ANTIMICROBIAL FINISHING ON 100% COTTON FABRIC BY USING STEM OF ABUTILON INDICUM

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ABSTRACT

Abutilon indicum (Linn) family Malvaceae, commonly known as Atibala is an important medicinal plant. The whole plant as well as specific part such as root, leaves, and flowers is used to treat various healthy aliments skin treatment. It is found as a weed in sub Himalayan tracts, hills up to 1200m and in hotter parts of india. The plant is found to possess immunodulatory, anticonvulsant, larvicidal, lipid lowering, diuretic, and anti-ulcer activity. The plant contains antimicrobial activity in nature.The stem of the plant was shade dried and powdered to test the presence of antimicrobial activity .

This study reveals the effect of antimicrobial activity and antifungal activity of the abutilon indicum plant extract on cotton fabric.

INTRODUCTION

The Indian textile industry has a significant presence the economy as well as in the international textile economy. Its contribution to the Indian economy is manifested in terms of its contribution to the industrial production, employment generation and foreign exchange earnings. It contributes 20 percent of industrial production, 9 percent of excise collections, 18 percent of employment in the industrial sector, nearly 20 percent to the countries total export earning and 4 percent to the Gross Domestic Product. Indian has been well known for the textile goods since very ancient times.

In the last three decades, Indian textile industry has witnessed drastic changes. With the time of globalization, the Indian textile industry has to face an open market, the words quality & cost effectiveness has assumed a great importance. The competitive atmosphere and quality

consciousness, has reached a new mark. With the steady improvement in technology and application standards, a gradual rise was observed in consumer demands. And to reach up to that mark, a manufacturer has to add something to their products to get some added value for their product. This value added products not only reward with considerable increase in profit but also build the brand image.(Mr Yogesh Nimodiya, **(2011).)**

The recent resurgence in the developed world of interest in natural product has created an expanding market for plant based products from developing countries. As a result, the demand for medical plants is increased the years have been exploited in traditional medicine for the treatment of various alignments. The uses of plant derived products diseases control agents have been studied. Since they tend to have low mammalian toxicity, less environmental effects and wide public acceptance.

Essential oils are concentrated hydrophobic liquid containing volatile aromatic compounds extracted from plants. They may provide potential alternatives to the control agents currently used because the composition of essential oils is rich of bioactive chemicals. Many plants extracts and essential oil have been shown to exert biological activity in vitro and vivo, which justified research on traditional medicine focused on the characterization of antimicrobial activities by (p. Selvakumar,, etal (2012).)

Many textile manufacturers and research laboratories are currently engaged in developing various anti-bacterial and anti-fungal finishes for textile products. The textile finish needs to have properties such as skin friendly and resistant to washings, for its effective usage along with its antibacterial or antifungal effect found (Lal Bahadur Shastri Marg., (2010).)

The field of apparel and textile finishing is very broad. Globalization has added competition at the highest level. Making an apparel product more sustainable, fashionable and customer focused by increasing its both aesthetics and functional properties is the way to make the apparel products more demandable in the market. **(**Md. Mazedul Islam (2013).)

The textiles industry has made a major contribution to the national economy in terms of direct and indirect employment generation and net foreign exchange earnings. The sector contributes about 14 per cent to industrial production, four per cent to the gross domestic product (GDP), and 27 per cent to the country's foreign exchange inflows. It provides direct employment to over 45 million people. The textiles sector is the second largest provider of employment after agriculture. Thus, the growth and all round development of this industry has a direct bearing on the improvement of India's economy.

