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ORIGINAL RESEARCH

Chemical Characterisation of Components Present In Rhizomes of Curcuma Aromatica by Gas Chromatography-Mass Spectroscopy Method

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ABSTRACT:

Curcuma aromatica is commonly known as wild turmeric and extensively used as an herbal excipient in the preparation of cosmetic preparations. It is indigenously grown in India and having anti-inflammatory, wound healing, antioxidant, anti-tumour, anti-cancer, anti-repellent, antitussive, anti-platelet activity and ant nephrotoxic activities. The present research work is to characterise the individual chemical components present in the rhizomes of Curcuma aromatica by Gas Chromatography-Mass Spectroscopy method.

Keywords: Curcuma aromatica, cosmetic preparation, chemical characterisation.

INTRODUCTION:

Curcuma aromatica, also referred to as "JangliHaldi," Apart from India, numerous other countries cultivate this plant for its rhizomes. Common applications for this rhizome include condiment and flavourings agent. The genus Curcuma, which contains Curcuma aromatica, belongs to the plant family Zingiberaceae.[1] In South Asia and the surrounding regions, wild turmeric, which is botanically related to Curcuma australisica, has been widely used as a cosmetic herb. It can be called with different names in different areas i.e Vana-haridra in Sanskrit, JangliHaldi in Hindi, Yellow zedoary and cochin turmeric in English, SafrandesIndes in French, Kapurkachali and Vanahaladara in Gujarati, Banhaludi in Bengal, Kasturi-manjal in Tamil, Kasturi-manjal in Telugu, Ambehaldi in Bombay and Anakuva and Kattumannar in Malayalam.[2]

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Figure 1:Image of C.Aromatica plant ariel parts and underground rhizomes

1.3 Cultivation Specifications

There are over 1600 species in the Zingiberaceae family of flowering plants, which consists of about 50 genera.[4] The annual vegetation disappears in the late fall, and the rhizomes go dormant throughout the winter. In the early spring the blossom initially appears at the base of the rhizomes. Within a few weeks after the summer monsoon season, the plant grows fast and robustly. Larger coloured bracts with pink tips cover the stalk, which grows to a height of roughly 20–30 centimetres (7.9–11.8 in). Leaves are frequently present after the flowers. When completely developed, the plants can reach a height of 40 cm (16 in).[5] The main objective of present study is explore the phytoconstituents present in the C.Aromatica rhizomes. As there is numerous medicinal properties of curcuma aromatica which have been demonstrated to include antibacterial, anti-angiogenic, choleretic, anthelminitic, anticancer, wound healing, cytoprotective, anti-inflammatory, and antioxidant activities.

MATERIALS & METHODS

Plant Collection and Authentication

Rhizomes of Curcuma aromatica were obtained from the nearby region of Duggirala, Guntur district, Andhra Pradesh, India. Rhizomes were authenticated by Dr.Ramakanth Raju, Retired professor, S.V.University, Andhra Pradesh, India.

Extraction of Volatile Oil

The obtained rhizomes were properly washed, any unwanted foreign objects were removed with water, and then they were allowed to dry for a week in the shade. Once the material had finished drying, it was ground into a coarse powder, which was then weighed about 100 g and transferred to a 1000 mL distillation flask. 500ml of water with 100ml of glycerine is added into the Round bottom flask (RBF) and is connected with Clevenger's apparatus Purchased from zoom scientific world, Ambala, India by using a temperature of 35oc for about 48 hours by connecting to cooling condenser obtained distillate is separated and collected the volatile oil of Curcuma aromatica Volatile oil accumulated at the collector area was collected into a separating funnel by opening the stop cock. The resultant distillate was then dried using magnesium sulphate to remove the last drop of the water. Prior to analysis, the oil was kept in a sealed vial at 40c in a refrigerator. The obtained oil is examined for the organoleptic characteristics and phytoconstituents present in the extracted volatile oil is determined by using GC-MS analysis.

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Analysis by GC-MS

Agilent's 7890 gas chromatograph and 5975n mass spectrometry detector, California, United states were used to conduct the GC-MS analysis. The column was a capillary column with the dimensions of 30 m x 0.25 mm and a film thickness of 0.25 m called HP-5MS UI (cross-linked 5% Methyl phenyl Silox). The temperature of the oven was raised from 40 to 200°C at a pace of 6°C/min. Then, the temperature was maintained between 200 and 280 °C at a rate of 30 °C/min. After that, post-run in 280°C for 10 minutes. The carrier gas, helium, flowed at a rate of 1 mL/min. The injector and detector were 250°C in temperature. Scan mode and split less were used while introducing 1 L of material (0.1% in absolute methanol) into the GC-MS system. The external standard utilised was quinaldine.

RESULTS

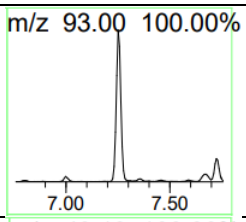
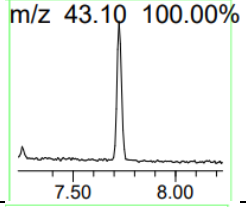
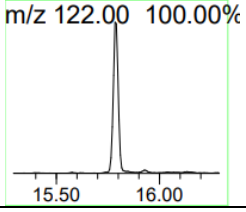
It is discovered that the yield of volatile constituents from steam distillation is 3.6% w/v. The characteristics of the oil as determined by organoleptic characterization are as follows:

Organoleptic Characterisation

Colour: Pale yellow
Odour: Aromatic and characteristic
Taste: Bitter and pungent
Solubility: Insoluble in polar solvents
Soluble in non-polar solvents (methanol, n-hexane, petroleum ether)

