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Studies on the Leaf Essential Oil of *Coleus zeylanicus* (Benth.) L.H.Cramer-A Valuable Medicinal Plant.

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ABSTRACT

Iruveli (*Coleus zeylanicus*) belongs to the family Lamiaceae and it is medicinally important aromatic herb. The genus *Coleus* contains a number of medicinally important compounds such as volatile oils, alkaloids, flavonoids, saponins and fatty acids. The present study describes the antibacterial activity of *Coleus zeylanicus* against various pathogenic bacteria. The essential oil from leaves of the plant was extracted by hydro distillation using Clevenger type apparatus for 2 hours. The essential oil thus extracted was analyzed by GC-MS for the first time. Around twenty five phyto components were identified of which Geraniol (2.93%), Neryl propionate (0.84%), Linolool (0.73%), β -Myrcene (0.31%), Bicyclo sesquiphellandrene (0.26%), Longifolene (0.23%), γ -Selinene (0.18%), δ -Cadinene (0.21%), β -Caryophyllene (0.09%), α -Terpineol (0.07%), Citronellyl acetate (0.07%), α -Copaene (0.07%), α -Bisabolol (0.07%), α -Farnesene (0.06%), were found to be the major volatile compounds. These volatile organic compounds fractionated revealed around 98.82% of the total extract composition. These volatile organic compounds mostly fall into the sesquiterpene category. These play a vital role in enhancing fragrance and flavor. Some of the components have also been found to have antimicrobial properties. The findings suggest feasibility of application of *Coleus zeylanicus* oil in perfume and cosmetic industry.

Keywords: *Coleus zeylanicus*, essential oil (EO), GC-MS, phyto component.

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INTRODUCTION

Lamiaceae is a family of flowering mint variety specially known for its aromatic nature which includes widely used culinary herbs such as basil, mint, rosemary, oregano, thyme, lavender. Some species are shrubs, trees (such as teak), or, rarely, vines. Besides those grown for their edible leaves, some are grown for decorative foliage, such as *Coleus*. The family is particularly important to humans for its flavor, fragrance, or medicinal properties. Many members of the family are widely cultivated not just for their aromatic qualities but also due to their ease of cultivation. This plant especially is among the easiest plants to propagate by stem cuttings [1]. The essential oil extracted from plant parts is used in a wide variety of consumer goods such as detergents, soaps, toilet products, cosmetics, pharmaceuticals, perfumes, confectionery food products, soft drinks, distilled alcoholic beverages (hard drinks) and insecticides. Essential oils (aromatherapy oils) are the highly concentrated, volatile, aromatic essences of plants. All the countries of the world provide essential oils, making aromatherapy a truly global therapy. New directions essential oils are true, undiluted essences extracted directly from a variety of flowers, fruits, leaves, barks, roots, herbs and spices.

Essential oils have held a place of importance for hundreds of years as components of herbal treatments for a variety of ailments. The genus *Coleus* is an important aromatic herb which is routinely grown as a traditional medicinal herb in India. It is considered as best medicine against urinary tract infection and also to increase the digestion. *Coleus zeylanicus* is an important aromatic medicinal plant that belongs to the family Lamiaceae. This plant contains several medicinally important components such as alkaloids, volatile compounds, sesquiterpene and flavonoids. Most of these components are used as anti-hepatotoxic, anti-ulcerogenic, anti-inflammatory, appetiser, digestive, stomachic, liver tonic, cardiogenic [2]. Recent pharmacological investigation of the leaves and root extract of genus *Coleus* revealed that immune modulator, anticancer, antimicrobial, anti-inflammatory, antioxidant, antiallergic property [3, 4, 5]. To our knowledge there are no reports available on this plant. Hence the present study is designed to investigate and determine the essential oil composition of *Coleus zeylanicus* and throw light on its commercial importance.