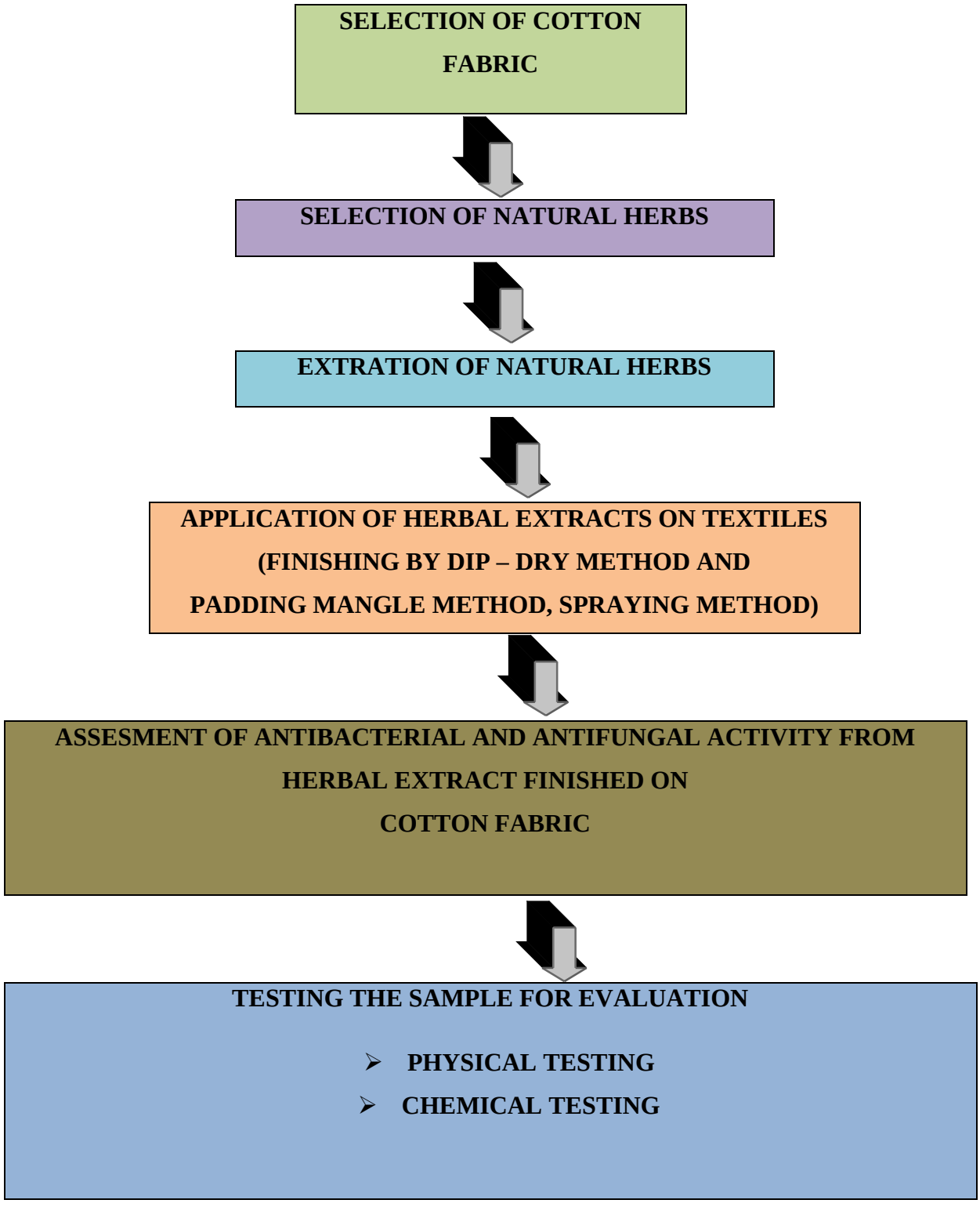
Medical textiles is the important product category within the technical textiles. Technical textiles are non-commodity textiles which are predominantly used in non-apparel application such as automotive textiles, medical textiles, geo textiles, sports textiles, etc. Even in the tighter economy, technical textiles are a fast growing by (veerash mudnoor and s.k.laga(2012)).

OBJECTIVES:

- To select the 100% cotton fabric
- To identify and collect the natural herbs.
- To desizing the 100% cotton fabric for removing the scouring.
- To prepare the extraction of the natural herbs.
- To apply the natural herbs extraction on 100% cotton fabric.
- To examine the best anti-bacterial and antifungal activity for extract finished fabric.
- To evaluate the physical qualities of treated finished fabric.

METHODOLOGY

FLOW CHART FOR THE METHODOLOGY:



3.1 SELECTION OF FABRIC

Cotton has different kind of physical properties depending on its fines and length of fibre. The hundred percent (100%) cotton is the most important of all natural fibre used by the world's textile industry. Cotton fabric is soften and comfortable to wear lose to skin because of its good moisture absorption qualities. Cotton fabric were purchased from Periyanaiken Palayam, Coimbatore.

Cotton is probably one of the most common fabrics are likely to clothing. Cotton is a natural fibre and is used in a wide variety of clothing and home furnishing. Cotton is easily washed and dry cleaned. Cotton is a good strong fabric that is absorbent, and easy to work with. Cotton is a tendency to wrinkle very easily, so cotton began to popular. Cotton is the most prevalent fibre in the world. Renewed for its breathability, strength and versatility, cotton has helped shape the history of the world by clothing and protecting countless civilization and adventurers from the effect of nature.

3.2 DESIZING

Desizing is the process of removing the size material from the warp in woven fabrics. Sizing agents are selected on the basis of type of fabric, environmental friendliness, ease of removal, cost considerations, effluent treatment, etc., Fabric containing water soluble size can be desized by washing using hot water, perhaps containing wetting agents and a mild alkali. The water relace the size on the outer surface of the fibre, and absorbs within the fibre to remove any size residue.

3.3 SELECTION OF NATURAL HERBS:

Abutilon indicum plants herb was selected for the experimental process.

3.4 EXTRACTION OF NATURAL HERBS:

Abutilon indicum plant were collected and shade dried. The dried plant were powdered and used for the experimental process.

