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Research Article

Antimicrobial and Antioxidant Analysis of Pleurotus Ostreatus

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Abstract
The methanol extracts edible oyster mushroom scientific name is Pleurotus ostreatus by Paul Kumar (1871), was examined for the presence of many of its bioactive components, which have potent therapeutic benefits such as the removal of free radicals and the treatment of aging-related illnesses in humans. The study aims to assess the Pleurotus ostreatus sample mushroom's total antioxidant activity (TAA) and reducing power activity (RPA) utilizing DPPH free radical scavenging activity. These biomolecules were identified in the wild mushroom sample using widely accepted conventional biochemical techniques. Additionally, the antibacterial and antifungal properties thof mushroom extract are tested. Pleurotus ostreatus is commonly called as oyster mushroom that grows on decaying wooden logs in hillsides naturally and cultivation on compost by humans in large scale. Pleurotus ostreatus comprehensive view of the species it's taxonomy, morphology and distribution by MycoBank(2022).Cultivation of Pleurotus ostreatus booting different substrates and estimation of yielding rate by Singh et..al (2020).Different bio active organic components are like polyphenols ,terpenoids, and polysaccharides identified by Zhang et…al(2020).A systematic review of the health benefits like antioxidant ,ant inflammatory and immune boosting oyster mushrooms by Kim et..al(2019).
Keywords: DPPH; Total Antioxidant Activity; Reducing Power Activity; Pleurotus ostreatus.

1. Introduction

Nowadays, mushrooms are used for both medical and nutritional purposes. In the past, the Swedish, Greeks, Egyptians, Romans, and Japanese all utilized mushrooms extensively for medicinal purposes. There is still more research to be done on the pharmacological significance of mushrooms. Mushrooms are rich, tasty dietary supplements that also have therapeutic benefits. Certain mushrooms' antimicrobial qualities help humans prevent illness and strengthen their immune systems. Recently Mushrooms were considered as and good source of protein, minerals and more antioxidants.

Since the most widely used synthetic antioxidants may have changed their structure to be used in food, the food business and preventive medicine have become more interested in the creation of natural antioxidants. It has been claimed that a variety of mushrooms contain antioxidants that can counteract free radicals. Sanchez and Carmen (2017). Because they have fewer or no negative effects, antioxidant derivatives derived from biological sources are thought to be safer than synthetic ones. The possibility of obtaining additional nutrients and antioxidants from wild

mushrooms Sundeep and associates (2017). Using the crude methanol extract technique, the antioxidant activity of wild mushrooms growing in India's Western Ghats was examined and demonstrated by the DPPH and Nitric oxide scavenging assays. Raghupathi et….al (2018). Huge amount of volatile and different anti-bacterial bioactive components identified in Chlorophyllin molybdites Paidi Rama Rao et…al (2020).

Antioxidants play a key role in removing of harmful free radicals generated by the physical stress, biological process and powerful pollutants. Assumed antioxidant activities have been attributes" to various mechanisms such as avoiding of Chain initiation, binding of metal ions enzyme catalysts, decomposition of peroxides, avoiding of continuous hydrogen abstraction and free radicals scavenging in cells, tissues in the body.

2. Materials and Methods

The main aim of the present study is to analyze the antimicrobial and antioxidant capacity of Pleurotus ostreatus which are collected and identified by Department of Botany Andhra University, Visakhapatnam in November 2023 at Mahendra Giri hills area, Srikakulam dist. Andhra Pradesh India.

2.1. Preparation of Mushrooms Extracts by Soxhlet Extraction Method

Using a Soxhlet extractor, the dried and powdered components (20 gm) were extracted with 200 ml of each solvent separately for 2 to 5 hours at a temperature that did not exceed the solvent's boiling point. Methanol serves as the study's solvent. After filtering, the extracts were dried out by concentration. Before being used, the extract was placed in glass vials and stored at 4º C. To create a stock solution of 100 mg/ml, the extracts were diluted in 25% aqueous dimethyl sulfoxide (DMSO). Before being employed in the assays, the dried extracts were kept at -18°C. Five percent dimethyl sulfoxide (DMSO) was used to dissolve the extracts.

Fig. 1: A) Soxhlet Extraction Method; B) Destined Extraction Method

A B

2.2. Test Organisms:

The bacterial organisms like: Staphylococcus aureus (MTCC-3160)
Streptococcus pyrogens (MTCC-442),
Klebsiella pneumoniae (MTCC-452)
Escherichia coli (MTCC-443)
Pseudomonas aeruginosa (MTCC-424)

The fungal organisms like: Aspergillus Niger (MTCC-961)
Aspergillus flavus (MTCC- 3396)
Aspergillus fumigatus (MTCC 2584) was obtained from the Institute of Microbial Technology (IMTECH), Chandigarh, India's Microbial Type Culture Collection and Gene Bank. Freshly made nutrient agar for bacteria and potato dextrose agar for fungus were used.

