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Antifungal Activity Of Cymbopogon Winterianus And Lavandula Angustifolia Essential Oils

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ABSTRACT
The two pure essential oils from two plants namely Lavender *(Lavandula angustifolia*) and Citronella (*Cymbopogon winterianus*) were tested for their antifungal activity in vitro. Define concentrations of oil were tested against three fungi as *Aspergillus niger, Penicillium sp* and *Fusarium oxyaporum.* Citronella oil was found to be most potential antifungal oil that inhibited all the tested fungi up to 90 percent inhibition of mycelia. While, Lavender oil was found only effective against *Penicillium* sp and *F. oxysporum.* It indicates that these essential oils are specific in their target. It could be use to control the plant diseases caused by these pathogens.

Keywords: Essential oil, antifungal*, Fusarium oxysporum, Cymbopogon winterianus, Penicillium* sp.

INTRODUCTION:

Essential oils are complex and volatile natural compounds products of various origin, have a very high variability in their chemical composition, both in qualitative and quantitative terms, their main components belonging to various chemical Classes: From terpenes and phenols to alcohols, ethers, oxides, aldehydes, ketones, esters, amines, amides (Dhifi et al. 2016). The aromatic profile of plants is mainly determined by presence of essential oil. Essential oils can be obtained from plants or plants parts by distillation and enzymatic action (Sethi and Meena, 1997).
The diversity and richness of their chemical composition endures different essential oils with antibacterial, antifungal, or insecticide properties, opening diverse scope areas of utilization or research interest for novel applications. (Maier et al., 2018). Many essential oils have been reported to have strong antimicrobial activity (Maruzella and Sicurella, 1960; Lis – Balchin and Deans, 1998). A wide range of medicinal and aromatic plants have been explored for their essential oils in the past few decades. Essential oils have great potential in the field of biomedicine as they effectively destroy several bacteria, fungal and viral pathogens (Swamy et al. 2016). Essential oils have been utilized for treating various human ailments and diseases. Cancer cell prevention and cytotoxicity are exhibited through a wide range of mechanism of action. (Blowman et al. (2018). Essential oils have an important role in the preservation of foodstuffs and pharmaceuticals against filamentous fungi and bacteria. All medicinal preparations contain one or more active principles derived from higher plants. This highlights the need to establish and implement interdisciplinary research programmes for the further exploitation of the natural sources of pharmaceutical products. Essential oils are incorporated into lotions intended for use to treat dermatological infections. It

was also tested for food and pharmaceutical preservation properties. They can be aromatherapy and as pesticide.

The antimicrobial properties of plants have been particularly assess and found to offer promising avenues against a range of microbial infections and in the combat of microbial resistance organism (Gupta and Birdi, 2017).

By considering this, present work was carried out to evaluate antifungal activity of two essential oils from plants namely Lavender *(Lavandula angustifolia*) and Citronella (*Cymbopogon winterianus*) in vitro.

MATERIALS AND METHODS

Collection of essential oils

In present study two essential oils were use as *Lavandula angustifolia* (Lamiaceae)and *Cymbopogon winterianus* (Poaceae) oil obtained from different commercial sources Satt Naturals and Core and Pure respectively. The specimen samples received in glass bottles containers and stored under refrigeration for further uses.

Isolation and purification of fungi

Aspergillus niger, *Penicillium* sp and *Fusarium oxysporum* fungi were used as test organism. Fungi were isolated from soil. For isolating fungi, PDA (Potato dextrose agar) plates were prepared containing extract of 200 g peeled potato, 20 g Dextrose, 15 g agar in 1000 ml distilled water to grow fungi. All samples were cultured in PDA using serial dilution method and then pure culture was obtained. The media was supplemented with antibiotics to prevent bacterial growth.

Preparation of Inoculums:

Fungi inoculums was prepared by growing cells in PD medium for 72 h at 37ºC. Mycelium growth then inoculated for pure culture. Pure culture was prepared in and it was stored at 4°C.

Anti -fungal Assay:

The fungi were added into the conical flasks containing 25ml of Czapek's broth and define concentrations of essential oils except the control flask which was without essential oils. For each oil, 5 flasks were prepared from which 4 flasks were incorporated with 4 different concentrations of essential oils which was labeled and the 5th flask was the control which contain broth and fungi but essential oil. Then the 4 test flasks were label with concentration of oils (1 μl, 2μl, 5μl and 10μl) after that flasks were incubated for 15 to 20 days to determine the anti-fungal activity of essential oils. After the incubation, mycelium from each flask were taken out and dried in oven and weighed. The percent of mycelia inhibition was calculated by using the following formula:

$$\text{Inhibition index} = \frac{(C - T) \times 100}{C}$$

Where C is the mean dry weight of the mycelium from the control and T is the mean dry weight of mycelium from test flasks.

