

Antimicrobial Finish on Cotton Fabric with Amla Juice

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Abstract- Amla is an amazing gift of nature . It has good antimicrobial property . I treated cotton fabric with amla juice by pad batch method in acidic condition . The antimicrobial activity on the cotton fabric was evaluated against AATCC 147 method . I found there is antimicrobial activity on the fabric after doing test . The aim of the project was to check the antimicrobial activity of cotton fabric after application of amla juice in the fabric.

Index Terms- Antimicrobial Finish , Amla , Nicotanic Acid , Curing ,Cotton

I. INTRODUCTION

Textiles have always played an important role in the evolution of human culture by being at the forefront of both technological and artistic development. The protective aspects of textile have provided the most textile ground for innovative developments. Hygiene has acquired importance in recent years. Odour has become an important factor. Unpleasant odour can arise from the acquisition of a variety of compounds produced in bodily fluids such as perspiration. Consumers are looking for solutions to odour and microbial problem and the unique benefits provided by antimicrobial finish.

Microorganism growth is another factor that has resulted in development of antimicrobial finish. Microbial infestation poses danger to both living and non-living matters. Microorganisms cause problems with textile raw materials and processing chemicals, wet processes in the mills, roll or bulk goods in storage, finished goods in storage and transport, and goods as the consumer uses them. Obnoxious smells from the inner garments such as socks spread of diseases, staining and degradation of textiles are some of the detrimental effects of bad microbes. The consumers are now increasingly aware of the hygienic life style and there is a necessity and expectation for a wide range of textile products finished with antimicrobial properties.

The inherent properties of the textile fibers provide room for the growth of microorganisms. Besides, the structure of the substrates and the chemical processes may induce the growth of microbes. Humid and warm environment still aggravate the problem. Infestation by microbes cause cross infection by pathogens and development odour where the fabric is worn next to skin. In addition, the staining and loss of the performance properties of textile substrates are the results of microbial attack. Basically, with a view to protect the wearer and the textile substrate itself antimicrobial finish is applied to textile materials.

Antimicrobial textile products continue to increase in popularity as demand for fresh smelling, skin friendly, high performance fabrics goes on. Modern performance fabrics are required in many specialist applications, sports textile is one example. These need to exhibit high degrees of performance in

terms of longevity and durability, and by imparting antimicrobial properties to the fabric. These properties can be improved as well as increasing the comfort and hygiene factor making them more pleasant to wear. Odour can be neutralized and skin problems caused by microbial growth reduced thus emphasizing the hygiene nature of the treated product.

I tried in my research work to find out the antimicrobial property in cotton fabric after treating the fabric with amla juice. There are two kind of antimicrobial finish in the fabric. They are anti fungal finish and anti bacterial finish. In my research work I did the antibacterial finish on the cotton fabric.

Amla:

Amla scientifically known as **Phyllanthus emblica** which has antimicrobial property . According to ayurveda there are 2 varieties of amla :

- 1.Vanya (wild)
2. Gramya (cultivated)

Chemical composition of amla:

The fruit contains

- | | |
|-------------------------------------|---------------------------------|
| 1. Gallic acid | 8. Tannic acid |
| 2. Albumin | 9. Cellulose and other minerals |
| 3. <u>Ascorbic acid</u> (vitamin C) | 10. It contains moisture |
| 4. Proteins | 11. Fats |
| 5. Carbohydrates | 12. Calcium |
| 6. Phosphorus | 13. Iron 1.2 mg |
| 7. Nicotinic acid | 14. A seed contains stable oil |



Figure 1: Amla

Fruit Traditional medicine:

In traditional Indian medicine, dried and fresh fruits of the plant are used. All parts of the plant are used in various Ayurvedic / Unani medicine herbal preparations, including the fruit, seed, leaves, root, bark and flowers. According to Ayurveda, amla fruit is sour and astringent in taste, with sweet, bitter and pungent secondary tastes .Its qualities are light and dry, the post digestive effect is sweet and its energy is cooling .

