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Antimicrobial Activity of *Omphalotus olivascens*

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ABSTRACT

An antimicrobial activity of *Omphalotus olivascens* wild mushroom was evaluated. The mycelia culture filtrate extracts showed varying degree of inhibition on the test organisms (*Bacillus cereus*, *Escherichia coli*, *Salmonella paratyphi A*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Candida albicans*). The antimicrobial activity of mushroom sample varied according to the solvents. The ethyl acetate extract was the most active when compared with other extracts, to inhibit the growth of *Acinetobacter baumannii* (32mm), *Klebsiella pneumoniae* (31mm), *Bacillus cereus* (31mm), and *E.coli* (28mm), *Pseudomonas aeruginosa* (28mm) *Salmonella paratyphi A* (27mm) and *Canidida albicans* (24mm). The bioactive contents of the mushroom are promising natural antimicrobial agents that can be harnessed as antimicrobial toxicants.

Keywords: antimicrobial, *Omphalotus olivascens*, culture filtrate

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INTRODUCTION

In the recent years, the human pathogenic microorganisms have developed multiple drug resistance owing mainly to the indiscriminate use of commercial antimicrobial drugs¹. There is an urgent need for discovery of novel antimicrobial chemotherapeutic agents. Mushrooms have long been used as garnish for tonics in the folk medicine. *Lentinus edodes* is well-known for its antitumour activity; it has been demonstrated to increase the host resistance to bacterial and viral infections Jong and Birmingham². Several compounds extracted from the mushrooms displayed antifungal and antibacterial activity^{3,4}.

Many researchers have observed the antimicrobial activity of mushrooms^{5,6,7}. An extensive examination of over 200 species of Basidiomycetes demonstrated that about 50% of them showed significant antibiotic activity against a range of test organisms Suay and Arenal, (2000)⁸. An antibacterial protein from *Cordyceps sinensis* showed effective antibacterial activity against human pathogens. The extracts from fruiting body, mycelium and culture filtrate have some biologically active compounds with a wide-range of antimicrobial activity Ishikawa *et al* (2001)⁹. The chloroform and ethyl acetate extracts of the dried mushroom *L.edodes* showed antibacterial activity against Gram-positive, Gram-negative human pathogenic bacteria and effectively inhibited the growth of *Candida albicans* Hirasawa *et al* (1999)¹⁰; Shouji *et al* (2000)¹¹, Stamets, (2002)¹²; Sheena *et al* (2003)¹³.

Omphalotus olivascens, commonly known as the western jack-o'-lantern mushroom, is an orange to brown-colored gilled mushroom native to California and Mexico. To an untrained eye, *O. olivascens* appears similar to some chanterelles, but unlike the chanterelle, the jack o'lantern mushroom is poisonous. While not lethal, consuming this mushroom leads to very severe cramps, vomiting, and diarrhea Micheal (2011)¹⁴. Unlike chanterelles, the jack-o'-lantern mushroom has true gills (rather than ridges) and it can have olive coloration that chanterelles lack, they are saprotrophic, grow directly on wood, and are bioluminescent Micheal (2011)¹⁴. A subspecies with blue flesh, *O. olivascens* var. *indigo*, was described growing on live oak Moreno *et al* (1993)¹⁵. A recent molecular study shows the jack-o'-Lantern to be most closely related the Ghost Fungus *Omphalotus nidiformis*. This species is belongs to kingdom fungi, subkingdom Dikarya, phylum Basidiomycota, subphylum Agaricomycotina, class Agaricomycetes, order Agaricales, family marasmiaceae, genus *Omphalotus*, species *olivascens*. This paper deals with the screening of the antimicrobial activity of ethyl acetate extract of *Omphalotus olivascens* against some human pathogens. Natural Habitat of *Omphalotus olivascens* shown in figure 1.



Figure 1: Natural Habitat of *Omphalotus olivascens*.

MATERIAL AND METHODS

Fungal isolate

Omphalotus olivascens mushroom was collected on the wood, troops, area of Kolli Hills, Namakkal District, Tamil Nadu, and India. The pure cultures, preserved specimens and photographs of the mushroom was taking for identification at the Centre for advanced Studies in Botany, University of Madras, Chennai, and specimen was submitted to Herb. MUBL culture collection centre have the accession number of 3625. The mushroom was identified morphologically. To get the pure culture of the mushroom, the freshly collected mushroom was tissue cultured by cutting the tip of the stipe after removing the pileus and placed on potato dextrose agar (PDA) medium. This was carried out in the Laminar flow under sterile condition. The pure cultures of the mushroom were maintained on Potato Dextrose Agar (PDA) medium at 25°C for further study.

