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ORIGINAL ARTICLE **OPEN ACCESS**

Chemical Characterization of Volatile oil Components of *Curcuma caesia* Rhizomes Using Gas Chromatography-Mass Spectroscopy

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ABSTRACT
Curcuma caesia is a perennial herb widely available in the north east part of India, often known as black turmeric or black zedoary or Kali haldi's, which has bluish-black rhizomes. Kali haldi's rhizome has a flavour that is harsh, spicy, bitter, and has a good aroma. It is a laxative and has antibacterial and antifungal properties. It is utilised as a heart and brain tonic. Leukoderma, hemorrhoids, pneumonia, influenza, cancer, spleen enlargement, granulomatous glands of the neck, epilepsy convulsions, inflammatory diseases, and asthmatic can be effectively treated with rhizomes. The goal of the current study is to carry out the assessment by using Gas Chromatography-Mass Spectroscopy method to identify the various Phyto constituents that are present in the Curcuma caesia rhizomes.
Keywords: *Curcuma caesia, Gas Chromatography, Mass Spectroscopy, derivatization, Ionisation*

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INTRODUCTION

The perennial rhizomatous plant *Curcuma caesia* has dark blue rhizome [1]. It belongs to the Zingiberaceae family's, also known as "Black Turmeric". Because of its unique therapeutic qualities, this species has been steadily gaining recognition among interested parties. *Curcuma caesia* is a very uncommon and nearly unexplored medication that is used by traditional healers mostly in north east part of India [2] and in Andhra Pradesh it is used widely as ethno medicinal treatment to cure a variety of ailments. The plant's rhizomes have been investigated for their antifungal, antioxidant, smooth muscle relaxant, analgesic, anti-asthmatic, loco motor depressant and anticonvulsant effects, as well as their anxiolytic, anti-bacterial, CNS depressant, anti-ulcer and numerous diverse activities.
The midrib of the dark green leaves' blades is bordered by a red line. Red flower bracts are present. The plant is extremely comparable to zeodary in terms of size and look (Curcuma zeodaria).
Like with ordinary turmeric, there are similar growing and harvesting procedures. [2] The rhizomes are properly cleaned in the fields before being put in a cauldron with a large opening. The cauldron is filled with water until the rhizomes are completely submerged. The rhizomes were cooked for 30 min till the froth comes out of the cauldron having potent aroma, they turn mushy with the change of their inner portion from blue to dark or pale brown and the water content has reduced to one-third of the intitial level. The next step is to dry the rhizomes in the sun for two weeks till they become firm. Then they are packaged for sale.The obtained volatile from the rhizomes of *C.Caesia* revealed 30 constituents in it.It consists 28% of camphor, 12% tumerone (Z)-ocimene (8%), 7% of aromatic-curcumene, 3% of curcumene, 3% of bornyl acetate, 5% elemene, 5% of cineole are found to be primary constituents[3] According to other phytochemical testes the main ingredients are Terpenes, Phenyl propyl molecultes, diphenalkaloids,flavonoids, steroids, and alkaloids. [4]

MATERIAL AND METHODS

COLLECTION AND AUTHENTICATION OF PLANT:

The rhizomes of *Curcuma caesia*were collected for the experiment from Udipi region, karnataka. Dr. Ramkanth Raju, a retired professor at S.V. University in Andhra Pradesh, verified the authenticity of the rhizomes.

ISOLATION OF ESSENTIAL OILS BY USING STEAM DISTILLATION:

The obtained rhizomes were screened for removing unwanted foreign objects and were properly washed with water, obtained rhizomes were then allowed to dry in the shade. After thorough drying, rhizomes were made into powder by using Dry grinder, obtained powder was sieved by using sieve no # 22. About 100 g coarse powder is distillated by the help of 1000 mL distillation flask with the help of clavengers apparatus. Volatile is collected at a temeperature of 35 degree centigrade the process was completed in twenty four hours. The resultant distillate was then dried using magnesium sulphate to remove the water particle from the volatile oil. The oil was preserved in asealed vial at 4°C before examination. The obtained oil is examined for its organoleptic properties, and the major constituents of the extracted volatile oil were identified byGC-MS analysis.

