

WOUND HEALING FABRIC-NATURAL ANTIBACTERIAL FINISHES ON COTTON FABRIC USING HERBAL LEAVES

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ABSTRACT

Cotton fabric has been widely used in various fields for its soft, cool, fluffy characteristics. It plays a major role in healthcare domain for wound healing process. Natural antibacterial finishes on cotton fabrics are less toxic and free of chemicals. It has multifunctional healing properties when compared to chemically made wound dressing materials. One such natural finishes has been extracted from *Catharanthus roseus*, *Ocimum tenuiflorum* by aqueous method. The comfort properties such as Drop test, Wicking test, Immersion test has been performed and shows good results. Antibacterial activities of these medicinal leaf extracts has been analyzed by comparing its result with CF, TF, CTF. Hence the extract of the herbal products imparts cotton based fabric with more antibacterial properties in addition to its own and smoothness.

Key words: wound healing, leaf extract, antibacterial activity.

Nomenclature: CF- *Catharanthus roseus* finish, TF- *Ocimum tenuiflorum* (Tulsi) finish, CTF- *Catharanthus roseus* and *Ocimum tenuiflorum* finish.

INTRODUCTION

Wound healing is the process of repairing of the skin and other soft tissues that follows immediately after an injury [1]. Beginning phases of wound healing include hemostasis and inflammatory phase followed by combination of collagen and other extracellular framework which are subsequently renovated to shape scar [2]. It is a typical natural reaction to the injury that sets into movement an arrangement of occasions. Unhealed wounds continually produce alarming arbiters that produce pain and swelling at the injury site. Chronic wound may even prompt numerous organ disappointment or demise of the patient [3].

Cotton fabric is quite possibly the most regularly utilized sorts of fabric in the world. This material is organic in nature, which implies that it doesn't contain any synthetic mixtures [4]. Cotton assumes significant part in medicinal uses. The utilization of raw cotton fibers in various clinical applications which includes, wound dressing, protecting burns. Cotton fibers are less harmful and free of synthetic compounds.

Natural herbs can be used as an eco-accommodating compounds instead of engineered antimicrobial agents for textile application because of its minimal expense and its lower frequency of antagonistic response compared

with synthetic agents [5]. *Catharanthus roseus* is a herbaceous plant, which is generally utilized in the therapy of tumor growth, dermatitis, sores, ringworm, scabies and heart tonics. Fundamentally leaves and blossoming points of the plant are utilized for extraction of oil which is found to have antibacterial activity. *Ocimum tenuiflorum* (Tulsi) is an aromatic bush, which is suggested as a treatment for a scope of conditions including, skin illnesses, ringworm and snake bites. The nano encapsulated herbal extracts finished cotton fabric shows greater antibacterial activity and it is emerging as a advanced wound healing technology [6]. Hence in the present study the aqueous extract of *Catharanthus roseus*, *Ocimum tenuiflorum* were investigated for their performance of antibacterial activities.

MATERIALS AND METHODS

Selection of materials: Cotton woven fabric has been chosen for the current study. The selection of the cotton fabric was made for its soft feel. The yarn count used for the study was 30's. The desized cotton woven fabric about 3 meters was sourced from Maharaja fabrics, Pollachi, TN, India for the current study.

Selection of herbs: *Catharanthus roseus* and *Ocimum tenuiflorum* (Tulsi), was selected as natural extraction. These extraction was selected as it is abundantly available and proved to have better finishing toward anti-bacteria.

Drying: The leaves of *Catharanthus roseus* and *Ocimum tenuiflorum* (Tulsi) was collected and were washed separately under running tap water. Before they were used for extraction, excess of water was removed from the leaf by using filter paper. Both leaves were shade dried for 9 days. The dried leaves were made into fine powder using blender.

Extraction of herbs (Separate form): The extraction of *Catharanthus roseus* and *Ocimum tenuiflorum* was done using aqueous method. The dried powder was ready for extraction. The following recipe was followed for the process of extraction. 10 g of dried herbal powder was mixed in 300ml of hot water, let it become warm, then it was poured in an air tight conical flask and kept in shaker for about 1 hour, after that the extract solution was left for 24 hours in room temperature and then filtered using filter paper.