MATERIALS AND METHODS

Collection of plant material

The plant material was collected from Agro Biotech Industries Pvt. Ltd, Kerala, India in August 2014. The twigs of the plant were potted and further sub cultured by means of vegetative propagation. The leaves were harvested after a fruitful growth of 45 days. The leaves were collected and air dried under the shade (25-29 °C) for 10 days. These dried plant material was used for further studies.

Extraction of essential oil

100g of dried leaves of *Coleus zeylanicus* was put in a round bottom flask; 200ml of distilled water was added to it and was subjected to hydro distillation for 2-3 hours using Clevenger apparatus. The oil obtained was pale yellowish in color and liquid at room temperature. The oil recovered was dried over anhydrous sodium sulphate and kept in the refrigerator at 4°C before use. The oil extracted had a pleasant odor of the plant [6].

Gas chromatography mass spectrometry (GC-MS) analysis

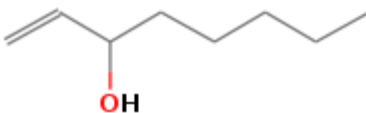
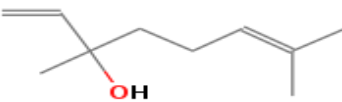
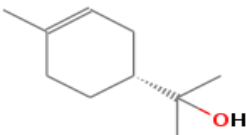
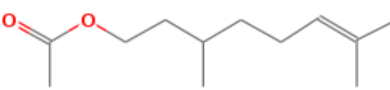
The oils were analyzed by capillary GC-MS by using a Perkin Elmer 8500 instrument with a FID and a capillary column Chrompack CP-WAX-58CB, 25 mx0.32 mm, film thickness 0.2 mm. Running conditions were: initial column temperature, 50°C; temperature rise rate, 3°C/min to 190°C and 60 min hold; injector temperature, 250°C; detector temperature, 270°C; helium flow rate, 20 cm/s. Identification of the major components of the oils was obtained by GC/MS using a Hewlett-Packard 5890 Gas chromatograph equipped with a fused silica capillary column Supelcowax 10 (30 m x 0.25 mm internal diameter ; 0.25 mm film thickness) connected to a Mass Selective Detector 5971A (Hewlett-Packard). Operating conditions were: temperature program, 40°C for 5 min, 40°C–240°C at 2.5°C/min and 15 min hold; injector temperature, 250°C; transfer line temperature, 240°C; carrier gas, helium; head pressure, 8 psi; linear flow rate, 34 cm/s at 100°C; injection volume, 2 ml; split ratio 1:30; electron voltage, 70 eV; temperature of ion source, 150°C; scanning range, 40–450 m/z; scan speed, 1.8 scan/s. Components were first identified comparing their retention index

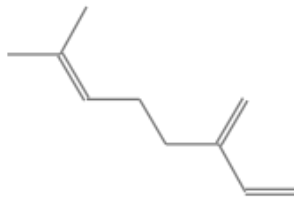
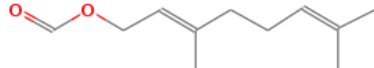
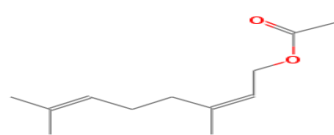
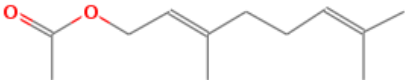

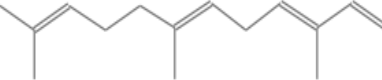
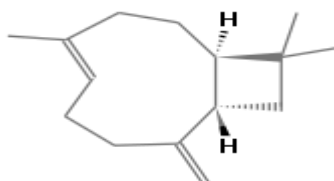
with that of available authentic standards. Further identification was achieved by GC/MS Wiley and NIST Library, Hewlett-Packard PBM search.

