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Research Article

DEVELOPMENT OF CURCUMA CAESIA COATED FACEMASK

[1]Sowmiya kumari. R, [2]Nethra. J,[3] Shanmathi. K, and [4]Dr.S.Kavitha

[1,2,3]Department of Fashion Technology. Kumaraguru College of technology, Coimbatore, India
[4]Assistant Professor III, Department of Fashion Technology. Kumaraguru College of technology, Coimbatore, India

A R T I C L E I N F O

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A B S T R A C T

Natural antimicrobials are used to inhibit the growth of bacteria. It is a known fact that the Curcuma longa (yellow Turmeric) has a good antibacterial activity which is the main ability to cure acne in the face and it is used to cure acne right of the ancient days since then many numbers of medications have evolved. But those medications have the risk of Side effects, wrinkles, ageing of face. This paper explains about fabric face mask which has the antibacterial property to clear acne in face. Curcuma caesia (black turmeric) used here has the same ability as Curcuma longa (yellow turmeric) to cure acne on the face. Curcuma caesia (Black Turmeric) is taken instead of Curcuma longa (turmeric) since it has a high amount of Curcumin content compared to Curcuma longa (yellow turmeric). The Curcuma caesia extract is applied on the Woven fabric, knitted fabric and Nonwoven fabric. Their properties were compared in terms of a various test in terms of their ability to restrict the growth of the bacteria and the fabric which is more effective in preventing the antimicrobial activity is selected for the acne preventing face mask. The face mask developed will be user friendly and eco-friendly and saves consumers' time.

INTRODUCTION

Skin is the outermost covering of the body and is the largest organ of the integumentary system. The primary function of the skin is to act as a barrier against mechanical impacts, pressure, microorganisms, radiations, chemicals etc. Keeping our skin healthy and moist helps keep this barrier strong. Good skin care requires cleansing and moisturizing. Cleansing is essential to remove dirt and dead skin cells.

It helps to prevent pimples or acne. Normal skin especially in women, occasional blemishes at pre-menstruation stage due to an increased release of male hormone "androgen". Androgen is known to alter the skin's pH which causes an increase in sebum production which blemishes. Acnes are a major problem among teenagers and the treatments and medicines available to cure acne have many side effects. Medicinal plants can be considered as the backbone of traditional medicine and are widely used to treat a plethora of acute and chronic diseases all over the world.

India has more than 7000 herbal plant species and is used in various indigenous system of medicine Herbal plants are widely known as "Chemical Goldmines" due to the presence of natural chemicals, which are acceptable to a human physiological system. Hence the herbal medicines will be the best alternative to cure acne. Acnes are caused when the bacterium blocks the oily region of the skin's pores.

Corresponding author:* **Sowmiya kumari. R
Department of Fashion Technology. Kumaraguru College of technology, Coimbatore, India

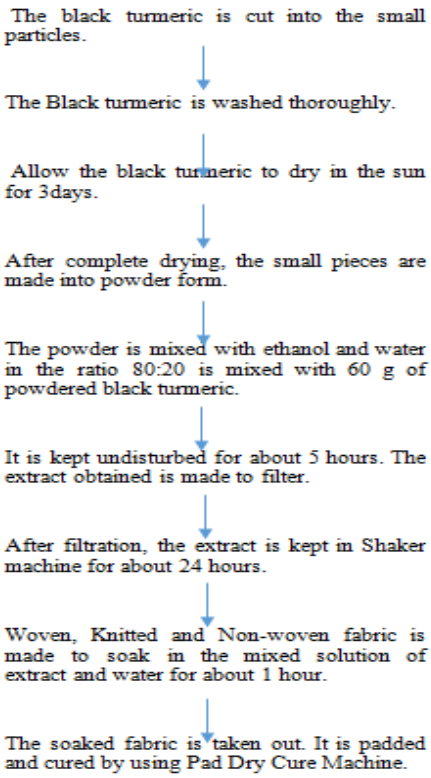
The extracts of the herbal plants with the antibacterial property, when applied on skin, can inhibit the blocking by the bacterium and it is used as a home remedy right from the ancient days. But the risk and duration of the time occurred during the application of those extracts is more. Hence the facemask coated with the herbal extract will be the best and alternative solution to avoid those risk occurred during the direct application of herbal extracts on face.

MATERIALS AND METHODS

Materials Used

Machine: Pad Cure Dry Machine, Shaker Machine.
Apparatus: Conical Flask, Funnel, Beaker.
Sample: Grained black Turmeric powder.

Methodology



Testing

The following tests were done on the treated fabric.

