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## SHORT COMMUNICATION

### **Antimicrobial activity of natural dyes obtained from *Terminalia arjuna* (Roxb.) Wight & Arn barks**

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#### **ABSTRACT**

In the present study to evaluate the antimicrobial activity of *Terminalia arjuna* (Roxb.) Wight & Arn barks. Many of the plant materials, from which natural dyes are obtained, found to have some medicinal values. During the present study, dyeing materials were prepared from barks of *Terminalia arjuna*. The well diffusion method was adopted to examine antimicrobial activity of dyeing material against test organisms. The result showed that the dyeing material of *Terminalia arjuna* was most active for antibacterial (8 mm) and antifungal (7 mm). Results of the present study suggest that the dyeing material of *Terminalia arjuna* has significant antibacterial activity against pathogenic bacteria and fungus.

**Keywords:** *Terminalia arjuna*, Antimicrobial activity, Well diffusion method, Natural dyes

## 1. INTRODUCTION

*Terminalia arjuna* (Wight & Arn.) is an important medicinal plant, belongs to the family Combretaceae. *Terminalia arjuna* is about 20-25 meters tall, deciduous tree found in many parts of the world. It has been reported by various scientist that leaves, shoot, fruit, bark, seed and other part of this plant are found useful in the treatment of many kind of diseases [1]. The bark powder has been found to possess cardioprotective properties, anti-ischemic, antioxidant action [2], hypercholesterolemia effect [3], fungicidal and antibacterial [4], antimicrobial [5], Anti-inflammatory, immunomodulatory and antinociceptive activity [6], it is also useful to cure obesity, hypertension and hyperglycaemia [7]. The higher antioxidant potential of *T. arjuna* stem bark is due to the presence of higher amount of phenolic and flavonoids [8]. The *T. arjuna* based phytochemicals are considered as one of the best heart tonic [9] therefore, it can be used on daily bases as tonic for healthy cardiovascular system.



**Photo 1.** *Terminalia arjuna* (Roxb.) Wight & Arn

Plants have limitless ability to synthesize secondary metabolites such as tannins, terpenoids, alkaloids, flavonoids, glycosides and phenols which have been found to have antimicrobial properties [10-12]. The leaves and bark of *T. arjuna* contain glycosides having cardio protective effect, flavanoids having antioxidant, anti-inflammatory, antimicrobial (luteolin), anti-cancerous and lipid lowering effects, tannins responsible for astringent, wound healing, antioxidant, anti-cancer, anti-viral and antimicrobial activity. In addition to these phytochemicals bark also contains triterpenoids responsible mainly for cardio protective and antibacterial (arjunic acid, arjungenin and, arjunetin) effect [13-15].



**Photo 2.** Bark pieces of *Terminalia arjuna* (Roxb.) Wight & Arn

## **2. MATERIAL AND METHODS**

### **2. 1. Collection of bark materials**

The barks of *Terminalia arjuna* was collected from Hogenakkal Cauvery river, Dharmapuri District, Tamil Nadu. The botanical identity of the plant of was confirmed by Dr. S. John Britto, Rapinat Herbarium, St. Joseph's College, Tiruchirappalli.

## 2. 2. Preparation of Dying Material

The small pieces of *Terminalia arjuna* bark (5 g) was extracted with 40% ethanol at room temperature for one day. The extract was filtered and concentrated under reduced pressure in a rotary evaporator and extracted dying material was boiled with 68 °C than cooled. The dying material were subjected to antimicrobial activity.

## 3. EXPERIMENTAL WORK

### 3. 1. In-vitro antimicrobial activity (Well diffusion method)

The dying material were prepared 100 ppm concentration were used for antimicrobial activity.

### 3. 2. Test microorganisms

Pure cultures of *Bacillus Pumilus*, *Bacillus Cereus*, *Escherichia coli*, *Salmonella* SPS (Gram positive bacteria), *Pseudomonas aeruginosa*, *Staphylococcus aureus* (Gram negative bacteria) specie of bacteria's and *Candida albicans*, *Aspergillus flavus* specie of fungi's were procured from Rontgen Laboratory, Thanjavur. These microorganisms were identified and confirmed by Microbiologists, Department of Microbiology, Thanjavur Medical College, Thanjavur.

