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CHEMICAL COMPOSITION OF THE ESSENTIAL OIL FROM THE LEAVES OF *CIPADESSA BACCIFERA* (ROTH.) MIQ.

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ABSTRACT: *Cipadessa baccifera (Roth.) Miq*. of Meliaceae family, is an ethnobotanically important plant and is widely used in folklore medicine for treating a range of maladies including diabetes, dysentery, malaria, rheumatism, piles, head ache, and psoriasis. The present study was aimed at investigating the essential oil composition from the leaves of *C. baccifera*. The essential oil was extracted through hydrodistillation and its chemical composition was analyzed by gas chromatography and mass spectrometry technique (GC-MS). The yield of essential oil based on the dry weight of the plant was 1.1% (v/w). Forty one different phytoconstituents accounting for 99.62% of essential oil were identified. The study showed the presence of Sesquiterpenes as the major group of compounds representing 78.14% of the total essential oil. Significant Sesquiterpenes identified were Caryophyllene (17.32%), Isoledene (9.12%), 1S, Cis-Calamenene (7.42%) and β-Sesquiphellandrene(7.32%). Sesquiterpenes are known to exhibit pharmacological activities and the present report could contribute for their further use as anticancer, immunosuppressive and anti-inflammatory agents.

INTRODUCTION: Essential oils or ethereal oils are concentrated hydrophobic and aromatic volatile products of secondary metabolism secreted by oil cells, glandular hairs or secretion ducts in different parts of the plants and are concerned with the vital processes, giving a characteristic odor, protecting the plants from diseases and insect attacks [1, 2, 3]. The essential oils have been in use for centuries; in ancient civilizations of Rome, Egypt, Greece and the Far East as perfume, food flavors and for medicinal purposes.

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Presently, essential oils have received great attention for their broad spectrum action, uses in agronomic, perfumery, food, sanitary, cosmetic industries [4], conventional, alternative medicines [5] and having profound applications in treating coronary heart diseases [6], hypertension [7], hyperglycemia [8] and cancer [9, 10, 11].

The biological activity of essential oils is generally determined by the relative concentration and major compounds present in them, which plays a key role in drug synthesis. Hence screening and characterization of plant essential oils are very important [12, 13]. *Cipadessa baccifera* (Roth.) Miq. belonging to the family Meliaceae, is a shrub distributed in North Circars, Deccan, Western Ghats of India and Southwest of China. It is a traditional medicinal plant used by folklore of India for treating a range of maladies, including diabetes,

dysentery, malaria, rheumatism, piles, head ache, and psoriasis [14, 15, 16, 17].

Review of literature reveals the presence of essential oils in the leaves of Meliaceae members viz. *Azadirechta indica* [18], *Melia dubia* [19], *Toona* and *Cedrela* species [20] and *Cedrela Mexicana* [21] however, there are no studies on the chemical analysis of essential oils in *C. baccifera.* There is a correlation between the volatile phytochemical compounds of essential oils present in medicinal plants and the biological activities they exert [22]. In view of this, the present study focuses on the extraction and chemical analysis of essential oils from the leaves of *C. baccifera*.

MATERIALS AND METHODS:

Plant collection:

The plant samples were collected from Thavarekere, Magadi Taluk, Bangalore Rural district in the months of November to January. Identification of *C.baccifera (Roth.) Miq.* was authenticated by National Ayurvedic Dietetics Research Institute, Bengaluru; with vide voucher specimen number, RRCBI-8971. Voucher specimen is also maintained in the herbarium of the Research Centre, St. Joseph's College, Bengaluru.

Extraction of the Essential Oil:

Fresh, healthy and infection free samples of leaves of *C.baccifera* were collected, shade dried, pulverized and stored in air tight containers at room temperature. About 100g of the leaf powder was subjected to hydrodistillation for 10 hours in a Clevenger apparatus [23]. The extracted oil samples were collected by solubilizing in hexane, which was then allowed to evaporate completely at room temperature. The hydrodistillation extractions were repeated several times and the oil obtained was pooled and stored in vials at 4ºC in a refrigerator for further analysis.