3. Antibacterial Activity

3.1. By Agar Well Diffusion Method

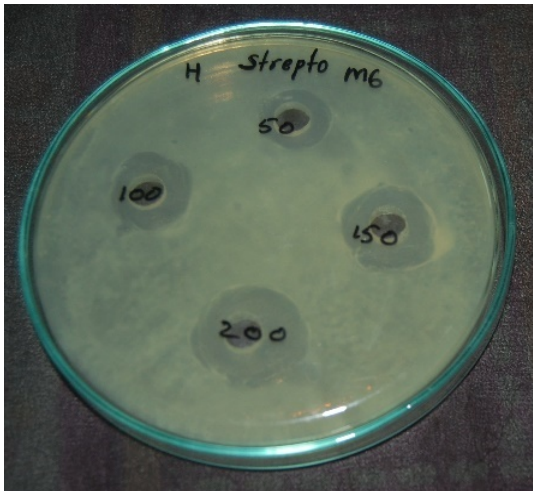
To test for antibiotic activity, the bacterial and fungal cultures were incubated overnight at 37°C and 28°C. Separate 100 ml conical flasks containing the nutrient agar medium and potato dextrose agar medium were autoclave sterilized at 121 °C and 15 Lbp for 15 minutes before the media were transferred into Petri plates. Using a sterilized glass spreader, the bacterial and fungal inoculums are applied to the agar plate surface. Using a sterile corn borer, four antibacterial and antifungal wells were created at identical distances. When the zone of inhibition was larger than 8 mm, antibacterial activity was observed. Three duplicates of each study were conducted, and the mean value was determined. Sterilized streptomycin was employed as the control antibiotic.

1. Statistical analysis

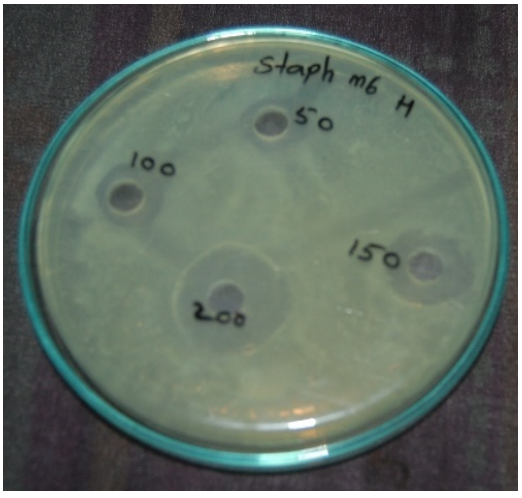
Data were averages of three results+-standard Deviations (SD) by using Microsoft Excel. Zone of inhibitions were measured in millimeter (mm) and the average values were calculated and recorded.

2. Antibacterial Activity:

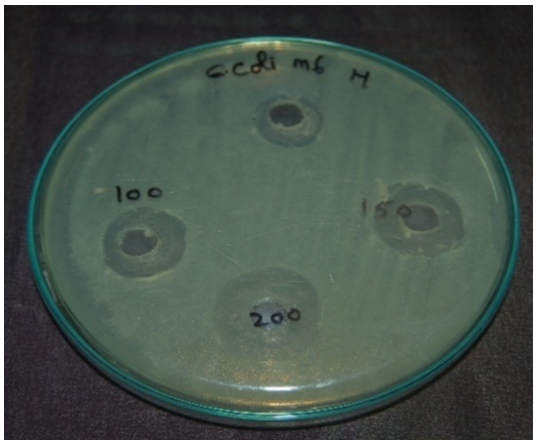
The antimicrobial activities of mushrooms extracts are showed varying degree of inhibition on the test organisms. In the present study antibacterial activity of mushroom sample of Methanol extract with different concentration of 50, 100, 150, 200µg/ml were carried out against pathogenic bacteria namely Staphylococcus aureus, Streptococcus pyogenes, Escherichia coli, Klebsiella pneumoniae and Pseudomonas aeruginosa. In the analysis of the mushroom extracts were tested against five bacterial species. Compared with four concentrations highest zone of inhibition was observed in 200µg/ml concentration in all extracts shown in the Table. The results revealed that the Methanol extract showed highest antimicrobial activity against Klebsiella pneumoniae with zone of inhibition diameter of 24mm in the sample.