### 3. 3. Preparation of 24 hours' pure culture

A loop full of each of the microorganisms was suspended in about 10 mL of physiological saline in a Roux bottle. Each of these was streaked on to the appropriate culture slants and was incubated at 37 °C for 24 hours except for fungal which was incubated at 25 °C for 24 - 48 hours. After completion of incubation period, when growth was observed the tubes were kept into 2-8 °C until use.

### 3. 4. Preparation of dying material solutions for the experiment

The dying material was dissolved in sterile distilled to prepare appropriate dilution to get required concentration. Control used as respective solvent (Aqueous). They were kept under refrigerated condition unless they were used for the experiment. Standard solution as Chloramphenicol for bacteria and fluconazole (25 mg/mL distilled water - 30 µL) for fungi used to compare the test solution. They were kept under refrigerated condition unless they were used for the experiment.

The plates were incubated at 5 °C for 1 hour to permit good diffusion and then transferred to incubator at 37 °C for 24 hours. After completion of 24 hours, the plates were inverted and placed in an incubator set to respective temperature for 24 hours.

### 3. 5. Antimicrobial assay

Antibiogram was done by disc diffusion method (NCCLS, 1993; Awoyinka et al., 2007) [16] using plant extracts. Petri plates were prepared by pouring 30 mL of NA/PDA medium for bacteria/fungi. The test organism was inoculated on solidified agar plate with the help of micropipette and spread and allowed to dry for 10 minutes.

The surfaces of media were inoculated with bacteria/fungi from a broth culture. A sterile cotton swab is dipped into a standardized bacterial/fungi test suspension and used to evenly inoculate the entire surface of the Nutrient agar/PDA plate. Briefly, inoculums containing *Bacillus Pumilus*, *Bacillus Cereus*, *Escherichia coli*, (Gram positive bacteria), *Salmonella SPS*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* (Gram negative bacteria) specie of bacteria were spread on Nutrient agar plates for bacteria and *Candida albicans*, *Aspergillus flavus* specie of funguses were spread on potato dextrose agar for fungus strains. The plates were incubated at 37 °C for 24 hours for the bacteria and 48 hours for fungus at room temperature (30 ±1) for 24-48 hour for yeasts strains. Each sample was tested in triplicate.

#### 4. RESULTS AND DISCUSSION

Result obtained in the present study the antimicrobial activity of the *Terminalia arjuna* bark shown in Table 1 & 2. The result shows dying material of *Terminalia arjuna* was effective against both antibacterial and anti-fungal activities. For antibacterial activity was recorded as the *Escherichia coli* at 6 mm, *Bacillus Pumilus* at 8 mm, *Bacillus cereus* 7 mm, *Salmonella SPS* 8 mm and *Pseudomonas aeruginosa* 8 mm when compared with chloramphenicol as standard. For anti-fungal activity of *Aspergillus flavus* 7 mm was observed when compared with nystatin as standard. The antimicrobial activity of the *Terminalia arjuna* bark was effective against both antibacterial and anti-fungal activities.

**Table 1.** Anti-bacterial activity of dying material of *Terminalia arjuna* bark

S. No	Name of Organism	Diameter in mm
<b>Gram positive bacteria</b>		
1	<i>Bacillus Pumilus</i>	8 mm
2	<i>Bacillus Cereus</i>	7 mm
3	<i>Eschericha coli</i>	6 mm
<b>Gram negative bacteria</b>		
4	<i>Salmonella SPS</i>	8 mm
5	<i>Pseudomonas aeruginosa</i>	8 mm
6	<i>Staphylococcus aureus</i>	Nil

**Table 2.** Anti-fungal activity of dying material of *Terminalia arjuna* bark

S. No	Name of Organism	Diameter in mm
1	<i>Aspergillus flavus</i>	7 mm
2	<i>Candida Albicans</i>	Nil

## 5. CONCLUSION

In the present study dying material of *Terminalia arjuna* bark indicate that maximum activity of both gram positive, negative bacteria and fungi's. Hence the dying material of *Terminalia arjuna* bark was worthy for further investigation as used as some natural drugs developments.

