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PHYTOCHEMICAL SCREENING AND GC-MS ANALYSIS OF THE ESSENTIAL OIL EXTRACT OF THE AROMATIC PLANT *CYMBOPOGON CITRATUS*

Zoology

Umadevi. D Department of Biochemistry, Sree Krishna College, Guruvayur, Kerala.

K.U.M.A Rafeeq* Department of Zoology, MES Mompad College, Malappuram, Kerala. *Corresponding Author

ABSTRACT

Cymbopogon citratus, widely known as lemongrass is used as folk medicine for several disease conditions. Preliminary phytochemical screening of the essential oil extract of C. *citratus* revealed the presence of various bioactive compounds like alkaloids, flavonoids, saponins, tannins and phenolic compounds in the aqueous extracts. Essential oil was extracted from C. *citratus* leaves and its chemical constituents were identified by Gas Chromatography-Mass Spectrometry (GC-MS).

KEYWORDS

Medicinal plant, *Cymbopogon citratus*, essential oil, Gas chromatography.

INTRODUCTION

Cymbopogon citratus is one of the important medicinal plant and it has various applications in traditional medicines. It is commonly used for the treatment of numerous diseases like fever, sore throats, cough, laryngitis, bronchitis, oral candiasis, headache, digestive problems etc. It has been used for treatment of HIV complications, especially secondary bacterial infections[1]. Laboratory studies have shown that *C. citratus* have cytoprotective, hypocholesterolemic, antioxidant, anti-inflammatory antimalarial, and antifungal properties[2,3]. Rafeeq *et al*. reported the anti-insect activity of essential oil hydrodistilled from *Cymbopogon citratus* against the rubber litter beetle, *Lupropstristis* [4]. In the present study, we have extracted the essential oil from *C. citratus* and the chemical constituents were identified using Gas Chromatography-Mass Spectrometry (GC-MS). In addition, the phytochemical content analysis of the extract was also conducted.

MATERIALS AND METHODS

Plant Collection

Fresh leaves of *C. citratus* was washed thoroughly in tap water, air dried and used for extraction. Taxonomic authentication of the specimen was done at Calicut University herbarium (CALI), Department of Botany, University of Calicut, Kerala.

Phytochemical Screening

Major constituents of the essential oil extract from *C. citratus* were screened qualitatively as per the standard procedures[5]. The important constituents analyzed were alkaloids, flavonoids, steroids, tannins, terpenoids, saponins, carbohydrates and proteins.

Essential Oil Extraction

Fresh leaves of *C. citratus* was chopped into small pieces and subjected to hydrodistillation using a modified Clevenger type apparatus[6]. Conditions of extraction were as follows. About 100 g of *C. citratus* leaves were taken in 500 ml distilled water and 4 h of distillation was carried out. A 1000 ml round bottom flask, with plant parts in distilled water was heated in a heating mantle at a temperature around 100˚C so that vapors came up and condensed in the cooling water. Volatile oils collected in the reservoir on top of the aqueous layer. After extraction, the essential oil was transferred to a glass vial, and dehydrated by treating with anhydrous sodium sulphate. The quantity of essential oils obtained were averaged over three experiments and calculated according to fresh weight of the plant materials. The distilled essential oils were stored in amber coloured glass vials in a refrigerator at 4 °C until being used for the experiments.

Analysis of essential oils from *C. citratus* by Gas-Chromatography and Mass spectrometry (GC-MS)

The Gas Chromatography - Mass Spectrometry (GC-MS) analyses were performed on a Agilent Model GC 6890 N equipment coupled with a Hewlett Packard (HP) 5975 B Mass Selection Detector (MSD) system operating at 70 eV and 250 ˚C, equipped with a split-less injector. A cross linked 5% phenyl methyl siloxane column (HP-5), with 320 µm×30 m and 0.25 µm film thickness was used. Helium was used as the carrier gas at a flow rate of 1.4 ml/min. During the run the temperature program for the HP-5 column was set as follows: 40˚C for 3 min and rise at 5˚C / min to 280 ˚C, isotherm for 10 min; post run 10 min at 300 ˚C. Run time was 61 min.

The injection volumeof each sample was 1.0 µl. The identification of the components was based on comparison of their mass spectra with those of MP and NIST search libraries[7] and co-injection with standard compounds. The peaks in the chromatogram represent the signal created when a compound elutes from the GC column into the detector. The x-axis shows the retention time (RT), and the y-axis shows the intensity (abundance) of the signal.