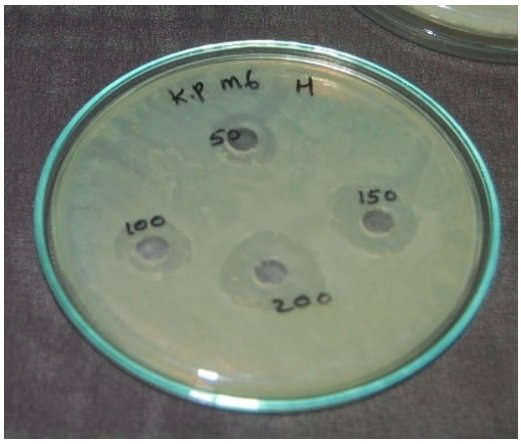
(O1) Staphylococcus aureus



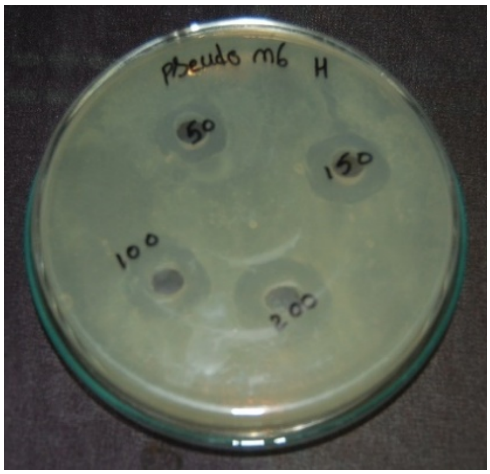
(O2) Streptococcus pyogenes



(O3) Escherichia coli



(O4) Klebsiella pneumoniae



(O5) Pseudomonas aeruginosa

Fig. 2: Different observations of antibacterial activity

3.2. Methanol Extract

The antibacterial activity of methanol extract ranged from 10mm to 24 mm zone of inhibition against all five bacterial pathogens. Minimum zone of inhibition observed in 50µg/ml concentration shows figure 1.

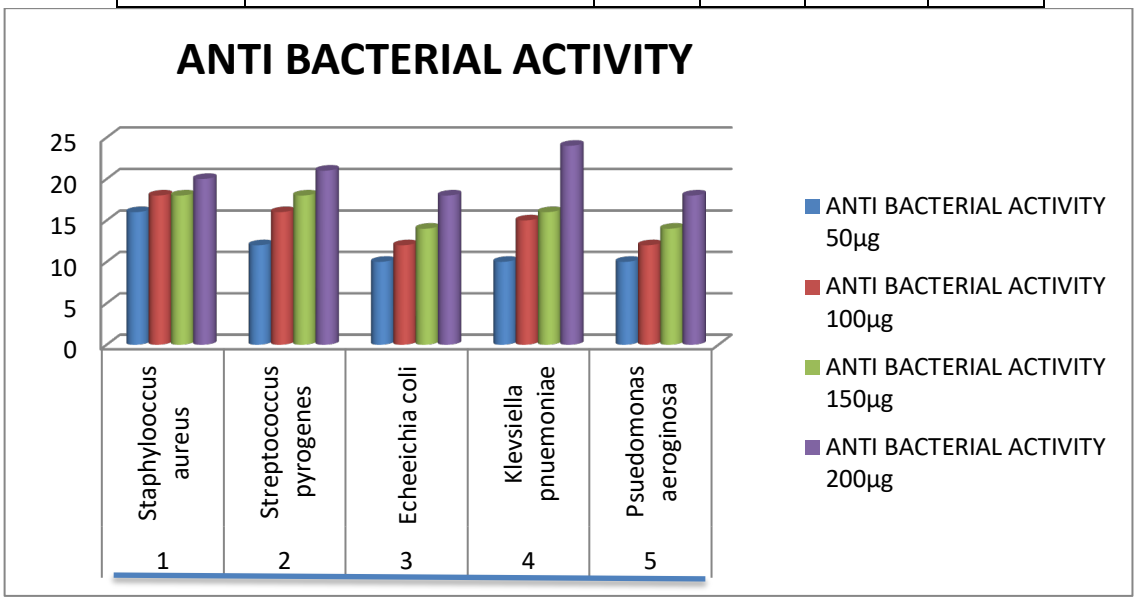
4. Observations:

1. In the 50 µg/ml concentration the zone of inhibition ranged from 10 to 16mm. The highest zone of inhibition was observed against Staphylococcus aureus that is 16mm in mushrooms sample.
2. In the 100µg/ml methanol concentration 12mm to 18mm zone of inhibition range was observed. The maximum zone of inhibition was observed in mushrooms sample against Staphylococcus aureus that is 18mm.
3. In the 150µg/ml concentration the zone of inhibition ranged from 14 to 18mm. The highest 18mm zone of inhibition observed in the sample against Staphylococcus aureus and the sample against Staphylococcus aureus and Streptococcus pyogenes were observed.

