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Application of Tridax Procumbens on Cotton and Linen Fabric for Wound Healing

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Abstract: **Various finishes were applied in the cotton and linen fabric. Here we use tridax procumbens herb extract for treatment on fabric. This study is mainly about wound healing medical fabric. For wound healing we choose tridax procumbens plant. The plants were collected from our college campus and dried and grained as a fine powder. Using soxhlet apparatus the ethanolic herbal extracts were taken and citric acid was added as a crosslinking agent. The extracts were treated on both cotton and linen fabric using normal dyeing method. The treated fabrics were subjected to an antimicrobial test to check the wound healing effect on the fabric. The treated samples should act against both gram positive and gram negative bacteria and check which has more efficiency on wound healing.**

Keywords: **Herbs, wound, finishing, tridax, cross linking, healing.**

1. Introduction

One of the important survival mechanisms is wound healing. The pharmaceutical company still faces a challenge for wound healing [1]. Only 1-3% of drugs used for curing and healing of wounds in western pharmacopeias. It is due to this challenge that medical plants possess enormous potential to come up with solutions for wound healing property [2]. In ancient centuries natural plants were used as a remedial for human diseases [3]–[5]. Here we use tridax procumbens treated fabric for wound care textile. Wound care textile is to apply directly on human skin so it should have better hygienic effect. The popular English name of tridax procumbens is 'coat buttons' because of the appearance of the flower. And in sanskrit the plant is commonly known as 'Ghamara' which is one of the Ayurvedic medicine plants. Tridax herbs are 13-24cm long and leafs are 6-9cm long. Tropical America, Africa, Asia and India are the native of this plant. In India tridax are found along rail road, river banks, road sides, waste grounds. The study shows that tridax is well known for hepatoprotective activity, Immunomodulatory activity, wound healing activity, Antidiabetic activity, and Antimicrobial activity. For wound care textile we treat the extract of tridax on both cotton and linen. Here we use 100% organic bleached cotton and linen fabric for better absorbency and hygienic purpose. The extraction of tridax procumbens is using soxhlet apparatus using ethanol solution. The herbs tridax procumbens we use are naturally available in many countries. FTIR analysis of tridax procumbers extract was revealed to have antimicrobial property. It shows the good reduction of bacteria. The SEM analysis of treated and untreated fabric shows the presence of antimicrobial component in the fabric [6]. Treatment of tridax procumbens by using pomegranate mordant using pad-dry-cure method had higher antimicrobial activity [7]–[9]. The finished fabric imparted to the antimicrobial test by AATCC 147 [10]. It shows that the treated fabric acts against staphylococcus aureus and E.coli bacteria. Here they use knitted fabric. The fabric samples are treated with herbs using citric acid as a cross linking agent. Here the known quantity of tridax procumbens leaf powder was mixed with 70% ethanol, and 70% methanol and incubated for 24 hours at room temperature. And the extract was filtered using filter paper. The antimicrobial activity of tridax shows only in the concentrated form. The result showed that increase in concentration of extract shows the increase in the zone of inhibition against microorganism [11]. It shows that phytochemical constituents present in the tridax extract. The phyto components such as tannins and flavonoids in the extract shows it has more antimicrobial activity. The presence of phytochemical and antimicrobial activity is enough to prove that it has wound healing property. The leaf of tridax mainly consists of crude proteins 26%, crude fibre 17%, soluble carbohydrates 39%, and calcium oxide 5%. Compared to aqueous extract the wound healing property is more in ethanol extract. By the wound healing model they observe that the aqueous and ethanolic extract of TP shows 95.79% and 98.86% [12]. The leaf extract reduces the bleeding time on wounds. It also lowers the blood clotting time and it depends on the concentration and amount of extract applied on the wound. The extract works against gram-positive pathogens namely S.aureus and K.pneumonia than gram-negative pathogens, namely P.auruginosa and E.coli when it is above 16% of concentration. This article is about a sustainable antimicrobial coated wound care application. It is 100% natural resources, it is biodegradable and environmentally [13], [14].

2. Herbs Used for Wound Healing Property

Tridax procumbens which are commonly known as coat buttons or tridax daisy. It is one of the flower plant species.