Extraction procedure

The mycelia of the mushroom was cultured in Potato Dextrose Broth (PDB) and incubated at 25°C in a rotator shaker at 150 – 200 rpm for 14 days and the culture filtrate (Figure 2) was extracted with different organic solvents *viz* hexane, dichloromethane, chloroform and ethyl acetate. The extraction flasks were kept in a shaker for 24 h at 100 rpm. The suspension containing bioactive substances were separated by centrifugation at 5000 rpm for 20 min. The fine particles in the suspension were removed by filtration through Whatman No.1 filter paper. The organic portion was allowed to dry in vaccum to get dried materials, then the dried materials were named as crude organic extracts, weighed and resuspended in 1mL of 10 % DMSO and were used for antimicrobial assay.



Figure 2 Mycelial Culture filtrate of *Omphalotus olivascens*.

Cultures

The axenic cultures of *Bacillus cereus*, *Escherichia coli*, *Salmonella paratyphi A*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *C.albicans* were obtained from the Microbial Type Culture Collection (MTCC) and Gene Bank, Institute of Microbial Technology, Chandigarh, India and were maintained on nutrient agar in a refrigerator.

Determination of antimicrobial activity of crude extracts (well diffusion method)

The antimicrobial activity of the crude extract was determined against human pathogens by Well diffusion method. About 0.1 mL of inoculums (1.5×10^8 cells / mL) was swabbed on molten MHA plates. The wells of 8 mm diam were cut by scooping out agar, with a sterile cork borer. The crude extracts dissolved in 10 % DMSO were loaded in the wells (50 µg/ well to 200µg/well) and a control well was added with 4% DMSO alone. After incubation for 24 h at 37°C, the plates were observed for the zone of inhibition and the diameter of the same was measured.

RESULTS and DISCUSSION

In this study, antimicrobial activity of submerged mycelial strain *Omphalotus olivascens* against test microorganisms was compared with the results of positive control antibiotics of vancomycine and fluconazole. The antimicrobial activity of mushroom sample varied according to the solvents. The ethyl acetate extract was the most active when compared with other extracts, to inhibit the growth of *Acinetobacter baumannii* (32mm), *Klebsiella pneumoniae* (31mm), *Bacillus cereus* (31mm), and *E.coli* (28mm), *Pseudomonas aeruginosa* (28mm) *Salmonella paratyphi A* (27mm) and *Canidida albicans* (24mm). In the present study, *Omphalotus olivascens* showed activity against some of the studied test microorganisms (Table 1) shown in figure 3 to 9.

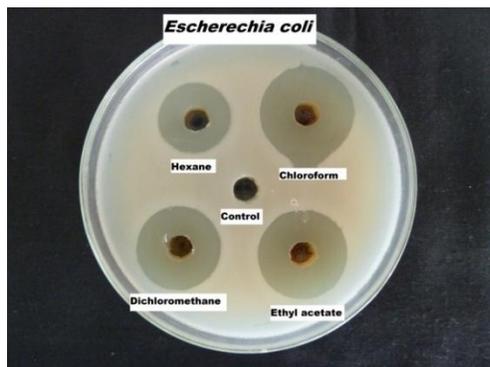


Figure 3: Antimicrobial Activity of *Omphalotus olivascens* against *Escherichia coli*

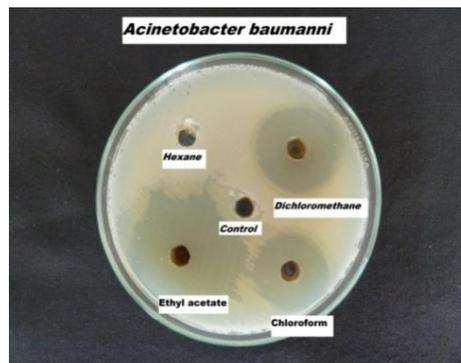


Figure 4: Antimicrobial Activity of *Omphalotus olivascens* against *Acinetobacter baumannii*