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## References

- [1] Aggarwal, M.R. Agarwal, S. Rajpal: Method of plant analysis. Phytochemical Methods, A guide to modern technique of plant analysis 3rd ed. Ltd, London, 43, 2009, 1-33.
- [2] Shahriar M, Akhter S, Hossain MI, Haque MA, Bhuiyan MA. Evaluation of in vitro antioxidant activity of bark extracts of *Terminalia arjuna*. *Journal of Medicinal Plants Research* 2012; 6(39): 5286-5298.
- [3] Patil RH, Prakash K, Maheshwari VL. Hypolipidemic effect of *Terminalia arjuna* (L.) in experimentally induced hypercholesteremic rats. *Acta Biologica Szegediensis* 2011; 55(2): 289-293.
- [4] Nema R, Jain P, Khare S, Pradhan A, Gupta A, Singh D. Antibacterial and antifungal activity of *Terminalia arjuna* leaves extract with special reference to flavonoids. *Basic Res J Med Clin Sci.* 2012; 1(5):63-65.
- [5] Aneja KR, Sharma C, Joshi R. Antimicrobial activity of *Terminalia arjuna* Wight & Arn: An ethnomedicinal plant against pathogens causing ear infection. *Brazilian Journal of Otorhinolaryngology* 2012; 78(1): 68-74.
- [6] Halder S, Bharal N, Mediratta PK, Kaur I, Sharma KK. Anti-inflammatory, immunomodulatory and antinociceptive activity of *Terminalia arjuna* Roxb bark powder in mice and rats. *Indian journal of experimental biology.* 2009; 47(7): 577.

- [7] Rao BK, Sudarshan PR, Rajasekhar MD, Nagaraju N, Rao CA. Antidiabetic activity of *Terminalia pallida* fruit in alloxan induced diabetic rats. *Journal of Ethnopharmacology* 2003; 85(1): 169-172.
- [8] Chaudhari GM, Mahajan RT. Comparative Antioxidant Activity of Twenty Traditional Indian Medicinal Plants and its Correlation with Total Flavonoid and Phenolic Content. *International Journal of Pharmaceutical Sciences Review and Research* 2015; 30(1): 105-111.
- [9] Dwivedi S. *Terminalia arjuna* Wight & Arn. A useful drug for cardiovascular disorders. *Journal of ethno pharmacology* 2007; 114(2):114-129.
- [10] Cowan, MM. Plant products as antimicrobial agents. *Clin Microbiol Rev.* 1999; 12(4): 564-82.
- [11] Sher A. Antimicrobial activity of natural products from medicinal plants. *Gomal J Med Sci.* 2009;7(1): 72-8.
- [12] Das K, Tiwari RKS, Shrivastava DK. Techniques for evaluation of medicinal plant products as antimicrobial agent: Current methods and future trends. *J Med Plants Res.* 2010; 4(2): 104-11.
- [13] Jain S, Yadav PP, Gill V, Vasudeva N, Singla N. *Terminalia arjuna* a sacred medicinal plant; phytochemical and pharmacological profile. *Phytochem Rev.* 2009;8(2):491-502.
- [14] Singh DV, Gupta MM, Kumar TRS, Saikia D, Khanuja SPS. Antibacterial principles from the bark of *Terminalia arjuna*. *Curr Sci.* 2008; 94(1): 27-9.
- [15] Awoyinka OA, Balogun IO, Ogunnowo AA., Phytochemical screening and invitro bioactivity of *Cnidocolus aconitifolius*. *J. Med. plants Res.* 1(3) (2007) 63-65.