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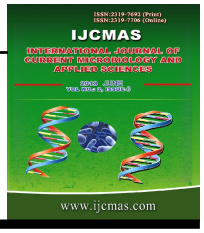

Original Research Article

Studies on the antibacterial activities of mushroom

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A B S T R A C T

Mushrooms have been cultivated worldwide for commercial purposes. However, little research has been done to ascertain the antibacterial properties of indigenous edible mushrooms. Four species of cultivated and wild varieties were taken for the present study. Among the cultivated species Ganoderma shows inhibitory activity against *Bacillus sp., Staphylococcus aureus., Escherichia coli, Klebsiella sp*.,and all other cultivated species like *Pleurotus obstreactus, Lentinus edodes, Agaricus bisporus* shown no inhibitory activity until 48 hours of incubation . In the wild species strain 1 shows activity against Bacillus sp., and Staphylococcus aureus and other strains didn't show any such activity. The results obtained in this study suggest that the cultivated varieties doesn't show any antibacterial activity due to alteration of genes and loss of microbial activity by continuous sub culturing from mother spawn and the wild varieties shows some activity confirms that they posses such character in a given natural population

Keywords

Antibacterial; Bacteria; cultivated strains; mushroom; wild strains.

Introduction

Mushroom is a macro fungus with a distinctive fruiting body that is large enough to be seen by the naked eyes. It includes both edible and non edible species. Some mushrooms serve as food because of their nutrient contents while some have been used extensively in traditional medicine (Stamets, 2000). Of the hundreds of known mushroom varieties, several have been studied for their ability to enhance the human immune system and fight infections. They are known to posses all essential aminoacids, minerals, vitamins recommended as a food especially to the under developed has become a real threat to human health. In fact, mushrooms have a definite primary and secondary physiological effects on the human immune modulating, antibacterial, antiviral, antitumor, antiparasitic, cardiovascular effects. Intake of some varieties can reduce total cholesterol level and also affect glycemic levels and inflammatory conditions. In the 20^{th} century, a study in Japan found three kinds of antibacterial substances in Shiitake mushrooms that were effective against *Streptococcus* sp., *Actinomyces* sp., *Lactibacillus* sp., *Prevotella* sp., *Porphyromonas* sp., of oral origin.

In the present study a few strains of mushrooms were tested for their antibacterial activities against known bacterial cultures.

Materials and Methods

Sources of mushrooms

Some quantities of four different mushroom species such as *Ganoderma, Pleurotus obstreactus, Lentinus edodes, Agaricus bisporus* were purchased from local markets and four different wild strains were collected from field sides.

Extraction of mushroom

Fresh mushrooms were thoroughly washed with clean water and alcohol for surface sterilization cut into pieces and air-dried. Each of the different air-dried mushroom samples were respectively collected and boiled with distilled water and the extracts were separated (crude extract) stored (4ºC) in a clean sterile container for further use. Glassware used in present work were thoroughly washed and dried. They were done sterilized at 180°C for one hour in a hot air oven.

Sources of Microorganisms

Pure culture of Staphylococcus aureus, *Klebsiella pneumoniae, Escherichia coli, Pseudomonas aeruginosa, Bacillus* sp., were obtained from bacteriology laboratory and was sub-cultured on nutrient agar to ensure the purity of the culture and the pure isolate identified and used for present study.

Antibacterial activity

Medically important bacteria such as *Staphylococcus aureus, Klebsiella pneumoniae, Escherichia coli, Pseudomonas aeruginosa, Bacillus sp.,* were swabbed in the selective media under sterile conditions. Sterile disc was dipped in the crude extract of mushrooms was placed in the media containing bacteria. After over night incubation the plates were observed for the appearance of zones. The results were noted.

Results and Discussion

Antibacterial activity of Ganoderma strain

In the analysis the Ganoderma strain were tested against five bacterial species. It shows medium inhibitory action against *Bacillus* sp., on Nutrient agar and *Staphylococcus aureus* on Mannitol salt agar during the incubation period of 24 hours and low inhibitory action against Escherichia coli on Endo agar and *Klebsiella pneumoniae* on CLED during the incubation period of 24 hours respectively. But against *Pseudomonas aeruginosa* on Cetrimide agar no zone was observed, it shows that the organism is resistant against the strain (Table 1)

Antibacterial activity of wild strain 1

In the analysis the Wild strain 1 was tested against five bacterial species. It shows medium inhibitory action against *Bacillus* sp., on Nutrient agar and *Staphylococcus aureus* on Mannitol salt agar during the incubation period of 24 hours respective. But against *Escherichia coli* on Endo agar, *Klebsiella pneumoniae* on CLED and *Pseudomonas aeruginosa* on Cetrimide agar no zone was observed, it shows that the organism is resistant against the strain (Table 2).

Antibacterial activity of Wild strain (2,3,4)

In the analysis the Wild strain (2,3,4) were tested against five bacterial species such as

Bacillus sp., on Nutrient agar shows medium inhibitory activity . But against *Staphylococcus aureus* on Mannitol salt agar , Escherichia coli on Endo agar and *Klebsiella pneumoniae* on CLED and *Pseudomonas aeruginosa* on Cetrimide agar no zone were observed until 48 hours of incubation, it shows these species were resistant against the strain (Table 3).