3.5 TYPES OF FINISHING METHODS:

3.5.1 DIP – DRY METHOD

Fabric	: 100% Cotton,
Quantity	: 1 metre,
MLR	: 1:20
Herbal powder	: 200gms,
Time taken	: 30 to 45 minutes,
Temperature	: 80^{o} to 90^{o}C,
Drying	: Shade drying.

3.5.2 PADDING MANGLE METHOD

Fabric	: 100% Cotton,
Quantity	: 1 metre,
MLR	: 1:20
Herbal powder	: 200gms,
Time taken	: 30 to 45 minutes,
Temperature	: 80^{o} to 90^{o}C,
Rpm	: 15.3
Pressure	: 25.5
Repeatation	: 5 times
Drying	: Shade drying.

3.5.3 SPRAYING METHOD

Fabric	: 100% Cotton,
Quantity	: 1 metre,
MLR	: 1:20
Herbal powder	: 200gms,
Time taken	: 30 to 45 minutes,
Equipment	: Sprayer
Drying	: Shade drying.

3.6 ANTIMICROBIAL AND ANTIFUNGAL ASSESSMENT OF TESTING METHOD:

3.6.1 TEST MICROORGANISM

The Bacterial strains used were Staphylococcus Aureus, Bacillus Subtilis, Shigella Sp., Escherichia Coli.

The Fungal strains used were Aspergillus Flavus and Aspergillus Niger.

3.6.2 ANTIMICROBIAL ASSAY

Antimicrobial assays are important tools to test and screen the inhibitory effects of myriad compounds against microorganisms before establishing their inhibitory spectra (broad vs. narrow). Knowledge of the inhibitory spectra of antimicrobial compounds before their application in the fields of agriculture, biotechnology, and medicine is crucial.

Various conventional and contemporary methods are available, but they vary in their sensitivity and efficacy. In this study, our objective was to measure and compare the sensitivity and efficacy of an agar-based diffusion bioassay and a fluorescence-based assay for antimicrobial activity.

3.6.3 ANTIFUNGAL ASSAY

The powder that showed better antifungal assessment. The activity of the short listed powder on various fungal strains was assayed by agar cut method. The fungicidal effect of the oil can be assessed by the inhibition near the agar plugs.

This medium was prepared and poured on to the prtriplate. A fungal plug was placed in the centre of the plate sterile discs immersed in the source respectively were placed above the gel in the plate.

3.7 EVALUATION

Objective assessment attempts to find the relationship between fabric hand and some physical ,mechanical, comfort and color fastness properties of a fabric objectively. It quantitatively describes fabric using translation result from some measured values of relevant attributes of a fabric. Techniques used for objective hand evaluation are by special instrument for measuring properties of fabric.

3.7.1 FABRIC WEIGHT

The fabric weight is also expressed as mass per unit area and weight per unit length. The weight of the fabric can be described in two ways, either as the “weight per unit area” or “weight per unit length”.

Electronic weighing balance was used to determine the fabric weight. The samples were cut by using a GSM cutter and weighed using a electronic weighing balance.

3.7.2 FABRIC THICKNESS

The following points need consideration in fabric thickness measurement.

The fabric is kept between two place parallel plates and a known arbitrary pressure is applied between the plates and maintained. Then the distance between the plates is measured precisely.

3.7.3 PPI, EPI

This measurement of warp end count and filling pick count and is applicable of woven fabric.

Fabric count has been used to describe the end and pick count of woven fabrics. The terms warp (end) and filling (pick) count are replacing the term fabric count, to provide clarity.

3.7.4 TENSILE STRENGTH

The strength of a materials under tension on distinct from compression, fusion or shear.

3.7.4.1 SAMPLE PREPARATION

The sample was prepared to determined the tearing strength for both warp and weft yarn.

3.7.4.1.1 CUT STRIP TEST

Cut 5 specimens of size 12”x2” along warp direction and 5 specimens along weft direction from the given fabric sample. Ensure that the threads of sample run through full length till clamping and accuracy of width gauge length should be 75mm.

3.7.4.1.2 PROCEDURE

1. Mount the top and bottom jaws in its position properly. Ensure that the jaws are firm and tight.
2. Set the parameter for corresponding test in the instrument.
3. Secure the test key on control unit.
4. After completion of test, the result will be shown in the control unit. Note this reading.
5. Repeat the test for all other warp way and weft way specimens.
6. After the test results are displayed ,bottom jaws return back to its original position. Now the instrument is ready to test next specimen.
7. Tabulate the results and find the average.

3.7.5 STIFFNESS TEST

Stiffness in the resistance offered by material to a force which tends to bend it. It is related with the handle and drape of fabric.

The stiffness test to determine the bending height, flexural rigidity and bending modules of fabric on sample procedure and calculation.

3.7.6 ABRASION TEST

Abrasion is the wearing a way of any part of a material by rubbing against another surface. It is stated in terms of number of cycles on a specified degree or amount of abrasion. Standard test method ASTM D 4966-98 was used to determine the abrasion resistance of textile fabric using martindale abrasion tester (modal GT-7012-M).

