



RESEARCH ARTICLE

ANTIMICROBIAL ACTIVITY OF AQUEOUS EXTRACTS FROM OYSTER MUSHROOM

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Abstract

Pleurotus ostreatus, commonly known as the oyster mushroom, is recognized not only for its high nutritional value but also for its significant biomedical potential due to its diverse bioactive compounds. This study aims to investigate the phytopharmacological properties of Pleurotus ostreatus. Fourier-transform infrared spectroscopy analysis identified various functional groups in the extract, including cycloalkanes, nitriles, halogenated compounds, aromatic monosubstituted compounds, and carboxylic acids. HPLC was employed to identify and quantify these components. The aqueous extract demonstrated notable antimicrobial activity against Bacillus megatherium and Bacillus amyloquifaciens.

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Introduction:-

Pleurotus ostreatus, commonly known as the oyster mushroom, is a highly nutritious fungus with significant biomedical potential [1]. It is valued for its rich array of bioactive compounds that contribute to its therapeutic effects. Recognized as a functional food, oyster mushroom is rich in protein, vitamins, minerals, fiber, and antioxidants such as selenium, which protect cells from oxidative damage caused by free radicals [2]. These properties may help in preventing chronic diseases and boosting the immune system. Phytochemical analysis of oyster mushroom has identified the presence of carbohydrates, tannins, saponins, phenols, volatile oils, terpenes, and anthraquinones, highlighting its diverse bioactive profile [3]. Previous studies have demonstrated its antinociceptive, hypercholesterolemic, antioxidant, antitumor, and antidiabetic effects across various solvents. Additionally, the probiotic characteristics of oyster mushroom further underscore its importance in human health and nutrition [4]. This research aims to evaluate the range of bioactive compounds present in oyster mushroom and assess their bioactivity [5]. Using Fourier-transform infrared spectroscopy (FTIR), we examined the functional groups and compounds in the mushroom. Furthermore, the antimicrobial activity of oyster mushroom was investigated to determine its potential for developing novel therapeutic agents [6].

Materials and Methods:-

Extraction and purification of oyster mushroom

Oyster mushrooms are procured from local market, Vijayawada, Andhra Pradesh, India and washed with distilled water, made into an aqueous extract as smoothie with use of motor and pestle. In a 250 ml conical flask 100ml distilled water and 10 gram of mushroom was mixed. The extract is mixed with the help of magnetic stirrer for about

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24 hours. Later the extract is autoclaved to avoid unwanted contamination and filtered with muslin cloth. This lysate is subjected for dialysis against PBS buffer for 4 hours to remove impurities [7].

Phytochemical screening & FTIR Analysis

The aqueous extract of oyster mushroom was screened for phytochemical constituents using standard procedures. Sample is placed between the two windows and concentrate was stacked an FTIR spectroscope, with a Scan range from 400 to 4000 cm^{-1} with a goal of 4 cm^{-1} FTIR spectrometer (Perkin-Elmer), interfaced to spectrum operating system, was used during FTIR spectra acquisition [8].

High pressure liquid chromatography

Oyster mushroom aqueous extract and fructose standard was injected in HPLC with mobile phase of acetonitrile and water. Mobile phase is prepared with HPLC grade acetonitrile and water (Merck) in combination of 120:80 ratio. 27mg of fructose is diluted in 1ml of distilled water is prepared as standard. 900 μl of mobile phase and 100 μl of fructose was injected to HPLC machine, UV absorbance at 210nm and Flow rate of 0.5ml / min is used with C18 column (5 μm , 250x 4.6mm) in 30 minutes (runtime) [9].

Antibacterial activity (Agar well diffusion method)

The nutrient agar media was employed in an agar well diffusion approach to test the antibacterial activity of oyster mushroom aqueous extracts against *Bacillus megaterium*, *Escherichia coli*, *Bacillus subtilis*, *Bacillus amyloliquefaciens*, and *Bacillus licheniformis*. Using a sterile cotton swab, bacterial strains were swabbed over Nutrient Agar medium and wells were made using a sterile well cutter. Extracts of varying concentrations of 30, 60, and 90 $\mu\text{g/ml}$ solvent were aseptically transferred to the wells separately and incubated at 37°C for 24 hours and the diameter of the inhibition zone was recorded. Control wells were maintained with sterile distilled water [10].

Result and Discussion:-

Qualitative phytochemical screening

The screening of early phytochemicals of different bioactive compounds was found. Standard methods were used to conduct the screening [11]. In this research, the qualitative analysis of the extracts revealed a strong indication of the existence of metabolites. The majority of phytoconstituents were found in the solution of oyster mushroom, comprising phenols, carbohydrates, tannins, terpenoids, volatile oil, Antra quinones, and saponins [12]. The screening was performed by using standard procedures and is summarized in the Table 1.