For the assessment of antifungal activity Czapek's media was used. It contain Sucrose – 30g, Sodium nitrate-2 g, Potassium phosphate- 1g, Magnesium sulphate-0.5 g, Potassium chloride-0.5g, Ferrous sulphate-0.01 g in 1 liter water. And pH was maintained 5.7$\pm$ 2. Sterilize the media by autoclaving at 15 lbs pressure (121°C) for 15 minutes. Cooled media to 45-50°C mixed well and poured into sterilized conical flasks. Flask was covered with cotton and Aluminum foil.

RESULT AND DISCUSSION:

Antifungal activity of *Cymbopogon winterianus* essential oil:

The inhibition of mycelium observed in each concentration (Fig.1). Each concentration showed more than 50% of inhibition against tested fungi. *C. winterianus* oil exhibited significant antifungal activity against all tested fungi. Highest percent inhibition was observed in *F. oxysporium* followed by *A. niger* at 10 μl concentration Table -2. Whereas lowest was found in *Penicillium.* As the concentration increases the percentage of inhibition also increases.

Antifungal activity of Lavender oil (*Lavandula angustifolia)*

The inhibition of mycelium was observed against *F. oxysporium* and *Penicillium* but in *A. niger* mycelia instead of inhibition growth has promoted after treatment of oil (Fig. 2). As the concentration of oil increases the percentage of inhibition also increases except against *A. niger*. Highest inhibition of mycelia growth was reported in *F. oxysporium* followed by *Penicillium* sp 90.21 % at 2 µl and 86.19 at 1µl respectively. In both oils, mycelia of tested fungi were inhibited up to 90 percent. The oil also showed negative effects against *A. niger* instead of inhibiting it promoted the growth of the fungus. From these results it suggests that they show specificity against fungi. It might be due to the different chemical content in their cell wall. Even chemical content of fungal cell wall varies from class to class in some extent. Darabad et al., (2015) tested *Lavandula angustifolia*, other essential oils against prevalent microorganisms causing sinusitis they worked on antimicrobial effects. Singh et al., (2015) screened antimicrobial activity of citronella essential oil on antimicrobial drug resistant bacteria.

They found that citronella oil inhibited growth of only 10.6% strains of antimicrobial resistant organism. None of the antifungal activity of Citronella and Lavender oil was found in previous literature. Gundidza, (1993) reported antifungal activity of *Schinusmolle* essential oil against different plant pathogenic fungi like *Alternaria alternata, Aspergillus flavus, Aspergillus niger, Fusarium culmorum, , Penicillium* etc.,

CONCLUSION:

Among both the plant oil, Citronella oil (*Cymbopogon winterianus)* was found to be potential one against all tested fungi. While Lavender essential oil (*Lavandula angustifolia)* significantly effective against *Fusarium oxysporum* and *Penicillium* but *Aspergillus niger.* The lavender oil (*Lavandula angustifolia)* promoted the growth of *A. niger.* This is first report of antifungal activity of these oil.

Fig. 1. Percent Inhibition of mycelium by *Citronella* essential oil

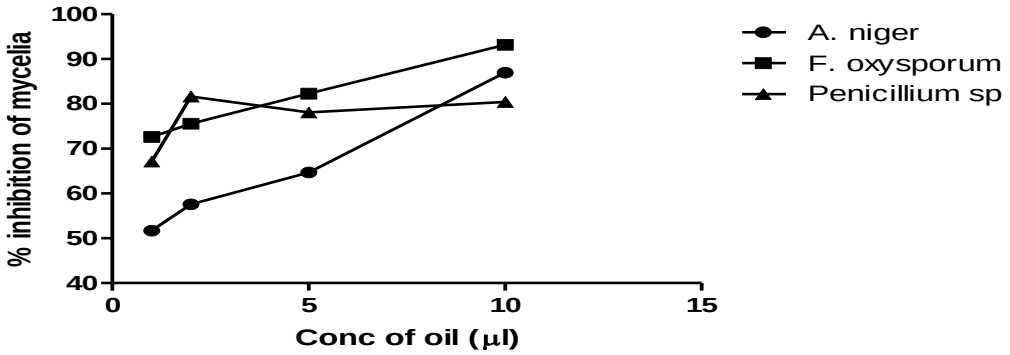
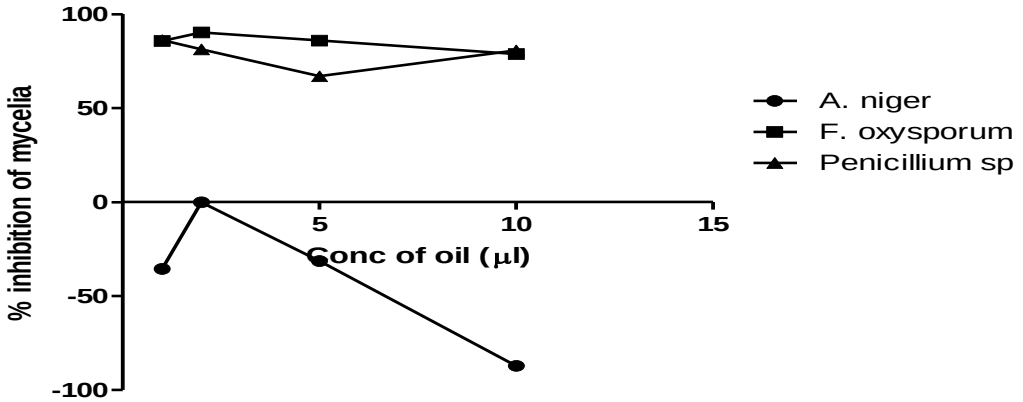


