EVALUATION OF ANTIBACTERIAL POTENTIALS OF SOME EDIBLE MUSHROOM SPECIES

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Abstract

Edible mushrooms are nutritionally endowed fungi. They serve as repositories of several phytochemical constituents and biomolecules that are responsible for the antimicrobial, antitumor activities etc. Hence a study was undertaken to test the presence of phytochemical constituents and antibacterial activity of five edible mushroom species. Aqueous extract of mushrooms exhibited antibacterial activity against oral bacterial isolates and the degree of inhibition varied with the mushroom species.

Keywords: Antibacterials, Mushrooms, Phytochemicals, Zone of inhibition

Introduction

Mushrooms are known for protein rich food and they have long been appreciated for their flavor and texture. There are thousands of different mushroom species and about 700 species have significant pharmacological properties. Edible mushrooms are valuable source of biologically active compounds (Miles and Chang, 2004). Both fruiting bodies and the mycelium of mushrooms contain compounds with wide range of antimicrobial activity (Mehmet et al., 2009). In recent years, multiple drug resistance in human pathogenic microorganisms has developed due to indiscriminate use of commercial antimicrobial drugs, commonly used in the treatment of infectious diseases. Attempts have been made in many parts of the world to explore the use of mushrooms and their metabolites for the treatment of a variety of human ailments. Hence, this study was attempted with the objective of evaluating the antibacterial activity of aqueous extract of Agaricus bisporus, Calocybe indica, Hypsizygus ulmaris, Pleurotus ostreatus and Pleurotus platypus against oral bacterial isolates.

Materials and Methods

Collection of mushroom species

Five different mushroom species were used in this study. Agaricus bisporus and Calocybe indica were procured from Karpaga Vinayagar Mushroom Farm, Madurai. Pleurotus platypus and Hypsizygus ulmaris were obtained from Tamil Nadu Agricultural University, Coimbatore. Pleurotus ostreatus was obtained from Tamil Nadu Agricultural University, Madurai. Fruiting bodies were collected and were dried in hot air oven at 40°C. The dried fruiting bodies were ground to powder and stored in air tight container at room temperature for further work.

Preparation of aqueous extract (Johnsy and Kaviyarasan, 2014)

Ten gram of mushroom powders were extracted by using a soxhlet extractor for 3 hours with 100 ml of distilled water under reflux conditions and the extracts were used for qualitative testing of phytochemicals. The
water extracts were dried in a freeze drier and used for antimicrobial study.

**Phytochemical screening**

Presence of alkaloids, flavonoids, phenols, saponins, tannins in aqueous extracts of mushroom powders was qualitatively tested.

**Alkaloids (Edeoga et al., 2005)**

To 1ml of aqueous extract, 5 ml of dilute sulphuric acid was added and distributed into equal portions. Few drops of Mayers reagent was added to one portion and 2-3 drops of Dragendorffs reagent was added to another portion. Formation of white precipitate with Mayers reagent and reddish brown color with Dragendorffs reagent indicates the presence of alkaloids.

**Flavonoids (Harborne, 1973)**

Five ml of dilute ammonia solution was added to 5ml of aqueous filtrate of each mushroom species. To this mixture, 2 drops of Concentrated H₂SO₄ was added and observed for yellow colouration.

**Total Phenols (Harborne, 1998)**

One ml of aqueous extract was heated to remove the solvent and the residue was taken in a little of aqueous methanol (Merk, India). To this, 0.5% Ferric chloride solution was added and the change in color indicated the presence of phenols.

**Saponins (Edeoga et al., 2005)**

Five ml of aqueous extract was boiled with 20 ml of distilled water in water bath and filtered. Ten ml of the filtrate was mixed with 5 ml of distilled water and shaken vigorously for a stable persistent Froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously. Formation of emulsion indicated the presence of saponins in the mushroom aqueous extract.

**Tannins (Harborne, 1998)**

A few drops of 0.1% Ferric chloride solution was added to the extracts and observed for brownish green or a blue – black coloration.

**Antibacterial activity of aqueous extract of mushroom species (Surekha et al., 2011)**

In the present study, aqueous extract of five mushroom species was screened for the antibacterial activity (Plates 2-7) and the results are presented in Table.2. The results show that alkaloids, flavonoids, phenols, saponins and tannins were present in *Agaricus bisporus* and *Pleurotus ostreatus*. *Calocybe indica* showed the presence of all the phytochemicals except alkaloids. Phenols and saponins alone were present in *Hypsizygus ulmaris* whereas only alkaloids and phenols were found in *Pleurotus platypus*.
Table 1: Phytochemical constituents of aqueous extract of mushroom species

<table>
<thead>
<tr>
<th>Phytochemicals</th>
<th>Agaricus bisporus</th>
<th>Calocybe indica</th>
<th>Hypsizygus ulmaris</th>
<th>Pleurotus ostreatus</th>
<th>Pleurotus platypus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloids</td>
<td>+ve</td>
<td>-ve</td>
<td>-ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>+ve</td>
<td>+ve</td>
<td>-ve</td>
<td>+ve</td>
<td>-ve</td>
</tr>
<tr>
<td>Phenols</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>Saponins</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
<td>+ve</td>
</tr>
<tr>
<td>Tannins</td>
<td>+ve</td>
<td>+ve</td>
<td>-ve</td>
<td>+ve</td>
<td>-ve</td>
</tr>
</tbody>
</table>

Table 2: Effect of aqueous extract of mushroom species on oral bacterial isolates

<table>
<thead>
<tr>
<th>Oral Bacterial Isolates</th>
<th>Zone of inhibition in (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Agaricus bisporus</td>
</tr>
<tr>
<td>Isolate 1</td>
<td>9</td>
</tr>
<tr>
<td>Isolate 2</td>
<td>9</td>
</tr>
<tr>
<td>Isolate 3</td>
<td>Nil</td>
</tr>
<tr>
<td>Isolate 4</td>
<td>14</td>
</tr>
<tr>
<td>Isolate 5</td>
<td>14</td>
</tr>
</tbody>
</table>

Plate 1: Edible mushrooms used in this study

Plate 2: Pure Culture Of Oral Isolates

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Oral isolate 1

Oral isolate 2

Oral isolate 3

Oral isolate 4

Oral isolate 5

Plate 3: Effect of Aqueous Extract Of Mushroom Species on Oral Isolate 1


Plate 4: Effect of Aqueous Extract Of Mushroom Species on oral Isolate 2
Plate 5: Effect of Aqueous Extract Of Mushroom Species on Oral Isolate 3

Plate 6: Effect of Aqueous Extract Of Mushroom Species on Oral Isolate 4

Plate 7: Effect of Aqueous Extract Of Mushroom Species on Oral Isolate 5
Discussion

Edible mushrooms are commonly thought to have nutritional value. They have phytochemical constituents and they produce a wide range of secondary metabolites having medicinal value (Jayakumar et al., 2009, Asuquo and Etim, 2011). In this perspective, results of the present study showed the presence or absence of phytochemical constituents in the selected edible mushroom species and their antibacterial activity against bacterial isolates. The extracts of mushroom species showed activity against bacterial isolates as reported earlier (Jonathan et al., 2003, Barros et al., 2007). In this study the mushroom species exhibited varying activity against oral bacterial isolates. The spectrum of antibacterial activity may be attributed to the presence of phytochemicals of various chemical types in mushrooms (Johnsy and Kaviyarasan, 2014). The present findings suggest that further extraction and characterization of phytochemicals from edible mushrooms followed by testing their activity against infectious disease causing bacteria may help the researchers to develop novel drugs from mushrooms.

References