1. Drapability
2. FTIR analysis
3. Crease Resistance
4. Air Permeability
5. Weight change
6. Thickness
7. Antimicrobial

Antibacterial Testing AATCC 147

Antibacterial activity assessment of textile materials using Parallel streak method (Parallel streak Method-Qualitative method to determine the antibacterial activity of fabrics) Qualitative method to determine leachable (diffusible) antibacterial activity of antibacterial agents on antibacterial treated textile materials were do to detect bacteriostatic activity on textile materials for Gram-positive and Gram-negative bacteria.

Test Specimens

Test specimens (non-sterile) were taken in the size of 25mm x 50mm. The specimen was laid across 5 parallel inoculums streaks each of diminishing width from both 8mm to 4mm wide with a distance between each streak 1cm.

Test Organism

S. aureus (ATCC 6538), K. pneumoniae (ATCC 4352)

Procedure

Preparation of nutrient broth (NB) • autoclave - NB, distilled water, glass tubes, in sterilization bin at 121 ˚C for 20 minutes. Wiped the surface of biological safety cabinet (BSC) with 70 % alcohol and place NB, glass tubes and inoculating loop and the stock culture was taken out from fridge (It was well prepared from freeze dried culture--> mother culture in the form of slant (-80celcius - 5 year) or petri plates. After the culture temperature reaches room temperature, the loop was inoculated with full of stock cultures of S. aureus & K. pneumoniae in 5 ml of NB in the respective tubes, it was closed and kept in a beaker/stand and incubated for 24 h in bacteriological incubator at 37 ˚C. The growth of cultures (visual turbidity) inoculated in Day 1 (18 to 24 hours) was checked.

Samples of size 25 mm width and 50 mm length was taken using the AATCC 147 sample template in Laminar Air Flow (LAF) .S .a. and K. p culture was taken from incubator to BSC and inoculum was prepared by transferring one ml of culture into 9 ml of sterile dis. Water and mixed well by vortexing the inoculum - diluted culture. 4mm Ni-Cr inoculating loop was incinerated, cooled and loaded one loop full of diluted S. a and K. p culture and 5 parallel streak of ~ 60 mm length and 10 mm space was made covering the central area of NA plates without refilling the inoculum.

It was allowed for a minute, and test specimen is placed across 5 inoculated streaks and ensured intimate contact by pressing the specimen to the agar surface with sterile forceps.

It was incubated at 37 ˚C± 2 ˚C for 18 – 24 h. and examined the incubated plates for interruption of growth along the streaks of inoculum beneath the test sample and for a clear zone of inhibition beyond its edge. The average width of a zone of inhibition is calculated along a streak on either side of the test specimen using formula W = (T-D)/2, where W = Width of the clear zone of inhibition in mm, T = Total diameter of the test specimen and clear zone in mm, D = Diameter of the test specimen in mm.

Fig 1 Antibacterial test using Klebsiella pneumonia

Fig 2 Antibacterial test using Staphylococcus aureus

Test Results

Test results showed better activity against both the Kelbseilla pneumonia and Staphylococcus aureus bacterium.

Drapability

Fabric Drapability is a morphological characteristic occurring when fabric is hanging down for its gravity. Drapability of fabric is a combined effect of several factors such as stiffness,

flexibility, rigidity, thickness. Draping is affected by the stiffness of yarn, size of yarn, thread count and method of construction.

Table 1 drapability test results

S.NO	Fabric	Drapability
1	Woven	0.5714
2	Non-woven	0.45
3	Knitted	0.3373

The wove,non-woven and knitted fabrics was tested for drapability and the test results show that woven,non-woven and knitted fabrics have good drapability co-efficient so that it can be fitted to face accordingly.

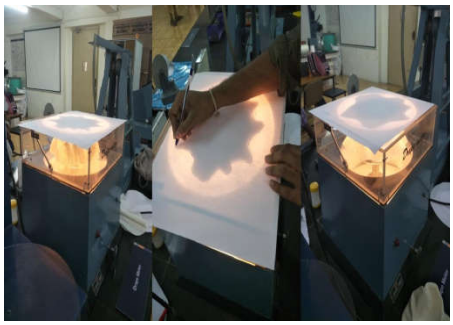


Fig 4 drapability

Ftir Analysis

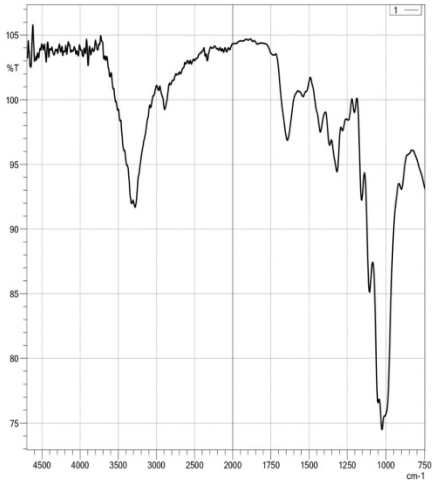


Fig 4 FTIR results

Here, x-axis indicates the wave number and the y-axis represents the transmittance (%). The test result shows that the various functional groups obtained from both treated and treated fabrics were confirmed the presence of bio-active substances. The result of FTIR study confirmed that the isolated compound is curcumin. The peak at 3014 cm^{-1} represents C-H Stretching and 1602 cm^{-1} peak was assigned to C=C symmetric aromatic ring stretching. The peak at 1506 cm^{-1} represents C=O, while enol C-O peak was obtained at 1280 cm^{-1} and benzoate trans-C-H vibration was at 962 cm^{-1}.The FTIR spectrum of the curcumin was matching with the FTIR spectrum reported in literature.