In this test method abrasion resistance was measured by subjecting the sample to rubbing motion in the form of a jeomatric figure under known condition of pressure and abrasive action. Specimon face was placed down into the specimen holder and polyurethane foam was placed between the specimen and the metal insert.

The assembled holder was put on the machine above the fabric/felt piece and pressed b a weight of 1.31± 0.03 psi (9± 0.2 kpa). After this counter was set at 2000 cycles to recovered the desired movement and abrasion machine was started.

RESULT AND DISCUSSION

4.1 ANTIBACTERIAL ACTIVITY ASSESSMENT TEST METHOD:

Antibacterial activity of the textiles samples was determined. MULLUR HINTON AGAR(MH) Plates were swabbed (sterile cotton swabs) with 0.1 OD cultures of Gram positive (2 cultures) and Gram negative (2 cultures) bacteria. STAPHYLOCOCCUS AUREUS and BACILLUS SUBTILIS were gram positive and SHIGELLA SP. and ESCHERICHIA COLI were Gram negative organisms. Samples were cut in equal diameters into small pieces and placed over swabbed plates. And the values were tabulated.

TABLE-I

DIAMETER OF THE ZONE OF INHIBITION (IN CM)					
S.NO	**TYPES OF METHOD**	**STAPHYLOCOCCUS AUREUS**	**BACILLUS SUBTILIS**	**SHIGELLA SP.**	**ESCHERICHIA COLI**
1	DIP – DRY	NO ZONE FOUND	NO ZONE FOUND	NO ZONE FOUND	NO ZONE FOUND
2	PADDING MANGLE	1.5	1.7	NO ZONE FOUND	0.2
3	SPRAYING	1.1	NO ZONE FOUND	0.6	NO ZONE FOUND

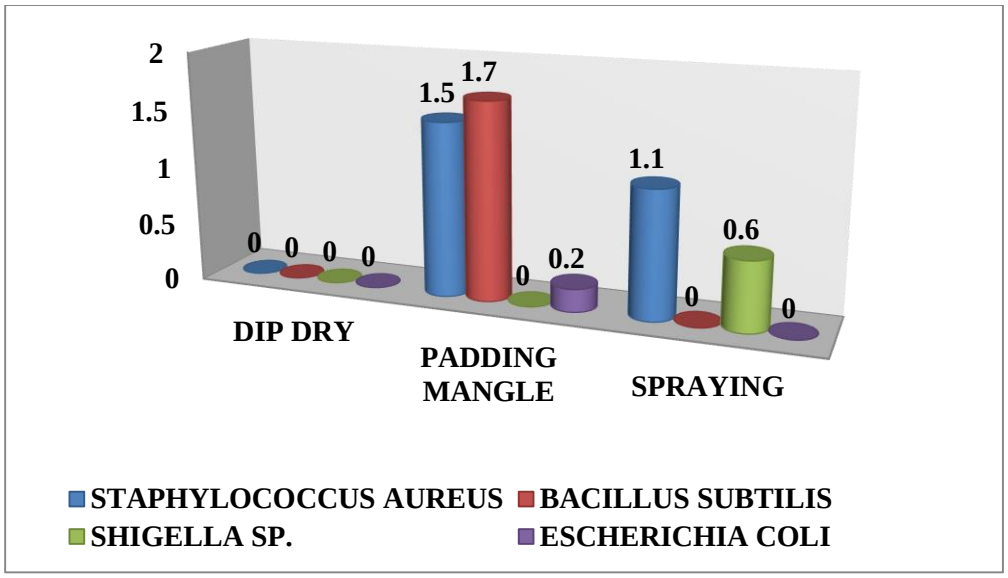


FIGURE-I

From the Table I and Figure I was concluded that the higher range of zone was found in Padding mangle method than Dip-dry and Spraying method.

4.2 ANTIFUNGAL ACTIVITY ASSESSMENT BY AATCC 30-2003 TEST METHOD:

Antifungal activity of the textile samples was determined. Potato Dextrose Agar plates were (sterile cotton swabs) with cultures of ASPERGILLUS FLAVUS and ASPERGILLUS NIGER. Samples were cut in equal diameters into small pieces and placed over swabbed plates. Then the plates were incubated at 37^{o}C for 48 hours. And the values were tabulated.

