ANTIFUNGAL ACTIVITY OF NELUMBO NUCIFERA EXTRACT AGAINST THE DERMATOPHYTES

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ABSTRACT

Nelumbo nucifera flower used in traditional systems of medicine, Natural products, especially plants have been used in the treatment of varies diseases for thousands of years. The present work deals with the antifungal activity of Nelumbo nucifera flower against the silver nanoparticles. Dandruff is a major public health burden in both developed and developing countries. Nelumbo nucifera (lotus) plant derived agents are being used for the treatment of dandruff. Aqueous extract of lotus flower Nelumbo nucifera (lotus) was studied for antifungal properties against the dermatophytes, such as Trichophyton, Malassezia furfur, and candida. Three different types of compounds were separated to different time intervals (C-I, C-II and C-III) by using column chromatography and tested for disc diffusion test. The compound – III gave the maximum zone of inhibition. The results were compared with silver nanoparticles (Ag-NPs). The antifungal activity was significantly increased in the Ag-NPs.

INTRODUCTION

Nelumbo nucifera is a monogeneric plant belongs to the family Nelumbonaceae, commonly known as sacred Indian lotus, Nelumbo nucifera is a perennial ornamental water plant grown in Asian countries for its edible rhizomes and seeds.

Dermatophytosis is a superficial fungal infection in keratinized substrates and caused by a group of filamentous fungi called dermatophytes. Among these fungi, Trichophyton rubrum (T. rubrum) is known to account for as many as 69.5% of all dermatophyte infections [2, 3, 4]. Silver or silver ions have long been known to have strong inhibitory and bactericidal effect as well as a broad spectrum of antimicrobial activities. It is expected that the high specific surface area and high fraction of surface atoms of silver nano particles will lead to high antimicrobial activity compared to bulk silver metal [8]. Silver nanoparticles (NPs). Recent studies revealed the effects of silver NPs on some species of fungi particularly candida genus. However, only few studies have been performed for the mention effects on dermatophytes fungi such as Trichophyton rubrum [1, 5]. To the best of our knowledge, there is no study carried out for other dermatophyte pathogens such as Malassezia furfur, and Tinea capitis. In this study, we investigate the effects of compound I, II, and III against the fungal pathogen. The significant compound are identified and compared with silver nanoparticles.

MATERIALS AND METHODS

Collection of the plant

The plant Nelumbonucifera was collected from moist regions of Tirichirappalli District and identified by local flora. The flower were separated from the collected plant and dried under shade. After drying, it was powdered and used for our studies.

Continuous extraction – using column apparatus

Column chromatography is used to purify liquids by separating an organic solvent from a mixture of solvent. The flower extract was prepared by grinding the mixture in mortar pistol containing 22 ml of acetone, 3ml petroleum
ether and calcium carbonate. The pigments was filtered and mixed with 20 ml petroleum ether and 20ml of 10% aqueous sodium chloride solution. The separating funnel was shaken carefully and the lower layer was allowed to drain in to the beaker plug of cotton is placed to the bottom of the column so that silica and soil won’t fall out. Slurry of silica was prepared and poured into the column carefully. It is allowed to settle and sand is added. The sample was added using a pasture’s pipette carefully above the sand. The eluent is added on top of the sand .The mobile phase slowly flows down through the silica gel column by gravity leaving behind zone of colour and a component was eluted from the column.

Experimental procedures involved in the synthesis of silver nanoparticles using plant extract

10 g of *Nelumbo nucifera* flower were boiled in 100ml of distilled water contained in the conical flask. The resulting filtrate (12ml) was taken and treated with 88ml of aqueous 1 mM AgNO3 solution and incubated in dark condition, at room temperature. Appearance of brownish yellow coloured solution indicates the formation of AgNPs. The previous studies showed that nano-Ag [6, 7, 8] but the effects of nano-Ag against fungal pathogens of the skin including clinical isolates of *Trichophyton rubrum Malassezia furfur, and Tinea capitis*. Species are mostly unknown. The primary significance of this study is the observation that nano-Ag could inhibit the growth of dermatophytes, which cause superficial fungal infections. To our knowledge, this is the first study to apply nano-Ag successfully to dermatophytes. Secondly, the fact that preparation method of nano-Ag described here is cost-effective is also of importance. Therefore, it could be expected that nano-Ag may have potential as an anti-infective agent for human disease caused by dermatophytes.

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Antifungal agent</th>
<th>Name of the fungi</th>
<th>Concentration (μg)</th>
<th>Standard (mm)</th>
<th>Observed (mm)</th>
<th>(X^2=(O-E)^2)</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><em>Nelumbo nucifera</em></td>
<td><em>T. rubrum</em></td>
<td>64</td>
<td>18</td>
<td>19</td>
<td></td>
<td>0.555</td>
</tr>
<tr>
<td>2</td>
<td>flower powder</td>
<td><em>M. furfur</em></td>
<td>64</td>
<td>18</td>
<td>15</td>
<td></td>
<td>0.502</td>
</tr>
<tr>
<td>3</td>
<td>flower powder</td>
<td><em>Candida sps</em></td>
<td>64</td>
<td>18</td>
<td>16</td>
<td></td>
<td>0.222</td>
</tr>
</tbody>
</table>

Table value \(X^2\) (0.05) = 3.481
Chi square value significance at 5% level
Table 2. Zone of inhibition by silver nanoparticles of *Nelumbo nucifera* flower against Dermatophytes

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Antifungal agent</th>
<th>Name of the fungi</th>
<th>µg</th>
<th>Zone of the inhibition in diameter</th>
<th>X²=(O-E)²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Standard (mm)</td>
<td>Observed (mm)</td>
</tr>
<tr>
<td>1.</td>
<td>Nelumbo nucifera silver nanoparticles</td>
<td><em>T. rubrum</em></td>
<td>64</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>2.</td>
<td></td>
<td><em>M. furfur</em></td>
<td>64</td>
<td>18</td>
<td>17</td>
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<tr>
<td>3.</td>
<td></td>
<td><em>Candida sps</em></td>
<td>64</td>
<td>18</td>
<td>17</td>
</tr>
</tbody>
</table>

Table value X² (0.05) = 3.481
Chi square value significance at 5% level

**Fig 1. Zone of inhibition by silver nanoparticles**
A - *Trichophyton rubrum*  
B - *Malassezia furfur*  
C - *Tinea capitis*

**Fig 2. Zone of inhibition by silver nanoparticles**

**Fig 3. Zone of inhibition by silver nanoparticles**

**CONCLUSION**

The present work concludes that 64µg concentration of *Nelumbo nucifera* powder more suitable to inhibit the dermatophytes such as *Malassezia furfur*, *Trichophyton rubrum* and *candida sps*. From the above preliminary study comparing with silver nanoparticles, we conclude that the silver nanoparticles from aqueous extract of *Nelumbo nucifera* proved to be one of the herbal remedies for dermatophytes. We recommend that the *Nelumbo nucifera* is more suitable to inhibit the dandruff organisms.

**REFERENCES**