Gas Chromatography - Mass Spectrometry:

GC-MS analysis of leaf essential oil was performed using Shimadzu GC-MS-QP-2010S instrument. The compounds were separated using RTX-5 capillary column (30m× 0.25 mm id; 0.25 µm film thickness). An aliquot of 1µL oil was injected into the column using 10:1 split injection, the injection port temperature was set at 225ºC. Initial temperature of oven was kept at 130ºC then programmed to 165 ºC at a rate of 2ºC/min, then it was ramped to 200ºC at 10ºC/min and finally increased to 300ºC, at the rate of 20ºC and held for 5 min. The helium gas was used as carrier gas with flow 1.0 mL /min. Significant quadrupole MS operating parameters included interface temperature of 300ºC and ion source temperature of 200ºC. The mass spectrometer was operated in the 70eV EI mode, with scan mass range of 40-600 *m/z* at 0.5s, sampling rate of 1.0 scan/s. The compounds were identified by comparing mass spectra of each peaks with NIST 5 and WILEY library [24, 25, 26].

RESULTS AND DISCUSSION: The hydrodistillation of leaf of *C. baccifera* yielded 1.1% (v/w) pale yellow oil. The GC-MS analysis results showed 41 chemical compounds, accounting for 99.62% oil. The compounds and their relative percentage concentration in the order of their elution are listed (**Table 1**).

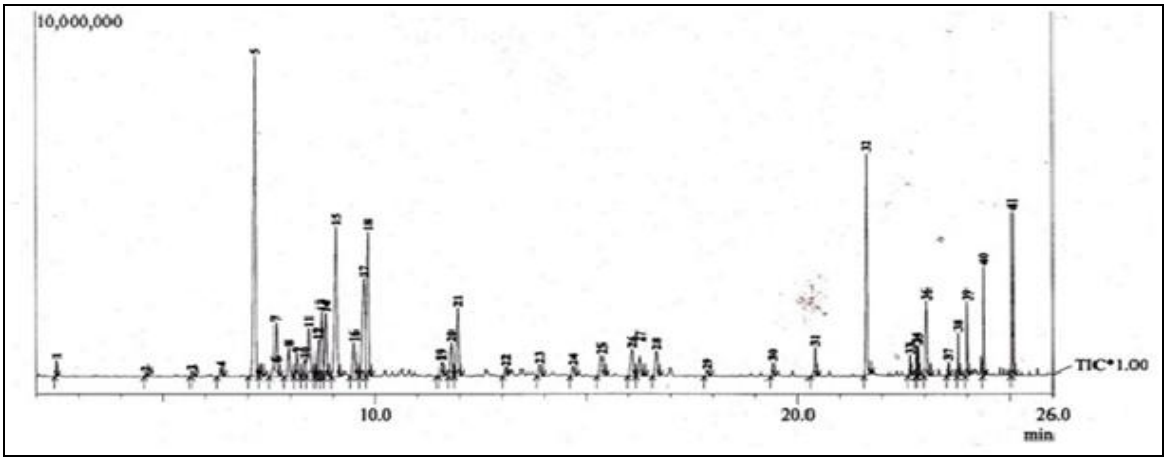

FIG.1: CHROMATOGRAM OF ESSENTIAL OIL OF *CIPADESSA BACCIFERA* LEAF

TABLE1: THE COMPOSITION OF ESSENTIAL OIL OF *CIPADESSA BACCIFERA* LEAF

Identified Peak No.	Compound Name	Retention Time	Area (%)
1	Caprylic acid	2.495	0.42
2	Hendecanal	4.605	0.10
3	1-Undecanol	5.693	0.16
4	(-)-β-Elemene	6.377	0.43
5	Caryophyllene	7.183	17.32
6	Bicyclo[3.1.1]hept-2-ene, 2,6-dimethyl-6-(4-Methyl-3-pentenyl)-	7.315	0.53
7	(Z)-β Farnesene	7.657	2.65
8	α-Humulene	7.956	1.47
9	Alloaromadendrene	8.15	1.11
10	α Amorphene	8.345	0.93
11	β-Himachalene	8.448	3.57
12	Aromadendrene	8.657	1.72
13	δ-Cadinene	8.723	3.27
14	Zingiberene	8.825	3.18
15	(-)-Isoledene	9.077	9.12
16	(+)-Epi-bicyclo sesquiphellandrene	9.503	1.91
17	β-Sesquiphellandrene	9.722	7.32
18	1S,Cis-Calamenene	9.832	7.42
19	Spathulenol	11.563	0.83
20	(-)-Caryophyllene oxide	11.796	1.88
21	2-Octylfuran	11.956	3.76
22	Guaiol	13.094	0.57
23	Bicyclo[6.3.0]Undec-1(8)-EN-3-ON,2,2,5,5-tetramethyl	13.886	0.67
24	Bicyclo [6.3.0]Undec-1(8)-EN-3-ON,2,2,5,5-tetramethyl	14.677	0.53
25	Isospathulenol	15.365	1.47
26	β-copaen-4 -α-ol	16.093	1.90
27	β-Ionone	16.276	1.18
28	trans-Farnesol	16.649	1.62
29	2,2,7,7-Tetramethyl-tricyclo(6.2.1.0 1,6)undec-4-en-3-one	17.854	0.31
30	Menthyl Chloride	19.391	0.59
31	2-Pentadecanone, 6,10,14-trimethyl-	20.401	1.17
32	Bicyclo[5.2.0] nonane, 2-methylene-4,8,8-trimethyl-4-vinyl-	21.627	7.64
33	Thunbergol	22.642	0.55
34	Manoyl Oxide	22.796	0.76
35	5-Eicosyne	22.844	0.67
36	Longipinane, (E)-	23.035	3.09
37	4-Isopropyl-1,7,11-trimethyl-2,7,11-Cyclotetradecatrien-1-ol	23.533	0.34
38	Trans-Phytol	23.778	0.79
39	6.β.Bicyclo[4.3.0] nonane, 5β-iodomethyl-1 β-isopropenyl-4 α,5 α-dimethyl-	23.992	1.61
40	Farnesol Isomer A	24.366	2.05
41	9,19-Cycloergost-24(28)-en-3-ol, 4,14-dimethyl-acetate(3 β.,4 α.,5.α,)-	25.05	3.01
	Total	99.62%	

