FUNCTIONAL MODIFICATION OF KHADI FABRIC USING AYURVEDIC HERBAL FINISHING

Dr. S. GRACE ANNAPOORANI* & J.PEARLY**
Professor* & Research Scholar**
Department of Textiles and Apparel Design
Bharathiar University, Coimbatore – 641 046
E -mail Id: gracetad@buc.edu.in, rarp.pearl@gmail.com

Abstract

Ayurveda is India's ancient medicine for herbal treatment of many illnesses. Ayurveda consists of two distinct phrases. It's Aye and Veda. Aye is life or lifespan, and Veda is wisdom. The Science of Life or Wisdom of Life when it combines it gives the real meaning. Ayurvedic textiles used for cancer, illnesses of the skin, respiratory diseases, discoloration of the skin, eczema, psoriasis, hypertension, asthma, rheumatism, arthritis, blood pressure, diabetes. Raw fibers, woven & knitted fabrics, unwoven textiles, stitched clothing and cotton, wool & silk textiles needed to prepare Ayurvastra. Ayurvastra Use 100% organic cotton, hand-loomed herbal coloring depending on the disease. Keeping this in mind, herbal textiles are often used to create bed clothes, underwear, towels, and clothes for meditation, sleepwear and other clothes that stay close to the skin. There is also technology for creating herbal clothes. An attempt was produced in conjunction with Neem and Tulsi to impregnate the active components current in the herbal extract from the Mixture of chosen Ayurvedic herbs- Four ficus tree. Four ficus tree-Neem, four ficus tree-Tulsi extract using Myrobalan as mordent on 100% cotton Khadi fabric. Linn's ficus racemosa. (Moraceae) is a common medicinal plant in India that has long been used for numerous diseases including diabetes, liver disorders, diarrhea, inflammatory conditions, and hemorrhoids, respiratory and urinary diseases in the ancient Indian medicinal system of Ayurveda. The herbs used are turmeric, neem and tulsi for skin diseases. A detailed study on anti-allergic activity of finished fabric, antibacterial activity of finished fabric. Then the coated sample was analyzed for in vitro cytotoxicity, phytochemical test.

Keywords: *Ayurveda, Ayurvastra, Medicinal Herbs, Eco friendly, Textiles etc.*

1. Introduction

Increasing interest in natural dyes in textile implementation is primarily owing to its environmentally friendly, economical option, harmony with nature and property of biodegradability. However, in several developing countries, natural dyes can give not only a fashionable and varied supply of dyes, however conjointly the change of financial gain through property harvest. [1] Natural dyes are in fact colors and pigments obtained from animal or herbal sources, acquired through the use of minimal chemical treatments.

Ayurvastra or the ayurvedic medicative fabric are manufactured from 100% pure organic cotton or silk, wool, jute and fiber product that has been ready handy loom, processed and dyed by using various ayurvedic herbs to assimilate medicinal qualities into them. Thus, these are free from any chemicals that may release toxins and irritants harmful to users as well as environment [2].

Ayurvedic practitioners also recognized a number of herbal preparations to cure different illnesses and ailments. There are several reports of crude extract antimicrobial activity prepared from crops that inhibit different bacterial pathogens, but a restricted number of herbal preparation in vitro research have been released. Hence a trial was created to screen the medicinal drug potential of flavoring preparations within the management interference of enteric microorganism infection. [3].

Among all the natural antibacterial agents, the plant products comprise the major segment. Healing power of a number of the plant materials has been used since earlier period. Cluster fig, Indian laureal, Peepal tree, cluster hiptage is distributed all over India. Roots are useful in treating dysentery. The bark is beneficial as a wash for wounds, highly efficacious in threatened abortions and recommended in uropathy. The ripe fruits square measure sweet, cooling and square measure utilized in symptom, thirst and physiological reaction [4].

The aim of this research was to evaluate the performance of dye, extract from Mixture of selected Ayurvedic herbs- *Four ficus tree* in combination with *Neem* and *Tulsi* on cotton khadi fabric dyeing with the specific objective to analyze the aqueous extraction process of the dyes, to explore the possibilities of producing

fashionable hues from the dyes using mordant, to analyze the colour values, and to assess the color fastness properties of dyed fabric.