GAS CHROMATOGRAPHY-MASS SPECTROSCOPY ANALYSIS

Gas chromatograph and mass spectrometer are the two main parts of GC-MS. The capillary column used in the gas chromatograph has features for molecular separation that are dependent upon that column's properties(such as length, film thickness and diameter), and also on the phase properties (for example, 5% phenyl polysiloxane)[5]. The separation of the molecules along the column's length is aided by the chemical characteristics difference of the various molecules of the mixture and their binding towards to the stationary phase. The molecules are eluted from the column based on the retention timewhich allows the mass spectrometer downstream to catch,fragment each molecule into ionised pieces, accelerate, deflect, and detect the ionised molecules separately using their mass-to-charge ratios[6, 7].When the gas chromatography and mass spectrometry are combined, the process of identification of the substances can be done considerably more precisely than when they are utilised alone. Use of gas chromatography or mass spectrometry alone makes it impossible to identify a specific molecule with accuracy [8].

VOLATILE OIL ANALYSIS BY PURGE AND TRAP (P&T) GC-MS

The examination of volatile oil constituents was done by introducing the samples throughpurge and trap (P&T) concentrator system. Purging or sparging is the process of combining the sample with water and purging it using the mobile phase inert gas (such as nitrogen gas) inside of an airtight chamber in order to recover the target analytes[9]. Following their movement into the headspace above the water, the volatile chemicals are pulled out of the chamber along a pressure gradient (produced by the entry of the purge gas). Onto a "trap," the volatile substances are dragged along a hot line[10] The chemicals are held in the trap by being returned to the liquid phase in a column of adsorbent material that is at room temperature. The sample chemicals are then added to the GC-MS column using a divided intake system is known as the volatiles interface once the trap has been heated[11]. Volatile organic compounds (VOCs) and BTEX (benzene, toluene, ethyl benzene and xylene) chemicals are especially well suited for P&T GC-MS analysis[12] (aromatic compounds associated with petroleum).The "purge-closed loop" system offers a quick alternative to the above. In this system, the inert gas is bubbled through the water until the concentrations of organic molecules in the vapour phase are in equilibrium with concentrations in the aqueous phase[13]. The gas phase is then immediately examined after that.