Chemically essential oils are very complex natural mixtures which contain about 20-60 components of different concentrations. They are characterized by 2-3 major components present in fairly higher concentration compared to others present in trace amounts. Terpenes (monoterpenes, ditepenes

sesquiterpenes) form the major constituent of the essential oil, while minor constituents include low molecular weight aliphatic and aromatic compounds.

The major compounds identified were Caryophyllene (17.32%), Isoledene (9.12%), Bicyclo [5.2.0]nonane, 2-methylene-4,8,8-trimethyl-4-vinyl (7.64%), 1S,Cis-Calamenene (7.42%) and β-Sesquiphellandrene(7.32%). The chromatogram patterns of the essential oil from leaf of *C.baccifera* revealed the presence of sesquiterpenes as major components (**Fig 1**). Caryophyllene was the major sesquiterpene found in the oil besides traces of their derivatives. The other notable compounds (with concentrations less than 5%) were β-Farnesene, α Humulene, Zingiberene, Farnesol, Longipinane, Aromadendrene, δ Cadinene, Caryophellene oxide, β Himachalene, Alloaromadendrene, 2-Octylfuran, Isospathulenol, trans Farnesol, Farnesol isomer A and 9, 19-Cycloergost-24(28)-en-3-ol,4,14 - dimethyl-acetate, (3 beta.,4 alpha,5,alpha).

Sesquiterpenes have been reported as the major component of leaf essential oil of Meliaceae members with 69% present in *A. Indica* [27], 73.99% in *M. Azaderach* [28] and 58.27% in the different parts of *Trichilea connaroides* [29]. It is noteworthy that in the present investigation 25 out of the 41 compounds identified representing 78.14% of the total leaf essential oil were sesquiterpenes and their derivatives. As major phytoconstituents they determine the biological properties of the essential oil and are used as anti cancer, immunosuppressive and anti inflammatory agents [30].

Reports indicate that Caryophyllene, a bicyclic sesquiterpene is a major constituent in the essential oil obtained from leaves of Meliaceae members; *A.indica* (12.73%) [18], *Cedrela mexicana* (19%) [21] and *M.dubia* (6.07%) [19] . The present study showed significant concentration of Caryophyllene in the essential oil obtained from the leaves of *C.baccifera* (17.84%) (**Table 1**). Caryophyllene and Caryophyllene oxide are attributed with antibacterial, anti-inflammatory [31], analgesic [32], antiproliferative, neuroprotective, and anticancer properties [33, 34]. They are also used in the manufacture of medicaments, in the treatment of chronic degenerative diseases like rheumatoid arthritis, osteoarthritis, ulcerative colitis, psoriasis, atopic eczema, atherosclerosis and non-degenerative diseases like depression, cellulites and allergies [35].

CONCLUSION: Bioactive components of the essential oils play a key role in the drug synthesis, have medicinal and (ethno-) pharmacological properties and provide an alternate approach to combat ailments. The present investigation is the first report of GC-MS analysis of the essential oil obtained from leaves of *C. baccifer*a. The results reveal the presence of sesquiterpenes (78.14%) as the major significant constituent which could be potential targets of pharmaceutical interest attributed with anticancer, anti-inflammatory, anti-diabetic, immune-suppressive and antimicrobial activities. The results of the present study provide a reference point for further research in the development of new therapeutic agents.

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