4. The maximum zone of inhibition presents in 200µg/ml concentration the zone of inhibition ranged from 16 to 24mm. Klebsiella pneumoniae shows 24mm in mushroom sample

Table – 1: Antibacterial activity of mushroom sample Methanol extract

ANTI BACTERIAL ACTIVITY					
S. No	**Name of Bacterium**	**50µg**	**100µg**	**150µg**	**200µg**
1	Staphylococcus aureus	16	18	18	20
2	Streptococcus pyrogens	12	16	18	21
3	Escherichia coli	10	12	14	18
4	Klebsiella pneumonia	10	15	16	24
5	Pseudomonas aeruginosa	10	12	14	18



5. Anti-Fungal Activity

5.1. Selected Mushrooms:

In the present study antifungal activity of six mushroom samples with Methanol extracts with different concentrations of 50, 100, 150, 200µg/ml were carried out against pathogenic fungi namely Aspergillus Niger F1(MTCC-961), Aspergillus flavus F2 (MTCC- 3396) and Aspergillus fumigates F3(MTCC 2584).

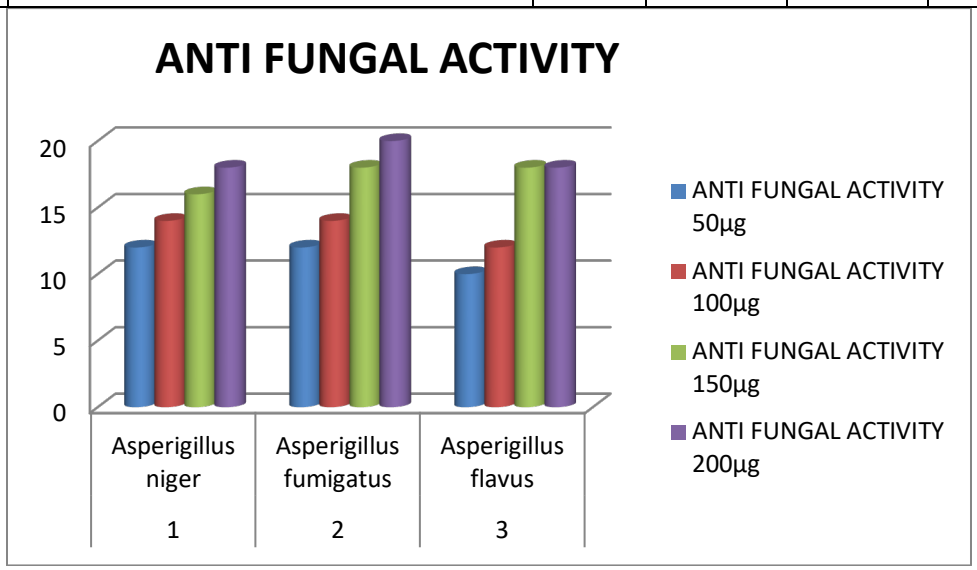
5.2. Activity Analysis:

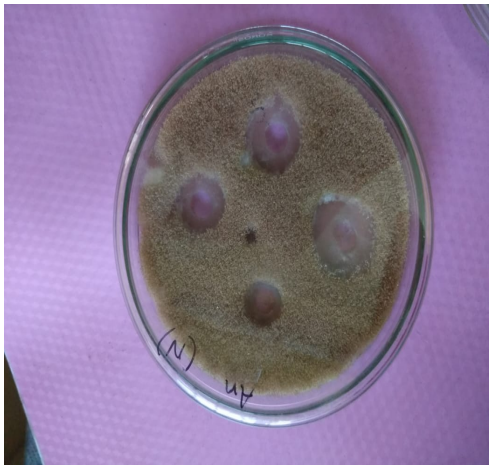
In the analysis of the sample extracts were tested against three fungal species. Compared with four concentrations highest zone of inhibition was observed in 200µg/ml concentration in the extracts shown in the Table. The results revealed that the Methanol extract showed highest anti-fungal activity when used against Aspergillus Niger and

Aspergillus fumigatus with zone of inhibition diameter of 20mm. The lowest zone of inhibition was observed that is 10mm at 50µg/ml concentration for Aspergillus Niger, Aspergillus flavus and Aspergillus.

