Does *Wrightia tinctoria* incapacitate *E. coli*, *Pseudomonas*, *Staphylococcus* and Candida-a New Finding?!

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**Abstract**

*Introduction:* Health threat post by *E. coli* and species of the genus *Pseudomonas*, *Staphylococcus* and *Candida* are well known. Further, the emerging drug resistance and the capability of these organisms to skip the immune surveillance and develop simultaneous resistance against several antibiotics pose great challenge to the medical world.

**Objective:** This study was taken up to find the efficacy of the herb *Wrightia tinctoria* in inhibiting the growth of these pathogens at lower concentration.

**Results:** The herb was found to reduce the growth of *E. coli* by 77% and 98-99% reduction was observed in case of other three microorganisms. **Discussion:** The results of this study certainly confirm the broad spectrum antimicrobial activity of the herb *W. tinctoria*, but the results may vary when it comes to clinical scenario as the experiment was carried out in laboratory medium.

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1. Introduction

Health threat post by *E. coli* and species of the genus *Pseudomonas*, *Staphylococcus* and *Pseudomonas*, *Staphylococcus* are well known. Further, the emerging drug resistance and the capability of these organisms to skip the immune surveillance and develop simultaneous resistance against several antibiotics pose great challenge to the medical world. (Kumar M. et al., 2016; Hirsch et al., 2010; Ikram et al., 2015; Prasad et al., 1995).

In the above circumstances, exploring the possible role of herbs mentioned to have enormous therapeutic values in Indian systems of medicine to combat these pathogenic microbes cannot be excluded. (Sharma et al., 2009). The plant *Wrightiatinctoria* enjoys a princely status in Siddha system of medicine due to its multi-vari-al medicinal benefits including curative value for Psoriasis. (Khyade et al., 2014) One of the well-stated benefits of *W. tinctoria* is the antimicrobial property against wide variety of microbes. (Moorthy et al., 2012) However, the earlier findings were less convincing and inconclusive.

Surprisingly, the findings of the present study show that *W. tinctoria* could inhibit the growth of four organisms viz., *E. coli*, *Pseudomonas*, *Staphylococcus* and *Candida* close to near 100% at 1mg/ml concentration. Details are presented in the paper.

2. Objective of Research

To find out the efficacy of the herb *W. tinctoria* in inhibiting the growth of pathogenic microbes at low concentration of 1mg/ml.

3. Materials and Methods

3.1 Collection of Microbes
Pure cultures of *E. coli*, *Staphylococcus*, *Pseudomonas* and *Candida* were collected from Department of Microbiology, Dr. MGR Janaki College for Women, Chennai.
3.2 Collection of Plant and Preparation of Extract
The seeds of *W. tinctoria* were procured from an approved Indian medicinal plant supplier and were subjected to rigorous quality check as per the pharmacopeial standards of Indian medicine.

The seeds were then ground to powder and the powder was subjected to hot extraction using alcohol as solvent. The process of extraction was done for 2 hrs and then the soup was filtered and the filtrate was dried to evaporate the solvent. The final extract was dissolved in 3% DMSO and a stock extract of 2mg/ml was prepared.

3.3 Preparation of Inoculum
Freshly grown cultures of all four microbes in Nutrient broth/ SD broth were used as inoculum.

3.4 Effect of Wrightia tinctoria on Microbial Burden
In brief, macro broth dilution technique was employed. (Reller et al., 2009) A known quantity of inoculum of each organism was inoculated into 1ml of Nutrient/SD broth with and without the alcoholic extract of *W. tinctoria* at 1mg/ml. After 48hrs of incubation, 0.1 ml of the broth from each tube was taken separately and diluted accordingly and then plated. The plates were incubated for the period of 24 hrs. The number of colonies was counted and the total number of colonies perml was calculated by including the dilution factor. The entire experiment was done inquadruplet.