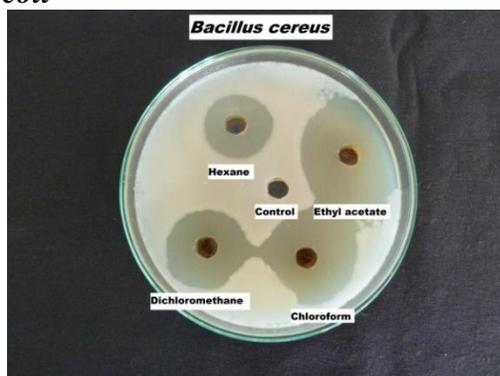


Figure 5: Antimicrobial Activity of *Omphalotus olivascens* against *Bacillus cereus*

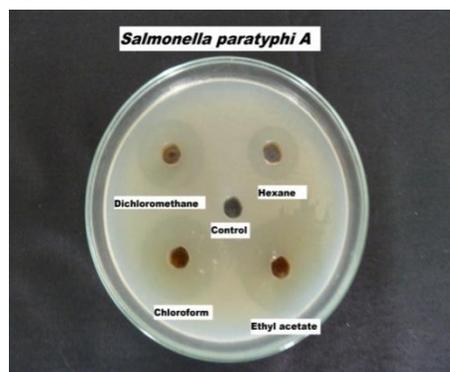


Figure 6: Antimicrobial Activity of *Omphalotus olivascens* against *Salmonella paratyphi A*

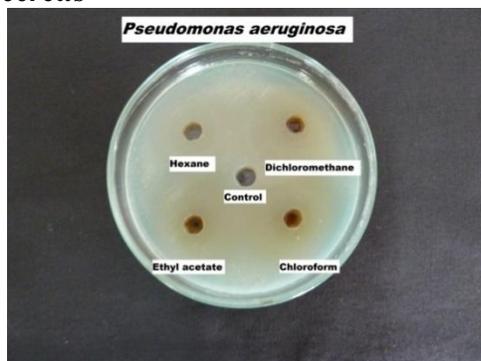


Figure 7: Antimicrobial Activity of *Omphalotus olivascens* against *Pseudomonas aeruginosa*

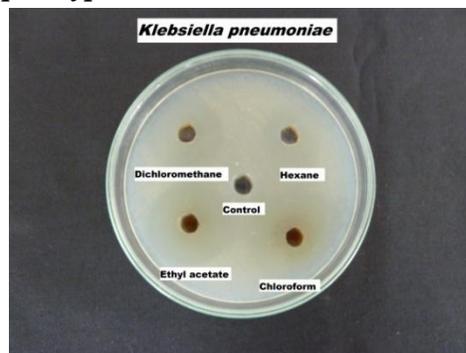


Figure 8: Antimicrobial Activity of *Omphalotus olivascens* against *Klebsiella pneumoniae*

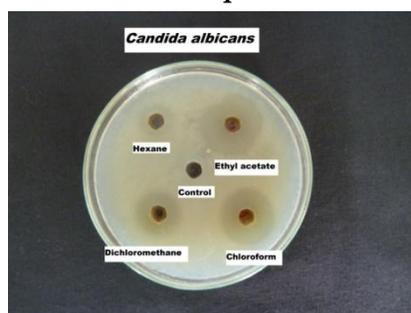


Figure 9: Antimicrobial Activity of *Omphalotus olivascens* against *Candida albicans*

The activities of *Omphalotus olivascens* were higher than positive control (vancomycine or fluconazole) against *Acinetobacter baumannii* and *Klebsiella pneumoniae*. But, in the present study, our *Omphalotus olivascens* strain did show less activity against *Candida albicans*. These combine activity of antibacterial increase the chance of the mushroom for medicinal purposes. The fact that the Basidiomycetes have been insufficiently investigated coupled with the broad range of structural types of antibiotics. However, basidiomycetes may be a source of new and useful bioactive compounds. To our knowledge, no investigation has been performed for comparing antimicrobial activity potential of basidiomycete's strains in different life forms. Further studies on isolation and identification of the active compounds may provide a better source for developing new therapeutic agents.

