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Curcuma amada Roxb - Chemical composition of rhizome oil

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ABSTRACT

GC and GC-MS analyses showed the presence of twenty two components accounting for 91.47% of the rhizome oil from *Curcuma amada*. Major constituent is myrcene (80.54%) followed by β-pinene (4.64%), (E)-β-ocimene (1.88%) and perillene (1.47%).

INTRODUCTION

The genus Curcuma contains about 70 species of rhizomatous herbs. *Curcuma amada* (Family; Zingiberaceae) is growing in plains of West Bengal, India. It is also known as 'Mango-ginger' due to mango like taste of rhizome. The field trials of mango-ginger for two seasons under varying levels of shade revealed that this crop is shade tolerant and is suitable for intercropping situations (Jayachandran and Sreekandan Nair, 1998). Its rhizome has a wide medicinal use for sprains, bruises and treatment of various intestinal diseases, fever, jaundice etc (Jain, 1995). It is also used in preparation of sweet meats, chutneys and pickles because of its mango like aroma (Gholab and Bandhyopadhyay, 1984). The rhizome on hydrodistillation gives a light yellow oil, whose chemical composition is meagerly investigated (Dutt and Tayal, 1941; Chodhury *et al.*, 1996; Srivastava *et al.*, 2001). Hence we have undertaken the chemical analysis of *Curcuma amada* rhizome oil by GC and GC-MS.

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MATERIALS AND METHODS

Plant materials

The rhizomes were collected from Sohagi Barwa, Mahrajganj, UP (India), in July 2001. A voucher specimen was deposited at the Herbarium, Science Faculty of DDU Gorakhpur University, Gorakhpur.

Isolation of oil

The dried rhizomes were cleaned,

washed, crushed and 100g material of the same was subjected to hydrodistillation. The oil was dried over anhydrous sodium sulphate and stored at 4°C. The yield of the volatile oil was 0.9% (v/w).

Chemical investigation

The chemical analysis of this oil was undertaken by GC and GC-MS.

Gas Chromatography

The GC profile of the oil was obtained using a Hewlett-Packard 5890 Series II gas chromatograph equipped with a Flame Ionisation Detector and HP-5 fused silica column (30 m x 0.32 mm), whose injector (FID) temperatures were maintained at 250°C and 270°C respectively. The amount of sample injected was 0.1 µl (in split mode) and the flow rate was fixed as 1.1 mL/min. Nitrogen was used as carrier gas and the oven temperature was programmed as follows: 75°C held for 1 min., rising at 1.5°C/min to 185°C held for 1 min, then at 9°C/min to 275°C and held for 2 min.

GC-MS

The GC-MS analysis of the oil was undertaken using a Hewlett-Packard HP 6890 series GC fitted with a Hewlett Packard Mass Detector (model 5973) and a HP-5 GC column (30 m and 0.25 mm) cross linked 5% phenyl methyl siloxane. The injector, GC-MS interphase, ion source and selected mass detector temperatures were maintained at 250°, 280°, 230° and 150°C respectively. Helium was used as the carrier gas and the oven temperature was programmed as follows: 75°C held for 1 min., rising at 1.5°C/min to 185°C held for 1 min. then at 9°C/min to 275°C and held for 2 min.

Identification of components

Chemical constituents were identified by comparing their mass spectra with the library NBS 75 K and/or by co-injection with authentic samples (Table 1).

Table 1. Chemical compostion of rhizome oil of *Curcuma amada*.

S.No.	Compounds	% FID	RI
1.	propanone	0.19	-----
2.	tricyclene	tr	0926
3.	α-pinene	0.70	0941
4.	camphene	0.18	0953
5.	sabinene	tr	0975
6.	β-pinene	4.64	0980
7.	myrcene	80.54	0993
8.	limonene	0.13	1031
9.	1,8-cineole	0.06	1035
10.	(Z)-β-ocimene	0.22	1040
11.	(E)-β-ocimene	1.88	1050
12.	perillene	1.47	1100
13.	camphor	tr	1144
14.	terpinen-4-ol	0.09	1177
15.	alpha-copaene	0.13	1378
16.	β-caryophyllene	0.53	1420
17.	β-gurjunene	0.07	1434
18	α-humulene	0.05	1458
19.	α-muurolene	0.07	1499
20.	caryophyllene oxide	0.34	1582
21.	curzerenone	0.14	1603
22.	α-muurolol	0.04	1647

RESULTS AND DISCUSSION

The chemical investigation of rhizome oil from *Curcuma amada* by GC and GC-

Table 2: Comparative chemical composition (%) of *Curcuma amada* (rhizome) volatile oils from different origins.

S.No.	Chemical components	Our results	Choudhury *et al.*	Srivastava *et al.*	Dutt and Tayal
1.	α-pinene	0.7	0.9	0.4	18.0
2.	β-pinene	4.64	4.9	0.6	-
3.	myrcene	80.54	88.6	0.2	-
4.	β-ocimene (E & Z)	2.1	2.4	-	47.2
5.	perillene	1.47	0.4	-	-
6.	limonene	0.13	0.1	0.4	-
7.	camphor	tr'	-	11.2	-
8.	β-elemene	-	-	2.8	-
9.	isoborneol	-	-	4.5	-
10.	β-curcumene	-	-	11.2	-
11.	curzerenone	0.14	-	7.1	-
12.	ar-curcumene	-	-	28.1	-
13.	1,8-cineole	0.06	0.1	6.0	-
14.	linalool	-	-	0.4	11.2
15.	linalyl acetate	-	-	-	9.1
16.	safrole	-	-	-	9.3
17.	zingiberene	-	-	1.4	-
18	camphene	0.18	-	1.7	-

MS, showed the presence of twenty two components accounting for 91.47% of the total oil. The major constituents is myrcene (80.45%) followed by β-pinene (4.64%), (E)-β-ocimene (1.88%) and perillene (1.47%). This oil also contains a little amount of sesquiterpenoids. Choudhury *et al.*, (1996) examined the rhizome oil of this plant obtained from plain districts of Assam (North-eastern India) and found myrcene and β-pinene as major components but the number of reproted components was quite less. Dutt and Tayal (1941) has also investigated an Indian rhizome volatile oil and reported β-ocimene (47.2%), linalool (11.2), α-pinene (18.0%), linalyl acetate (9.1%), safrole (9.3%) as major components. Very recently, Srivastava *et al.* (2001) analysed the rhizome oil of *C. amada* from Lucknow (India) and found ar-curcumene (28.1%), β-curcumene (11.2%), camphor (11.2%), curzerenone (7.1%), 1,8-cineole (6.0%; as main components. The comparative results (Table 2) showed a considerable variations in the chemical composition of the rhizome oils of this plant, which may possibly be due to pedogenetic or geographical differences of cultivation.

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