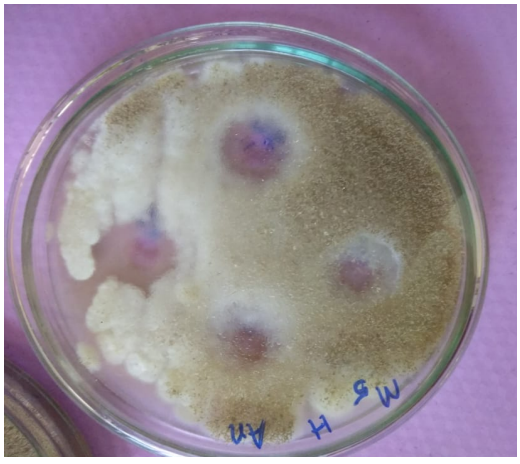
Table – 2: Anti-Fungal activity of mushroom sample Methanol extract

ANTI FUNGAL ACTIVITY					
S. No	**Name of Bacterium**	**50µg**	**100µg**	**150µg**	**200µg**
1	Aspergillus Niger	12	14	16	18
2	Aspergillus fumigatus	12	14	18	20
3	Aspergillus flavus	10	12	18	18

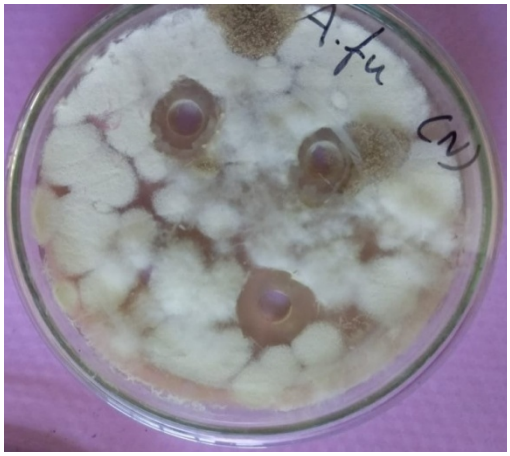




Aspergillus Niger



Aspergillus flavus



Aspergillus fumigatus

Fig. 3: Different observations of antifungal activity

6. (DPPH Free Radical Scavenging Activity) of Methanolic Extract:

Methanol was used to create the test extracts' diluted working solutions. Accurately 100 ml of test samples (0.6-20.0 mg/ml) in methanol was combined with 5 µl DPPH solution on 96-well microtiter plates. A solution of 0.002% DPPH in methanol was made. To be examined individually, one microliter of this solution was combined with one milliliter of the sample solution and the reference solution. A spectrophotometer was used to determine the optical density of these solution combinations at 517 nm in relation to methanol after they had been left in the dark for 20 minutes. One milliliter of methanol and one milliliter of DPPH solution (0.002%) served as the blank. Using the following formula, the optical density was measured, and the percentage of inhibition was computed.

Percent inhibition of DPPH activity = (A–B/A) × 100

Where A is optical density of the blank and B is optical density of the sample.

7. Statistics and IC50:

The quantity of sample needed to reduce the absorbance of the DPPH free radical by 50%, or IC50 (go/ml), was determined by plotting decolonization against the concentration of the sample extract and creating a linear regression curve. Three duplicates of each analysis were performed, and the findings were reported as mean ± SD. SAS was the computer program used to conduct statistical studies.

8. Total Antioxidant Capacity:

The extract's reduction of Mo (VI) to Mo (V) and the subsequent development of a green phosphate/Mo (V) complex at an acidic pH are the basis for the test. Ninety minutes were spent incubating the tubes with extract (1 mg/ml) and reagent solution (0.6 M sulphuric acid, 28 mM sodium phosphate, and 4 mM ammonium molybdate) at 95°C. Each solution's absorbance at 695 nm was measured against a blank once the combination had cooled to room temperature. Ascorbic acid equivalent (AAE) was used to express the antioxidant ability.

9. Antioxidants Analysis: -

Antioxidants activity of the methanolic extract of Pleurotus ostreatus mushroom was studied by using DPPH, reducing power assay, and total antioxidant capacity giving a clear picture of mushroom sample about antioxidant activity.

10. DPPH free radical Scavenging Actively of Methanolic extract 2,2, diphenyl 1-picrylhydrazyl: -

The stable DPPH radical is scavenged using the following model. The capacity of different samples to scavenge free radicals is assessed using a commonly DPPH works well with nitrogen-

centered free radicals (those whose color changes from violet to yellow) that are reduced by either hydrogen or electron donation.

Table 3: DPPH Reducing Activity of Pleurotus ostreatus

Sl. No.	Concentrations	Reading
01.	50ul	69.13
02.	100ul	73.92
03.	150ul	86.13
04.	200ul	92.04
05.	IC50	0.0660

