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SHORT COMMUNICATION

Chemical composition of *Ocimum gratissimum* essential oil from the South Western Ghats, India

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ABSTRACT

The EO from aerial parts of *Ocimum gratissimum* (Rama tulsi) growing in the South Western Ghats, India was examined for the first time. The essential oil was extracted by hydro-distillation and resulted in 1.31% oil (w/v). GC-MS analysis of *O. gratissimum* resulted in 18 chemical constituents comprising 99.4% of the oil. The main fractions were classified as phenylpropene (55.73%), sesquiterpenes (27.49%) and monoterpenes (16.14%). The major constituents were eugenol (54.42%), germacrene D (15.43%), β-ocimene (12.37%), and caryophyllene (4.59%). These major constituents can be utilized for aroma, perfumery and pharmaceutical industries.

Keywords: *Ocimum gratissimum*; essential oil; GC-MS; eugenol; germacrene D; β-ocimine; caryophyllene

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INTRODUCTION

Ocimum gratissimum (L.) is commonly known as Rama tulsi in India. It's native to Asia and is predominantly distributed and cultivated in India, Sri Lanka, Nepal, Nigeria and West Africa (Nadkarni, 1999). Leaves of this plant widely used folk medicine in teas and infusion of leaves to treat cough, cold, abdominal pain, anxiety, headache, and bronchitis (Matasyoh et al., 2007). Several scientific reports say that *O. gratissimum* has potential antioxidant, antimicrobial (Joshi, 2013), anti-inflammatory (Ajayi et al., 2014), anthelmintic (Aderibigbe and Idowu, 2020), antimutagenic (Gontijo et al., 2014), antidiarrhoeal (Offiah and Chikwendu, 1999), anticancer and antidiabetic activities (Aguiyi et al., 2000). Hydrodistillation, steam distillation, microwave, ultrasound-assisted and supercritical fluid methods are used to extract the EO from plants (Azwanida, 2015; Ashokkumar et al. 2020a; Ashokkumar et al., 2020b). Among them, hydrodistillation method is most commonly used by several researchers across the world, due to its less cost of Clevenger

apparatus and solvent as water (Ashokkumar et al., 2020c). The EO yield of *O. gratissimum* is varied between 0.21% and 0.70% (Dubey et al., 2000; Matasyoh et al., 2007; Joshi, 2013). The EO of *O. gratissimum* has predominant in phynelypropene (eugenol & methyl eugenol), sesquiterpenes (germacrene D & caryophyllene, γ-muurolene) monoterpenes (β-ocimene) and other constituents (Matasyoh et al., 2007; Padalia, and Verma, 2011; Joshi, 2013). Several studies have been carried out EO of the plant from across the world (Matasyoh et al., 2007; Padalia, and Verma, 2011). Based on the above interest and our knowledge, this study was the first report of EO composition from aerial parts of *O. gratissimum* growing from southern Western Ghats, India.

MATERIALS AND METHODS

The *O. gratissimum* were collected from Cardamom Research Station, Pampadumpara, Idukki (Western Ghats, India) during, July 2020. A voucher specimen (CRS/BIOTECH/22-07-2020), is preserved for future reference. Freshly collected aerial parts were shade dried at room temperature for ten days or until moisture content reached nearly 10%. *O. gratissimum* were ground well in a blender, and the finely powdered samples were subjected to hydrodistillation for 3 hours (Ashokkumar et al. 2020d). Chromatographic conditions were followed our laboratory previous studies report (Ashokkumar et al., 2020d). The chemical constituents of OGEO were identified after comparison with those available in NIST and Wiley library attached to GC-MS analyzer. The individual constituent concentration (%) of oil.

RESULTS AND DISCUSSION

EO extraction

The *O. gratissimum* used for the determination of EO yield using hydrodistillation method. An average EO yield, three technical repeats were 1.31% (Table 1). Other studies have been reported yield of OGEO ranged from 0.21% to 0.70% (Dubey et al., 2000; Matasyoh et al., 2007; Joshi, 2013; (Ashokkumar et al., 2020b).

