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COMPARATIVE STUDY OF ESSENTIAL OILS OF *OCIMUM BASILICUM* AND *CYMBOPOGON MARTINII* ADDRESSING ANTIBACTERIAL ACTIVITY

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Keywords:

Cymbopogon martinii, *Ocimum basilicum*, Antibacterial activity, *Streptococcus faecalis* and *Staphylococcus aureus*

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ABSTRACT: The present study was designed to judge the in vitro antibacterial activity and comparison of *Ocimum basilicum* and *Cymbopogon martinii*. From the folklore claim and ethnobotanical review, the plant *Ocimum basilicum* and *Cymbopogon martinii* leaves have been found to contain terpenes and terpenoids *i.e.* essential oil, and the plants are used in indigenous system of medicine for the treatment of bacterial infections. It is generally considered that compounds produced naturally rather than synthetically, will be biodegraded more easily and be therefore environmentally more acceptable. Thus, natural drugs which are used to treat various diseases antibacterial, antiviral, antifungal, antioxidants, cytotoxic and nutrients gained importance in the recent years, and their use and positive image among consumers are spreading. In recent years multiple drug resistance in both human and plant pathogenic microorganisms have been developed due to the indiscriminate use of commercial antimicrobial drugs commonly used in the treatment of infectious diseases. To find new therapeutic agents, plants that have antibacterial (antimicrobial) activity have attracted the attention of researchers. The antibacterial activity was studied in three different concentrations (10 µl, 15 µl, 20 µl) were tested against *Streptococcus faecalis* and *Staphylococcus aureus*. At the highest concentration of 20 µl exhibits more antibacterial activity and *Cymbopogon martinii* shows more antibacterial activity than *Ocimum basilicum* in all three concentrations by using well diffusion method.

INTRODUCTION: Herbs as Potential Drugs: Some medicinal plants have been used for a wide variety of purposes pharmaceutical, food preservation [1] alternative medicine and natural therapies for many thousands of years. It is generally considered that compounds produced naturally rather than synthetically, will be biodegraded more easily and be therefore environmentally more acceptable.

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Thus, natural drugs which are used to treat various diseases antibacterial [2] antiviral, antifungal, cytotoxic and nutrients gained importance in recent years, and their use and positive image among consumers are spreading. In recent years multiple drug resistance in both human and plant pathogenic microorganisms have been developed due to the indiscriminate use of commercial antimicrobial drugs commonly used in the treatment of infectious diseases. To find new therapeutic agents, plants that have antibacterial (antimicrobial) activity have attracted the attention of researchers. [3]

Volatile Oils and Terpenoids: The odorous volatile principles of plant and animal sources are known as volatile oils. As they evaporate when exposed to air at ordinary temperatures, they are

also called as **"**ethereal oils". They represent essence or active constituent of the plant; hence they are also known as "essential oils."

Chemically, they are derived from terpenes and their oxygenated compounds. They are made up of isoprene units (C_5H_8) and are usually monoterpenes or terpenes, sesquiterpenes and diterpenes with empirical formulae as $C_{10}H_{16}$, $C_{15}H_{24}$ and $C_{20}H_{32}$ respectively [4]. Volatile oils are soluble in alcohol, ether, and other lipid solvents and practically insoluble in water. They are usually lighter than water. They possess characteristic odors and they have high refractive indices.

Most of them are optically active. They are secreted in special structures such as a duct, cell, schizogenous or lysigenous glands, trichomes, *etc.* They are commonly found in the species of Labiatae, Lamiaceae, Rutaceae, Piperaceae, Zingiberaceae, Umbelliferae, Myrtaceae, and Lauraceae. They are present ion entire plant or in any part of the plant. Volatile oils are extracted by steam distillation, solvent extraction or mechanical means such as ecucelle and effleurage techniques. Terpenes and terpenoids are the primary constituents of the essential oils of many types of plants and flowers. Essential oils are used widely as natural flavor additives for food, as fragrances in perfumery, and traditional and alternative medicines such as aromatherapy.

