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SCREENING OF ANTIBACTERIAL ACTIVITY IN EDIBLE MUSHROOM *PLEUROTUS EOUS* (BERK.) SACC. USING DIFFERENT SOLVENT EXTRACTS

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ABSTRACT

Oyster mushroom is an edible mushroom, can be cultivated on a wide variety of substrates containing lignin and cellulose. It has nutritional and medicinal properties. The study is to investigate antibacterial activity in *Pleurotus eous* cultivated in paddy straw substrate using different solvents acetone, aqueous and petroleum ether was tested against *Escherichia coli, Klebsiella pneumoniae, Bacillus subtilis, Staphyllococcus aureus* and *Pseudomonas aeruginosa* by disc diffusion method. The result showed maximum zone of inhibition in petroleum ether extract against *Staphylococcus aureus* and the minimum zone of inhibition was observed in *Klebsiella pneumonia* in acetone extract.

Keywords **:** *Pleurotus eous,* Solvents, antibacterial activity.

Introduction

Edible mushrooms are a large and fascinating group of fungi, which include 3283 mushroom species as edible or conditionally edible, accounting for about 20% of all mushroom taxa recorded in the global sources (Zhang *et al.,* 2021). *Pleurotus* is the second most distributed edible mushroom worldwide (Sekan *et al.,* 2019). *Pleurotus* species are well known commercial and essential mushrooms, which widely cultivated throughout all over the world and due to their exceptional ligninolytic properties (Bellettini *et al.,* 2019). Several myco-chemicals could be found in *Pleurotus* mushrooms including polysaccharides, phenolic compounds, proteins, lipids, and terpenoids, which have beneficial effects for human nutrition and health (Cateni *et al.,* 2021). Many fungi, including mushrooms contain dozens of active constituents that together combine to give the mushrooms their therapeutic value (Stamets, 2000). Fruiting body and the mycelium of mushrooms contain compounds with wide ranging antimicrobial activity. Several studies report the efficacy of different mushroom extracts against several microorganisms (Barros *et al.,* 2008).

Materials and Methods

Kingdom	-	Fungi
Division	-	Basidiomycota
Class	-	Agaricomycetes
Order	-	Agaricales
Family	-	Pleurotaceae
Genus	-	*Pleurotus*
Species	-	*eous*

Collection of materials

The edible mushroom spawn *Pleurotus eous* was collected from Vellayani Agriculure college, Thiruvanthapuram, Kerala.

Preparation of Extract

The selected edible mushroom *Pleurotus eous* was dried under shade condition for one month and cut in to small pieces, pulverized in a grinder and store in sterile container for further use. The solvents like acetone, aqueous and petroleum ether were used for the extraction.

About 10 gram of powdered mushroom was soaked separately in 100 ml of acetone aqueous, petroleum ether for three to four days at room temperature in dark condition. The extracts were filtered by using Whatsman No. 1 filter paper. The filtrate was concentrated to dryness under reduced pressure at 40^0C using a rotary evaporator and stored at 4^0 C for further use. Each extracts was re-suspended in the respective solvent and used for the analysis of antibacterial activity.

Bacterial strains

For antibacterial study five bacterial pathogens, *Escherichia coli (*MTCC 1652)*, Klebsiella pneumonia* (MTCC 7162), *Bacillus subtilis* (MTTC 5981), *Staphyllococcus aureus* (MTCC 3160) and *Pseudomonas aeruginosa* (MTCC 2295) were selected and were obtained from MTCC, Chandigarh.

Disc diffusion method

Antibacterial activity was carried out using Disc diffusion method (Bauer *et al.,* 1966). The medium was prepared by dissolving 38 g of Muller-Hinton Agar Medium (Hi Media) in 1000 ml of distilled water. The dissolved medium was autoclaved at 15 Lbs pressure at 121 ^{0} for 15 min (pH 7.3). The autoclaved medium was cooled, mixed well and poured in to petri plates (25 ml/plate). The plates were swabbed with pathogenic bacterial culture viz. *Escherichia coli, Klebsiella pneumoniae, Bacillus subtilis, Staphylococcus aureus* and *Pseudomonas aeruginosa*. Finally, The Sample or Sample loaded disc was then placed on the surface of Muller-Hinton Agar medium. The standardized disc Amikacin was used for positive control and empty sterile disc was used for negative control. The plates were kept for incubation at 37°C for 24 hours. After incubation, the inhibition zone was measured the edge of disc to the clear zone in millimeter.

Result and Discussion

The antibacterial activity was observed using acetone, aqueous and petroleum ether extract against bacterial pathogens of gram positive *Staphyllococcus aureus, Bacillus subtilis* and gram negative *Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa.*

