WWJMRD 2017; 3(12): 208-210
www.wwjmrd.com
International Journal
Peer Reviewed Journal
Refereed Journal
Indexed Journal
UGC Approved Journal
Impact Factor MJIF: 4.25
e-ISSN: 2454-6615

Arpita Bhakta
Research scholar
Shri J.J.T University
Chudela, Jhunjhunu,
Rajasthan, India

Rajarshi De
NSOU College, Chudela,
Jhunjhunu, Rajasthan, India

Kartik Maiti
Raja N.L. Khan Women's
College, Chudela, Jhunjhunu,
Rajasthan, India

Correspondence:
Arpita Bhakta
Research scholar
Shri J.J.T University
Chudela, Jhunjhunu,
Rajasthan, India

Study of Antibacterial Potentiality of Mushroom

Arpita Bhakta, Rajarshi De, Kartik Maiti

Abstract
Antimicrobial efficiency of seven mushroom were examined using water ,acetone and chloroform as solvent and tested against five human pathogen like Klebsielia pneumonia, Shigella dysentery, Staphylococcus aureus, Salmonela typhi, and Escherichia coli.Among the test mushrooms ,four are edible (Agaricus bisporus,Agaricus campestris,Lactarius piperatus, Pleurotus ostreatus) and three are wild (Calvatia rubroflava,Ganoderma applanatum, Lentinus praerigidus). Acetone and water extracts of Calvatia rubroflava show slight increase in the antimicrobial potentialities by 14 &11 mm against the pathogens Salmonella typhi & Staphylococcus aureus respectively .Again acetone extracts of Agaricus campestris tagged with silver nanoparticle showed inhibition zone of 11mm against the pathogen Escherichia coli.Klebsielia pneumonia,Shigella dysentery, Staphylococcus aureus , Salmonela typhi and Escherichia coli were resistant to all extracts of Agaricus bisporus,Lactarius piperatus, and Lentinus praerigidus.Acetone extracts of Pleurotus ostreatus and water extract of Agaricus campestris along with silver nanoparticle had no antimicrobial activity against Staphylococcus aureus,Salmonela typhi ,and Escherichia coli . The effect of mushroom extract and nano particle could be possible new way to treat infections as well as general sanitization.

Keywords: Antimicrobial activity, edible mushroom, wild mushroom, nanoparticle

Introduction
Mushroom are fruit bodies of macroscopic, filamentous and epigeal fungi and they are made up of hyphae which forms interwoven web of tissues known as mycelium in the substrate upon which the fungus feeds (Ola et al., 2001).It is a macro fungus with distinctive fruit bodies, which can be hypogenous, large enough to be seen in naked eye. From the taxonomic point of view, mainly basidiomycetes but also some species of ascomycetes belongs to mushroom. Often their mycelia are buried in the tissue of a tree trunk, or a fallen log of wood or in other nourishing substrate. Those that are common belongs to the following species;Termitomyces sp.,Agaricus sp.,Plerotus sp.,Lentinus sp.,Trametes sp.,Poria sp.,etc.

Materials &Methods:
1. Chemicals-Nutrient agar was bought from Himedia Pvt. Ltd. Mumbai. All other chemicals procured are of analytical grade.
2. Sampling of mushroom-Fresh edible mushroom were collected in the month of September and October from the nearest market, and non-edible mushroom were collected from Guurgiripal, Paschim Medinipur.
3. Extraction-Desired amount of fresh mushrooms were cut into small pice and mixed with extracting solvent like water ,acetone, and chloroform in a ratio of 2.5(w/v).Samples were kept in water, acetone and chloroform for 24h at 37°C in shaking condition at 130rpm.
4. Microorganisms-Antibacterial activity of the mushroom extract was tested against five pathogenic microorganisms (S. Aureus,K.pneumoniae,S.dyscentry,E.coli and S.typhi) were collected from the Swami Vivekananda Tribal College of the Teacher Education. Pathogenic bacteria were grown on nutrient broth at 37°C for 24h.
5. Synthesis nanoparticle-
   a. Preparation of 7-nm silver nanoparticle-A total of 100mL of $AgNO_3$ 0.001 M awas placed in a 250 ml reaction vessel. Under magnetic stirring, 10 ml of deionized water containing 0.01 g of gallic acid was added to the Ag^+ solution.