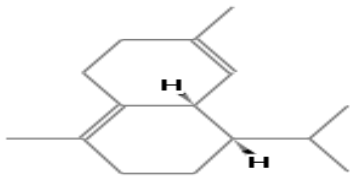
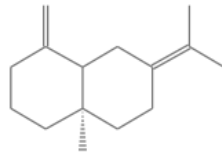
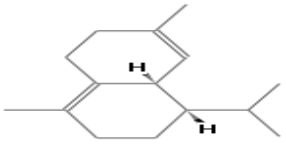
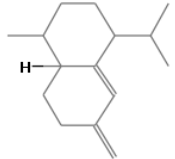
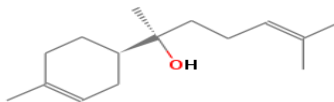
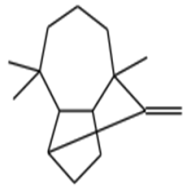
RESULTS AND DISCUSSION

100g of dried leaves of *Coleus zeylanicus* was subjected to hydro distillation for 2-3 hours using Clevenger apparatus. The percentage yield of essential oil obtained from *Coleus zeylanicus* was found to be 0.5% for 100g of dried leaves. The oil obtained was pale yellowish color with a pleasant odor. GC-MS analysis of the essential oil resulted in a total of 25 volatile organic compounds (Table 1). Among the identified compounds, the highest percentage of compound is Geraniol (2.93%), followed by Neryl propionate (0.84%), Linolool (0.73%), β -Myrcene (0.31%), Bicyclosquiphellandrene (0.26%), Longifolene (0.23%), γ -Selinene (0.18%), δ -Cadinene (0.21%), β -Caryophyllene (0.09%), α -Terpineol (0.07%), Citronellyl acetate (0.07%), α -Copaene (0.07%), α -Bisabolol (0.07%), α -Farnesene (0.06%), were found to be the major volatile compounds. Essential oils have held a place of importance for hundreds of years as components of herbal treatments for a variety of ailments. There are evidences of plant derived aromatic compounds, being used by almost all ancient civilizations [7]. Essential oils have been shown to possess analgesic, anesthetic, antiacne, antidiarrheic, antineuralgic, antiseptic, antispasmodic, CNS-stimulant, cancer-preventive, cosmetic, insect repellent, anti-asthmatic, antibacterial, anti-inflammatory, sedative flavor and perfumery [5, 8]. The use of essential oil for the prevention and treatment of infection has been gaining popularity within the research field over the past decades [9].

Table 1. GC-MS Analysis of *Coleus Zeylanicus*

Peak	Rt	Area%	Id	Formula	Structure
1	15.08	0.06	1-Octen-3-ol	C ₈ H ₁₆ O	
2	16.70	0.73	1,6-Octadien-3-ol, 3,7-dimethyl- (Linolool)	C ₁₀ H ₁₈ O	
3	18.12	0.07	α -Terpineol	C ₁₀ H ₁₈ O	
4	18.18	0.07	6-Octen-1-ol, 3,7-dimethyl-, acetate (Citronellyl acetate)	C ₁₂ H ₂₂ O ₂	

5	18.32	0.31	Beta Myrcene	C ₁₀ H ₁₆	
6	18.94	0.07	2,6-Octadien-1-ol, 3,7-dimethyl-, formate (Geranyl formate)	C ₁₁ H ₁₈ O ₂	
7	19.76	0.84	2,6-Octadien-1-ol, 3,7-dimethyl-, propanoate (Neryl propionate)	C ₁₃ H ₂₂ O ₂	
8	20.03	2.93	2,6-Octadien-1-ol, 3,7-dimethyl-, acetate (Geranyl acetate)	C ₁₂ H ₂₀ O ₂	
9	20.34	0.07	α-Copaene	C ₁₅ H ₂₄	
10	21.02	0.06	α-Farnesene	C ₁₅ H ₂₄	
11	21.31	0.09	β-Caryophyllene	C ₁₅ H ₂₄	