GC-MS analysis

The obtained EO was analyzed by GC-MS, which resulted in identifying 18 total constituents comprising (99.36%) (Table 1). The essential oil profile of *O. gratissimum* was presented in Figure 1. The essential oil was characterized by high concentration of oxygenated phenylpropene (55.73%) followed by sesquiterpene hydrocarbons (27.34%), monoterpene hydrocarbons (13.51%), oxygenated monoterpenes (2.63%), and oxygenated sesquiterpenes (0.15%). Among the phenylpropenes, eugenol (54.42%) is the predominant constituent followed by methyl eugenol (1.31%). The major sesquiterpene constituents were germacrene D, and caryophyllene and the corresponding concentration were 15.43% and 4.59%. Though, the concentration was greater than previously reported 4.3% (germacrene D) and 1.7% (caryophyllene) in Kenya grown *O. gratissimum* (Dambolena et al., 2010). β-ocimene is main monoterpene constituents and others were trace level. Similar reports were observed from the earlier studies of Nigeria grown *O. gratissimum* essential oil (Martins et al., 1999). Furthermore, the present study gave extensive variation in EO constituents chemical composition compared to previous reports. Change in the EO and its composition is due to various factors, including origin of the sample, oil extraction methods, varieties, harvesting time and methods and storage conditions.

CONCLUSION

The chemo-profiling of aerial parts of OGEO through GC-MS analysis discloses that eighteen chemical constituents represent 99.36 % total oil. Phenylpropene concentration was predominant, followed by sesquiterpene and monoterpenes. OGEO was predominantly accumulated with eugenol, germacrene D, caryophyllene, γ-murrolene and copane. These bioactive molecules' existence as chief constituents from the OGEO serves as a novel possible source of phenylpropene, sesquiterpene, and monoterpenes.

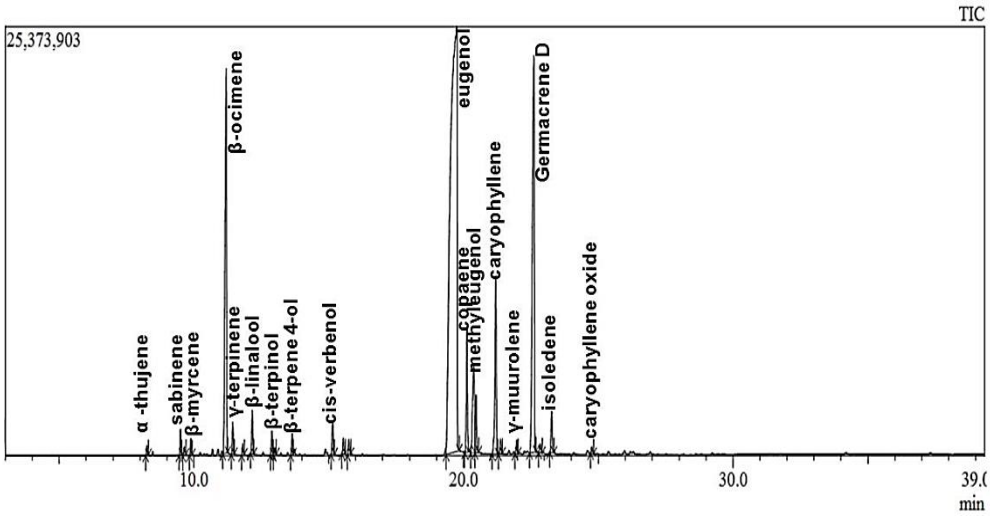

Figure 1. GC-MS analysis of EO profile of *Ocimum gratissimum*

Table 1. Profiling chemical constituents of EO from *Ocimum gratissimum*

Sl. No.	Compound name	RT[a]	RI[b]	RI[c]	Area (%)
1.	α-thujene	8.25	924	930	0.17
2.	sabinene	9.54	946	946	0.47
3.	β-myrcene	9.89	958	950	0.29
4.	β-ocimene	11.43	976	976	12.37
5.	γ -terpinene	11.80	1054	1059	0.21
6.	linalool	12.88	1087	1095	0.48
7.	β-terpineol	12.99	1158	1159	1.43
8.	cis-verbenol	15.54	1136	1137	0.72
9.	eugenol	19.50	1356	1359	54.42
10.	copaene	20.08	1374	1376	2.77
11.	methyleugenol	20.41	1451	1453	1.31
12.	caryophyllene	21.18	1464	1466	4.59
13.	humulene	21.95	1454	1454	0.30
14.	γ-muurolene	22.40	1478	1479	3.05
15.	germacrene D	22.52	1480	1481	15.43
16.	γ-elemene	22.83	1499	1490	0.24
17.	isoledene	23.25	1419	1379	0.96
18.	caryophyllene oxide	24.75	1582	1583	0.15

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