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Comparative Study of Antimicrobial Activities of *Ocimum* Sps. Against Pathogenic Microorganism

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ABSTRACT

The family Lamiaceae has several significant decorative, therapeutic,aromatic plants, some of which generate economically important essential oils that are utilised in both conventional and contemporary medicines. World-wide distributed plants of family Lamiaceae like *Leonurus, Mentha, Nepeta, Origanum, Leucas, Salvia, Hyssopus and Ziziphora* etc are frequently used to heal wounds, treatment of various types of disorders like gastritis, infections, dermatitis,bronchitis and inflammation. *Ocimum sanctum* and *Ocimum basilicum*, two varieties of the basil herb that are widely available for cultivation, may be a strong contender for usage as a plant with antibacterial properties. *C. freundii* and *M. luteus* bacterial strains were used to test the antibacterial effects of ethanolic extracts from *O. sanctum* and *O. basilicum.* By using agar disc diffusion tests maximum inhibition zones against the pathogenic bacteria *C. freundii* and *M. luteus* were seen in ethanolic leaf and stem extracts of *O. sanctum*. *O. sanctum and O. basilicum* may be suggested as easily accessible and renewable antibacterial agent source rather than manufactured chemicals. The antimicrobial efficiency of *O. sanctum* leaves and stem exhibits significant antimicrobial capabilities.

Key Words : Antimicrobial activity, Lamiaceae, Medicinal herb, *Ocimum sanctum, Ocimum basilicum,* Ethanolic extracts.

INTRODUCTION

One of the primary factors causing a number of diseases is microbial infection. Bacteria that may have an effect on public health is one of the sources of infection. According to the World Health Organization (WHO), 80% of the populace in the developing nations relies on traditional medicines, mostly pharmaceuticals made from the plants (Bahmani et al,2014). Additionally, the current pharmacopoeia continues to include at least 25% of medications that are derived from plants, in addition to a large number of synthetic analogues to plant-derived prototype chemicals. The necessity of medicinal plants is rising in both developed and developing countries as people are becoming more aware of the benefits of natural goods, which are often the only form of healthcare for the poor because they are non-narcotic, have no adverse effects, are readily available, affordable, and easy to obtain. Medicinal plants have long played a significant role in India's rural and tribal communities , spiritual, and medical life. (Awang ,2009).

In ayurveda, medicinal herbs are hugely significant. It is employed to treat a number of disorders. Various types of plant extracts have been utilized for a variety of uses for thousands of years. Antibacterial testing of medicinal plants provides information to create novel medications (Ali et al, 2017) . There is increased interest in medicinal plants as a source of potential antimicrobial medication discoveries since pathogenic microorganisms become resistant to antibiotics employed in modern medicine (Rathnayaka, 2013).

Over 7000 species from 245 genera make up the worldwide family Lamiaceae . They have several uses in medicine, cosmetics, cuisine, and

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Fig : Selected plants (1) *Ocimum sanctum*
(2) *Ocimum basilicum*

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other fields because of the family members' enduring appeal for having unique essential oil characteristics. Many of the Lamiaceae plants that have been grown and used since antiquity are still in use. Due to the wide range of biological activities of their secondary metabolites, such as antifungal, antimicrobial, antioxidant, anticancer properties and anti-inflammatory, lamiaceae plants are used by the locals according to their inherited empirical skills or as a result of the acquisition and exchange of traditional and/or modern knowledge (Napoli et al,202;Waller et al,2017; Turner et al,2011;Cilliers,2009;Hrisrova et al,2017;Bosi et al, 2020; Ntalli et al, 2020; Ghalkhani et al, 2021; . Dzhambazov et al, 2002; Mladenova et al, 2021).

This family has a variety of species that are high in terpenes and flavonoids, with diterpenoids being the most prevalent. They are also abundant in other medicinally important compounds, have helped with taxonomic classifications. Six most popular spices includes thyme, basil, oregano, rosemary, sage, and lemon balm having fragrant characteristics. Due to the diversity of bioactive chemicals that provide the Lamiaceae family's plants antioxidant, insecticidal, fungicidal, and bactericidal capabilities, there is a possibility that these plants might have significant economic and pharmaceutical significance (Bekut et al,2018; Vieira, et al,2002; Harley et al,2004; . Uritu et al,2018).

Ocimum sanctum is commonly referred to as holy basil, is a fragrant plant which is native to asia and tropics of africa . Majority of plants belongs to family Lamiaceae are most widely utilised as a source of medical plants and valuable essential oils that are used as spices and flavours in a variety of various culinary products. O. sanctum has an upright, 75 cm in height, heavily branched, hairy stem, and simple opposite, green, intensely fragrant leaves, petiole up to 5 cm long, and typically toothed leaves (Jirovetz et al,2002; Malima et al,2013; Kaya et al,2008).

