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Analysing the Effect of Antimicrobial Wound Healing Property Using Natural Herbs on Woven Fabrics

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ABSTRACT:

Despite advances in technology, wound healing remains a challenge for the pharmaceutical industry. Only 1-3% of the drugs listed in Western pharmacopoeias are intended for wound cure and healing. Because of this challenge, medicinal plants have a huge potential to develop comprehensive solutions for wound healing at the moment. Furthermore, medicinal plants are now regarded as a rich source of wound treatment. Proper and adequate nutrition is critical in the treatment of wounds and associated infections. It is a complex process by which the skin heals itself after injury. In this research, the post-trauma repairing process is represented as a discrete timeline of physical characteristics (phases) corresponding to wound healing. The epidermis (surface layer) and dermis (deeper layer) of healthy skin act as a barrier to protect against the elements. A controlled series of biochemical events are launched when the barrier is breached to repair the harm. Blood clotting (haemostasis), inflammation, tissue growth (proliferation), and tissue remodelling make up the three predictable phases of this process (maturation). Instead of being a distinct stage, blood clotting could be viewed as a component of the inflammation stage. In this research study the wound healing property of psidiumguajava L, Tridaxprocumbens Linn, Acalypha indica finishing on organic cotton fabric.

Keywords: Organic Cotton fabric**,** psidiumguajava L, Tridaxprocumbens Linn, Acalypha indica, Punica granatum, Skin Care

1. INTRODUCTION:

A rise in accidents is to blame for the various kinds of wounds, which has had an effect. The continuity of the living tissue within an anatomical structure is disrupted by a wound. Healing is the process of repair after a wound to the skin or other soft tissues. In essence, the healing process for wounds is an attempt to maintain the normal structure and function. The ability of a wound to heal in part depends on the depth of the wound in addition to an individual's overall health and nutritional status. A wound can be categorised as acute or chronic based on how quickly it heals.An acute wound compromises the integrity of the soft tissue envelope enclosing any part of the body. Acute wounds are identified by their depth, size, and involvement of anatomical structures. However, the exact time it takes for a condition to heal and whether it is considered acute or chronic are arbitrary and frequently depend on the location and source of the wound, the patient's age and physical condition, as well as other variables. In terms of healing time, an acute wound takes 4 to 6 weeks longer than a chronic wound. By this time, if an acute wound has not healed naturally, it is likely that it will become a chronic "problem wound" that requires further care. Multiple mechanisms that compromise the health of the skin and subcutaneous tissues are frequently the cause of acute wounds. These mechanisms include piercing or blunt trauma in addition to a range of environmental exposures, such as chemicals, temperature extremes, prolonged or excessive pressure, and radiation. The continuity of the skin may be compromised by any of these mechanisms, allowing pathogens to enter and spread an infection locally or systemically. Regardless of the type of cutaneous injury, acute wounds are anticipated to heal in a predictable amount of time; however, the type, location, and depth of the wound will influence the type of treatment required to promote healing. A further study of the literature Chronic wounds are ones that don't heal well or don't have the desired results.The progression of the repair phases in a timely manner promotes faster wound healing. The timeliness of treatment depends on the type of wound pathology, the patient's health, and environmental factors. The majority of chronic wounds are associated with a small number of clinical conditions, particularly chronic venous stasis, diabetes mellitus, and pressure necrosis. Skin is an example of a tissue that, despite the fact that some healing processes also involve regenerative elements, responds to injury primarily through repair. The stages of wound healing are hemostasis, inflammation, proliferation, epithelialization, and maturation-remodeling. The phases might all occur simultaneously and systematically. Epithelialization, wound contraction, and the formation of collagenous scars are the three main mechanisms that promote the healing of skin wounds. Even though the relative contributions of each process vary depending on the type of wound, all of these processes are activated in response to injury. A partial-thickness burn heals primarily through epithelialization, as opposed to an incisional wound, which heals primarily through the formation of a collagenous scar. Wound contraction is the first step in the secondary healing of large open wounds like pressure sores. Epithelialization, wound contraction, and collagenous scar formation are the last stages of wound healing. There are numerous different precursors needed for these terminal events. Together, all of these beginning and finishing processes help wounds to mend in a methodical, controlled way.

