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Diabetic Foot Wound Care Treatment Using Cleome Viscosa Herb

R Pragadheeswari[1] and Dr K Sangeetha[2]
[1]Assistant professor Fashion Design, Tamilnadu Open University, Chennai, India
[2]Professor Department of Apparel and Fashion Design, Bharathiar University, Coimbatore, India

Abstract-*Herbal remedy is the traditional form of health care system recognized by mankind. Herbs had been used by all cultures throughout history.Herbs are the potential source of chemical constituents which have high therapeutic value. The present investigation was undertaken to evaluate the wound healing property of the leaves of Cleome viscosa. The extracts of Cleome Viscosa leaves have been obtained and finished on to the cotton knitted fabrics. The finished fabrics are assessed for the antibacterial activity against the selected wound pathogens which are commonly present in the human foot wounds. Phytochemical analysis showed presence of flavonoids, tannins, saponins and alkaloids. The herbal extract treated fabrics show good antibacterial activity against the pathogens.*

Keywords: *Medicinal plants, antimicrobial activity, Diabetic Wound Pathogens*

I. INTRODUCTION

Diabetic foot infection is a common cause for diabetic patients in India. Herbs have been integral to both traditional and non-traditional forms of medicine dating back at least 5000 years. Preparations from traditional medicinal plants are often used for wound healing purposes covering a broad area of different skin related diseases. Large number of medicinal and aromatic plants found growing widely and several of these plants have been in use for centuries of their medicinal properties (1).Plants act generally to stimulate and supplement the body's forces; they are the natural food for human beings (2, 3). *Cleome viscosa* Linn. is also known as Tickweed, or Spider plant. It occurs in woodland and grassland, and is a weed of fallow land, fields, roadsides and wasteland, often occurring on sandy soils, but sometimes on calcareous and rocky soils.

Vernacular name in India-
Common name- Asian spider flower, Cleome, Jakhiya, Tickweed

Hindi- Bagra
Urdu- Hulhul
Malayalam- Naivela
Tamil- Naikkaduku
Kannada- Nayibela
Gujarati- Pilitalvani
Telugu- Kukkavaminta
Botanical Name- *Cleome viscosa* (4)

Whole plant and its parts (leaves, seeds, and roots) are widely used in traditional and folkloric systems of medicine. In Asia and Africa

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the leaves and seeds used to treat infections, fever, rheumatism and headache. The whole herb is used in treatment of inflammation of the middle ear and applied on wounds and ulcers. A decoction is used as an expectorant and digestive stimulant and the vapour from a steaming decoction of the whole plant is inhaled to treat headache (5). The roots are a remedy for scurvy and rheumatism (6). The seeds and its oil have anti helminthic properties but they are ineffective in treating roundworm infections (7).Plant is also used for treatment of skin diseases, gulma (any tumor, lump or diverticulosis), asthila (prostate enlargement), krmiroga (worm infection), kandu (pruritus), and karnaroga (ear diseases) in Ayurvedic medicinal system(8). The analgesic, anti microbial, anti diarrhoeal, anti pyretic, hepato protective, anti hyper lipidemic and anti ulcer activities of the aerial parts has been reported (9). The popular use of the whole plant and leaves refers mainly to its antiseptic, anti inflammatory activity and wound healing.(10).Wound healing property of *Cleome viscosa*- The leaves and whole plant of *Cleome viscosa* are used as a folk remedy to cure the wounds, ulcers, inflammations and skin infections.(11).Hence, in this study Direct, Microencapsulation technique has been used to fix the herbal extracts on the fabrics. The extracts were applied to the cotton knitted fabric by direct application method and microencapsulation method. An extensive study was conducted to assess the efficacy against the selected human foot wounds pathogens.

II. Materials and Methods

A. Collection of Plant Material

The *Cleome viscosa* plant material collected from local areas of Coimbatore, Tamilnadu. Small young leaves were collected from healthy plants of *Cleome viscosa*. They were washed under continuous flashing of running tap water for 30 minutes and then with distilled water three times, shaded, dried and then powdered with the help of blender. The powdered material was kept in airtight bottles until further use. .

B. Preparation of Plant Extracts

10 grams of the herbal powder was mixed thoroughly with 100 ml of methanol and it was kept in airtight conical flask. The conical flask was incubated for 24 hours in the room temperature. The supernatant was filtered using a Whatmann no.1 filter paper and the filtrate was dried and the methanol was evaporated at room temperature. When exposed to the air.

C. Phytochemical Screening

The phytochemical compounds are responsible for therapeutic effect are usually the secondary metabolites The extracts of plant cleome viscosa were subjected to preliminary phytochemical screening by using standard procedures (Harborne, 1993; Trease and Evans, 2002) for the detection of tannins, alkaloids, flavonoids, saponins, Phenol, , Fixed oil and fats

D. GC-MS Analysis

GC-MS analysis was carried out using GC Clarus 600 Perkin Elmer system interfaced to a mass spectrometer (GC-MS) instrument employing the following conditions: column Elite-35ms fused silica capillary column (30 X 0.25 mm ID X 0.25 mm film thickness, composed of 5% Phenyl, 95% Dimethyl Polysiloxane), operating in electron impact mode at 70 eV, The carrier gas was Helium (99.99%) used at a constant flow rate of 1.51 ml/min. injector and mass transfer line temperature were set at 200°C and 240°C respectively. The oven temperature was set from 70 to 220°C at 10°C/min, held isothermal for three minutes and finally raised to 300°C at 10°C/min. Two microlitres of the sample was injected in a split mode with a scan range of 40 – 1000 m/z. The total running time of GC-MS was 30 min. The relative percentage of the extract was expressed as percentage with peak area normalization. (12&13).

