

DESIGN AND DEVELOP A MEDICAL TEXTILE MATERIAL WITH INHERITED ANTIBACTERIAL PROPERTIES

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Abstract - The research work was designed to investigate the antidiabetic activity of the ethanol extract of flowers of *Tabernaemontana divaricata*. *Tabernaemontana divaricata* is a common garden plant in tropical countries has been used as a traditional medicine. In present study, the antimicrobial activity and antidiabetic activity of 100% ethanolic extract of flowers of *tabernaemontana divaricata* were evaluated. Using magnetic stirrer for influence of extraction methods on plant material and to achieve maximum possible extraction methodology of Magnetic stirrer, which possess certain advantages, improvement in organic solvents consumption, improvement in extraction efficiency. The raw materials used for Subsequently, cotton, polyester fabric and bamboo web were developed to prepare tri-layer fabric to fulfil the objectives. Thus, the extraction are applied from pad-dry-cure method for tri-layer fabrics. Then finally, fabrics were tested for anti-bacterial properties. Thus, the findings of the present research study concluded that tri-layer fabric coated with extraction of *tabernaemontana divaricate* possess excellent antioxidant and anti-diabetic properties. This may beneficial for the treatment of diabetes and its related complications.

Key Words: *Tabernaemontana divaricata*, Cotton, Polyester, Bamboo, diabetes, Wound healing

1. INTRODUCTION

According to the world health organization (WHO), India would have around 57 million Diabetic patients by the year 2025. *Tabernaemontana divaricata* (T.D) belongs to apocynaceae family. In India, it is mainly cultivated as an ornamental plant and it grows wild in hedges and shady forest. However, it is medicinally important evergreen shrub having various curative properties. In the folk medicine, it has been used for anti-infection, anti-inflammation, analgesic effects, anti-tumor effect, anti-oxidative effect. Wound healing is body's natural process of regenerating dermal and epidermal tissues which involves a sequence of complex events, resulting in restoration of wounded tissue to normal state found prior to wound repair. To address the growing concern about personal protection and environment, present study was carried out to develop a textile with inherited antibacterial and antidiabetic properties which reduced the amount of chemicals and trash being disposed of in the landfills.

2. OBJECTIVES

- To study the medicinal values of TD (*Tabernaemontana Divaricata*) and anti-diabetic activity of the flower.
- To identify multiple pathophysiological issues that can lead to diabetic wound disease.
- To identify the antibacterial activity of the sample.
- To Find the Presence of Alkaloids, Flavonoids, Phenols, Tannins, Terpenoids, Coumarin, Anthocyanin, Carotenoid, Protein, Carbohydrates.

3. MATERIALS AND METHODOLOGY

3.1 Raw Material

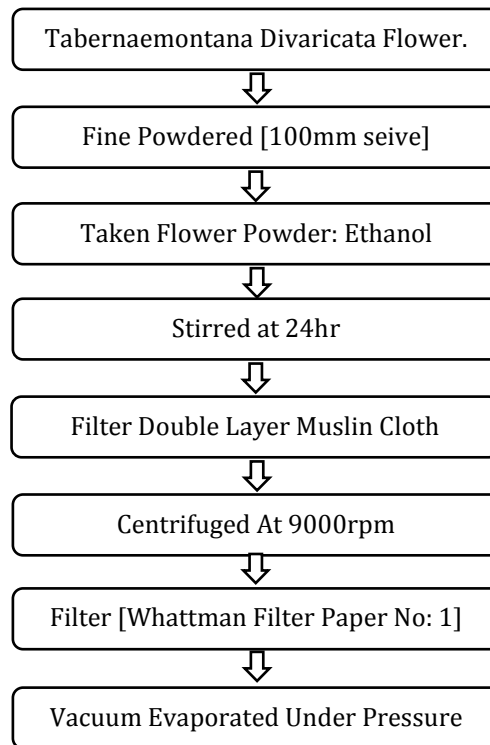
Tabernaemontana divaricata flower, cotton fabric, polyester fabric and bamboo web.

3.2 Fabric Parameters

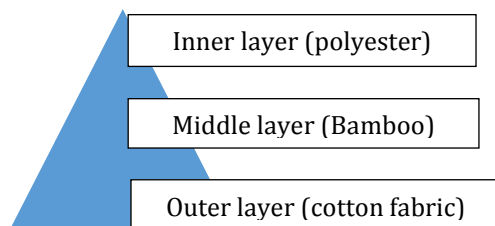
S.No	Fabric Detail	EPI	PPI	Warp Count	Weft Count	GSM
1	Cotton Finer Plain Fabric	94	60	34	28	130
2	Cotton Coarser Plain Fabric	42	36	10	8	242

3	Polyester Finer Plain Fabric	134	94	66	46	102
4	Polyester Coarser Plain Fabric	70	66	20	18	199

3.3 Preparation of Crude Extract



3.4 Wound Product Construction



3.4.1 Inner Layer [Polyester Fabric- Wicking Property]

Transport of water takes place through the phenomenon of capillarity. Capillarity is the ability of liquids to penetrate fine pores with wettable walls and be displaced from those with non wettable walls. Wicking polyester has a special cross-section and a large surface area, which picks up moisture and carries it away from your body, spreading it out, to evaporate easily on the outside of the fabric. So, you stay cool and dry. Some people will refer to wicking fabrics as being breathable – that is, they let air in and sweat out. Breathable showerproof and waterproof fabrics have tiny pores in the fabric, larger than water vapor molecules (so these can get out) but much smaller than drops of rain (so these can't get in).