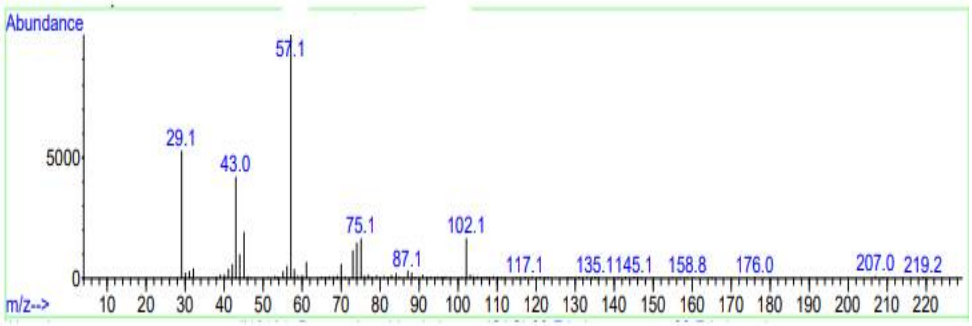
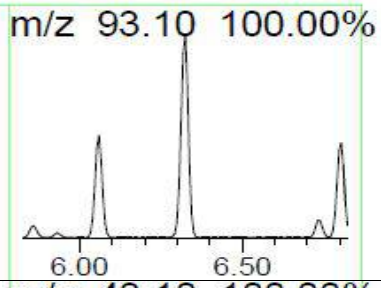
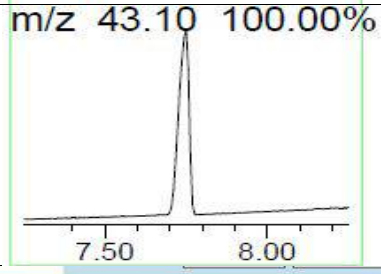
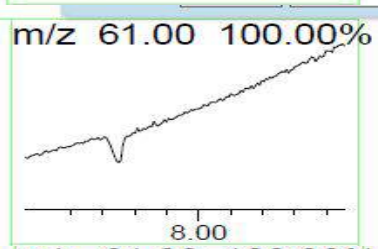
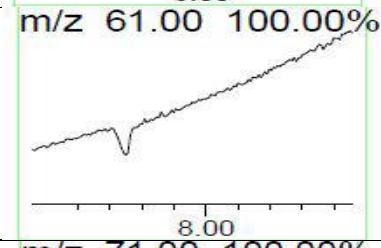
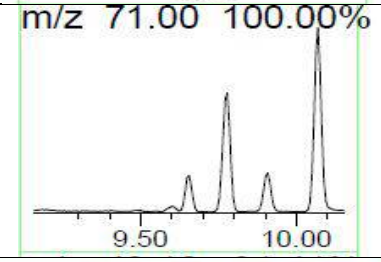
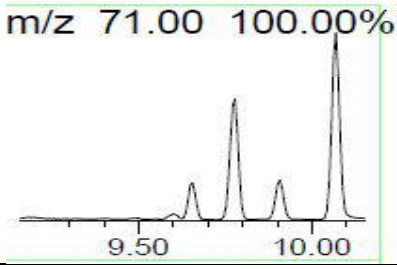
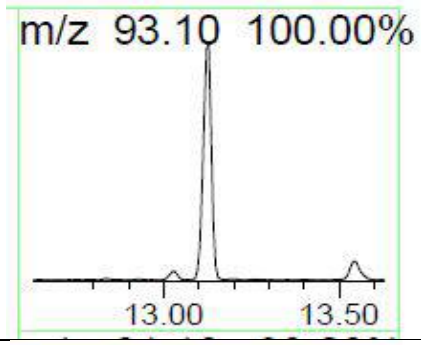
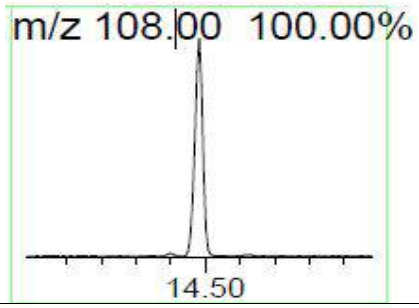
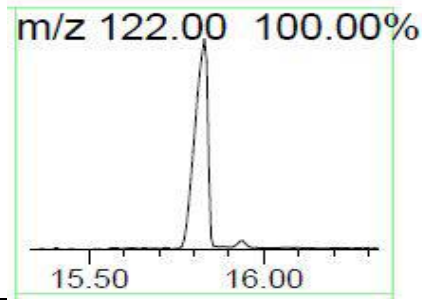
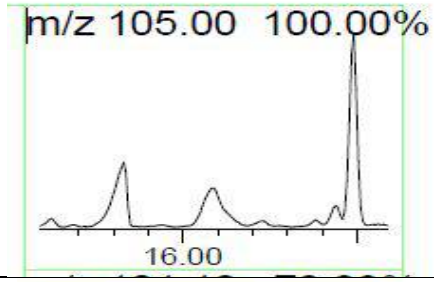
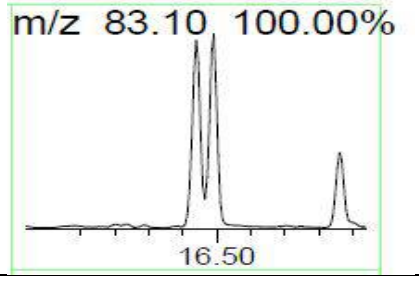