b. Preparation of 29-nm silver nanoparticle:-A total of 0.0169 g of $AgNO_3$ was dissolved in 100ml of deionized water and this solution was placed in a 250 ml reaction vessel. A total of 0.01 g of gallic acid was dissolved in 10 ml of deionized water and under magnetic stirring were added to the Ag^+ solution.

6. Characterization of silver nanoparticle- The produced Nano particles were characterized by UV-Vis spectroscopy using a Hitachi UV- Vis spectrophotometer.
7. Coating of mushroom extract on nanoparticle- For coating of mushroom extract on Nano particles, 2ml of nanoparticle (7nm and 29nm individually)were mixed with 2ml of mushroom extract and incubated at 40°C for 24hour (Sastry et al.,2003).
8. Antimicrobial susceptibility testing- The primary screening antibacterial potentialities of mushroom extracts were evaluated by agar well diffusion method (Olutioal et.al., 1991) using nutrient agar medium. The microorganisms were activated by inoculating a loopful of the strain in the nutrient broth (25ml) in a 100ml Erlenmeyer flask and incubated at 37°C on a rotary shaker for 36 h. Then 0.1 ml of fresh inoculums was spread onto the surface of sterile nutrient agar plate using a sterilized glass spreader. The collected different extracts (50µl) were dispended into the well. Then the plates were incubated aerobically at 37°C (for bacteria).The zone of inhibition (mm) of the different extracts were examined after 24h.

Result & Discussion

Primary screening for antimicrobial susceptibility

The antibacterial activities of seven species of mushroom (Agaricus bisporus, Agaricus campestris,Lactarius piperatus, Ganoderma applanatum, Calvatia rubroflava, Pleurptus ostreatus,Lentinus praerigidus) extracts were determined by agar well diffusion method against five pathogenic isolated (Staphylococcus aureus,Shigella dysentery,Escherichiacoli,Klebsielia pneumonia,Salmonela typhi). Amongst the solvent extracts obtained from A campestris showed an effective inhibitory activity against E. Coli(9mm) and also acetone extract of C. Rubroflava showed inhibitory activity against S typhi (12mm) as seen table 1.

Water extract also played an immense role.Water extract showed inhibitory zone the maximum in case of S. Typhi (15mm) for P. Ostreatus. But it is good enough to give it activity against S. aureus in both case of G. Applantatum(13mm) and C. Rubroflava (9mm).

Table 1. Antimicrobial activity (Zone of inhibition, mm) of various mushroom extracts [water (W), chloroform (C) and acetone (A)] against pathogens.

Name of the mushroom	Name of the organism														
	S. aureus			Sh. dysentery			K. pneumonia			E. coli			S.typhi		
	W	C	A	W	C	A	W	C	A	W	C	A	W	C	A
Agaricus bisporus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Agaricus campestris	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-
Lactarius piperatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ganoderma applanatum	13	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calvatia rubroflava	9	-	-	-	-	-	-	-	-	-	-	-	-	-	12
Pleurotus ostreatus	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-
Lentinus praerigides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

No, other extract was capable enough to show the inhibitory zone against the pathogens, and also, mushroom extracts have a lower antimicrobial activity as to comparison to antibiotic activity which was studied earlier.

Secondary screening for antimicrobial susceptibility

Secondary screening was done along with silver nanoparticle that is coated with mushroom extract (showing positive result). The experiments were done in the combination of [Nanoparticle-Mushroom extract coated nanoparticle] in each plate against three pathogenic Microorganisms namely S. aureus, E. coli and S. Typhi.