Extraction of herbs (Composite form): The *Catharanthus roseus* and *Ocimum tenuiflorum* dried powder was ready for extraction. The following recipe was followed for the process of extraction. 5 g of *Catharanthus roseus* and 5 g of *Ocimum tenuiflorum* dried herbal powder was mixed in 300ml of hot water, let it become warm, then it was poured in an air tight conical flask and kept in shaker for about 1 hour, after that the extract solution was left for 24 hours in room temperature and then filtered using filter paper. The filtrate extracts was collected and kept in the bottles stored at 4⁰C for further use.

Finishing on cotton fabric:

Finishing on fabric (Separate form): The cotton fabric was treated with herbal extract by dip method. It was then immersed in the *Catharthus roseus* and *Ocimum tenuiflorum* extract for 30 min and dried at room temperature.

Finishing on fabric (composite form): The cotton fabric was immersed in the composite *Catharthus roseus* and *Ocimum tenuiflorum* extract for 30 min and dried at room temperature.

Antibacterial Activity: To perform antibacterial activity using *Pseudomonas aeruginosa*, *staphylococcus aureus* enterococci species were selected viz., bacterial cultures

Media and culture condition: Muller-Hinton Agar (MHA), Nutrient Broth (NB) were used throughout the study for determining the antibacterial assay. The media was adjusted to the pH and autoclaved at 121°C for 15 minutes.

Preliminary Assessment of Antibacterial susceptibility Testing: The Enterococcus faecalis, Pseudomonas aeruginosa, Staphylococcus aureus gram positive and gram negative bacterial strains were inoculated for 1 hour culture into supplement both and incubated for growth at 37C. Wells of 6mm distance across was penetrated on the agar medium. About 150u0pl of the concentrate was added to the wells. After which the plates were incubated at 37c for 24hrs in a hatchery. Later on, zone of restraint was measured and recorded. The best activity herb and the solvent were chosen dependent on the maximum inhibition rate.

RESULT AND DISCUSSION**Antibacterial activity:**

Anti-Bacterial result of finished cotton fabric as follows,

S. No.	Bacteria	Zone of inhibition in finishes(in cm)		
		CF	TF	CTF
1	<i>Enterococcus faecalis</i>	1.8	1.5	2.1
2	<i>Pseudomonas aeruginosa</i>	1.5	1.7	2.0
3	<i>Staphylococcus aureus</i>	1.7	1.8	2.0

Table 1: Representation of antibacterial zone

The antibacterial zone is higher in composite of *Catharthus roseus* and *Ocimum tenuiflorum* (CTF) when compared to separate form of *Catharthus roseus* (CF) , *Ocimum tenuiflorum* (TF). Especially the antibacterial

activity of composite CTF showed higher zone of inhibition against *Enterococcus faecalis* when compared to *Pseudomonas aeruginosa* *Staphylococcus aureus*



Fig 1: Enterococcus faecalis Fig 2: Pseudomonas aeruginosa Fig 3: Staphylococcus aureus

Comfort testing

S. No.	Type of test	Test session & type of fabric	Values in seconds	Values in cm
1	Drop test	Before Test- BF	2	1.8
		After Test- CF	2	2
		TF	2	1.6
		CTF	2	2.1
2	Wicking test	Before Test- BF	5	4.5
		After Test- CF	5	5
		TF	5	5.4
		CTF	5	5.8
3	Immersion test	Before Test- BF	4.2	-
		After Test- CF	4	-
		TF	4.4	-
		CTF	4.6	-

Table 2: Results of comfort testing

CONCLUSION

The study demonstrated the preparation of herbal extracts from *Catharanthus roseus*, *Ocimum tenuiflorum* using aqueous method. This method was proved to be an easy way to synthesize chemical free herbal extracts. The

results obtained were well supported the penetration of the herbal extract into the cotton fabric. The antibacterial results shows that the antibacterial zone is higher in composite form of *Catharanthus roseus* and *Ocimum tenuiflorum*. When compared to separate form of *Catharanthus roseus* and *Ocimum tenuiflorum*. Our future work involves conversion of the prepared fabric into medical bandages and other wound healing products.

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