Fig.2. Percent Inhibition of mycelium by Lavender oil



REFERENCES

1. Blowman, K., Magalhães, M., Lemos, M.F.L., Cabral, C. and Pires, I.M. (2018) Anticancer properties of essential oils and other natural products. Evidence-Based Complementary and Alternative Medicine, DOI: 10.1155/2018/3149362
2. Darabad S.G., Mohsenifar A, Haghighat S., Seyed A Y, Seyed A M , Bayat M. (2015).Antimicrobial Effects of Lavandula angustifolia Mill, Artemisia sieberi Besser, Cinnamomum verum J. Presl and Myrtus communis L. Encapsulated Essential Oils Against Prevalent Microorganisms Causing Sinusitis. Avicenna Journal of Clinical Microbiology and Infection. 5(2):1 6. DOI: https://doi.org/ 10.5812/thrita. 4(2)2015.24773.
3. Dhifi, W., Bellili, S., Jazi, S., Bahloul, N. and Mnif, W. (2016) Essential oils' chemical characterization and investigation of some biological activities: A critical review. Medicines, 3(4): 25. https://doi.org/10.3390/medicines3040025.
4. Gundidza, M. (1993) Antimicrobial activity of essential oil from Schinus molle Linn. Central African Journal of Medicine, *39*(11): 231234.
5. Gupta, P.D. and Birdi, T.J. (2017) Development of botanicals to combat antibiotic resistance. Journal of Ayurveda and integrative medicine, 8(4): 266-275. DOI: 10.1016/j.jaim.2017.05.004.
6. Lis-Balchin, M. and Deans, S.G. (1998) Studies on the potential usage of mixtures of plant essential oils as synergistic antibacterial agents in foods. Phytotherapy Research: An International Journal Devoted to Pharmacological and Toxicological Evaluation of Natural Product Derivatives, *12*(7): 472-475.
7. Maier, L., Pruteanu, M., Kuhn, M., Zeller, G., Telzerow, A., Anderson, E.E., Brochado, A.R., Fernandez, K.C., Dose, H., Mori, H. and Patil, K.R. Extensive impact of non-antibiotic drugs on human gut bacteria. *Nature*, 2018; *555*(7698):.623-628. doi: 10.1038/nature25979.
8. Maruzella, J.C. and Sicurella, N.A. (1960) Antibacterial activity of essential oil vapors. Journal of the American Pharmaceutical Association (Scientific ed.), 49(11): 692-694. https://doi.org/ 10.1002/ jps.3030491103.
9. Sethi, V. and Meena, M.R. (1997) Role of spices and their essential oils as preservatives and antimicrobial agents-A Review. Indian Food Packer, 51: 25-43.
10. Singh, B.R., Agrawal, R., Prasannavadhana, B.M. and Dubey, S. (2015) Antimicrobial activity of citronella essential oil on antimicrobial drug resistant bacteria from veterinary clinical cases. Clin Med Biochemistry Open Access, 1(106): 2. DOI:10.4172/cmbo.1000106.
11. Swamy, M.K., Akhtar, M.S. and Sinniah, U.R. (2016) Antimicrobial properties of plant essential oils against human pathogens and their mode of action: an updated review. Evidence-Based Complementary and Alternative Medicine, doi: 10.1155/2016/3012462.