TABLE-II

DIAMETER OF THE ZONE OF INHIBITION (IN CM)			
S.NO	**TYPES OF METHOD**	**ASPERGILLUS FLAVUS**	**ASPERGILLUS NIGER**
1	**DIP – DRY METHOD**	**NO ZONE FOUND**	**0.8**
2	**PADDING MANGLE METHOD**	**1.5**	**1.1**
3	**SPRAYING**	**0.3**	**0.8**

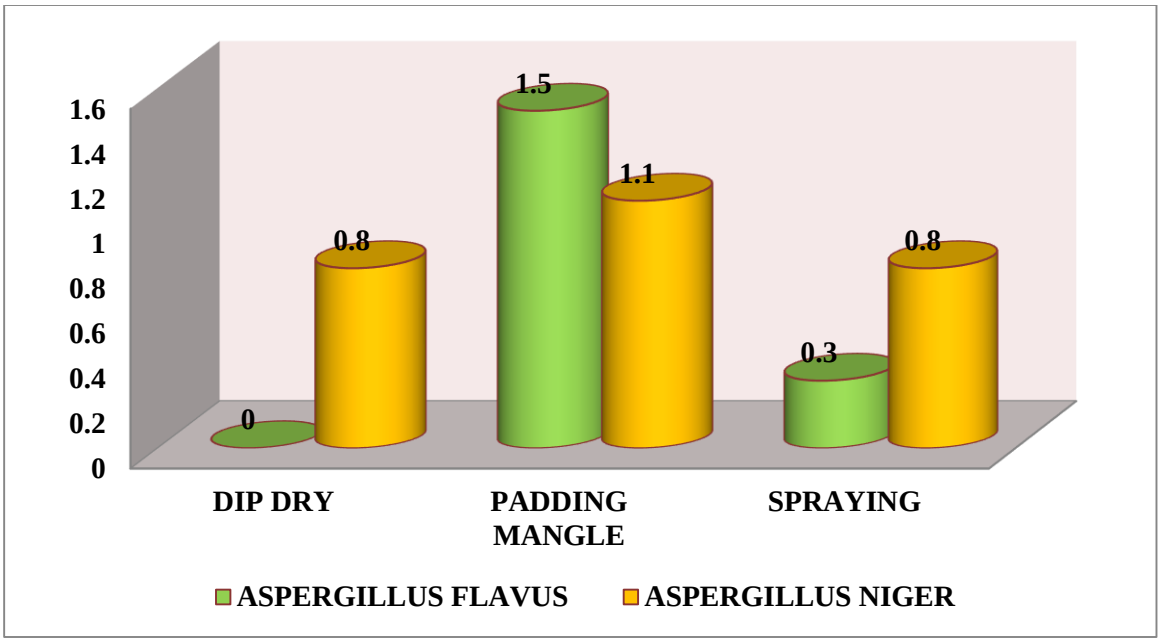


FIGURE-II

From the Table II and Figure II was concluded that the higher range of zone was found in Padding mangle method than Dip-dry and Spraying method.

4.3 EVALUATION OF PHYSICAL TESTING:

4.3.1 FABRIC WEIGHT (GSM):

TABLE-III

S.NO	SAMPLE	TESTING METHOD	ORIGINAL FABRIC (GSM)	TREATED FABRIC (GSM)
1	COTTON	DIP – DRY	1.4	1.5
		PADDING MANGLE	2.1	2.3
		SPRAYING	1.2	1.4

From the Table III was concluded that the higher range of thickness was found In Padding mangle method than Dip-dry and Spraying method.

4.3.2 EPI, PPI:

TABLE-IV

The Count (EPI/PPI) of the Unfinished and Finished Cotton Fabric**.**

S.NO	SAMPLE	ORIGINAL FABRIC		TREATED FABRIC	
		EPI	PPI	EPI	PPI
1	DIP DRY	63	52	64	54
2	PADDING MANGLE	66	54	67	56
3	SPRAYING	65	51	63	54

From the Table IV was concluded that the higher range of counts was found in Padding mangle method than Dip-dry and Spraying method.

4.3.3 CREASE RECOVERY (DEGREE):

TABLE-V

S.NO	SAMPLE	TESTING METHOD	TREATED FABRIC (degree)	
			WARP	WEFT
1	COTTON	DIP – DRY	14.6	13.4
		PADDING MANGLE	15.8	13.6
		SPRAYING	14.3	13.1