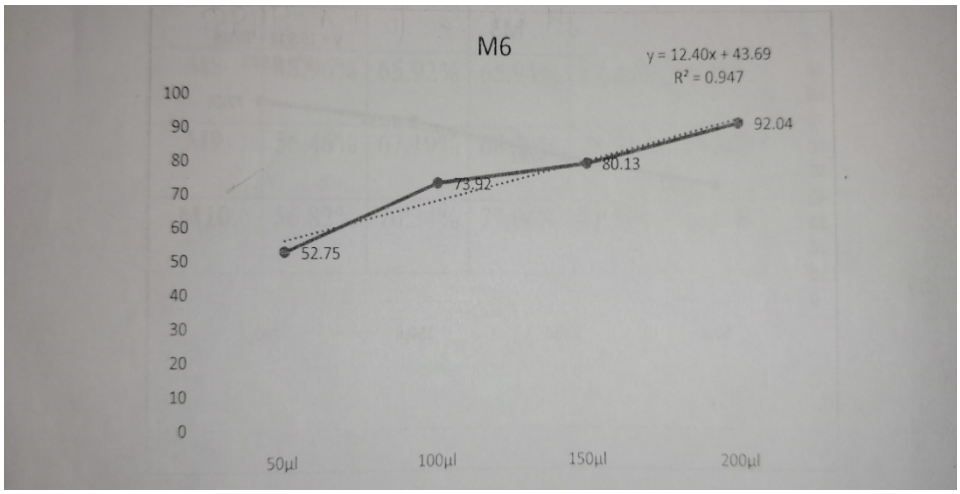


Fig.4: Pleurotus ostreatus DPPH Reducing Activity Graph

This mushroom sample strong higher free radicals scavenging activity for 69.13 to 92.04 at different concentrations. The Scavenging activity of any sample expended in terms of IC 50. Lower value of IC 50 also indicates stronger antioxidant sample having IC50 value is 0.0660 that mean it is very strongest antioxidant capacity.

11. Reducing Power:

With minor adjustments, the decreasing power was measured in accordance with Kudaet al. (2005). 2.5 mL of phosphate buffer (50 mM, pH 7.0), 2.5 mL of 1% potassium ferricyanide, and 1.0 ml of varying quantities of mushroom methanol extract were combined. Following that, the mixture was incubated for 20 minutes at 50°C. The mixture was centrifuged at 200×g for 10 minutes after 2.5 mL of 10% trichloroacetic acid was added. In the end, 0.25 mL of FeCl3 solution (0.1%, w/v) and 1.25 mL of distilled water were combined with 1.25 mL of supernatant. At 700 nanometers, the absorbance was measured. greater reducing power is indicated by greater absorbance readings. The absorbance graph at 700 nm was used to determine the extract concentration that provided 0.5 of an absorbance (EC50). BHT was used as standard.

12. Reducing Power Assay of Mushroom Sample:

Electron donating activity, a key mechanism of phenolic antioxidant action, is frequently shown by Fe3+ reduction. By contributing electrons, the chemicals in the mushroom extracts

can convert the yellow ferric form of lon to the blue ferrous form, which is the basis for the reducing power assay. By monitoring the development of Perl's Prussian blue at 700 mm, the quantity of Fe+ Complex may subsequently be tracked. A 700mm increase in absorbance denotes a greater capacity for reduction.

Reducing power assay demonstrates the reducing power of methanolic extract, BHT Ascorbic acid. The reducing power values of sample was very much lower than that of BHT, Ascorbic acid and so it was identified that reducing powder due to hydrogen donation ability.

Table 4: Total Antioxidant Assay of Pleurotus ostreatus (TAA)

S. No.	TAA Values	Reducing power Assay Values (RPA)
1	Pleurotus cornucopia 75.5	0.09498
2	BHT	0.1076
3	Ascorbic acid	0.1965

13. TAA Capacity. Total antioxidant Assay TAA: -

Total Antioxidant Assay was indicated by the formation of green phosphomolybdenum complex within the reaction mixture. The phosphor moduldenum method is based on the reduction of Mo. Mushroom Sample by the antioxidants of and formation of green phosphate/MO complex with the maximal absorption at 695mm.Total antioxidant of Methanolic extract was estimated by using ascorbic acid as standard analyzing agent the data highest total Oxidant. Activity observed value is 75, 5ug.High absorbance value of sample indicated high antioxidant activity. high antioxidant activity in mushrooms can suppress actave Oxygen species which related to ageing human diseases. So, this mushroom might be developed into functional foods and drugs in future.

14. Preliminary Biochemical Analysis: -

Preliminary biochemical tests such as Carbohydrates, proteins, alkaloids, glycol cedes, steroids, phenols, resins, tannins, quinones and flavonoids were carried out on the crude methanolic extract using standard procedures. Different biomolecules identified with specific biochemical tests

15. Microchemical Analysis of Chlorophyllum Molybdites:

Different biochemical tests were conducted to identify the various bioactive compounds in the mushroom sample.

