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Study of Antimicrobial Activity of *Cassia auriculata* Flower Extract Finished on Cellulosic Fabrics

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Abstract

The purpose of the study is to examine the antimicrobial efficiency of flower extract of medicinal plant species Cassicaauriculata by using aqueous, against two bacterial and fungal species viz., Escherichia coli, Candida tropicalis, Candidsalbicans for assessing the microbiological properties by parallel streak method. This paper determines, the research for the development of natural antimicrobial finishing for the alternate of synthetic finishing agents succeeds. The result of the study revealed that herbal finished fabric showed varied degree of anti-microbial activity against tested pathogens. Results concluded that this species, Cassia Auriculata flower contain high anti-microbial activity, as it can be used as hygiene products in the field of medical textile.

Keywords

Cassia auriculata, antimicrobial activity, Mirco organisms, medical textiles.

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1. INTRODUCTION:

Medicinal plants constitute the basis of primary health care for majority of population in the world. The plants are important sources for development of potent and antimicrobial drugs, they are continued to play a dominant role in maintenance of human health since ancient days [1]. Medicinal plants are currently in considerable significance view due to their special attributes [2] in textile fields as medical textiles.

Various antimicrobial textile materials are developed using variety of active agents like triclosan, phenols, organometallics, etc., which are toxic and can cause adverse effect on human health and also have environmental issues. Hence the research on eco-friendly herbal antimicrobial agents and their applications of various textile products gain importance among people.

These natural compounds derived from plants are non-toxic and are eco-friendly in nature. *Cassia auriculata* commonly known as Tanners cassia or Senna *auriculata*, also known as Avaram in Tamil, is a shrub belongs to the family caesalpiniaceae[3,4].The shrub is particularly famous for its attractive yellow flowers which are irregular and bisexual, used in the treatment of skin disorders and body odour[5].

This study is to investigate the potential of anti-microbial activity of two cellulosic fabrics (cotton and viscose) finished by Cassia auriculataflower extract against two types of human bacterial and fungal pathogenslike Escherichia Coli, Stapylococous, Candida tropicalis, Candidaalbicans using aquous solution. The antibacterial and antifungal activities of woven and nonwoven herbal finished fabrics were assessed with AATCC 476 method and AATCC 30 test methods. [7,8]

In this research paper work an attempt has been made to develop an eco- friendly, biodegradable, chemical free herbal medicated textile material. As a result, maximum antibacterial and antifungal activities were assessed in both fabrics finished with herbal extract, can be used for the development of medical products to avoid various infections and its effectsin future.

2. MATERIALS AND METHODS

2.1 Selection of fabric

Cellulosic fabrics were selected for this study, due to its good adaptability for natural dyes. The particulars are given below

Materials:

- 100% Cotton fabric with woven structure,
- 100% Viscose fabric with nonwoven, spun lace technique.

2.2 Selection of Medicinal herb

The plant that has been used for this research is identified based on its potential properties.

- Common name : Avaram
- Botanical name : Sennaauriculata
- Family : Caesalpiniaceae
- Part used : Flowers

Fig 2.2: Cassia auriculata-Avaram

2.3 Identification and collection of medicinal herb

The plant require for the study were collected from the interior villages of Coimbatore, which are grown under optimal environmental condition. The Flowers are fresh and disease free, the petals numbered with five, identified as bright yellow in colour veined with orange.

2.4 Herbal extraction process

The collected flowers of *Sennaauriculata*– Avaram were shadow dried within a temperature range of 37-40^{o} C. After drying the grinding was carried out to breakdown the flowers of the plant into fine powder. Antimicrobial active substances were extracted from the flower powder by aqueous extraction method, by adding 20g of herbal powder in 100ml of water for 24hrs.

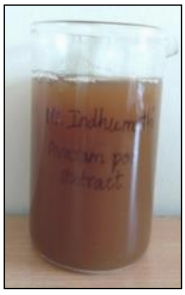
Fig 2.4(a): Dried Cassia auriculata

Fig 2.4(b): Powdered Cassia auriculata

2.5 Finishing process:

2.5.1 Imparting herbal finish to the selected fabric

The fabric samples were treated with herbal extract using citric acid as cross-linking agent. Aqueous extract of *Sennaauriculata*–Avaram was applied onto the fabrics by pad-dry-cure method with material- to liquor ratio of 1:20 at 50°C using 8% citric acid concentration. After padding for 30 min, the samples were taken and dried at 100-120°C for 5min and cured at 180°C for 3min.



Extract

Fig 2.5(a): Cassia auriculata extract

Cotton (woven) **Viscose (nonwoven)**

Fig 2.5(b): Fabrics finished with Cassia Auriculata flower extract in dip-dryprocess.

2.6 Antibacterial assessment for herbal finished medicated fabrics

The given fabrics cotton and viscose(finished with Avaram flower extract) were analyzed for their antibacterial testing using the standard AATCC – 147 test method(parallel streak method) against test organisms of gram positive organism (staphylococcus aureus) and gram negative organism(Escherichia coli).

Fig 2.6: Finished fabrics with herbal extracts

2.6.1 Inoculation of herbal treated specimen:

Test specimens (fabrics) were cut into pieces (25mm*50mm). A 50mm length permits the specimen to lay across parallel inoculums steaks each of diminishing width from both 8mm to 4mm wide. Sterile ATCC bacteriostasis agar plates were prepared. Using sterile 4mm inoculating loop, one loop full of culture (E.Coli ATCC 25922 and S.Aureus ATCC 6538) was loaded and transferred to the surface of the agar plate by making five parallel streaks. Most of the human pathogenic organisms grow will at 37°C. The culture media after inoculation is incubated at 37°C for 18-24 hours.

