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

D. Sai Sudha \* Tribhuvan Singh, P. Suresh and Sagar Pamu

Guru Nanak Institutions Technical Campus - School of Pharmacy, Ibrahimpattnam, Hyderabad- 501506, India.

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*Cymbopogon martini*,  
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activity, *Streptococcus faecalis* and  
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### Correspondence to Author:

**D. Sai Sudha**

Guru Nanak Institutions Technical  
Campus - School of Pharmacy,  
Ibrahimpattnam, Hyderabad-  
501506, India.

**E-mail:** datrik.saisudha1@gmail.com

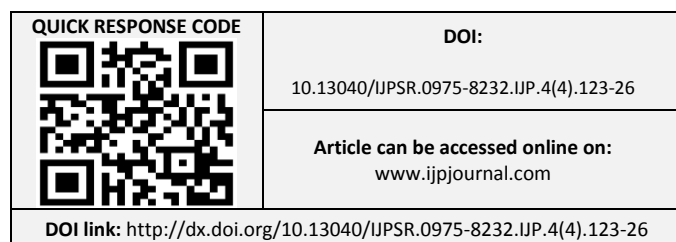
**ABSTRACT:** The present study was designed to judge the in vitro antibacterial activity and comparison of *Ocimum basilicum* and *Cymbopogon martinii*. From the folklore claim and ethnobotanical review, the plant *Ocimum basilicum* and *Cymbopogon martinii* leaves has been found to contain terpenes and terpenoids i.e.essential oil and the plants are used in indigenous system of medicine for the treatment of bacterial infections. 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. In order to find new therapeutic agents, plants that have antibacterial (antimicrobial) activity have attracted attention of researchers. The antibacterial activity was studied in three different concentrations (10µl, 15µl, 20µl) were tested against *Streptococcus faecalis* and *Staphylococcus aureus*. At highest concentration of 20µl 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<sup>1</sup> 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.

Thus, natural drugs which are used to treat various diseases antibacterial<sup>2</sup> antiviral, antifungal, 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. In order to find new therapeutic agents, plants that have antibacterial (antimicrobial) activity have attracted attention of researchers.<sup>3</sup>

**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 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<sup>4</sup>. 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 odours and they have high refractive indices.

Most of them are optically active. They are secreted in special structures such as 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 in 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 enfleurage 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 in 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 in addition they are also used as therapeutic agents in traditional system of medicine for treating various diseases like skin diseases, antioxidants<sup>5, 6</sup> bacterial infections<sup>7, 8</sup> anthelmintics<sup>9, 10</sup> 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 martini* 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 martini* 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 presence of terpenoids by taking 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 colour indicates the presence of terpenoids.

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

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 *Cymbopogon martini*

+ = 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 hrs broth cultures and suspensions were adjusted to 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 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 hrs. 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 martini* belonging to family Poaceae, were tested against set of microorganisms in order to estimate their antibacterial potentials. The results showed that volatile oil of *Cympobogon martini* at highest concentration (20 µl/disc) were more active against *S. aureus* and *S.faecalis* showing 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 conformed that terpenoids present in *Cympobogon martini* showed greater potency of anti bacterial 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 CYMPOBOGON MARTINI AGAINST S.AUREUS AND S. FAECALIS**

S.no	Treatment	Concentration (µl/disc)	Zone of Inhibition(mm) <i>S.aureus</i>	Zone of Inhibition(mm) <i>S.faecalis</i>	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 martini*

**CONCLUSION:** The essential oil of *Cympobogon martini* showed greater potency of anti bacterial 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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