Antibacterial activity of *Pleurotus eous* in paddy straw substrate

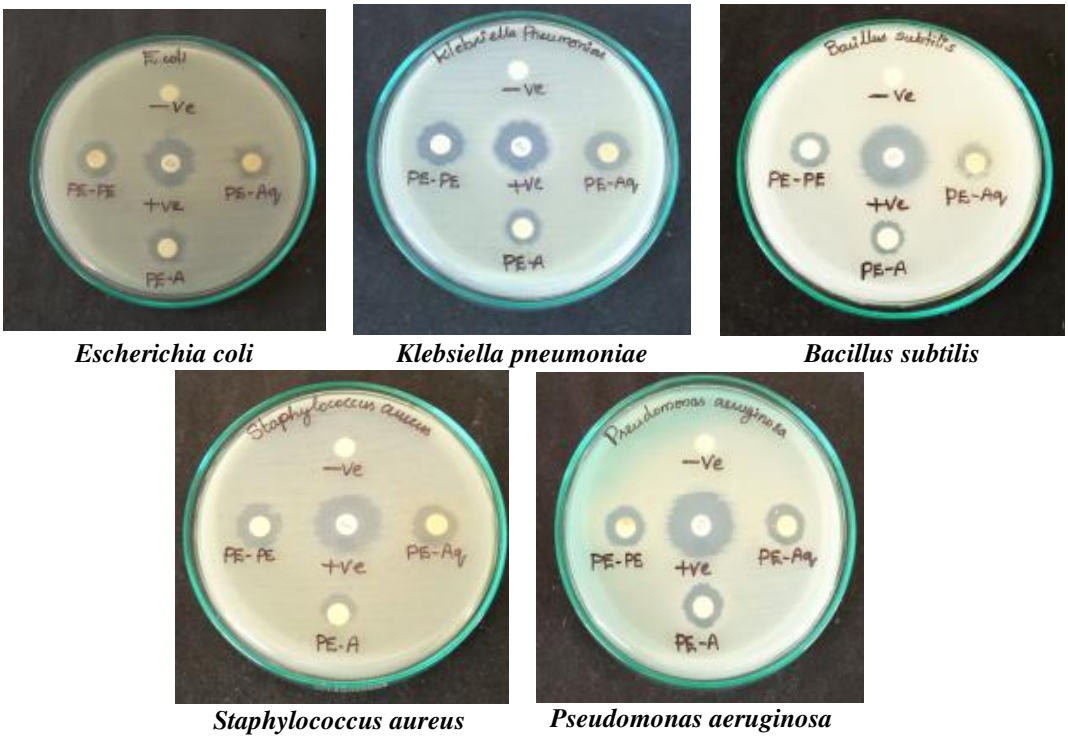
The result on antibacterial activity of *Pleurotus eous* in paddy straw substrate against bacterial pathogens were presented in Table 1.

The acetone extract of *Pleurotus eous* showed the antibacterial activity against the five pathogens with the inhibition zones of *Escherichia coli* (12 ± 0.81 mm), *Klebsiella pneumoniae* (9.66 ± 0.47 mm), *Bacillus subtilis* (10.33± 0.46 mm), *Staphylococcus aureus* (11± 0.82 mm) and *Pseudomonas aeruginosa* (11.33 ± 0.47 mm) respectively. The aqueous extract showed the inhibition zone of *Escherichia coli* (11 ± 0.81 mm), *Klebsiella pneumoniae* (13.33 ± 0.47 mm), *Bacillus subtilis* (11 ± 0.81 mm), *Staphylococcus aureus* (13 ± 0.81 mm) and *Pseudomonas aeruginosa* (12.66 ± 0.94 mm). The petroleum ether extract of *Pleurotus eous* showed the inhibition against the pathogens *Escherichia coli* (12.66 ± 0.94 mm), *Klebsiella pneumoniae* (14 ± 0.81 mm), *Bacillus subtilis* (12 ± 0.81 mm), *Staphylococcus aureus* (15.33 ± 0.47 mm) and *Pseudomonas aeruginosa* (13.33 ± 0.47 mm). The maximum zone of inhibition was observed in petroleum ether extract against *Staphylococcus aureus* (15.33 ± 0.47 mm). The minimum zone of inhibition was observed in *Klebsiella pneumonia* (9.66 ± 0.47 mm) in acetone extract. The antibiotic Amikacin showed highest activity against the pathogen *Bacillus subtilis* (21± 0.81 mm) and lowest activity against *Escherchia coli* and *Klebsiella pneumoniae* (17.33 ± 0.47 mm).The result was related to the findings of Muthukumaran *et al.,* 2014.

Table 1 : Antibacterial activity of different solvent extracts of *Pleurotus eous* in paddy straw substrate against bacterial pathogens

No	Bacterial Pathogens	Zone of Inhibition (mm)			
		Amikacin	Acetone	Aqueous	Petroleum ether
1	*Escherichia coli*	17.33 ± 0.47	12 ± 0.81	11 ± 0.81	12.66 ± 0.94
2	*Klebsiella pneumoniae*	17.33± 0.47	9.66 ± 0.47	13.33 ± 0.47	14 ± 0.81
3	*Bacillus subtilis*	21±0.81	10.33± 0.46	11 ± 0.81	12 ± 0.81
4	*Staphylococcus aureus*	20.66± 0.94	11± 0.82	13 ± 0.81	15.33± 0.47
5	*Pseudomonas aeruginosa*	20.47± 0.47	11.33 ± 0.47	12.66 ±0.94	13.33 ± 0.47

- Each value is a mean of three data
- Values were taken after substracting the standard disc value 6mm



Escherichia coli ***Klebsiella pneumoniae*** ***Bacillus subtilis***

Staphylococcus aureus ***Pseudomonas aeruginosa***

Plate 1 : Inhibition zone of *Pleurotus eous* using different solvent extracts

Conclusion

Now-a-days, mushrooms are used in medicine, pharmacy, food, and fermentation fields; they are considered a rich source of protein because they contain all essential amino acids, plus fiber and little fat. The result of the study showed that the *Pleurotus eous* contain high antibacterial activity, which confirms its use against bacterial pathogens. Further investigation on isolate the active antibacterial agents and identification of chemical compounds from these extracts.

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