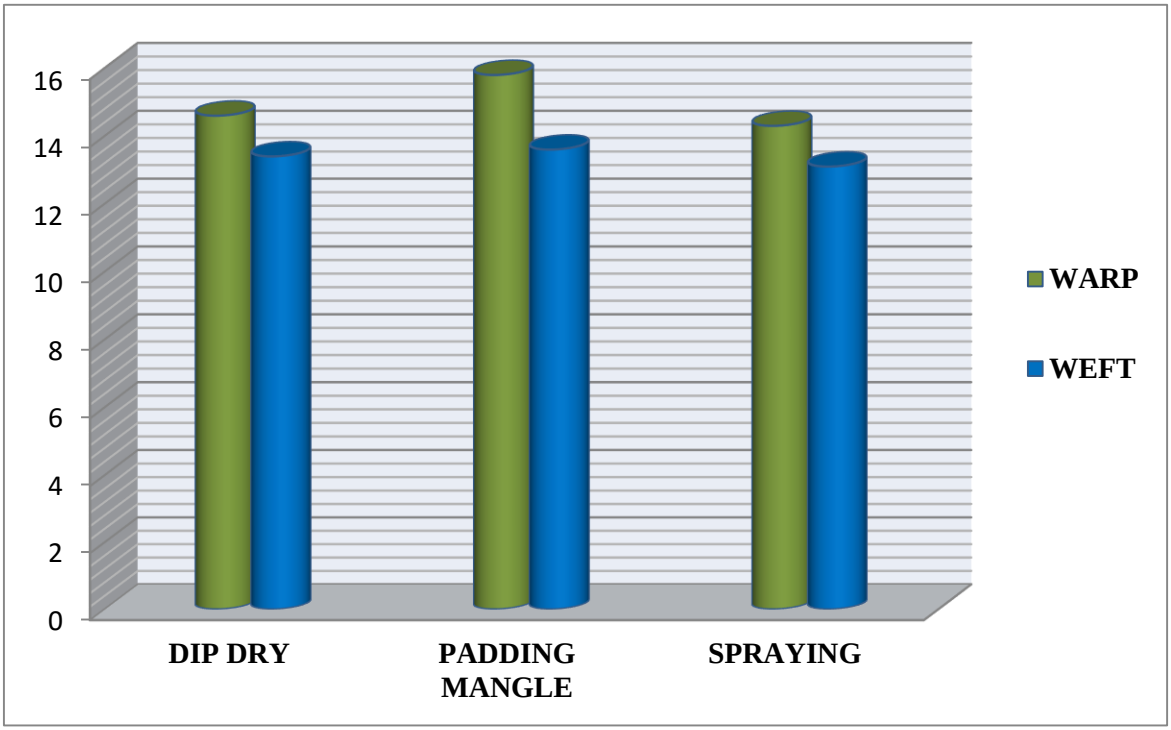


FIGURE-V

From the Table V and Figure V was concluded that the higher range of degree was found in Padding mangle method than Dip-dry and Spraying method.

4.3.4 ABRASION RESISTANCE (GM):

TABLE-VI

S.NO	SAMPLE	TESTING METHOD	ABRASION RESISTANCE TOTAL %
1	COTTON	DIP – DRY	6.6
		PADDING MANGLE	6.8
		SPRAYING	6.4

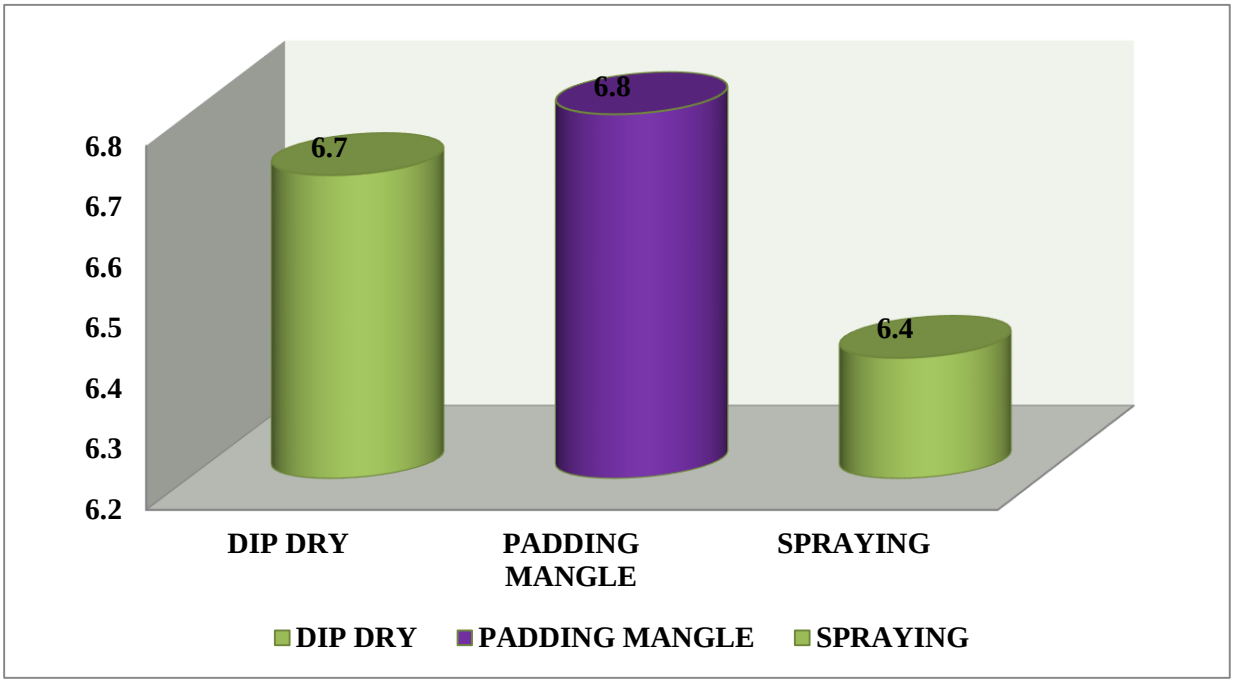


FIGURE-VI

From the Table VI and Figure VI was concluded that the higher range of percentage was found in Padding mangle method than Dip-dry and Spraying method.