2. LITERATURE REVIEW:

Recently, the textile industry has made extensive use of the sustainability concept. By preserving the environment and boosting the economy, organic production helps ensure that future generations will live in a higher standard of living. Organic cotton serves as the main raw material for textiles that are more environmentally friendly [1].The term "sustainability" has recently become popular in the textile industry. By protecting the environment and strengthening the economy, organically produced goods help ensure that future generations will enjoy a higher standard of living. Organic cotton is a primary raw material for more environmentally friendly textiles[2]. It is expected that consumers who want to purchase organic cotton clothing will also consider the performance of the garments. According to prior research, consumers who used "organic" as a purchasing criterion for clothing believed that buying organic cotton clothing would result in a high-quality product[3].

In traditional practises like Ayurveda, Unani, and Siddha, herbal medicines have been essential in treating and curing a variety of diseases and physiological conditions. This kind of treatment, also referred to as conventional treatment, served as the primary form of healthcare at the time.[6]

Tridax procumbens is a species of flowering plant in the daisy family, also known as coat buttons or tridax daisy. It is most well-known for being a pervasive weed and pest plant. Although it is native to the tropical Americas, it has been spread throughout the world to tropical, subtropical, and mild temperate regions. Tridax procumbens has historically been used in India to treat wounds as it was once known to treat infectious skin conditions in folk medicine. Along with treating gastritis and heartburn, it is a well-known ayurvedic remedy for liver disorders or having a hepato-protective nature.[4]

One of the weed plants with significant medicinal benefits for use in human health is Acalypha indica. It is frequently found in Pakistan, Sri Lanka, India, and Thailand. Extracts from the plant's leaves, roots, and stems are used medicinally to treat a wide range of conditions, including eye infections, respiratory issues, rheumatism, and skin issues, as well as to lower blood sugar levels. For the purpose of extracting the active ingredients from Acalypha indica, various extraction techniques are employed. Soxhlet extraction typically has a high efficiency and accuracy, but the thermal stress may cause the target photochemical components to deteriorate.[5]

Natural growth locations for Acalypha indica include moist, temperate, and tropical regions along the equator in Asia, Africa, Europe, Australia, South, and North America. The Indian population has a documented history of both using traditional and western medicines that were derived from plants [7]. Although many Australians are aware of this plant in their region, they are less likely to eat it [8]. According to reports that they used this plant as food, Acalypha indica is also found in the Arabian Gulf region [9]. In West Africa and southern Nigeria, acalypha indica is also a typical weed [10].

3. MATERIALS AND METHODOLOGY:

3.1 Selection of Materials:

The woven fabrics were procured from the market.

3.2 Selection of plant sources:

Raw, Tridaxprocumbens Linn,Acalypha indica,psidiumguajava L,Punica granatum are purchased from the ayurvedic centre .

3.3 Selection of Extraction Method and application :

3.3.1 Extraction Of Tridax Procumbens :

Purchase some fresh Tridax leaves.Clean and wash the Tridax leaves.Use a little water when grinding it. The solution is heated up after being ground.In the ratio of 45:5, add pomegranate juice as a binder.In the solution, dip the fabric for an hour.The fabric sample should be dried in the shade after dipping.

Fig:1- Tridax Procumbens Finished Fabric Sample

3.3.2 Extraction of Acalypha Indica:

Get some new Acalypha indica leaves.The Acalypha indica leaves should be cleaned.With a little water, grind it. After grinding, heat the solution until it is comfortable.Pomegranate juice in a 45:5 ratio should be added as a binder.Dip the fabric in the solution for an hour.After dipping, let the sample air dry in the shade.

Fig:2- Acalypha Indica Finished Fabric Sample

2.3.3 Extraction Of Psidiumguajava:

Obtain some new psidiumguajava leaves.The guava leaves should be cleaned.With a little water, grind it. After grinding, heat the solution until it is comfortable.Pomegranate juice in a 45:5 ratio should be added as a binder.Dip the fabric in the solution for an hour.After dipping, let the sample air dry in the shade.

Fig:2- psidiumguajava finished fabric sample

3.4 Testing of Fabric:

3.4.1 Air permeability:

Untreated cotton fabric,treated cotton fabric samples were tested for air permeability using an air tronic tester with a model 3240A air permeability tester under standard conditions in accordance with ASTM D737. The test area was 20 cm2 and the air pressure was 100 Pa. The woven cotton fabrics were tested, with an average of ten readings being taken for each sample, and readings were recorded.