Table-1: *Omphalotus olivascens* showed activity against microorganisms

| Pathogens | Zone of inhibition (mm in diameter) | | | |
|--------------------------------|-------------------------------------|-----------------|------------|---------------|
| | Hexane | Dichloromethane | Chloroform | Ethyl acetate |
| <i>B.cereus</i> | 20 | 25 | 28 | 31 |
| <i>E.coli</i> | 20 | 23 | 25 | 28 |
| <i>Paureginosa</i> | 20 | 23 | 25 | 28 |
| <i>Acenetobacter baumannii</i> | 21 | 25 | 28 | 32 |
| <i>Salmonella paratyphi A</i> | 20 | 23 | 25 | 27 |
| <i>Klebsiella pneumoniae</i> | 21 | 25 | 28 | 31 |
| <i>C.albicans</i> | 16 | 18 | 21 | 24 |

CONCLUSION

The present study has revealed that, the antimicrobial activity of the wild mushroom under study and suggest that the bioactive contents of the mushroom is the promising natural antimicrobial agents that can be harnessed as potential antimicrobial agents. Further, extensive studies are recommended for the mushroom to actually identify the bioactive components responsible for their antimicrobial activities.

REFERENCES

1. Karaman I, Sahin F, Güllüce M, Ögütcü H, Sengül M, Adigüzel A. Antimicrobial activity of aqueous and methanol extracts of *Juniperus oxycedrus* L. J Ethnopharmacol 2003; 85: 231-235.
2. Jong SC, Birmingham JM. Medicinal benefits of the mushroom *Ganoderma*. Adv. Appl Microbiol 1992; 34: 183-262.
3. Yasumoto K, Iowami K, Mitsuda H. A new sulphur-containing peptide from *Lentinus edodes* acting as precursor for lenthionine. Agric Biol Chem 197;135: 2059-2069

4. Barros L, Calhella RC, Vaz JA, Ferreira ICFR, Baptista P, Estevinho L. Antimicrobial activity and bioactive compounds of Portuguese wild edible mushrooms methanolic extracts. *Eur Food Res Technol* 2007; 225: 151-156.
5. Lee KS, Lee MW, Lee JY. Studies on the antimicrobial activity of *Poria cocos*. *Korean J Mycol* 1982; 10: 27-31.
6. Kim S, Fung DY. Antibacterial effect of water-soluble arrowroot (*Puerariae radix*) tea extracts on food borne pathogens in ground beef and mushroom soup. *J Food Protec* 2004; 67: 1953-1956.
7. Gao YH, Tang WB, Gao H, Chan E, Lan J, Li XT, Zhou SF. Antimicrobial activity of the medicinal mushroom *Ganoderma*. *Food Rev Inter* 2005; 21: 211-229.
8. Suay I, Arenal F, Asensio FJ, Basilio A, Cabello MA, Díez MT, García JB, Val AG, Gorrochategui J, Hernández P, Peláez F, Vicente MF. Screening of basidiomycetes for antimicrobial activities. *Antonie Van Leeuwenhoek* 2000; 78: 129139
9. Ishikawa NK, Kasuya MC, Venetti MCD. Antibacterial activity of *Lentinula edodes* grown in liquid medium. *Braz J Microbial* 2001; 32: 206-210.
10. Hirasawa M, Shouji N, Neta T, Fukushima K, Takada K. Three kinds of antibacterial substances from *Lentinus edodes* (Berk.) Sing. (Shitake and edible mushroom). *Int J Antimicrob Agents* 1999; 11: 151-15
11. Shouji N, Takada K, Fukushima K, Hirasawa M. Anticaries effect of a component from shitake (an edible mushroom). *Caries Res* 2000; 34: 94-98.
12. Stamets, P. Novel antimicrobials from mushrooms. *American Botanical Council Herbal Gram* 2002; 54: 28-33.
13. Sheena N, Ajith TA, Mathew T and Janardhanan KK. Antibacterial activity of three macrofungi, *Ganoderma lucidum*, *Navesporus floccose* and *Phellinus rimosus* occurring in south India. *Pharm Bio* 2003; 41: 564-567.
14. Michael Wood, Fred Stevens. *Omphalotus olivascens*. *California Fungi. Omphalotus olivascens*. Wikipedia 2011.
15. Moreno G, Esteve-Raventós F, Pöder R, Ayala N. *Omphalotus olivascens* var. *indigo*, var. nov. From Baja California (Mexico). *Mycotaxon* 1993; 48: 217-22.