Synthetic variations and derivatives of natural terpenes and terpenoids also greatly expand the variety of aromas used in perfumery and flavors used in food additives. Vitamin A is an example of a terpene, also, they are also used as therapeutic agents in the traditional system of medicine for treating various diseases like skin diseases, anti-oxidants [5, 6] bacterial infections [7, 8] anthelminthics [9, 10] antiseptic, anticancer, spasmodic, *etc*.

Since, they are hydrocarbons and oxygenated compounds *i.e*. terpenoids exhibit several biological effects, in the present work an attempt has been made to isolate terpenes and their oxygenated compounds which are rich in medicinally potent herbal source from the folklore claim and ethnobotanical review, the plant *Ocimum basilicum* and *Cymbopogon martinii* leaves has been found to contain terpenes and terpenoids, *i.e*. essential oil and the plants are used in indigenous system of medicine for the treatment of bacterial infections.

MATERIALS AND METHODS: *Ocimum basilicum* and *Cymbopogon martinii* was found and collected from Central Institute of Medicinal and Aromatic plants, Boduppal, Hyderabad with proper care and instructions to protect any adulteration. The essential oils of both *Ocimum basilicum* and *Cymbopogon martinii* were isolated using Clevenger's extraction apparatus was prepared, and the percentage yield is 0.8 and 1.2 w/v.

Procedure:

Extraction of Essential Oils: The Essential oils of both *Ocimum basilicum* and *Cymbopogon martinii* were isolated using Clevenger's extraction apparatus was prepared and the percentage yield is 0.8 and 1.2 w/v. The Essential oils are then examined for the presence of terpenoids by taking a small quantity of oil in a dried test tube. A bit of tin foil and 0.5 ml of thionyl chloride was added and heated gently. Formation of pink color indicates the presence of terpenoids.

TABLE 1: PRELIMINARY PHYTOCHEMICAL SCREENING OF ISOLATED ESSENTIAL OILS FROM THE LEAVES OF *OCIMUM BASILICUM* AND *CYMBOPOGON MARTINII*

Chemical Test	EOIE 1	EOIE 2
Alkaloids	-	-
Carbohydrates	-	-
Steroids	-	-
Tannins	-	-
Proteins	-	-
Terpenoids	++	++
Flavonoids	-	-
Anthocyanin	-	-
Quinones	-	-
Glycosides	-	-

EOIE 1− Essential oil of isolated extract of *Ocimum basilicum*, EOIE 2 − Essential oil of isolated extract of *Cympobogon martinii*, + = Present, - = Absent.

Antibacterial Activity: The organisms were cultured in nutrient broth, and the tests carried out on Mueller Hinton agar plates, the inoculate of the microbial strains were prepared from 24 h broth cultures and suspensions were adjusted to an optical density of 1.0 at 600nm turbidity.

The essential oils were dissolved in methanol (0.3 ml oil/2 ml methanol) and Muller Hinton agar (Hi-

media) was poured into Petri dishes. After solidification 0.5 ml of test strains were inoculated in the media separately. Care was to taken to ensure proper homogenization. The experiment was performed under strict aseptic conditions. After the medium solidified, a well was made in the plates with sterile borer (5 mm).

The oil samples of *O. basilicum* (10µl, 15µl, 20µl) and *C. martini (*10µl, 15µl, 20µl) were introduced into the well and plates were incubated at 37 °C for 24 h. Both the essential oils of the specified concentrations (10µl, 15µl, 20µl) were tested against *Streptococcus faecalis* and *Staphylococcus aureus*. A well without test material was taken as control. All well diffusion tests were performed in four separate experiments, and the antibacterial activity was expressed as the mean of inhibition diameters (mm). The MIC value was defined as the lowest concentration of the volatile oil required for inhibiting the growth of each microorganism.