According to Ayurveda, amla balances all three doshas. While amla is unusual in that it contains five out of the six tastes recognized by Ayurveda, it is most important to recognize the

effects of the "virya", or potency, and "vipaka", or post-digestive effect. Considered in this light, amla is particularly helpful in reducing *pitta* because of its cooling energy. It also balances both *Pitta* and *vata* by virtue of its sweet taste. The *kapha* is balanced primarily due to its drying action. It may be used as a *rasayana* to promote longevity, and traditionally important to enhance digestion, treat constipation, reduce fever, purify the blood, reduce cough, alleviate asthma, strengthen the heart, benefit the eyes, stimulate hair growth, enliven the body, and enhance intellect. In Ayurvedic polyherbal formulations, Indian gooseberry is a common constituent, and most significantly it is one of the primary ingredients in an ancient herbal *rasayana* called *Chyawanprash*. This formula, which contains 43 herbal ingredients as well as clarified butter, sesame oil, sugar cane juice, and honey, was first mentioned in the Charaka Samhita as a premier rejuvenative compound. In Chinese traditional therapy, this fruit is called *yuganzi*, which is used to treat throat inflammation.

Antimicrobial Element in Amla :

The component nicotinic acid (C₆H₅NO₂) is responsible for the antimicrobial activity of amla. The chemical structure of nicotinic acid is given below :

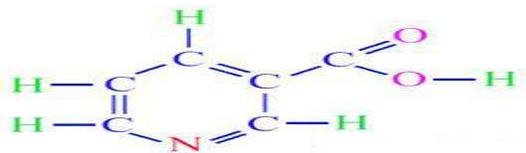


Figure 2 : Nicotinic Acid

2.Rota dyer	Labtec
3.Woven Dryer	Labtec
4.Padder	Labtec
5.Curing Machine	Labtec

Antimicrobial Finishing Process:

Preparation of amla juice:

1. At first I washed the amla with fresh water to remove the dust.
2. Then the amla were again washed with distilled water.
3. After removing the water, the amla were cut into small portion and blended amla without seeds.
4. Extraction of the amla juice was done by filtering.
5. Check the concentration of liquor.
6. Then the juice was kept in the clean bottle.



Figure 3: Amla Juice

Pretreatment of fabric:

The fabric was treated with 2g/L acetic acid at 70 °C for 15 minutes with water in rota dyer in 5.5 pH. The liquor ratio was 1:20. The material was given a cold wash for 5 minutes. The pH was maintained at 7 .

Process sequence of application of amla juice in the cotton fabric:

1. At first I took 150 ml amla juice in a beaker.
2. Then I checked the P^H of the liquor. The P^H was 2.5 which is not suitable to apply in the fabric.
3. Then I added 50 ml water with amla juice .
4. Then I added NH₄OH to maintain P^H level 5-5.5 because the amla juice P^H level was 2.5. It was acidic for this reason we used ammonium hydroxide to maintain P^H 5-5.5.
5. Then I took fabric samples of 12 gm.
6. Then I kept the fabric in the liquor for 30 min in the room temperature.

II. EXPERIMENTAL PART

Antimicrobial Finish with Amla :

Table 1:Necessary Element Used

Substance	Chemical	Equipment
1. 100% Scoured & Bleached Cotton Plain Woven Fabric. (150 GSM)	1. Amla Juice 2. Amoniam Hydroxide 3. Acetic Acid 4. Water	1.Beaker 2.Pipet