Table 5: Different biochemical tests were conducted to identify the various bioactive compounds

Name of the Test	Results
Carbohydrates	++
Proteins	+++
Alkaloids	+
Glycosides	++
Steroids	+
Phenols	+++
Resins	+

Tannins	+
Quinones	-
Flavonoids	+++

16. Alkaloids:

Test for alkaloids:

Eight milliliters of 1% HCl were combined with 0.5 to 0.6 grammes of different extracts, heated, and filtered. Two milliliters of the filtrate were treated independently with both reagents (Reindorf's and Meyer's), and the precipitate formation was used to determine if the alkaloids were recognized. Alkaloids have developed and precipitation has occurred in the current mushroom sample.

Synthesized from amino acids or their immediate derivatives, alkaloids are basic secondary metabolites having heterocyclic nitrogen (Brondz et al., 2007). Numerous fatal human illnesses, including AIDS, cancer, and lung conditions, have been linked to alkaloids (Mandal et al., 2007). Alkaloids trigger immunogenic cell death, have stimulating qualities, and control Na+ ions, channels, and microbial activity. Because alkaloids are known to have angiogenesis-inhibiting properties, they can help stop the proliferation of malignant cells (Janiszewski, 2015).

17. Glycosides:

Test for Glycosides:

Following a few hours of boiling on a water bath, five milliliters of each extract were hydrolyzed independently with five milliliters of concentrated hydrochloric acid. The resulting hydrolysates were then put through the following test: Aqueous 10% sodium hydroxide was added after a little amount of the samples' alcoholic extract had been diluted in 1 milliliter of water. The presence of glycosides was revealed by the formation of a yellow hue.

Glycosides play numerous important roles in living organisms. Mushroom sample shows glycosides positiveness and some of concentration observed in the sample.

The gastrointestinal system is impacted by the glycoside's activities; cyanogenic glycosides disrupt iodine ramification, which can lead to or encourage goiter and hypothyroidism. Nowadays, a variety of glycosidic substances are employed in medicine. Vitamin glycosides, polyphenolic glycosides (flavonoids), alkaloid glycosides, antibiotic glycosides, glycopeptides, cardiac glycosides, steroid and terpenoid glycosides, and so on are all associated with it.

18. Steroids:

Test for steroids:

A mixture of 0.5 g of each plant's different solvent extract fraction, 2 ml of acetic anhydride, and 2 ml of sulphury acid was prepared. When steroids were present, the hue of certain samples changed from violet to blue or green. One of nature's most significant substances is steroids. There was a certain level of steroid concertation in the sample used in this investigation.

19. Phenols:

Test for Phenols:

After adding a few drops of a 10% aqueous ferric chloride solution, 2 milliliters of distilled water were added to 1 milliliter of different solvent extracts of the sample. When a blue or green hue formed, it meant that phenols were present. Natural goods include naturally

occurring phenols. Most secondary products known as phenolic compounds are made by microbes and plants and have an aromatic ring with a hydroxyl substituent.

In the present study with mushroom sample more concertation of phenols observed in the mushroom sample compare with other biomolecules.

20. Resins:

Test for Resins:

One ml of various solvent extract was treated with few drops of acetic anhydride solution followed by one ml of conc. H_2SO_4. Resins give coloration ranging from orange to yellow and resins found in the mushroom sample. Resins are solid or highly viscous substance of plant or hydrocarbon secretions of many plants valued for their chemical constituent. Resins are usually mixtures of organic compounds. Plants secrete resins for their protective benefits in response to injures. The resin protects the plant from insects and pathogens. Presence of resins in the mushrooms confounds a wide range of herbivores, insect, and pathogens, while the volatile phenolic compounds may attract benefactors such as predators of herbivores that attack the mushrooms.

21. Test for Tannins:

After dissolving 0.25 g of different solvent extract in 10 ml of distilled water, the mixture was filtered. The filtrate was mixed with a 1% aqueous solution of iron chloride ($FeCl_3$). Intense green, purple, blue, or black coloration suggested that the test samples contained tannins.

22. Tannins:

However, it has been observed that tannins have astringent qualities and can help heal wounds and irritated mucous membranes (Okwu and Okwu 2004). Cell membrane rupture, protein synthesis inhibition, proteolytic enzymes, and microbial adhesions are some of the ways that tannins may produce their antibacterial effects (Dilger et al., 2002).

23. Test for Proteins:

Biuret's Test:

One milliliter of 4% w/v sodium hydroxide and one milliliter of 1% w/v copper sulphate were added to three milliliters of extract. Proteins are present when the fluid becomes violet or pink.

24. Millon's Test:

Five milliliters of Millon's reagent were added to three milliliters of extract, and when the mixture was heated, a white precipitate formed, which became brick red, signifying the presence of proteins. Protein is valued according to the types of amino acids that make it up. In addition to the most prevalent non-essential amino acids and amides, mushrooms also contain all the necessary amino acids.