2. Materials and methods

Khadi fabric was purchased from local market, Coimbatore and was soaked in distilled water and then treated with non-ionic detergent solution containing 2 gm/l each of soap and soda ash at 80 C for 60 min to remove starch and other stiffening agents. The plant material which was used in this study, *four ficus* tree leaves in combination with *Neem* and *Tulsi* was obtained from Kerala and all mordant Myrobalan were also purchased from the Ayurvedic shop, Coimbatore, Tamil Nadu.

2.1. Selection of samples

2.1.1. Source

Four ficus tree- ***Athi***–*cluster fig,* ***Ithi****-indian laurel,* ***Arayal****-peeple tree,* ***Peral*** *clusted hiptage* and *Tulsi, Neem* was collected from Kerala district.[Fig 1,2,3 a-f]

2.1.2. Fabric used

Desized, scoured and bleached Khadi fabric was used for dyeing.

2.1.3. Mordants used - Myrobolan

Dried myrobolan (Terminalia chebula) fruits have high tannin content and also contain a natural dye that is used for producing bright yellow shades for all textile materials. Myrobolan is additionally used as a natural mordant to mend totally different natural dyes on textile materials. Myrobolan is a part of the famous Ayurvedic preparation ‘‘triphala’’ and dyed materials are also imparted with medicinal properties such as antimicrobial, antifungal, and so on.

Figure.1: a.) Athi–cluster fig b.) Ithi-Indian laurel

Figure.2: c.) Arayal-peeple tree d.) Peral clustered hiptage,

Figure 3:.e.) Neem f.) Tulsi

2.2. Extraction of dye

2.1.1. Hot continuous extraction (soxhlet)

In this methodology, the finely ground crude drug is placed in an exceedingly porous bag or "thimble" fabricated from strong filter paper, that is placed in chamber E of the Sox let equipment. The Extracting solvent in flask A is heated, and its vapors condense in condenser D. The condensed extract hymenopter drips into the thimble containing the crude drug, and extracts it by contact. When the extent of liquid in chamber E rises to the highest of siphon tube C, the liquid contents of chamber Esiphon into flask A. This method is continuous and is applied till a drop of solvent from the siphon tube doesn't leave residue once gaseous. The advantage of this methodology, compared to antecedently delineate ways, is that enormous amounts of drug is extracted with a far smaller amount of solvent. This effects tremendous economy in terms of time, energy and consequently financial inputs. At small scale, it is employed as a batch process only, but it becomes much more economical and viable when converted into a continuous extraction procedure on medium or large scale. [5].

2.2.2. Dyeing of cotton Khadi fabric

Dyeing was carried out by conventional method in the absence and presence of mordant. Mordanted Khadi samples were drenched in the dye bath containing extracted dye. The M: L ratio was kept at 1:40 and the temperatures of the dye baths were raised till simmering point (91°c to 94°c) and left at that 100°c temperature for 1 hour. In order to get uniform dyeing the samples were stirred regularly. The dyed samples were washed with tap water. The samples were dried in shade at temperature.

2.3. Mordanting process

2.3.1. Pre-mordanting:

In this method, samples were pretreated with the solution of natural mordants. The pretreated khadi fabric was introduced into the dye bath containing required amount of dye extract and water. After 5 minutes Myrobalan is mixed in 6 liters of hot water to mordant 5 meters of selected fabric. Keep this for 24 hours at 80°c.The artificial samples were taken out, squeezed, washed with water and dried at temperature [6].[Fig 4]

Machine finished Dip method (24 hours)

Figure 4:.Myrobalan Finish

2.4. Antibacterial assay – well diffusion method

The AATCC plates were prepared by pouring 15ml of AATCC media into sterile Petri plates. The plates were allowed to solidify for 5min and also the microorganism culture was inoculated as single line followed by the four lines without renewal the immunization loop. The fabric was cut into 5X2.5 size and immersed in treatment bath containing herbal and antimicrobial agent's nanoparticle with the M: L ratio of 1:1 for 15 minutes and air dried in at room temperature. The finished fabric with the diameter of 2.5 cm was placed on over the inoculated bacterial species. And the plates were kept for incubation at 37ºC for 24 hours. At the end of incubation, zone of incubation formed around the fabric was measured in millimeter and recorded.