Table 2: Description of Machines

Machine	Manufacturer
1.Balance	Labtec

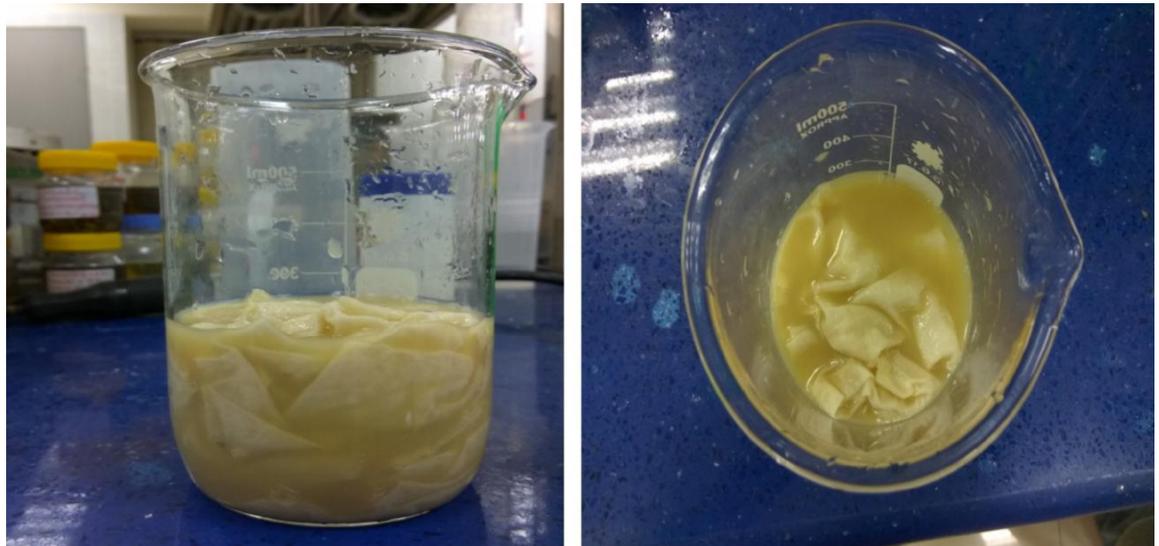


Figure 4: Cotton Fabric in Amla Juice (Side & Top View)

7. Then the samples were padded by the padder to maintain pick up percentage 90%.
8. Then the samples were dried in 60⁰c temperature for 30 min.

2. Then I cooled the samples in room temperature. After that I packed the sample in poly.

Fixation Mechanism (Possible Result) :

In the presence of ammonium hydroxide, cellulose create bond with nicotinic acid in high temperature and eliminate water molecule. And nicotinic acid fixed with cotton fabric surface and then the fabric will show antimicrobial property.

After Treatment:

1. Then I cure the samples. We cured the fabric sample for 2 min in 120⁰c temperature.

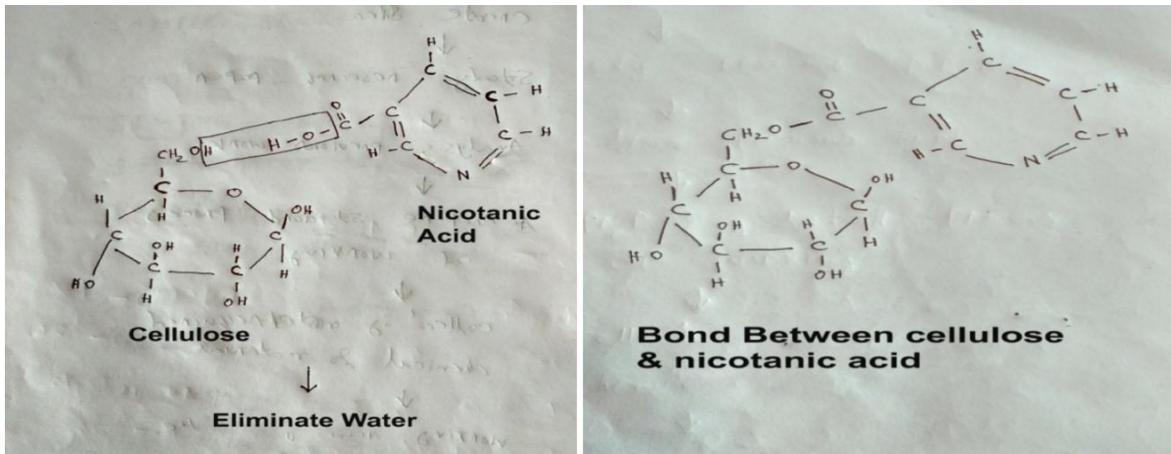


Figure 5 : Bonding

III. RESULT AND DISCUSSION

Test Method

I used AATCC 147 Parallel Streak Test method to evaluate the antibacterial test result. The AATCC 147 is a fast, qualitative means to measure the ability of an antimicrobial textile to inhibit the growth of microorganisms. The method offers options as to what microorganisms to test against, depending on the study sponsors testing objectives and products end use. I used for my test one kind of bacteria. I used Gram Positive Bacteria: **S.aureus** . The process of testing is given below :

- The test microorganism is prepared, usually by growth in a liquid culture medium. Per the method, representative microorganism is specified, *S. aureus* .
- Prior to initiating the test, sterilized molten growth agar is poured into sterile petri dishes and allowed to solidify completely before inoculating.
- The suspension of test microorganism is then standardized by dilution in sterile distilled water.
- Using a sterile inoculating loop, one loop full of the diluted inoculum suspension is used to streak 5 consecutive streaks, spaced evenly apart, without refilling the loop, onto the solidified growth agar. This allows for 5 parallel streaks varying in concentration.

- Samples, which have been cut to be rectangular in shape and measuring 25 x 50 mm, as recommended by the method, are evenly placed across the five parallel streaks.
- A parallel untreated test sample is also cut and tested alongside Treated Test Samples.
- Gentle pressure is placed on the samples onto the agar in order to ensure contact of the entire test sample and the inoculated agar.
- Treated and Untreated (Control) Samples, on the inoculated agar, are then incubated at the microorganism specific temperature and incubation period, to ensure optimal growth.
- All microbiological assays run at Prime Asia Testing Laboratory are performed with the necessary parallel

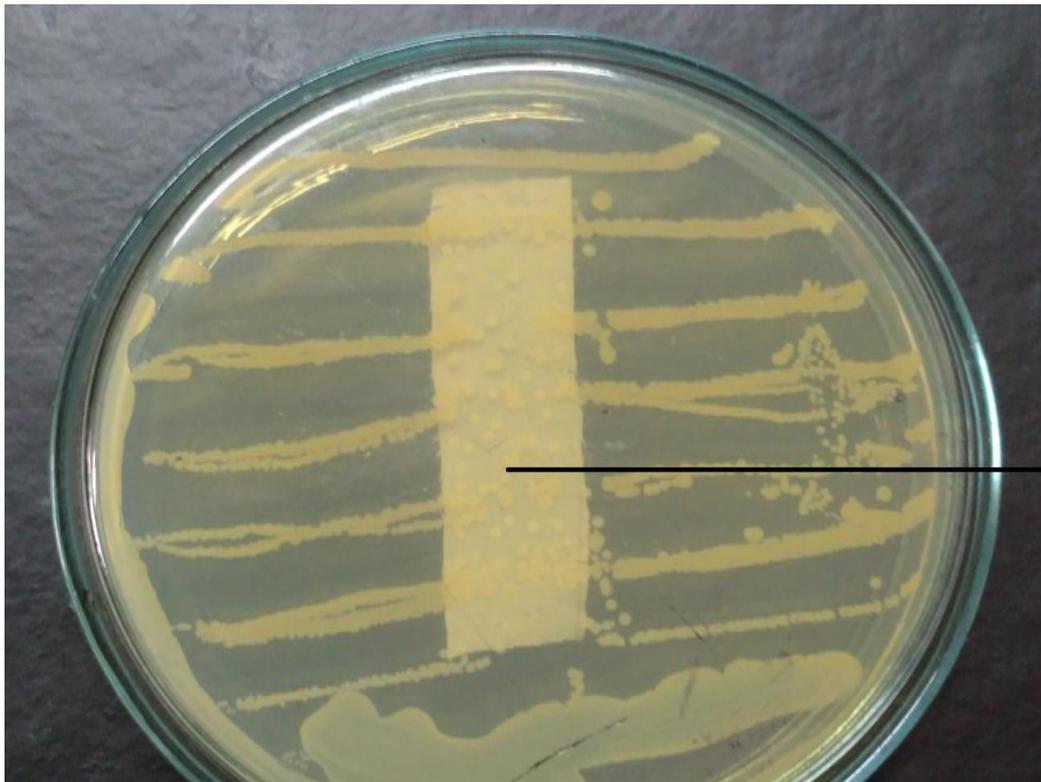
controls to provide adequate comparisons at both the start of the test as well as after the contact time.