3.4.1 Middle Layer [Bamboo Web- Anti bacterial Property]

The bamboo tree contains anti-bacterial substances as the tree trunk uses in order to protect it- self against insect attacks and fungus. This means that bamboo without the use of pesticides, which together with other factors such fast growing rate and low water consumption makes it a sustainable raw material for textiles. However, the anti- bacterial elements in the trunk do not get transferred to the fiber used in textiles. Bamboo, viscose has better order prevention properties than cotton.

3.4.1 Outer Layer [Cotton- Moisture Vapor Transmission]

The moisture and air circulation are properly matched is called the “comfort zone”. Microclimate that provides there is defined by physical and physiological condition three basic parameters of clothing. Physiology [temperature, moisture and air circulation] must be adopted to different internal and external influence like rest or body exercise and to the changes in outside climate hence clothing must a sure rapid adjustment to new conditions appropriate heat and moisture transport and air permeability. The main task of clothing for is therefore temperature regulation for the body the circulatory organs.

3.5 Pad – Dry- Cure Method

Pad-Dry-Cure or Exhaust-Dry-Cry is a finishing process applied to textiles to impart different finish treatments, such as antibacterial or anti-odor finishes. Here the prepared textile material is passed through a water-based solution bath containing the extract of tabernaemontana divaricata flower. Then the textile material is dried and cured using heat and/or pressure. This process is the parent process for several different finishing treatments. It is assumed that multiple finishes may be applied in the solution bath, therefore the impacts of this stage are the same regardless of the number of finish treatments applied. Process includes water, chemical and energy impacts.

4. TESTING

4. 1 Anti-bacterial activity test using Agar well diffusion technique (Perez, 1990)

The plant extract was tested for antibacterial activity by standard agar well-diffusion method against Clinical pathogen bacteria. The pure cultures of bacterial pathogens were subculture on nutrient broth; 20 ml of nutrient agar were poured into Petri plates The cultures were swabbed uniformly using sterile cotton swap. Wells of 6mm diameter were made on nutrient agar using gel puncture, respectively and then 100µl of plant extract solution was loaded into the wells. After incubation at 37°C for 24 hours, the different levels of zone of inhibition were measured.

S. No	Organism	Zone Of Inhibition In (mm)			Standard (CIP-1000g/ml)
		Ethanol Extract			
		50%	75%	100%	
1	E.coli	13	20	23	26
2	S.aureous	8	16	20	28

Table 4.1 Antibacterial Activity Using Well Diffusion Method

4. 2 T.D flower Qualitative Phytochemical Analysis

Preliminary phytochemical screening was carried out following standard procedures by Harborne, 1973, Kokate, 1994, Sani et al., 2007.

S.NO	PARAMETERS	ETHANOL EXTRACT
1	ALKALOIDS	+
2	FLAVONOIDS	+
3	PHENOLS	+
4	TANNINS	+
5	TERPENOIDS	+
6	COUMARIN	+
7	ANTHOCYANIN	-
8	CAROTENOID	-
9	PROTEIN	+
10	CARBOHYDRATE	+

Table 4.2 Qualitative Phytochemical Analysis

4.3 Fabric sample Zone of inhibition analysis

The sample was tested for antibacterial activity by standard agar well-diffusion method against Clinical pathogen bacteria. The pure cultures of bacterial pathogens were subculture on nutrient broth; 20 ml of nutrient agar were poured into petri plates. The cultures were swabbed uniformly using sterile cotton swap. Wells of 6mm diameter were made on nutrient agar using gel puncture, respectively and then 100µl of plant extract solution was loaded into the wells. After incubation at 37°C for 24 hours, the different levels of zone of inhibition were measured.

Material Code	Zone Inhibition (mm)	
	E.coli	S.aureus
1	14	16
2	14	18
3	11	14
4	14	16

Table 4.3 Antibacterial Activity of Fabric Sample

5. DISCUSSION

Thus the present study, the sample observed ethanolic extracts of effective against Escherichia coli and staphylococcus aureus bacterial activity. It can be concluded from the sample 2 an shown an inhibition zone of 14mm and 18mm against the Escherichia coli and staphylococcus aureus. The zone of inhibition within this range is satisfactory for further antibacterial studies. As per the studies we have concluded Sample 2 bacterial activity.

6. CONCLUSION

The present Investigation of ethanolic extract of flower Tabernaemontana divaricata shows the presence of flavonoids, phenols, tannins, terpenoids, coumarin, protein which possess excellent anti-bacterial, antioxidant, anti-microbial and anti-inflammatory. Alkaloids shows both anti-bacterial and anti-diabetic property. Phenols and phenolic compounds have been extensively used in disinfections. And the presence of carbohydrates shows the presence of reducing sugar. In the present study conclude that the prepared tri-layer have potential to act as a source of drug because of presence of various phytochemical constituents and also to improve the health status of consumers as a result of the presence of various compounds that are vital role for good health.

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