2.6.2 Measuring the zone of inhibition

The inoculated plates were examined for the interruption of growth along the streaks of inoculum beneath the fabric and for a clear zone of inhibition beyond the fabric edge. The average width of the

zone of inhibition around the test specimen calculated in mm.

2.7 Antifungal assessment of herbal finished medicated fabrics

The given fabrics finished with *Sennaauriculata*–Avaramflower extract were analyzed for their antifungal testing using the standard AATCC -30 test method, against the pathogenic organisms*candida albicans* and *candida tropicalis*.

2.7.1 Inoculation of herbal treated specimen:

Test specimens were cut into pieces (50mm in diameter). Sterile potato dextrose agar plates were prepared. Using sterile cotton swab the test fungal cultures (*Candida albicans and Candida tropicalis*) was transferred by swabbing all around the surface of the agar plate and also covering the central area of the petridish. The plates were incubated at 30°C for 72 hours.

2.7.2 Measuring the zone of inhibition:

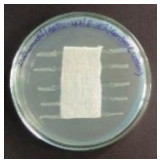
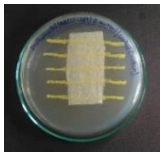
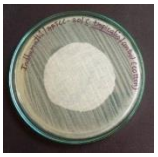
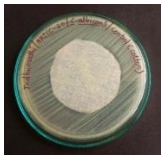
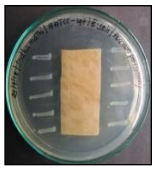
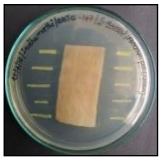
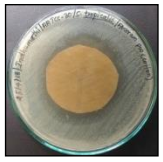
The inoculated plates were examined for the interruption of growth along the swabs of inoculum beneath the fabric and for a clear zone of inhibition beyond the fabric edge. The average width of the zone of inhibition around the test specimen calculated in mm.

3. RESULTS AND DISCUSSIONS:

3.1 Antimicrobial assessment of controlled and herbal finished fabrics.

The selected cellulosic fabrics were finished with Cassia Auriculata by pad dry cure method. The finished samples were qualitatively assessed for antimicrobial activity. The results obtained are depicted below.

Table-3.1.1: Assessment of qualitative antimicrobial activity of Cotton fabric finished with herbal extract

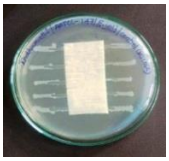
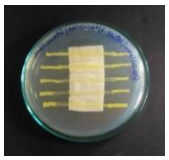
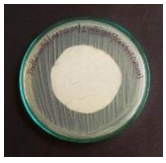
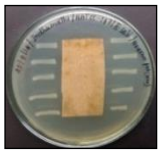
S. NO	FABRIC	ANTIBACTERIAL		ANTIFUNGAL	
	COTTON (woven)	***Escherichia coli***	***Staphylococcus aureus***	***Candida albicans***	***Candida tropicalis***
1.	CONTROL	Nil	Nil	Nil	Nil
	PLATES				
2.	HERBAL FINISHED	32.6	31.2	61	62
	PLATES				

The table-3.1.1 reveals that herbal finished cotton fabric shows, positive approach in both the organisms.

Cotton Fabric sample finished with *Senna auriculata*–Avaram flower extract shows excellent antimicrobial activity. Gram negative bacteria (*Escherichia coli)* shows better result than Gram positive bacteria (*Staphylococcus aureus*) *and fungus Candida tropicalis* shows better result compared to *Candida albicans.*

The antibacterial and antifungal inhibitory zone obtained for the finished cotton fabrics against test organisms indicates the presence of different phytochemical compounds in the plant extracts. The antimicrobial activity obtained in the present research was attributed by the presence of compounds like alkaloids, phenol and Terpenoids which need to be identified separately.

Table-3.1.2: Assessment of qualitative antimicrobial activity of Viscose fabric finished with herbal extract

S. NO	FABRIC	ANTIBACTERIAL AATCC-147		ANTIFUNGAL AATCC-30	
	VISCOSE (Nonwoven)	*Escherichia coli*	*Staphylococcus aureus*	*Candida albicans*	*Candida tropicalis*
1.	CONTROL	Nil	Nil	Nil	Nil
	PLATES				
2.	HERBAL FINISHED	31.8	31.5	54	56
	PLATES				

The table-3.1.2 reveals that herbal finished viscose fabric shows, positive approach in both the organisms.

Viscose Fabric sample finished with *Sennaauriculata* –Avaramextract shows excellent antibacterial activity. Gram negative bacteria (*Escherichia coli)* shows better result than gram positive bacteria (*Staphylococcus aureus*) and fungus *Candidastropicalis* shows better result compared to *Candida albican.*

The antibacterial and antifungal inhibitory zone obtained for the finished viscose fabrics against test organisms indicates the presence of different phytochemical compounds in the plant extracts, which are proved to be attributing for enhanced antimicrobial activity.

4. CONCLUSION:

The present study concludes that fabrics finished with Cassia ariculata flower extract shows good anti-bacterial and anti-fungal activity. Themedicinal value of plant cassia ariculata was due to the presents of phytochemical compounds like terpenoids, flavonoids, tannins, saponin, steroids, etc. Due to this the flower extract of this plant is used in the treatment of eye infections and urinary tract infections. The present study justifies that *Cassia auriculata* have high anti-microbial efficacy which can be impart on textiles for the use of wound healing bandages, hygiene products includes sanitary napkins, wipes, panty liners etc., finalized as medical textiles.

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