E. Selection of Fabric

Cotton fabric was selected for the application anti microbial extract of *cleome viscosa*.

F. Selection of Human Foot Wound Pathogens

The test organisms like *Staphylococcus sp. Methicilin-resistant Staphyloccous aures, Entrobactor colace, Pseudomonas sp. Klebsiella Pneumenia* which are present in the human foot wounds were procured from a diagnostic centre at Coimbatore, Tamilnadu, India.

G. Finishing of Fabrics

Following two methods were used for the finishing of fabrics.

(i) Direct Application Method

The prepared methanol extract was directly applied on the cotton fabric using pad-dry- cure method.

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(ii) Microencapsulation Method (14)

Microcapsules containing herbal extracts were prepared employing 3% of sodium alginate. Equal proportion of sodium alginate and extracts was prepared separately and then sprayed into calcium chloride solution by means of a sprayer.The formed droplets were retained in calcium chloride for 15 min to harden the capsules. The microcapsules were obtained by decantation and repeated washing with isopropyl alcohol followed by drying at 45°C for 12h. The microcapsules were then used for finishing on the bamboo/cotton fabrics by exhaustion method using 8% citric acid as binder. The fabric was kept immersed in the solution for 30 mins at 50°C. After finishing, the fabric was removed, squeezed, dried at 80°C for 5 min and finally cured at 120°C for 2 min.

H. Assessment of Antibacterial Efficacy

Antibacterial efficacy was assessed using AATCC 147 standards. The cotton fabric samples were cut in rectangular shape with 25 × 50 mm for analysis. Sterile bacteriostasis agar was dispensed into petri dishes. Broth cultures (24 h) of the test organisms were used as inoculums. Using sterile inoculation loop, the test organisms were streaked, considering 5 lines with 4 mm width over the surface of the agar plate. Pre-sterilized samples were placed over the culture inoculated agar surface by using sterile forceps. After placing the samples, all the plates were incubated at 37 °C for 18- 24 h. After incubation, the plates were examined for the zone of bacterial inhibition around the fabric sample. The size of the clear zone was used to evaluate the inhibitory effect of the sample.

III. Results and Discussion

A. Phytochemical Screening

The Methonal Extracts of plant cleome viscosa were subjected to and the table-1 shows the result of presence and absence of preliminary phytochemicals

Table-1 Preliminary phytochemical screening of powder

Phytochemical	Methonal extract
Tannins	+
Glycosides	-
Alkaloids.	+
Flavonoids	+
Saponins	+
Phenol	-
Fixed oil and fats	+

The phyto components present in the Methonalic extract of *Cleome viscosa* were identified by GC-MS analysis, GC-MS running time being 30 min. The GC-MS chromatogram of Methonalic extract of *Cleome viscosa* is presented in Fig. 1. The active compounds in the Methonalic extract of the plant, their retention time (RT), molecular formula, weight and concentration is provided. The present study on GC-MS revealed the presence of major compounds are of tannins, alkaloids,flavonoids, saponins,.

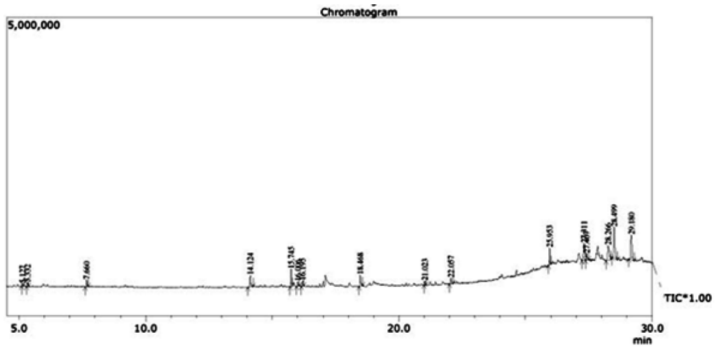

Fig.1 GC-MS analysis of *Cleome viscosa*

B. Assessment of Antibacterial Efficacy

The results of antimicrobial activity of the extracts of *Cleome viscosa* is summarized in Table-1. Both methanol Extract have showed good antimicrobial activity against *Staphylococcus sp. Methicilin-resistant Staphyloccous aures, Entrobactor colace, Pseudomonas sp. Klebsiella Pneumenia*. Microencapsulation technique shows the better result than the direct application.

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Table-2 Antimicrobial activity of cleome viscose

Name of the micro organisum	Mode of Extract	Diameter of the Zone of incubation	
		Direct application	Microencapsulation
Staphyloccous aures,	Methanol	12mm	18mm
Methicilin-resistant Staphyloccous aures,	Methanol	13mm	14mm
Entrobactor colace,	Methanol	14mm	17mm
Pseudomonas sp.	Methanol	10mm	12mm
Klebsiella Pneumenia	Methanol	8mm	12mm

IV. Conclusion

Thus the wound healing activity of the plant can be recognized to the presence of their phytochemical which may be dynamic individually or it may be the combined activity of the constituents. Study showed that *C. viscosa* possesses the better results showed that the plant possess significant wound healing activity against the wound infecting pathogens. The great number of plants used in Indian medicine especially in wound healing which could be of considerable interest in the application of Medical Textile.

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