Phytochemical	Presence
Carbohydrates	+ve
Tannins	+ve
Saponin	+ve
Flavonoid	-ve
Phenol	+ve
Glycosides	-ve
Sapponin	+ve
Volatile oil	+ve
Terpenes	+ve
Cardiac Glycoside	-ve
Antra quinones	+ve

Table 1:- Preliminary phytochemical screening of bioactive components in aqueous extract of oyster mushroom.

HPLC (High Pressure Liquid Chromatography)

A sample of oyster mushroom aqueous extract was injected into Shimadzu 3000 HPLC System. UV absorbance at 210nm and indicated that most of the unknown substances were monosaccharides. A substantial portion of the peptides eluted between 5 to 10 percent of acetonitrile (retention time 30 minutes) [13].

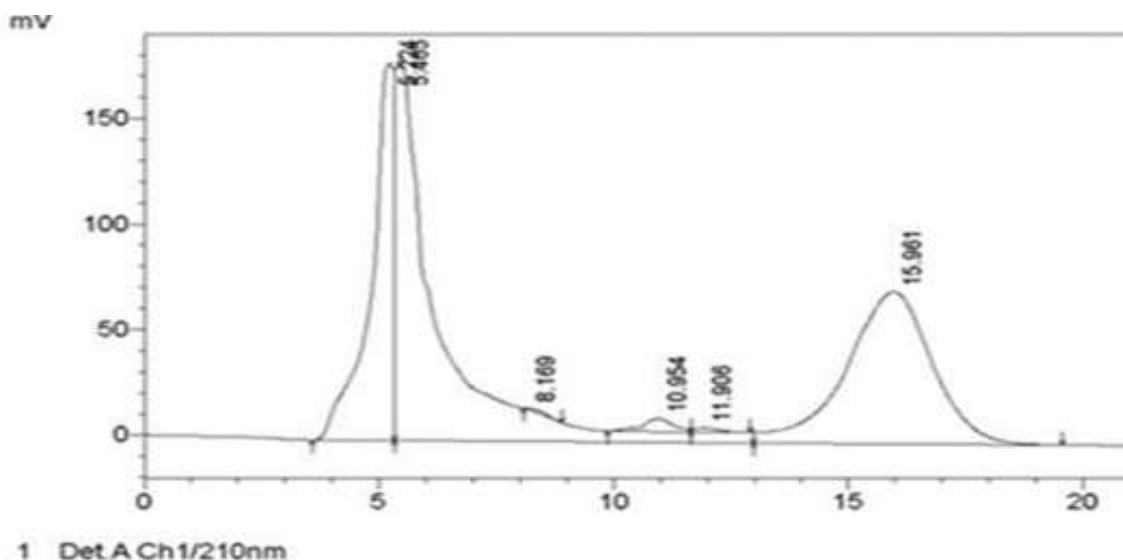


Figure 1:- Chromatogram of oyster mushroom.

Anti-Bacterial activity

Plants have long been an important source of natural compounds for human health, particularly in natural medicines. The aqueous extract of oyster mushroom had in vitro antibacterial activity against Gram-positive and Gram-negative bacteria, according to the antimicrobial assay. The extract didn't show any activity on *Escherichia coli* and *Bacillus licheniformis*. The results reveal that aqueous extracts of oyster mushroom were found to be extremely effective against *Bacillus megaterium*, *Bacillus subtilis* and *Bacillus amyloliquifaciens*. A significant inhibitory zone was discovered against *Bacillus megaterium* at 80 µg/ml of sample [14].

Microorganism	Zone of inhibition (mm)		
	30 µg/ml of extract	60 µg/ml of extract	90 µg/ml of extract
<i>Bacillus amyloliquifaciens</i>	13	17	21
<i>Escherichia coli</i>	0	0	0
<i>Bacillus licheniformis</i>	0	0	0
<i>Bacillus megaterium</i>	18	26	40
<i>Bacillus subtilis</i>	0	8	14

Table 2:- Antibacterial activity of aqueous extract of *Pleurotus ostreatus*.

Conclusion:-

In this study, we aimed to identify various phytochemicals and analyze the FTIR characteristics of oyster mushroom extracts, which may hold significant interest for research institutions and pharmaceutical companies in drug development. The antibacterial activity of the extracts was evaluated against both Gram-positive and Gram-negative microorganisms. This preliminary data is intended to aid in the identification of bioactive compounds, assess their efficacy through in vivo studies, and demonstrate their safety and effectiveness in clinical trials.

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