- Post incubation, the plates are removed from the incubator and measurements on either side of the samples, if present, are averaged and a method specified formula is used to calculate its the Zone of Inhibition.
- Then I observed the growth of bacteria on the surface of the fabric.

Test Result

Anti-bacterial Test Result is evaluated by the photograph of Amla Juice Treated Cotton Fabric . Which is given below :

For Untreated Sample:



Growth of Bacteria is very high

Figure 6: Untreated Fabric

For Treated Sample:

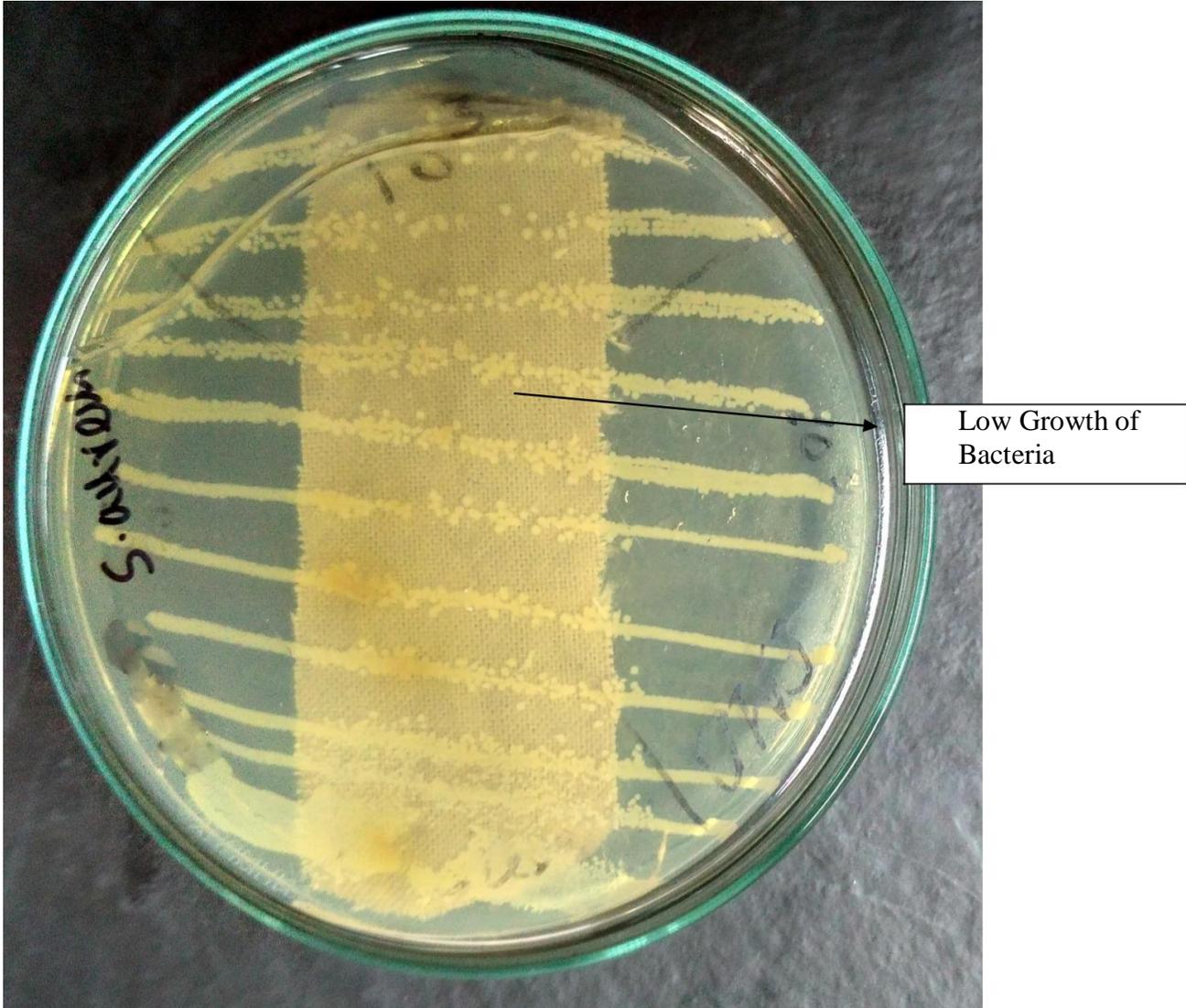


Figure 7: Amla Juice Treated fabric in S. auries

Test Observation :

- In untreated sample, growth of S.auries was very high. For this reason untreated scoured & bleached woven fabric cannot easily protect from the activity of S.auries. So it has no antibacterial activity.
- The anti bacterial property for amla juice treated fabric was good. Because I saw that the growth of microorganism in the fabric surface was very low. We can say that amla juice treated cotton fabric has a good anti bacterial property against gram positive bacteria.

Test Sample :



Figure 8: Amla Juice Treated Cotton Fabric