3.4.2 Tensile Strength:

A cut stripe test and tensile testing in dry conditions according to ASTM Standard D5035 have been carried out for the organic cotton fabric before and after treatment. These findings suggest that the treatment has potential for enhancing the durability and longevity of organic cotton fabrics.

3.4.3 Functional property Testing

3.4.3.1 Anti microbial testing

The test specimens were disassembled (20mm in diameter). Nutrient agar plates (g/L composition: Peptone (5g); yeast extract (5g); beef extract (3g); sodium chloride (5g); agar (15 g); and final pH (7.0 0.2) were prepared and allowed to solidify. One loop full of culture (Escherichia coli and

Staphylococcus aureus) was transferred using a sterile 4mm inoculating loop by swabbing all around the surface of the agar plate and also covering the central area of the petridish. In a sterile zone, separate Nutrient agar plates were used for each test organism. All inoculated plates were incubated for 24 hours at 37°C.The average width of the zone of inhibition around each type of fabric specimen was calculated and presented in Table separately. The zone of inhibition was measured in millimeter (mm).

4. RESULT AND DISCUSSION:

4.1 Air Permeability:

ORGANIC COTTON FABRIC	**AIR PERMEABILITY (l/min)**
Before Treatment	16.38
After treatment with Tridax Procumbens	15.56
After treatment with Acalypha Indica	15.04
After treatment with psidiumguajava	14.20

Table 1-Air permeability testing of treated and untreated fabric

In this result treated fabric Air permeability was not affected by the finishing when compared to untreated fabric. This suggests that the fabric's ability to breathe was not significantly impacted by the finishing procedure.

4.2 Tensile strength:

Before treatment :

	Mean strength(kg/f)	**Minimum strength(kg/f)**	**Maximum strength(kg/f)**	**S.D**
Break force	9.34	2.40	16.60	6.01
Elongation	4.58	1.50	7.00	2.51

Table 2 -untreated organic cotton fabric

After treatment of fabric with Tridax Procumbens :

	Mean strength(kg/f)	**Minimum strength(kg/f)**	**Maximum strength(kg/f)**	**S.D**
Break force	10.15	6.80	18.80	5.79
Elongation	11.22	10.40	12.40	0.89

Table 3 - organic cotton fabric treated with Tridax Procumbens

After treatment of fabric with Acalypha Indica :

	Mean strength(kg/f)	**Minimum strength(kg/f)**	**Maximum strength(kg/f)**	**S.D**
Break force	11.05	8.80	20.80	7.59
Elongation	10.32	11.40	14.40	0.92

Table 4 - organic cotton fabric treated with Acalypha Indica

After treatment of fabric with Psidium Guajava :

	Mean strength(kg/f)	**Minimum strength(kg/f)**	**Maximum strength(kg/f)**	**S.D**
Break force	11.25	7.78	19.78	6.92
Elongation	10.21	9.35	11.25	0.82

Table 5 - organic cotton fabric treated with Psidium Guajava

In this result treated fabric tensile strength was not affected by the finishing when compared to untreated fabric

4.3 Antibacterial testing :

S. No	**MICROORGANISM**	**ZONE OF INCUBATIONS (In mm)**		
		TRIDAX	**ACALYPHA INDICA**	**PSIDIUM GUAJAVA**
1	**STAPHYLOCOCCUS AUREUS**	12	14	18
2	**ESCHERICHIA COLI**	10	12	16

Table 6 -antimicrobial testing of treated fabric

Thus Psidium guajava has the property to kill the microorganisms like staphylococcus aureus and Escherichia coli when compared to other samples. In this result Psidium guajava is suitable for wound healing properties compared to other samples.

4. CONCLUSION

Thus by comparing the woven treated organic cotton fabric with Psidium guajava seems to have a better weight percentage and ability to kill microorganisms like Staphylococcus aureus and Escherichia coli effectively. The Psidium guajava sample appears to have better properties than other herbal treatments. Psidium guajava are widely available and have powerful healing properties .Since Psidium guajava leaves appear to have a higher healing capacity than other herbs like Acalypha Indica and Tridax. This research concentrated on the pharmacological studies of plant/plant extracts and the soluble extracts in the creation of a suitable wound healing preparation, which, if properly validated and scientifically supported, can serve as a stand-in or even replace the current crop of wound healing agents.

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