The silver nanoparticle (7nm and 29nm) coated acetone extract of Calvatia rubroflava showed (table 2) 12 and 14 nm of inhibition zone against S. Typhi respectively.

The silver nano particle (7 nm) coated acetone extract of Agaricus campestris show 11 mm against E. Coli while on the other hand the silver nanoparticle (29nm) coated acetone extract of Agaricus campestris show no inhibition zone against E.coli.

The water extract of Agaricus campestris coated on silver nanoparticle showed no inhibition zone against any pathogen.

Table .2: Antimicrobial activity (zone of inhibition, mm) of various mushroom extract along with silver nanoparticle [Sample (E), nano particle (N), and Sample extract coated nanoparticle (NE)] against pathogens.

Name of the Mushroom	Size of the nanoparticles	Solvent	Name of the organism								
			S.typhi			E. coli			S. aureus		
			E	N	EN	E	N	EN	E	N	EN
Calvatia rubroflava	7	Acetone	12	-	14	-	-	-	-	-	-
		Water	-	-	-	-	-	-	9	-	11
	29	Acetone	12	-	14	-	-	-	-	-	-
		Water	-	-	-	-	-	-	9	-	-

Agaricus campestris	7	Acetone	-	-	-	9	-	11	-	-	-
		Water	-	-	-	-	-	-	-	-	-
	29	Acetone	-	-	-	9	-	-	-	-	-
		Water	-	-	-	-	-	-	-	-	-
Pleurotus ostreatus	7	Acetone	-	-	-	-	-	-	-	-	-
		Water	15	-	-	-	-	-	-	-	-
	29	Acetone	-	-	-	-	-	-	-	-	-
		Water	15	-	-	-	-	-	-	-	-

Discussion

Antimicrobial activity of extracts of mushroom species (Agaricus bisporus,Agaricus campestris,Lactarius piperatus,Ganoderma applanatum,Calvatia rubroflava, Pleurotus ostreatus,Lentinus praerigidus) were studied. In the total observation obtained from the different solvent extract of the mushroom species were relatively low and this could be probably due to the extraction methods employed. Calvatia rubroflava showed antibacterial activity agaist Salmonella typhi (14mm). Against Escherichia coli,Agaricus campestris with nanoparticle extract showed inhibition zone (11 mm). Acetone and silver nanoparticle of Pleurotus ostreatus showed no activity.

Conclusion

Variations in the antimicrobial activities of mushroom may be due to the difference in their bioactive compositions or concentration, methods of extraction and mechanism of action ingredients in these edible mushrooms. Based on this result of this study, it can be concluded that non-edible mushrooms possessed a low –spectrum activity. Acetone proceeds to be a useful solvent in finding out the antimicrobial activity. Diameter differences of nanoparticle are responsible for anti-bacterial properties for identification of targets. However, further experimental and clinical studies are needed to identify mechanism of action, optimal dosing, efficacy, and safety alone or in combination with nanoparticles.

References

1. Anke T. (1989), Basidiomycetes: A source for new bioactive secondary metabolites. Prog. Indust, Microbial.27:51-66.
2. Conchran,K.W.S.T.,Chang,W.A.,Hayes (eds.).(1978).Medicinal effects ,In: The Biology and Cultivation of Edible Mushroom.Academic press,New York,162-187.
3. Demain AL., (1999), pharmaceutically active secondary metabolites of microorganism's .Appl.Microbiol.Biotechnol.52:455-463.
4. Eo Sk,Kim YS,Lee CK and Han SS.(1999).Antiviral activities of various water and methanol soluble substances isolated from Ganoderma lucidum.J.Ethnopharmacol.**68:**129-136.
5. Fasidi Io. And Kadiri M. (1995). Toxicological screening of seven Nigerian mushrooms.Food Chem.**52**:419-422.