4. Results
*W. tinctoria* has shown very high broad spectrum antimicrobial activity. The extract has reduced the burden of *E.coli* from 1.22 crore to 28.5 lakh (77%). *W. tinctoria* has reduced 99% abundance of other three organisms. (Table 1)

<table>
<thead>
<tr>
<th>Organisms</th>
<th>The reduction of microbial burden</th>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Control (CFU/ml)</strong></td>
<td><strong>Test (CFU/ml)</strong></td>
<td><strong>%</strong></td>
</tr>
<tr>
<td><em>Escherichia coli</em></td>
<td>1,21,77,903</td>
<td>28,54,196</td>
</tr>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>1,36,59,366</td>
<td>40,774</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>1,65,13,562</td>
<td>27,182</td>
</tr>
<tr>
<td><em>Candida albicans</em></td>
<td>1,11,31,364</td>
<td>95,139</td>
</tr>
</tbody>
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5. Discussion
The study has shown clearly that the plant *W.tinctoria* possess broad spectrum antimicrobial effect. (Khyadeet al., 2014) The findings further revalidate the astute wisdom of ancient Siddhars in giving princely status to the plant *W. tinctoria*. Near 100% inhibition of *Pseudomonas, Staphylococcus* and *Candida* assumes greater significance. The question of whether *W. tinctoria* can replace the conventional antibiotics remains doubtful; however, the plant can certainly be used as first choice medicament for treating the infections due to the above pathogens. Although the findings do not either promulgate or believe that 99% reduction of these microbes can be achieved with *W. tinctoria* in clinical conditions as the above findings were generated at laboratory level. The initial load of these microbes from about 1crore getting reduced to 99% assumes greater clinical significance because such high load of microbe is unlikely to be present in infections. Therefore, a reasonable correlation of the laboratory findings and the clinical outcome is possible.

However, we refrain from jumping into such conclusion because of the possible limitations in the present experiment. We advocate the use of *W. tinctoria* as first line of treatment for certain microbial infections purely in the light of both due to the ability of *W. tinctoria* to reduce the burden of these microbesto near 100% and the unlikely drug-resistance by the microbes against this plant.

Dr. JR Krishnamoorthy was the first clinical scientist to revolutionize the treatment of Psoriasis With *W. Tinctoria* oil. (Krishnamurthi et al., 1981) Further, he has established that this plant also can be used for treating dandruff and to boost immunity. (Krishnamurthi JR et al., 2006) Ever since his initial effort to bring *W. tinctoria* into thema in stream therapy of several diseases, many private and government organizations have also started to exploit this plant both for commercial and medical benefit. The additional benefit of *W.tinctoria* in combatting several pathogenic microbes as revealed by the present study makes this plant even more ‘wanted’ medicine in the arena of medical science. The present study also pins ahope for the possible role medicinal plants in treating microbial infections.
**Conclusion**

The herb *W.tinctoria* has been highly effective in the treatment of Psoriasis and many other diseases. Along with all those proven benefits, this study, in addition, confirms its broad spectrum antimicrobial activity giving us a small hope to face and challenge the threat of antimicrobial resistance possessed by these pathogens.

**Research Highlights**

Instead of leaves, extracts of *W.tinctoria* seeds were used in this study.

Three bacteria such as *E.coli, Staphylococcus* and *Pseudomonas* that are used in this study are currently listed under pathogens with greatest risk to human health. (WHO, 2017)

The herb was found to reduce the growth of these pathogens by 70-99% confirming its broad spectrum antimicrobial activity along with its other therapeutic benefits.

**Authors’ Contribution and Competing Interests**

Satarupa Mukherjee- Principal Investigator Aruna. V.- Co-investigator cum contributing author Gayathri.R- Research ideas and guidance

**Acknowledgement**

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**What is ‘very special’ finding/ report of this article?**

*Wrightia tinctoria* herb has received great importance due to its therapeutic benefits in treating Psoriasis. And this study proves its broad spectrum antimicrobial activity giving us a hope for challenging the multi-drug resistant microbes

**References**


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