Antibacterial activity of *Lentinus edodes* strain

In the analysis the *Lentinus edodes* strain were tested against five bacterial species such as Bacillus sp., on Nutrient agar, *Staphylococcus aureus* on Mannitol salt agar , *Escherichia coli* on Endo agar and *Klebsiella pneumoniae* on CLED and *Pseudomonas aeruginosa* on Cetrimide agar . No zone were observed until 48 hours of incubation, it shows these species were resistant against the strain (Table 4).

Antibacterial activity of *Agaricus biporus*

In the analysis the *Agaricus biporus* strain were tested against five bacterial species such as *Bacillus* sp., on Nutrient agar, *Staphylococcus aureus* on Mannitol salt agar , *Escherichia coli* on Endo agar and *Klebsiella pneumoniae* on CLED and *Pseudomonas aeruginosa* on Cetrimide agar . No zone were observed until 48 hours of incubation. it shows these species were resistant against the strain (Table 5).

Antibacterial activity of *Pleurotus obstreactus*

In the analysis the *Pleurotus obstreactus* strain were tested against five bacterial species such as *Bacillus* sp., on Nutrient agar, *Staphylococcus aureus* on Mannitol salt agar , *Escherichia coli* on Endo agar and *Klebsiella pneumoniae* on CLED and *Pseudomonas aeruginosa* on Cetrimide agar. No zone was observed until 48 hours of incubation, it shows these species were resistant against the strain (Table 6).

On the whole, the mushrooms studied were found to be a good source of protein, fibre and minerals. For the present study four species of cultivated and wild varieties were taken to assess their antibacterial activities. Among which the cultivated species Ganoderma shows inhibitory activity against Bacillus sp., Staphylococcus aureus., *Escherichia coli*, *Klebsiella* sp., and all other cultivated species like *Pleurotus obstreactus*, *Lentinus edodes*, *Agaricus bisporus* shown no inhibitory activity until 48 hours of incubation . In the wild species strain 1 shows activity against *Bacillus* sp., and *Staphylococcus aureus* and other strains didn't show any such activity. The results obtained in this study suggest that the cultivated varieties doesn't show any antibacterial activity due to alteration of genes and loss of microbial activity by continuous sub culturing from mother spawn and the wild varieties shows some activity confirms that they posses such character in a given natural population. Boiling or cooking did not dilute or reduce the medicinal properties. Hence, it is necessary to identify the biological and pharmacological potential of mushrooms especially edible mushrooms that are collected indigenously and cultivated

Table.1 Antibacterial activity of Ganoderma strain

Organisms	Media	Incubation period	Inhibitory activity
Bacillus sp	NA	24 hours	++
Staphylococcus aureus	MSA	24 hours	++
Escherichia coli	ENDO	24 hours	+
Pseudomonas aeruginosa	CETRIMIDE	24 hours	_
Klebsiella pneumoniae	CLED	24 hours	+

++ - Medium inhibition; +- Low inhibition; - No inhibition.

Table.2 Antibacterial activity of wild strain1

Organisms	Media	Incubation period	Inhibitory activity
Bacillus sp	NA	24 hours	++
Staphylococcus aureus	MSA	24 hours	++
Escherichia coli	ENDO	24 hours	_
Pseudomonas aeruginosa	CETRIMIDE	24 hours	_
Klebsiella pneumoniae	CLED	24 hours	_

++ - Medium inhibition;+- Low inhibition;- No inhibition.

Table.3 Antibacterial activity of Wild strain(2,3,4)

Organisms	Media	Incubation period	Inhibitory activity
Bacillus sp	NA	24 hours	+
Staphylococcus aureus	MSA	24 hours	_
Escherichia coli	ENDO	24 hours	_
Pseudomonas aeruginosa	CETRIMIDE	24 hours	_
Klebsiella pneumoniae	CLED	24 hours	_

++ - Medium inhibition;+- Low inhibition;- No inhibition.

Table.4 Antibacterial activity of *Lentinus edodes* strain

Organisms	Media	Incubation period	Inhibitory activity
Bacillus sp	NA	24 hours	_
Staphylococcus aureus	MSA	24 hours	_
Escherichia coli	ENDO	24 hours	_
Pseudomonas aeruginosa	CETRIMIDE	24 hours	_
Klebsiella pneumoniae	CLED	24 hours	_

++ - Medium inhibition;+- Low inhibition;- No inhibition.

Table.5 Antibacterial activity of *Agaricus biporus*

Organisms	Media	Incubation period	Inhibitory activity
Bacillus sp	NA	24 hours	_
Staphylococcus aureus	MSA	24 hours	_
Escherichia coli	ENDO	24 hours	_
Pseudomonas aeruginosa	CETRIMIDE	24 hours	_
Klebsiella pneumoniae	CLED	24 hours	_

++ - Medium inhibition;+- Low inhibition;- No inhibition.

Table. 6 Antibacterial activity of *Pleurotus ostreatus*

Organisms	Media	Incubation period	Inhibitory activity
Bacillus sp	NA	24 hours	_
Staphylococcus aureus	MSA	24 hours	_
Escherichia coli	ENDO	24 hours	_
Pseudomonas aeruginosa	CETRIMIDE	24 hours	_
Klebsiella pneumoniae	CLED	24 hours	_

++- Medium inhibition; +- Low inhibition;- No inhibition.

locally or sold in local and international market. The production and marketing of mushrooms and their products is vital for an economic importance. Therefore, it is also necessary to intensify research in identifying and isolating different varieties of mushrooms having nutraceutical and medicinal properties and to commercialize their production and marketing, which will boost the food industry and create employment especially in village

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