2.5. In vitro cytotoxicity (ISO 10993:5) – direct method

Cytotoxicity testing could be a speedy, standardized, sensitive, and cheap suggests that to see whether or not a fabric contains important quantities of biologically harmful extractable. This test allows both qualitative and quantitative assessment of cytotoxicity. Pipette is a known aliquot of the continuously stirred cell suspension into each of a sufficient number of vessels for direct exposure to the test sample. Distribute the cells evenly over the surface of each vessel by gentle horizontal rotation. Incubate the culture at (37 ± 1) °C in air, with or without carbon dioxide as appropriate for the buffer system chosen for the culture medium, until the cultures have grown to subconfluency. Verify the subconfluency and the morphology of the cultures with a microscope before starting the test. In exceptional cases, exponentially growing cells (e.g. primary cells, high proliferating cells) may be seeded at the starting point of the test. Remove and discard the culture medium. Then add fresh culture medium to each vessel. Carefully place individual specimens of the test sample on the cell layer in the centre of each of the replicate vessels. Ensure that the specimen covers approximately one tenth of the cell layer surface. Other ratios of specimen surface to cell layer surface may be used if justified. Exercise care to prevent unnecessary movement of the specimens, as this could cause physical trauma to the cells. For example, patches of dislodged cells can result from unnecessary movement. NOTE When appropriate, the specimen can be placed in the culture vessel prior to the addition of the cells. Prepare replicate vessels for both the negative control and positive control material.Incubate the vessels under the (37 ± 1) °C for an appropriate interval (a minimum of 24 h) corresponding to the selected specific assay. Discard the supernatant culture medium before adding chemicals/dyes in order to determine the cytotoxic effects.

2.6. Phyto chemical test

A small amount of the substance is taken and a few drops of alcohol and few drops of ferric chloride were added. It is shaken well till the appearance of greenish yellow color which indicates the presence of phenol. 0.5g of substance is mixed with 20ml of distilled water and it is boiled for some time and then few drops of 0.1% ferric chloride was added. It is mixed well till the appearance of brownish green colour which will indicate the presence of tannin. A small amount of the substance is mixed with sudan III which results in shining orange which indicates the presence of fat and fixed oil. Small amount of substance is taken and mixed with 10% sodium hydroxide which results in greenish brown colour which indicates the presence of flavonoids. [Fig 5]

Figure 5:.Phyto chemical test

3. Result and discussion

3.1. Antibacterial activity

The antibacterial activity (AATCC 6538, AATCC 8739) was performed using the pathogens *S.Aureus* and *E.Coli.* The zone of inhibition was on both the plates. The zone of inhibition was measured and tabulated as follows in Table 1.

Table 1: Antibacterial Activity

S.NO	SAMPLE	NOMENCLATURE	**ZONE OF INHIBITION(MM)**	
			S.aureus	**E.coli**
1	FINISHED FABRIC	AFN	10MM	8MM
2	FINISHED FABRIC	AFT	6MM	5MM