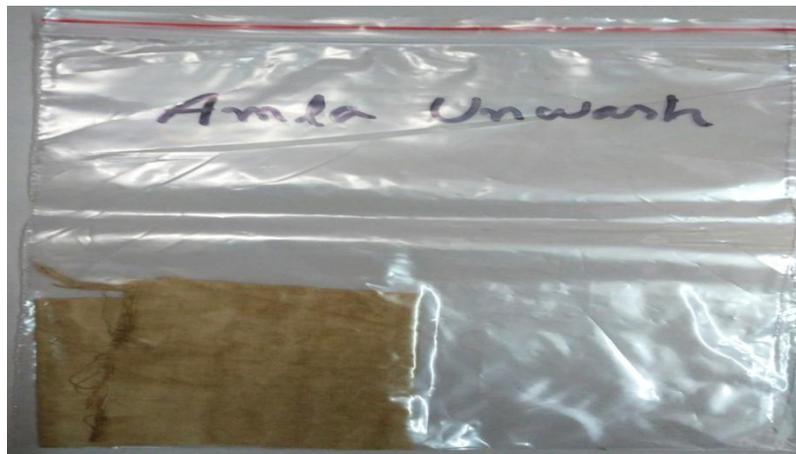


Figure 9: Amla Juice Treated cotton sample (Packed)

IV. CONCLUSION

In our nature we can find many natural fruit which have antimicrobial property .Amla is one of them . In my research work I worked with amla juice it has a good possibilities for antimicrobial finishing for cotton fabric. We can use the amla juice treated cotton fabric for one time use finished product . Like we can make antimicrobial musk from amla juice treated cotton fabric . We can make antimicrobial finished hand gloves from amla juice treated cotton fabric .In the Research work, antimicrobial finish on cotton fabric with amla juice, we learn many things. This research work has given a new idea in finishing on scoured & bleached cotton fabric for antimicrobial activity by using Amla juice. Amla juice treated fabric shows good antimicrobial activity than untreated fabric. There is a vast resource of natural antimicrobial agent, which can be used for imparting useful antimicrobial property to textile substrates. The finding of this study suggests that the treated fabrics can be used for textile application.

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