12	22.05	0.06	δ -Cadinene	C ₁₅ H ₂₄	
13	22.49	0.18	γ -Selinene	C ₁₅ H ₂₄	
14	22.95	0.15	δ -Cadinene	C ₁₅ H ₂₄	
15	26.42	0.26	Bicyclosesquiphellandrene	C ₁₅ H ₂₄	
16	26.99	0.07	α -Bisabolol	C ₁₅ H ₂₆ O	
17	27.9	0.23	Longifolene	C ₁₅ H ₂₄	

The essential oil components of *Coleus zeylanicus* was fractionated and reported in this research study for the first time. The GC-MS analysis revealed the presence of constituents of essential oil of the plant. Out of the 25 volatile compounds analyzed, the activity of the essential oil can be associated with the presence of Geraniol (2.93%), followed by Neryl propionate (0.84%), Linolool (0.73%), β -Myrcene (0.31%), Bicyclosesquiphellandrene (0.26%), Longifolene (0.23%), γ -Selinene (0.18%), δ -Cadinene (0.21%), β -Caryophyllene (0.09%), α -Terpineol (0.07%), Citronellyl acetate (0.07%), α -Copaene (0.07%), α -Bisabolol (0.07%), α -Farnesene (0.06%). These volatile organic compounds fractionated revealed around 98.82% of the total extract composition.

Similar GC MS analysis of essential oil has been reported in different species of *Coleus* plant and was found to exhibit antimicrobial activity. One such species of *Coleus* plant, *Coleus aromaticus* shows compounds like thymol (41.30), carvacrol (13.25), 1, 8- cineole (5.45), eugenol (4.40), β -caryophyllene (4.20) which shows good anti-inflammatory activity and low anti-microbial activity [10]. The presence of β -ionone, α -humulene in *Coleus laniniatus* and β -thujone, α -farnesene in *Coleus parviflorus* was comparatively reported by Thoppil *et al.*, in 1995 [11]. Phytochemical screening of the aqueous extracts of *Plectranthus amboinicus* Lour. Spreng also revealed the presence of tannins, saponins, flavonoids, steroid glycosides and polyuronides. GCMS analysis resulted in the presence of 11 chemical compounds constituting 97.6% of the total extract composition. The principle constituents include linalool (50.3 %), nerol acetate (11.6%), geranyl acetate (11.7 %) and carvacrol (14.3%) [12] as similar to that reported in this study.

As it is reported the fractionated components of essential oil of this plant resulted to be of utmost importance in perfume industries due to its characteristic odor. Geranyl acetate (2.93%) which is presented in higher percentage comparatively is used primarily as a component of perfumes for creams and soaps and as a flavoring ingredient. It is used particularly in rose, lavender and geranium formulations where a sweet fruity or citrus aroma is desired. It is designated by the U.S. Food and Drug Administration as generally recognized as safe (GRAS). Apart from being used as a perfume, Linalool is also found to be used as a mosquito repellent [13, 14]. Other sesquiterpenes reported in the study like Neryl propionate, β -Myrcene Bicyclosquiphellandrene, Longifolene γ -Selinene δ -Cadinene β -Caryophyllene α -Terpineol Citronellyl acetate, are used as a common ingredient in perfumes, cosmetics, and flavors. α -Copaene and α -bisabolol are reported to have anti-microbial, Anti-proliferative, antioxidant, anti-genotoxic and cytotoxic activities. α -Farnesol is active against a variety of *Candida albicans*. All these components found in the GC-MS report is found to be in minimal quantity comparatively.

CONCLUSION

Thus further optimization and standardization of procedure would result in higher concentration of the necessary components. The future research of the work could be to purify and isolate the compound that is responsible for the antimicrobial property and develop it into a potential herbal product. This work will have importance in the field of pharmaceutical and cosmetic industry which will be cost effective and there will be no side effects by the usage of this valuable medicinal plant.

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