Ocimum basilicum, also known as basil, grows in a variety of habitats. The leaves are utilised as spices in conventional food. Since many years ago, the essential oils of popular culinary herb basil have been used widely to flavour meats and sausages. In addition to being used in a variety of dental and oral treatments, basil oil has also found widespread use in fragrance. Additionally, naturally derived antimicrobial agents like basil are becoming increasingly significant in antimicrobial packaging since they are seen as posing a reduced danger to consumers due to the public's preference for natural food additives nowadays (Sappakul et al, 2003).

The current study set out to assess the possible antibacterial properties of Ocimum sanctum and Ocimum basilicum plants extracted using ethanol and four distinct leaf and stem extract concentrations against Citrobacter freundii and Micrococcus luteus.

Table 1. List of phytochemicals present in *Ocimum sanctum* and *Ocimum basilicum*

Sr. No.	Constituents	*Ocimum sanctum*	*Ocimum basilicum*
1.	Alkaloids	(+ve)	(-ve)
2.	Glycosides	(+ve)	(+ve)
3.	Tannins	(+ve)	(+ve)
4.	Flavonoids	(-ve)	(+ve)
5.	Steroids and Terpenoids	(+ve)	(+ve)
6.	Carbo- hydrate	(+ve)	(+ve)

(Where +ve= presence of bioactive compound , -ve=absence of bioactive compound)

MATERIALS AND METHODS

Vegetative parts of O. sanctum and O. basilicum , collected in the SLS, Khandari, Agra area of Uttar Pradesh (Fig.1). Collected plant parts were placed in poly bags and sealed. The stored plant material were carefully washed in tap water to remove dust particles and transfer to disinfectant then shade dried, grind and packaged (Srinivasan et al, 2004).

Antimicrobial activity assay

The disc diffusion technique was used to assess the in-vitro antibacterial activity of a particular plant extract. For susceptibility testing, extract solutions with different concentrations were made using serial dilution method . On sterile discs (6 mm in diameter), 25 µl of each extract solution was applied. A few colonies from the pure culture were mixed with a nutritional broth. The broth was inoculated across the whole surface of the nutrient agar plate using a cotton swab soaked in culture. The plant extracts containing discs were applied to the contaminated surface of the agar plate with sterile forceps and these plates were incubated at 37 °C for 24 hours . By measuring the width of the zones of inhibition surrounding each disc, the antibacterial activity was determined (millimeter) (Sharma *et al*, 2024).

RESULTS AND DISCUSSION

The Phytochemical analysis of the plant *O. sanctum* extracts was performed the phytoconstituent reported are tannin, phenols, steroids, ,alkaloids, glycosides, steroids and terpenoids a whereas flavonoids are not found while in *O. basilicum* extracts showed the presence of tannin, phenols, steroids ,glycosides, tannins ,steroids and terpenoids but alkaloid was not found in it. The data showing the zone of inhibition of selected bacterial strains viz, *C. freundii* and *M. luteus* due to action of different concentrations of ethanolic extracts of *Ocimum sanctum* and *O. basilicum (*Fig 1 and 2).

Maximum inhibition (20mm) was recorded in 12.5mg ethanolic leaf extracts of *O. sanctum* as compared to 16mm in *O. basilicum* respectively against *C. freundii*. However, inhibition decreased with the decrease in the concentration (fig 1).

This was interesting to note that all the concentration of ethanolic stem extracts were less sensitive as compared to leaf extracts. Maximum inhibition by 12.5mg ethanolic stem extract was 12mm in *O. sanctum* against *Citrobacter freundii* as compared to 10mm in *O. basilicum* (fig 2). Ethanolic leaf extract of *O. sanctum* showed highest inhibition zone (9mm) of *M. luteus.* While 8.5mm diameter and inhibition zone was found in *O. basilicum (*fig 3 and4).

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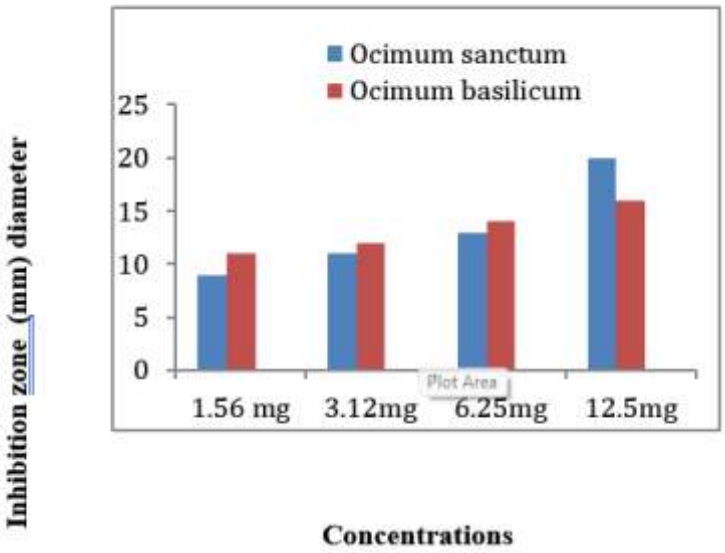


Fig. 1 : Inhibition zone (mm) diameter of *C. freundii* by different concentrations of ethanolic leaf extracts of plants.