4.3.5 TENSILE STRENGHT:

The tensile strength of the finished fabric was tested according to **ASTM** method.

TABLE-VII

S.NO	SAMPLE	TESTING METHOD	ORIGINAL FABRIC		TREATED FABRIC	
			WARP	WEFT	(WARP)	(WEFT)
1	COTTON	DIP – DRY	31	26	34.1	28.2
		PADDING MANGLE	38	31	43.2	32.4
		SPRAYING	30	24	33.2	27.2

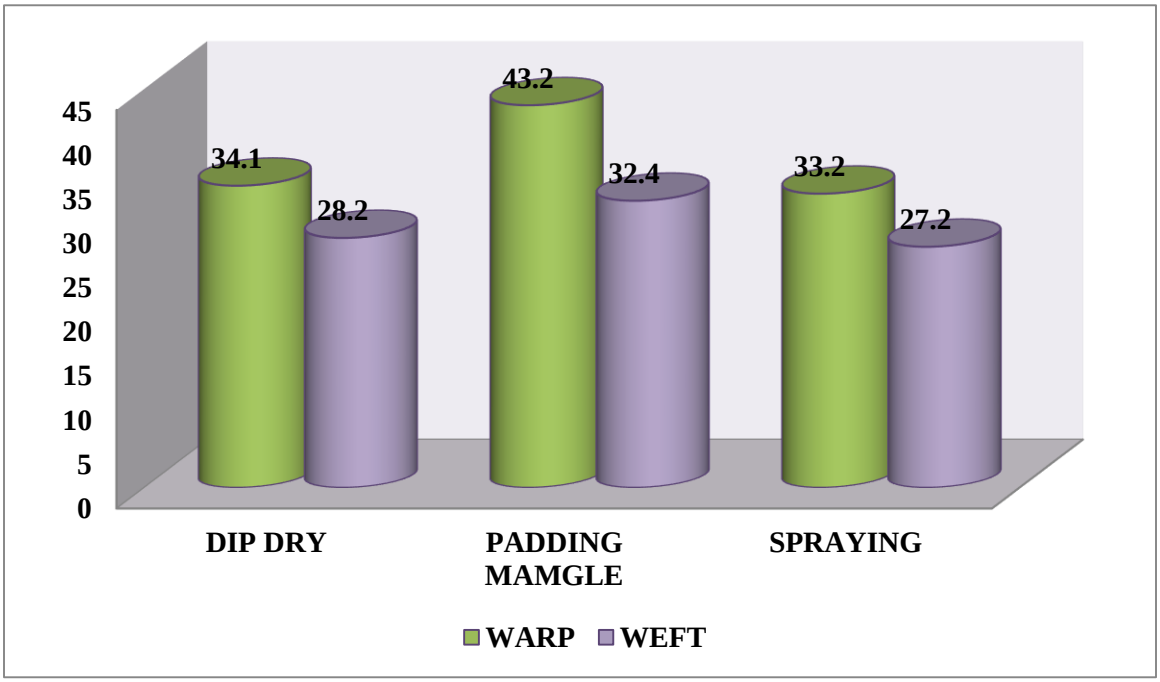


FIGURE-VII

From the Table VII and Figure VII was concluded that the higher range of tearing strength was found in padding mangle method than Dip-dry and Spraying method.

4.3.6 FABRIC STIFFNESS (CM):

TABLE-VIII

S.NO	SAMPLE	TESTING METHOD	ORIGINAL FABRIC	TREATED FABRIC
1	COTTON	DIP – DRY	0.731	0.739
		PADDING MANGLE	0.921	0.932
		SPRAYING	0.728	0.734