Crease Resistance-ASTM D1295 – 67

This is a fabric defect evidenced by a break line or mark or fold in a fabric generally caused by a sharp fold. Crease appears when the fabric is distorted in such a manner that part of it is stretched beyond its elastic recovery. During creasing the upper surface of fabric goes on extension and lower surface goes on compression.

Fig 5 Crease Resistance

Table 2 crease resistance result

S.NO	FABRIC	GSM
1	Woven	99.5
2	Non-woven	44.6
3	Knitted	208.6

When tested for crease resistance, the non-woven fabric has more crease resistance compared to woven and knitted fabric. The non-woven fabric with more crease resistance will be suitable for the face mask.

Table 3 thickness results

S.NO	Fabric	Thickness in mm
1	Woven	0.211
2	Non-woven	0.273
3	Knitted	0.371

Table 4 GSM results

S,no	Fabric	Crease resistance
1	Woven	Warp-52, Weft-57
2	Non-woven	104
3	Knitted	64

Table 5 air permeability results

S.no	FABRIC	Result $cm^3/cm^2/s$
1	Woven	9.81
2	Non-woven	41.48
3	Knitted	15.73

Air Permeability- ASTM D 737-96

Air permeability is the measure of airflow passed through a given area of fabric. This parameter influences the thermal comfort properties of fabrics to a large extent. It is generally accepted that the air permeability of a fabric depends on its air porosity, which in turn influences its openness. With more porosity, more permeable fabric is obtained

Fig 6 air permeability

When the fabrics is tested for air permeability, The air permeability values is higher for non-woven fabric compared to woven and knitted fabric. So that the non-woven fabric due to its structure might give higher air passage**.**

Curcuma caesia COATED FACEMASK

Fig 6 face mask pattern

The fabric is cut according to the standard face measurement and overlocked at the edges.

Fig 7 knitted fabric face mask

Fig 8 non-woven fabric face mask

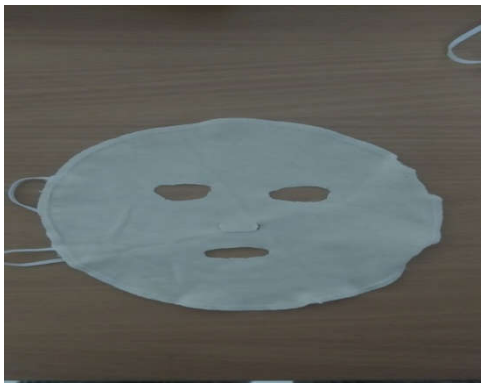


Fig 9 woven fabric face mask

RESULT AND DISCUSSION

The antibacterial test result shows that the Curcuma caesia coated fabrics have antibacterial Property against two types of bacteria namely Staphylococcus aureus and Klebsiella pneumonia. The FTIR result shows that the molecular structure of the fabric is not affected by the application of Curcuma caesia extract and effectively proves the presence of curcumin content as an active component. In terms of drapability, all the three woven, non-woven and knitted fabrics have good drapability coefficient. When the fabric is tested for crease resistance the non-woven fabric has good crease-resistant value. The test result for thickness and GSM shows that the knitted fabric has more values when compared with woven and non-woven fabric. In the testing for air permeability non-woven fabric shows the high passage of air due to its construction. From the test result, it shows that the face mask with Curcuma caesia coated non-woven fabric will be the more effective fabric among woven and knitted fabric. Further, this product can be made effective by applying the mask with a different fabric in human face.

6. CONCLUSION

Textile woven, non-woven and knitted face masks were developed with extract of curcuma caesia. Curcuma caesia treated fabrics are used for curing acne and making anti-ageing applications as an alternative to medicines and ointments. The treated face masks showed excellent antioxidant, antifungal, antiviral and antibacterial properties. The FTIR test result shows that the presence of functional groups in Curcuma caesia treated fabrics attributed to having better functional properties. This acne clear face mask has special advantages in comparison to other masks in that it is a purely herbal medicine and naturally undergo some properties such as antibacterial, anti-fungal. Apart from this, the curcumin content in Curcuma caesia is more than that of Curcuma longa, which is also a herb. New products from this can be made and become

successful. The successful result of the research work will efficiently cure acne.

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