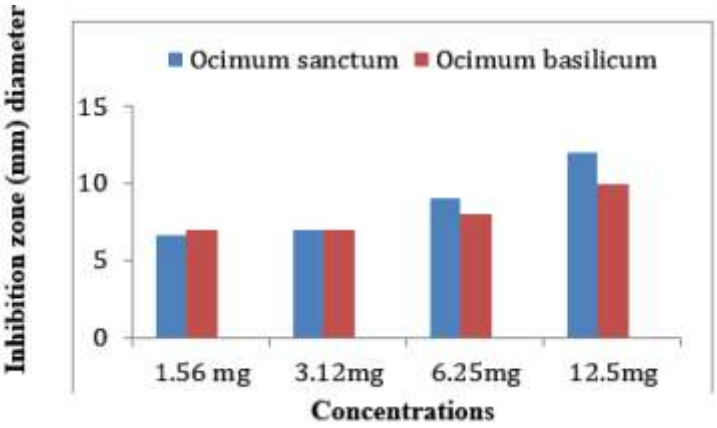


Fig. 2 : Inhibition zone (mm) diameter of *C. freundii* by different concentrations of ethanolic stem extracts of plants.

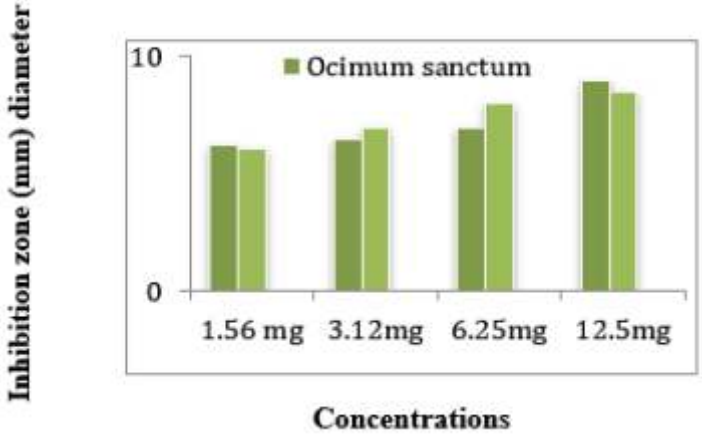


Fig 3. : Inhibition zone (mm) diameter of *M. luteus* by different concentrations of ethanolic leaf extracts of plants.

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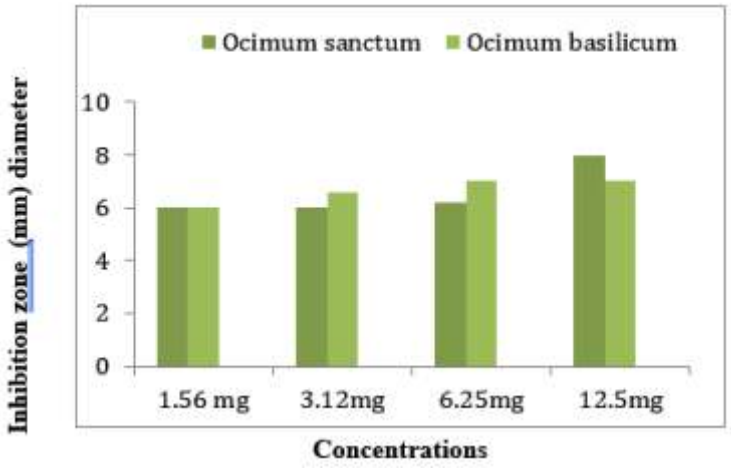


Fig.4: Inhibition zone (mm) diameter of *M. luteus* by different concentrations of ethanolic stem extracts of plants.

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CONCLUSION

According to the current study , *O. sanctum* and *O. basilicum* both plants are a rich in various types of phyto-chemical components. *O. sanctum* leaf and stem ethanolic extracts shows more potential to control the growth of both pathogenic bacteria. *O. sanctum* and *O. basilicum* are commonly occurring herb plants, because of its high antibacterial potential , their leaves and stems may be used as an antimicrobial drug instead of manufactured chemicals because they are readily available and renewably.

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