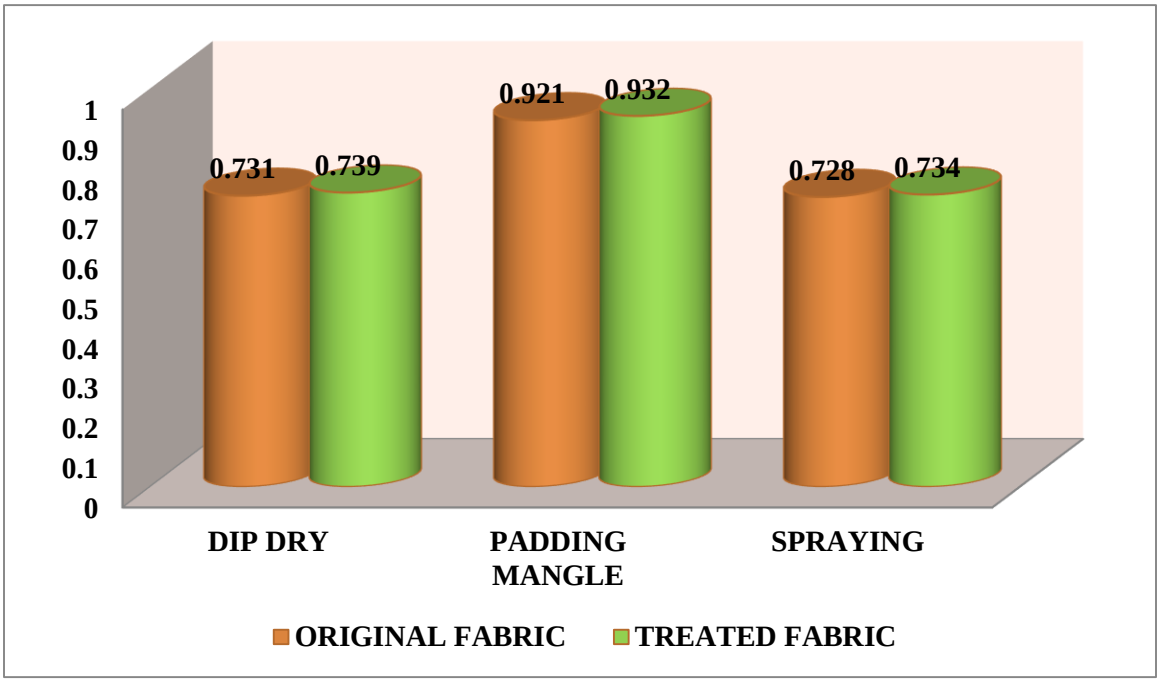


FIGURE-VIII

From the Table VIII and Figure VIII was concluded that the higher range of fabric stiffness was found in Padding mangle method than Dip-dry and Spraying method.

SUMMARY AND CONCLUSION:

Now-a-days, Medicinal plants are important part of our natural wealth. They serve as important therapeutic as well as valuable raw materials for manufacturing numerous traditional medicines. The history of medicinal plants use for treating diseases and alignment probably dates back to the beginning of human civilization.

Our forefathers compelled to use any natural substances that they could find to ease their sufferings caused by acute and chronic illnesses, physically discomforts, wound and injuries and even terminal illnesses. Since ancient times, plant with therapeutic properties have secured and had an important place in the healing practices and treatment of diseases

Plenty of medicinal plants are used from traditional system of medicine for the treatment of varied ailments. Many herbs belonging to the species Abutilon are documented for their various medicinal benefits. Also, the plants from Abutilon family are claimed for other medicinal properties for the treatment of different disorders, but still they are not satisfactorily exploited.

The extensive survey of literature revealed that the Abutilon indicum is an important plant of Ayurveda. It is being used since a long time in making ayurvedic medicines. In traditional medicine, Indian mallow various parts of the plant are used as a demulcent, aphrodisiac, laxative, diuretic, sedative, astringent, expectorant, tonic, anti-inflammatory, fever, ulcers, headaches, gonorrhea, and bladder infection.

In recent time abutilon species are traditionally believed for their wide range of medicinal and pharmacological importance and this species also shows antibacterial, antifungal, anti malarial activity against several micro organisms.

The antibacterial study was conducted using different micro organisms such as Staphylococcus Aureus, Bacillus Subtilis, Shigella Sp., Escherichia Coli. and the antifungal study was conducted using Aspergillus Flavus, Aspergillus Niger.

FINDINGS OF THE STUDY:

- From the table I and figure I was concluded that the higher range of zone was found in Padding mangle method than Dip-dry and Spraying method.
- From the table II and figure II was concluded that the higher range of zone was found in Padding mangle method than Dip-dry and Spraying method.
- From the table III was concluded that the higher range of thickness was found In Padding mangle method than Dip-dry and Spraying method.
- From the table IV was concluded that the higher range of counts was found in Padding mangle method than Dip-dry and Spraying method.
- From the table V and figure V was concluded that the higher range of degree was found in Padding mangle method than Dip-dry and Spraying method.
- From the table VI and figure VI was concluded that the higher range of percentage was found in Padding mangle method than Dip-dry and Spraying method.
- From the table VII and figure VII was concluded that the higher range of tearing strength was found in padding mangle method than Dip-dry and Spraying method.
- From the table VII and figure VII was concluded that the higher range of fabric stiffness was found in Padding mangle method than Dip-dry and Spraying method.

The Indian mallow (Abutilon Indicum), also called Atibala in India, is a tropical or semitropical plant in the mallow family. It's a small shrub that rarely grows taller than 6 feet. In recent time abutilon species are traditionally believed for their wide range of medicinal and pharmacological importance and this species also shows antibacterial, antifungal, anti malarial activity against several micro organisms.

Antibacterial and Antifungal finishing on 100% cotton fabric by using Dip-dry, Padding mangle and Spraying method.

FUTURE SCOPE OF THE STUDY:

- Any other fabric can be replaced for cotton fabric.
- Development of wound care products like bandages, etc..,

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