GCMS Analysis

Complete spectra is given in the form of additional file with this manuscript
It was observed that 81 peaks in essential oil obtained from the rhizomes of Curcuma aromatica had the following parameters can be utilised to examine volatile chemicals from curcuma aromatica oil. Major classes of compounds are sesquiterpenes, phenyl propanoid, oxygenated sesquiterpenes, and esters.[7] Obtained main compounds were given in the Table:1

Main Compounds	Area (%)	R.T in min	Peaks
l-Phellandrene	1.03	7.257	
Eucalyptol	1.30	7.730	
Epicurzerenone	4.01	15.791	

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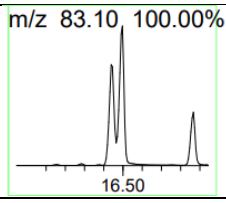
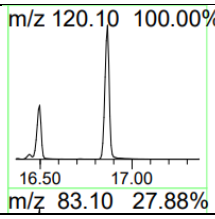
Tumerone	15.57	16.445	
	29.83	16.495	
Curlone	16.4	16.86	

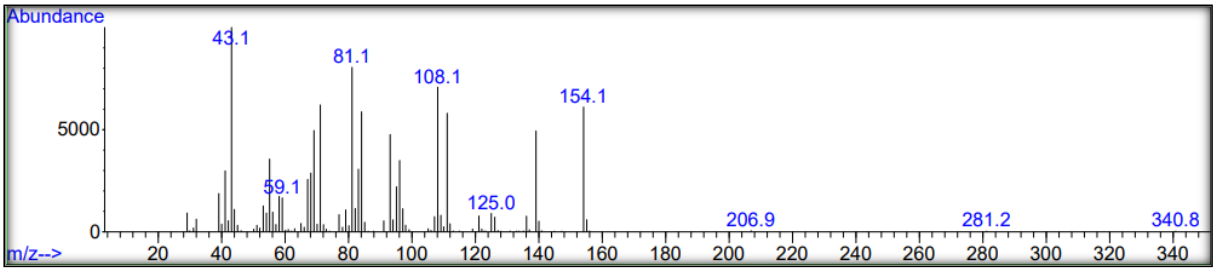


Figure 2: GC-MS Spectral peaks for the volatile oil of C.Aromatica rhizomes

DISCUSSION

The main objective of this research is to explore the phytoconstituents present in the volatile oil obtained from the rhizomes of Curcuma aromatica. Based on the GC-MS findings the main components identified were 1.03% l-Phellandrene, 1.30% Eucalyptol, 4.01% Epicurzerenone, 45.4% Turmerone, 16.4% Curlone, these finding will help us for development of synthetic preparation process for obtaining the effective pharmacological action from natural source.

One of the 80 members of the plant family Zingiberaceae is the wild turmeric. Late in the fall, the perennial foliage drops off, and over the winter, the rhizomes are dormant. At the base of the rhizomes, the flower first develops in the early spring. The plant develops quickly and strongly in the weeks immediately following the summer monsoon season. The stalk, which reaches a height of approximately 20–30 centimetres (7.9–11.8 in), is capped with larger coloured bracts that have pink tips. After the blossoms, leaves frequently still exist. The plants can grow as tall as 40 cm (16 in) when fully developed.

The extracted volatile oil is having a colour of dark yellowish orange colour, aromatic odour, evapourating point at 20oc, oil exhibited the solubility in organic solvents like hexane, petroleum ether, ethyl acetate, ethanol, insoluble in non-polar solvents like water.

GC-MS method was developed by optimising the condition of GC-MS by using the mobile phase as Helium gas at 1ml/min isolation and elution of the components in Curcuma aromatica and were detected by comparing the consequences of the chromatogram and reference retention time using Wiley mass spectra library (Wiley W9N11). Total 81 compounds were identified in the obtained volatile oils the five main compounds at high concentrations l-phellandrene at 7.25 RT, eucalyptol at 7.73 RT, tumerone at RT of 16.45,curlone at RT of 16.86, Epicurzerenone at 15.79 were determined and some compounds were identified in minute concentration were identified which including Pinene, Phellandrene, D-Limonene (0.6%), gama Terpinene, Caryophyllene oxide (0.7%), and Camphor (0.9%), 1,8-Cineole (0.05),

l-phellandrene is a terpene used in Eastern medicine for reducing phlegm and boost up the energy.Turmerone and curlone both are responsible for prevention arteries clogging process Epicurzerenone helps in prevention of the heart attack by inhibiting the thrombos formation, gama terpinene, D-Limonine , camphor has got flavouring action, 1,8-cineole has got analgeic action towards dental problems. Many other therapeutic uses like prevention of cancer, decreases inflammatory response, inhibits the free radical scavenging action.
By identifying the phytoconstituents present in the volatile oil extract we could able to plan for novel herbal formulation which can reduce the ailments with less side effects.

CONCLUSION

From the present research we conclude that Curcuma aromatica rhizomes extracted volatile oil confirms the presence of main phytoconstituents like 1- phellandrene, Eucalyptol, Epicurzerone, turmerone and curlone. Form the literature it was found that these constituents can help in reducing the heart attacks by delaying clotting process, which is considered as one of the major problems identified in many people especially in Post COVID symptoms, isolation of these constituents and by formulation development can help for producing better therapeutic action with fewer side effects.

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Author Contribution

- Mr.R.Ravi has carried out the collection, processing of the plant material
- Dr.CH K V L S N ANJANA Male has carried out the compilation process of the data and manuscript preparation
- Dr. S N V L Sirisha has carried out the GCMS characterisation
- Dr. Saidulu P has carried out the data gathering process

Conflicts of Interests

Author has no conflicts of interest

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