RESULTS AND DISCUSSION: The essential oils obtained from the leaves of *Ocimum basilicum* belonging to family Lamiaceae and leaves of *Cympobogon martinii* belonging to family Poaceae, were tested against a set of microorganisms to estimate their antibacterial potentials. The results showed that volatile oil of *Cympobogon martinii* at the highest concentration (20 µl/disc) was more active against *S. aureus* and *S. faecalis* showing a greater zone of inhibition at (19 mm and 17 mm). The antibacterial activity of the volatile oils tested was more pronounced against gram-positive *S. aureus* than again gram-positive *S. faecalis* bacteria. The result showed MIC of volatile oils at 7-9 µl/ml.

So, finally it may be confirmed that terpenoids present in *Cympobogon martinii* showed greater potency of antibacterial activity against Gram-positive bacteria contribution to a better valorization of the medicinal value. Future research work may be planned for isolation of biologically active constituent responsible for treating several other biological tests which will be worthwhile to search for more eventual activities of this plant

TABLE 2: ANTIBACTERIAL ACTIVITY AND COMPARISON OF ISOLATED ESSENTIAL OILS FROM THE LEAVES OF *OCIMUM BASILICUM* AND *CYMBOPOGON MARTINII* AGAINST *S. AUREUS* AND *S. FAECALIS*

S. No.	Treatment	Concentration (µl/disc)	Zone of Inhibition(mm) *S. aureus*	Zone of Inhibition (mm) *S. faecalis*	Minimum inhibitory concentration (µl /ml)
1	EOIE 1	10	11	10	9
		15	13	11	
		20	15	13	
2	EOIE 2	10	14	12	7
		15	16	14	
		20	19	17	

EOIE 1− Essential oil of isolated extract of *Ocimum basilicum*, EOIE 2 − Essential oil of isolated extract of *Cympobogon martinii.*

CONCLUSION: The essential oil of *Cympobogon martinii* showed greater potency of antibacterial activity than essential oil of *Ocimum basilicum* in all three concentrations against gram-positive bacteria contribution to a better valorization of the medicinal value.

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CONFLICT OF INTEREST: Nil

REFERENCES:

1. Pitman V: A practical approach in Aromatherapy, 2002: 54-55.
2. Anonymus: Wealth of India National Institute of Science Communication CSIR, New Delhi, 1998: 161-162.
3. Zahid Z, Khan S, Patel W, Khuman A, Lokre AG and Shekhar S: Antimicrobial activity of essential oil of flowers of *P. alba*. International Journal of Pharmacy and Pharmaceutical Sciences 2010; 2(4): 155-157.
4. Kokate CK, Purohit, Gokhale SB: Text Book of Pharmacognosy. Vallabh Prakashan, New Delhi, Edition 22nd, 2006: 115.
5. Diane S, Aschenbrenner Samantha J, Venable Singh T and Soni BK: Drug Therapy in nursing: *In-vitro* antioxidant studies of some 1,3,4-thiadiazole derivatives. International Journal of Research Pharmaceutical Biomedical Sciences 2011; 2(4): 1590-1592.

6. Singh T, Ravi KV, Imran UH and Sneha P: Evaluation of the antibacterial potential of SAP *Borassus flabellifer*. International Journal of Pharmacy and Pharmaceutical Research 2016; 6(1): 150-155.
7. Singh T and Khobragade SD: Synthesis and evaluation of Thiazolidine-4-one for their antibacterial activity. Journal of Pharmaceutical Sciences and Bioscientific Research 2014; 4(1): 110-113.
8. Nadkarni KM: Indian Materia Medica Popular Prakashan Pvt. Ltd, Bombay, 2002; 2: 1199-1202.
9. Singh T, Mishra A and Lavanya A: Comparative study of *In-vitro* anthelmintic activity of sap of *Azadirachta indica*. International Journal of Pharmacognosy 2016; 3(12): 110-113.

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