RESULT AND DISCUSSION

Phytochemical Screening

Preliminary phytochemical screening of the essential oil extract of *C. citratus* revealed the presence of various bioactive components. It showed the presence of alkaloids, flavonoids, saponins, tannins and phenolic compounds in the aqueous extracts.

Table:2. Phytochemical composition of aqueous extract of *C. citratus*

Phytochemicals	Results
Alkaloids	+ve
Flavonoid	+ve
Saponins	+ve
Quinones	-ve
Tannins	+ve
Terpenoids	-ve
Steroids	-ve
Phenol	+ve

Analysis of essential oil of *C. citratus* by Gas Chromatography-Mass Spectrometry (GC-MS)

The major chemical constituents of essential oils from the aromatic plant *C. citratus*, was identified using Gas Chromatography-Mass Spectrometry (GC-MS) analysis and are listed in table 2.

Relative proportions of the constituents were calculated using peak area by dividing the area under each peak by the total area. A wide spectrum of volatile chemical compounds was detected in the essential oils obtained from the leaves of *C. citratus* is shown in Figure1.

Nineteen constituents were identified from essential oil from lemongrass with geranial (47.46 %) and carveol (32.78 %) accounting for major portion of the constituents identified.

The other constituents identified include 6-methyl 5- heptene 2-one (0.23 %), eucalyptol (0.30 %), β-pinene (0.60 %), cis-verbenol (0.44 %), L. borneol (1.40 %), decanal (0.31 %),3-carene (0.25 %), L.P. pinene (2.32 %), cyclosativene (0.15 %), B. pinene (1.35 %), β-elemene (0.39 %), β-caryophyllene (4.52 %), α-caryophyllene (0.63 %), α-curcumene (0.17 %), β-cubenene (0.69 %), zingiberene (0.15 %), and γ-cadinene (2.19 %).

Additional minor compounds were detected but not identified as their concentrations were too low to be analyzed with mass spectroscopy.

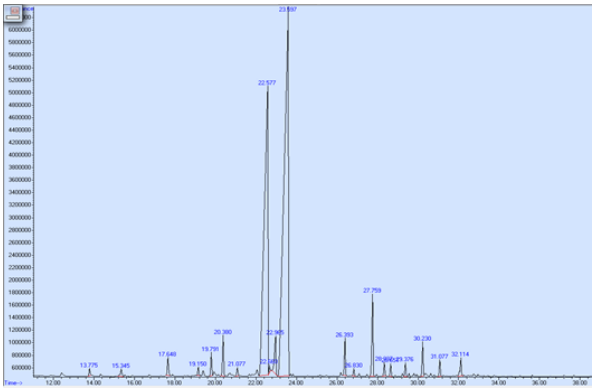

Fig : 1 GC-MS analysis of essential oil of *C. citratus* leaves

Table :2. Compounds identified from GC–MS analysis of essential oils obtained by the leaves of *C. citratus*

Sl. No.	Compound	Retention time (min)	% of total
1.	6-Methyl 5-heptene 2-one	13.788	00.232
2.	Eucalyptol	15.358	00.299
3.	β-Pinene	17.663	00.601
4.	Cis-Verbenol	19.809	00.440
5.	L. Borneol	20.393	01.403
6.	Decanal	21.090	00.308
7.	3-Carene	22.071	00.246
8.	Carveol	22.583	32.776
9.	L.P. pinene	22.978	02.322
10.	Geranial	23.602	47.460
11.	Cyclosativene	26.205	00.153
12.	B. pinene	26.405	01.350
13.	β-Elemene	26.843	00.391
14.	β-Caryophyllene	27.771	04.524
15.	α-Caryophyllene	28.663	00.629
16.	α-Curcumine	29.245	00.169
17.	β-Cubenene	29.388	00.685
18.	Zingiberene	29.568	00.150
19.	γ-Cadinene	30.242	02.191

CONCLUSION

The study revealed the presence of several phytocompounds in the aqueous extract of *C. citratus*. The presence of these bioactive components might be the reason for its wide usage as a folk medicine for the treatment of various diseases by traditional users. The GC-MS analysis revealed that the essential oil extract of *C. citratus* contained high level of geranial and carveol with low level of α-Curcumine and Zingiberene. As a result of their highly volatile nature, essential oils are not persistent in the environment and are less likely to leave residues on food products. These favorable properties of *Cymbopogon* oils suggest that products based on them may be viable options as a part of Integrated Pest Management.

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