The samples in the current investigation showed an increase in protein concertation. According to Samee et al. (2003) and Agrahar-Murugkar et al. (2005), the protein content of mushrooms varies depending on the physical and chemical differences in growth circumstances as well as the genetic strains of the species. Protein is the primary component of our diet that helps us grow our bodies. The amount of protein in mushrooms is determined by the species, harvest period, pileus size, and substratum composition (Bano and Rajaratnam, 1982). The protein content of edible mushrooms typically varied from 28.93 to 39.10% of dry weight, making them a highly regarded source of protein (Ragunathan et al., 2003).

25. Carbohydrates:

Test for Soluble Carbohydrate:

After boiling 0.1 g of the extract with 2 ml of distilled water, it was filtered. A little amount of naphthol solution in ethanol (Molich's reagent) was added to the filtrate. To create a lower layer, concentrated sulphuric acid was then carefully dripped down the test tube's side using a Pasteur pipette. Indicating the presence of carbohydrates was a purple interfacial ring.

There are several functions that carbohydrates serve in living things. "Carbohydrates are important for brain function," according to the study's sample. They provide rapid energy and have an impact on mood, memory, and other aspects of life.

The correct operation of the digestive system depends on the different carbohydrate molecules found in mushrooms, such as oligosaccharides, monosaccharides, and their derivatives. Carbohydrates provide working muscles energy and the central nervous system fuel. They also prevent protein from being used as an energy source and enable fat metabolism.

26. Quinones:

Test for Quinones:

Alcoholic potassium hydroxide solution was used to treat one milliliter of each of the different extracts independently. Quinines provide a range of colors, from blue to red. A family of quinoid chemicals known as quinones is extensively found in Over 1,200 quinones have been described thus far. They are distinguished by an According to Dey and Harborne (1989), quinones are a type of quinoid chemicals that are extensively found in nature. Quinones are a significant family of compounds with both physiological and medicinal properties. Quinine-positive samples were found in the current investigation. Quinones are found in a wide variety of plant families (Wei et al., 2008b). They are also present in fungi, (Carrasco et al., 2008)

27. Flavonoids:

Test for Flavonoids:

To get rid of the fatty elements (lipid layer), 0.5 g of different extracts were shaken with petroleum ether. After dissolving the defatted residue in 20 milliliters of 80% ethanol, it was filtered. The following experiments were conducted using the filtrate: (a) In a test tube, 3 milliliters of the filtrate and 4 milliliters of 1% aluminum chloride in methanol were combined, and the color was assessed. The presence of flavanols, flavones, and chalcones was shown by the formation of a yellow hue. (b) Concentrated H_2SO_4 was added after 5 milliliters of the diluted ammonia solution had been added to the part of each mushroom extract's aqueous filtrate. Flavonoids were present because of the yellow coloring that appeared.

The flavonoid content of the current mushroom sample is positive. One of the most varied classes of natural substances, flavonoids have been demonstrated to have a wide range of chemical and biological activities, such as the ability to scavenge radicals and to have antiallergenic, antiviral, anti-inflammatory, and vasodilating effects (Parajuli et al., 2015). Polysaccharides, polysaccharopeptides, and polysaccharideprotein complexes are the primary bioactive substances found in mushrooms that have immunomodulatory and antitumor properties (Jun Hu et al., 2017). Low-molecular-weight secondary metabolites and trace elements from mushrooms are other compounds of therapeutic relevance that are equally crucial for immunological function (Liu et al., 2007).

28. Discussions: -

The active methanol extract's initial mycochemical investigation reveals the presence of carbohydrates, alkaloids, glycocides, and steroids. The color change was used to identify phenols, resins, flavonoids, and quines. High+++ moderate ++low + no response - was the classification given to them. The table displays the findings of the bioactive contents. The bioactive metabolites are working against the several human health problems. Presence of more phenolic and Flavonoids in the wild mushrooms is very much useful to fight against Cancer and aging related human diseases.

29. Conclusion: -

According to these results, the extraction of Pleurotus osteatus conforms bioactive compounds that show the presence of major various phenolic compounds, which are reported to have the highest antioxidant, antifungal, and antibacterial activity. The Pleurotus cornucopia are not edible mushrooms, but they contain a vast number of medicinal contents. To assess the

creation of possible antibacterial, antifungal, and antioxidant medications for biomedical uses as well as anti-cancer medications in the future, further research is necessary. The greatest total oxidant was used to assess the methanolic extract using ascorbic acid as a standard analysing agent. 75.5 ug is the activity value that was observed. High antioxidative activity was shown by the sample's high absorbance value. High levels of antioxidants in mushrooms can inhibit oxygen species linked to aging-related illnesses in humans. So, this mushroom might be developed into functional foods and drugs in future.

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