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Tridax procumbens is very promising species that produce secondary metabolites reported to have a variety of medical uses. It is traditionally known for antiviral effect, antioxidant effect and wound healing activity [15]. The tridax procumbens leaf extract proves that it has the ability to decrease the time taken for blood clotting and helps in homeostasis. T.procumbens is a semi prostate annual or short-lived perennial herbs [16]. Flower heads are long-peduncled and white or creamy in colour. Tridax procumbens is one of the Indian tradition medicine plants. The tridax is rich in flavonoids (such as bergenins, centaurein, catechins), carotenoids, alkaloids, phytosterols, tannins, steroids and minerals [17]. The moisture content of tridax procumbens is 88.30% in stem and 90.05% in leaf. T.procumbens is rich in protein, here the protein content in stem is 37.44% in dry weight and 4.38% in wet weight. And the protein content in leaf is 34.57% in dry weight and 3.44% in wet weight [18]. The extract obtained from the leaf is applied on the spot of cut or wound to stop bleeding and pain. It's because of the property present in the herb [19]. The properties are antioxidant activity, anticancer activity, immunomodulating property, hypotensive effect, and antidiabetic activity, and wound healing property, anti-inflammatory and hepatoprotective activity. The extract of tridax has an inhibitory effect against staphylococcus aureus. It shows that it has better antimicrobial activity [20]. The flavonoids of tridax procumbens act against two gram bacteria (escherichia coli and proteus mirabilis) and one gram positive bacteria (Staphylococcus aureus) and also act against fungus (Candida albicans) [21]. The tridax procumbens acts against different bacterial strains was analysed. It also acts against Helminthosporium oryzae, Rhizoctonia solani and Pyricularia oryzae. These fungal pathogens significantly affected 0.1% concentration of extract. T.procumens shows hisher effect in H.oryzae in comparison to R.solani and P.oryzae. It shows that tridax procumbnes have anti-fungal activity [22].

3. Components Present In Tridax Procumbens Leaves

A flavonoids glycoside:-5,7,4-trihydroxy-6,3-dimethoxy flavone 5-O-alpha-L-rhamnopyranoside and 3,6-dimethoxy-5,7,2,3,4-pentahy droxy flavone 7-O-β-glucopyranoside; 3S-16-17-didehydro falcarinol [23].

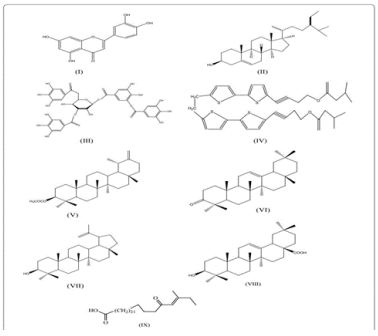

Fig. 1. List of some components from tridax procumbens

4. Finishing Methods

The extract of herbs can be applied in textile using different methods. There are exhaust methods, coating, spray, pad dry cure method, spray and foam technique. It can also be directly applied into the fibre spinning dope. In common the extract applied to the fabric during dyeing or any finishing process [24].

1) Direct method

In direct method the extract is directly treated with the fabric. Here according to the fabric weight the herbal solution is taken. Along with the herbal extract 8-10% of citric acid to be added. Here the citric acid acts as a binding agent. Padding was carried in a pneumatic padding mangle with required pressure to get a better wet pickup. After drying and curing process carried out at 80 C for 5min and 120 C for 2min [25]–[27].

2) Microencapsulation

Micro encapsulation is one of the best methods for functional finish to the textile material. In this process the tiny droplets of liquid particles of solid are covered with a continuous film of polymeric material. This process are more advantageous for conventional processes in terms of economy and efficiency. For microencapsulation the core material is the herb solution (tridax procumbens extract) and the cover material is the gum acacia. The methodology is, 10g of acacia powder was allowed to swell for 15min in 100ml of hot water. And 50ml of hot water was added along with this mixture and stirred for 15min at the temperature between 40ºC to 50ºC. The core material of 1.5g added to the solution and stirred for another 15min. Along with that 10ml of 20% of sodium sulphate and 6g of citric acid were added. After that the stirring was stopped and freeze the mixture to develop microcapsule. The mixture is applied to fabric by padding method [28]–[31].

3) Cross-linking method:

The herbal extract (tridax procumbens leaf) 1g was added with 100ml of formaldehyde based resins and 2g of MgCl2 was added as catalyst. The fabric is dipped in this resin and padded through a padding mangle and dried for 80ºC for 5min and cured at 120ºC for 2min [32]–[34].

5. Conclusion

Antimicrobial activity is important for textile materials to product the textile and humans from the pathogenic microbes. This study describes the various herbs used to produce the antimicrobial activity. This also describes the application methods and various compounds present in the herbs. This may be use full for the further studies. The herb tridax procumbens was selected and treated to the fabrics cotton and linen for wound healing property. The tridax procumbens extract was extracted using ethanol in a soxhlet apparatus and treat the fabrics using direct dyeing method. Citric acid is used as a crosslinking agent for both cotton and linen which improves the bonding between fabric and extract. The treated fabric shows better antimicrobial activity. The cotton and linen treated with tridax procubens act against both gram positive bacteria and gram negative bacteria. However the treated cotton fabric shows poor zone of inhibition than that of treated linen fabric.

The linen shows higher antimicrobial activity. It's because the linen has higher absorbency than cotton. The treated linen fabric is better for wound healing medical fabric than cotton.

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