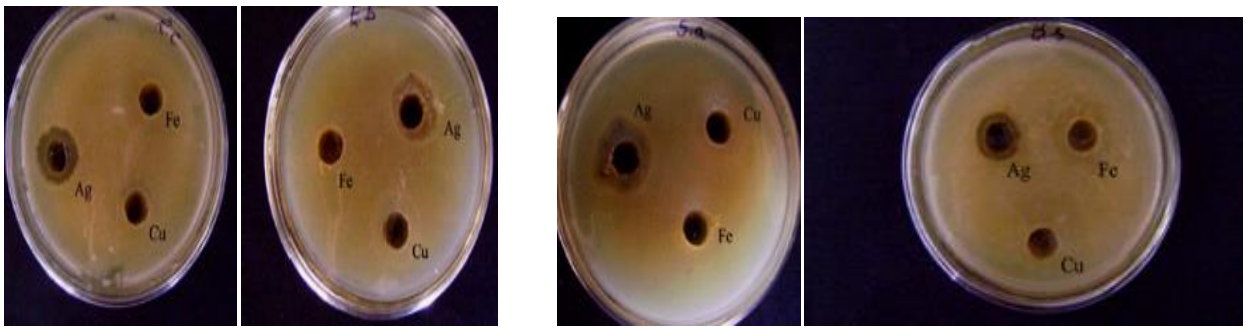

Figure 6: a.) E.coli b.) S.aureus

Fig 2.4. Zone of inhibition of different plant extracts against selected bacteria. (a) Zone of inhibition produced by the four ficus tree and Neem extract by disc diffusion method. (b) Zone of inhibition produced by the four ficus tree and Tulsi extract by disc diffusion method.

3.2 In vitro cytotoxicity

Determination of cell viability and cytotoxic reactivity in the samples.

Table 2: in vitro cytotoxicity (ISO 10993:5) – Direct method Observation

SAMPLE PARTICULARES		CYTOTOXICITY	CELL VIABILITY	CYTOTOXIC REACTIVITY
SAMPLES	CONC (UG/ML)			
AFN	50	0	>99	NONE
	75	0	>99	NONE
	100	0	>99	NONE
AFT	50	0	>99	NONE
	75	0	>99	NONE
	100	0	>99	NONE

From the Table 2 shows The method of evaluation and the results of the evaluation shall be included in the test report. The achievement of In vitro cytotoxicity direct method Observationis considered a cytotoxic effect results that, discrete intracytoplasmatic granules, no cell lysis, no reduction of cell growth is shown.

3.3. Phytochemical analysis

Determination of total phenolics and flavonoid contents

Table 3 : phytochemical analysis

Samples	Total Phenolics (mg GAE/1g extract)	Flavonoids (mg RE/1g extract)
NEEM	7.82 ± 0.7	79.77 ± 5.4
TULSI	0.75 ± 0.4	43.93 ± 12.5
FICUS	271.39 ± 6.9	655.10 ± 20.2

From the Table 3 it is evident that the ethanolic extract of ficus species showed a greater effect against microbes, worms and renal carcinoma in rat compared with the standard drugs.

Result - None cytotoxic reactivity to l929 cells after 24 hr. Contact in phytochemical test

