fever, flu, etc. The oil of *Z. officinale* has been studied for chemical and pharmacological activities and it was reported that zingiberene, β-sesquiphellandrene and ar-curcumene are the major constituents in most of the rhizome oils. These ginger oils showed good anticancer and antiinflammatory properties [2-5]. Some ginger species are high in sesquiterpene hydrocarbons and relatively low in monoterpene hydrocarbons while others have the opposite proportions. Another study on the ginger essential oil showed that it is rich in monoterpenoid compounds with camphene, geranial and geranyl acetate as main constituents [6]. The species under study is Sub Himalayan ginger cultivars namely gorubathane, shingboi and thingria, the chemical composition of these gingers not yet studied so far.

2. Materials and Methods

2.1. Plant material

The ginger cultivars were collected through Sikkim Marketing Federation (SIMFED) and Horticultural department (Sikkim).The specimens were deposited in the herbarium(NIIST) and the voucher numbers are G.10234,10235,and 10236.

2.2. Isolation of volatile oil

The rhizomes of three ginger cultivars were separately scrubbed and washed to remove the sand and other foreign particles and dried in the oven at 48℃±2℃ to a moisture content of 10%. Rhizomes were carefully milled to 20-40 mesh size particles and the samples (50 g) were hydro-distilled for 5 hrs in a Clevenger-type apparatus to get the oils. After drying over anhydrous sodium sulphate the oils were analyzed by GC and GC-MS. Analysis was carried out in triplicate.

2.3. GC analysis

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The GC analysis was carried out in a Hewlett-Packard GC (model 5890-II) equipped with an electronic integrator. Methyl silicone column (50 m x 0.2 mm, 0.17 μm) was used for the analysis. The conditions used were as follows: temperature programming from 80-200℃ at the rate of 5℃/min, held at 200℃ for 15 min, flame ionisation detector(F.I.D) temperature 300℃, injection temperature 250℃, carrier gas: nitrogen at a flow rate of 1 mL/min, split ratio of 1:75.

2.4. GC-MS analysis

GC-MS analysis was carried out in a Hewlett-Packard GC (Model No 5995) coupled with mass spectrometer under the following conditions: GC column and conditions were the same as in the capillary GC analysis. MS conditions were as follows: electron impact, ionizing voltage 70 eV, source temperature 150℃, electron multiplier at 2000 eV, scan speed 690 amu/s and scan 40-500 amu.

2.5. Identification of compounds

Compounds were identified by comparing retention indices/comparing mass spectra of each compound with those of authentic samples and library (NIST), and literature [7,8].

3. Result

The yield of essential oil from the gorubathane, shingboi and thingria cultivars were 3.8%, 3% and1.8% respectively. The chemical composition of ginger oils were shown in Table 1. The major constituents of shingboi ginger oil were geranial (20.07%), neral (9.44%) and ar-curcumene (6.56%). The gorubathane oil was rich in zingeberene (32.2%), β-sequiphellandrene (10.9%) and geranial (5.86%). Whereas thingria oil mainly contains zingeberene(12.58%), ar-curcumene(9.89%), β-sesuiphellanrene(9.4%) , β-bisabolene(7.18%)and geranial(6.72%). classifications of compounds in the volatile oils shown in Table 2.

Table 1.
Chemical composition of three ginger cultivars from sub Himalayan region.

Sl No	Component	Gorubathane(%)	Shingboi (%)	Thingria (%)	RI a	Identification
1	Tricyclene	0.03	–	0.1	926	MS b, RI
2	α-pinene	1.04	1.21	0.8	943	MS, RI
3	Camphene	2.5	2.54	1.9	954	MS,RI
4	2-heptanol	–	Tr c	–	957	MS,RI
5	Sabinene	0.99	1.42	1.58	976	MS,RI
6	Octenal	0.1	0.06	0.5	978	MS,RI
7	β-Myrcene	0.4	0.1	0.1	986	MS,RI
8	6-Methyl-5-hepten-2-one	0.2	0.3	–	994	MS,RI
9	α-phellandrene	0.24	1.02	1.5	1000	MS,RI
10	δ-3-carene	0.1	0.1	0.76	1003	MS,RI
11	α-terpinene	0.4	0.4	0.4	1008	MS,RI
13	p-cymene	0.2	1.09	1.34	1019	MS,RI
14	β-phellandrene	0.2	2.53	1.4	1021	MS,RI
15	1,8 cineole	–	0.2	0.5	1027	MS,RI
16	d-limonene	–	0.79	–	1030	MS,RI
17	γ-terpinene	Tr	0.82	0.7	1057	MS,RI
18	Trans-Linalool oxide	0.1	Tr	Tr	1081	MS,RI
19	Linalool	Tr	0.1	0.5	1089	MS,RI
20	2-nonanol	Tr	0.1	0.4	1092	MS,RI
21	Undecanone	Tr	Tr	Tr	1100	MS,RI
22	Citronellol	Tr	Tr	0.1	1117	MS,RI
23	Citronellal	Tr	1.3	0.67	1125	MS,RI
24	Camphor	Tr	0.5	0.3	1133	MS,RI
25	Sabinol	Tr	0.1	0.2	1137	MS,RI
26	Iso borneol	–	0.1	Tr	1154	MS,RI
27	Borneol	0.1	0.2	0.1	1164	MS,RI
28	Terpinen-4-ol	Tr	0.2	Tr	1174	MS,RI
29	α-terpineol	0.5	0.5	0.5	1184	MS,RI
30	Myrtenol	Tr	–	–	1196	MS,RI
31	Nerol	0.4	1.1	1.5	1218	MS,RI
32	Neral	2.64	9.44	3.62	1227	MS, RI
33	Carveol	Tr	1.02	Tr	1231	MS,RI
34	Geraniol	0.62	1.06	1.13	1240	MS,RI
35	Linalyl acetate	–	0.85	0.97	1244	MS,RI
36	Geranial	5.86	20.07	6.72	1255	MS, RI