Fig:1 GCMS Spectra of volatile obtained from *Curcuma caesia* rhizomes

Table 1:Percentages of volatile components in Curcuma caesia rhizomes

S.NO	MAIN COMPOUND	RT	AREA%	PEAK
1	CAMPHENE	6.3	2.63	
2	1,8-CINEOLE , 2-OXABICYCLO[2.2.2]OCTANE, 1,3,3-TRIMETHYL- (CAS) TERPAN	7.75	16.90	
3	GLYCERIN	7.167	0.29	
4	BICYCLO[2.2.1]HEPTAN-2-ONE	9.603	6.20	
5	BICYCLO[2.2.1]HEPTAN-2-OL	9.778	2.64	
6	BICYCLO[2.2.1]HEPTAN-2-OL	12.383	0.49	

7	BETA. ELEMENE	13.128	2.55	
8	BENZOFURAN,	14.48	3.42	
9	(5R,6R)-3,6-DIMETHYL-5-(PROP-1-EN-2-YL)-6-VINYL-6,7-DIHYDROBENZOFURAN-4(5H)-ONE	15.94	0.77	
10	1-METHYL-5,8-DIMETHOXY-1,2,3,4-TETRAHYDRO-1,4-IMINONAPHTHALENE	16.089	2.73	
11	AR-TUMERONE 2-METHYL-6-(4-METHYLPHENYL)-2-HEPTEN-4-ONE	16.43	1.87	

RESULTS AND DISCUSSION

Based on the GC-MS spectra given in fig:1 , *Curcuma caesia* essential oil contains 2.63% of Camphene (CAS) , 16.90% of 1,8-Cineole 2-Oxabicyclo[2.2.2]octane, 1,3,3-trimethyl- (CAS) Terpan, 0.29% of Glycerin 1,2,3-Propanetriol Glycerol Glycerine ,Glyceritol, 6.20% of Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-, (1R)-,6.20% of Bicyclo[2.2.1]heptan-2-one, 1,7,7-trimethyl-, (1R)-, 2.64% of Bicyclo[2.2.1]heptan-2-ol, 1,7,7-trimethyl-, exo- (CAS) Isoborneol (CAS),0.49% of Bicyclo[2.2.1]heptan-2-ol, 1,7,7-trimethyl-, acetate, (1S-endo) 2.55% of beta elemene,3.42 % of Benzofuran, 6-ethenyl-4,5,6,7-tetrahydro-3,6-dimethyl-5-isopropenyl-, trans, 0.77% of (5R,6R)-3,6-Dimethyl-5-(prop-1-en-2-yl)-6-vinyl-6,7-dihydro

benzofuran-4(5H)-one, 2.73% of 1-Methyl-5,8-dimethoxy-1,2,3,4-tetrahydro-1,4-iminonaphthalene, 1.87 % of Ar-tumerone 2-Methyl-6-(4-methylphenyl)-2-hepten-4-one. *Curcuma caesia* majorly consist of 1,8-Cineole 2-Oxabicyclo[2.2.2]octane which is commonly known as eucalyptol, is said to have antioxidant, anti-microbial, and anti-inflammatory properties [1-6]. Numerous clinical studies have shown 1,8-cineole to have strong anti-inflammatory properties. This suggests that it may be used as a primary therapy or as an adjuvant therapy to other anti-inflammatory drugs [7-13].

CONCLUSION

From the above results the following conclusion was drawn from the carried research work. The volatile and semi-volatile analytes which make up the essential oils can be easily separated, identified, and quantified by mass spectrometry (MS) and gas chromatography (GC), making them effective instruments for essential oil analysis. GC-MS is used to assess important quality control parameters like process optimization, authentication, and characterization, thereby it can be beneficial in obtaining detailed chemical information on essential oils.

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