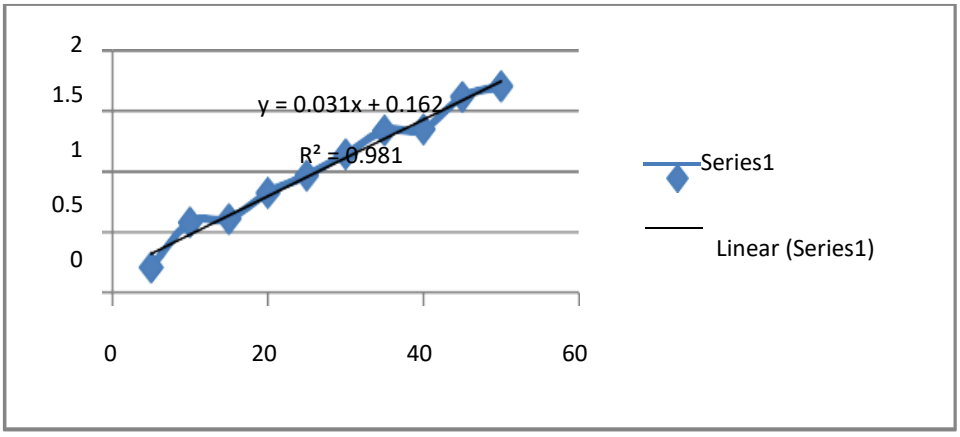

Figure 7: Phytochemical analysis- Phenolics

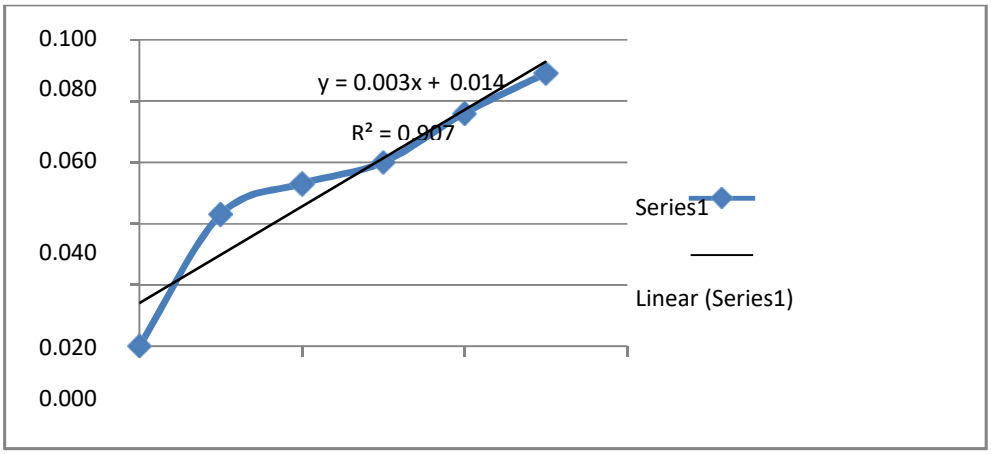

Figure 8: Phytochemical analysis- Flavonoids

4. Conclusion

Scope of Ayurvedic herbs is endless and it is the way to keep people healthy. Ayurvedic herbs principal is used to maintain good health and adopt a healthy way of life. Ayurvedic herbs has been receiving increased awareness from many parts of the world. Ayurvedic herbs as a way to revitalize and increase the market for their Khadi fabric industries and to create a rich for their eco-friendly Khadi fabrics. The above study interprets that in search of greener alternative to satisfy the consumer's growing demand of eco-friendly products, and progress has been made with the use of six different herbal plant which were collected dried and powdered, it was extracted in aqueous medium and extract was used to finish the fabric by dip and dry method .Then the fabric was tested for in vitro cytotoxicity it helps to identifying skin allergic problems in finishing fabric .The fabric tested for antibacterial activity and also test phytochemical test helps to identification of the chemical components of fabric

5. Reference

[1] Belemkar S, Ramachandran M (2015). Recent trends in Indian textile industry-Exploring novel natural dye products and resources. International Journal on Textile Engineering and Processes 1(3): pp: 33-41.

[2] Yadav .A and Nath .K (2010). Ayurvastra the Doctor of the Future. http://www.fibre2fashion.com/industry-article/28/2727/ayurvastra-the-doctor-of-the-future1.asp Accessed 22 February, 2014.

[3] S.B. Dahikar, D.T. (2010). "Screening Antibacterial Activity of Some Bhasma (Metal- Based Herbal medicines) Against Enteric Pathogens". Recent Research in Science and Technology, Vol.2, no.10, pp: 11

[4] Rajendran R, S, (2012) Characterization of Neem Chitosan Nanocomposites for Development of Antimicrobial Cotton Textiles Journal of Engineered Fibers and Fabrics Volume 7, Issue 1,136- 141.

[5] Sukhdev Swami Handa, Suman Preet Singh Khanuja, Gennaro Longo, Dev Dutt Rakesh. (2008) *Extraction technologies for medicinal and aromatic plants*, International center for science and high technology. Trieste, pp: 258-230.

[6] M.Kumaresan, P.N.Palnisamy and P.E.Kumar, Application of Ecofriendly Natural Dye obtained from flower of Spathodea Campanulate on Silk, European Journal of Scientific 2011. Research, Vol.52, No.3, pp: 306-312

6. Corresponding address

J.Pearly
PhD Research scholar
Department of Textiles & Apparel Design
Bharathiar University
Coimbatore - 641046
Tamil Nadu, India
E-mail rarp.pearl@gmail.com