

# DEVELOPMENT OF BACKBONE BOMBOO SPINE CURE HERBAL PATCH ATTACHED WITH POSTURE BELT

<sup>1</sup>Dr. T. R. Indumathi, <sup>2</sup>B. Naveen Kumar

<sup>1</sup>Assistant Professor, <sup>2</sup>B.Sc. Student  
Department of Costume Design and Fashion  
Dr. N.G.P. Arts and Science College  
Coimbatore.

**Abstract-** Bomboo spine” is a potential complication of ankylosing spondylitis (AS). AS is a chronic inflammatory arthritis that causes back pain and stiffness. It's caused by the exterior fibres of the annulus fibrosus in the intervertebral discs to ossify, which causes the spine's bones to fuse. This fusing changes the spine's shape and flexibility. It is now caused for many IT field workers. Our daily activities like sitting on the computer in our workplaces, working at home, studying, playing etc. Lays a lot of strain on our spine and back. Most of the people suffer from poster disorders while they are not aware of the fact that their daily activities have contributed to this state. To recover people affected by this Bomboo spine, this study was carried out by infusing medicated herbal extracts in a designed fabric patch attached with a posture belt. The developed herbal posture belt pain curing system, that is attached as a medicated patch on the lower spine area starts working on human body by penetrate the *Calotropis gigantea* curing oil through the skin and the belt positions correct with the reference of the spine posture. The standard tests were carried out for products bursting strength, elasticity, antimicrobial efficacy and also for subjective analysis in evaluation of its quality.

**Keywords:** Bomboo spine, Ankylosing spondylitis, *Calotropis gigantea*, Posture belt, Medicated patch.

## 1. INTRODUCTION

A side effect of AS, a persistent form of arthritis that inflames the spine and other parts of the body, is bamboo spine. Sometimes this inflammation causes the spine's bones to fuse together to form one continuous bone. Because the spine resembles a lengthy, grooved stick of bamboo, it is known as bamboo spine<sup>[1]</sup>. 24 tiny bones, or vertebrae, make up the adult spine, which extends from the neck to the lower back. The spinal column is formed by them stacking on top of one another. These bones are usually flexible and capable of autonomous movement. On the other hand, people with bamboo spines have stiffened, joined bones that make it difficult to move. Back pain can be a real pain<sup>[2]</sup>. It's important to take care of your back to avoid discomfort. Some common causes of back pain include poor posture, muscle strain, and injury. You can try doing gentle stretching exercises, maintaining good posture, and using ergonomic furniture and accessories to help alleviate back pain.<sup>[3,4]</sup>

Lycra cotton fabric benefits: Lycra cotton fabric blends offer a combination of benefits such as stretchiness, comfort, breathability, and durability. Lycra (also known as spandex or elastane) adds elasticity and shape retention to cotton, making garments more flexible and form-fitting. This blend is often used in activewear, sportswear, and everyday clothing for its ability to provide freedom of movement and maintain shape over time. Additionally, the natural fibers of cotton contribute to softness, moisture absorption, and breathability, enhancing overall comfort.<sup>[5]</sup>

*Calotropis gigantea*, the crown flower, is a species of *Calotropis*. People use the bark and root bark for medicine<sup>[6]</sup>. *Calotropis* is drought resistant, salt tolerant to a relatively high degree, grows wild up to 900 meters (msl) throughout the country. Flavonoids, triterpenoids, alkaloids, steroids, glycosides, saponins, terpenes, enzymes, alcohol, resin, fatty acids and esters of calotropeols, volatile long chain fatty acids, glycosides and proteases have been isolated from the various parts of the plant *Calotropis gigantea*<sup>[7]</sup>. People use *Calotropis* for conditions such as digestive disorders, toothache, cramps, joint pain, and many others, but there is no good scientific evidence to support these uses. Using *Calotropis* is unsafe, especially in high doses<sup>[8]</sup>.

In this study, to modify the posture belt as medical device, lycra cotton fabric is sewn in as a patchwork finished with medicated herbal oil extracted from *Calotropis gigantea* in traditional method also have its flexibility and elasticity. The health product medicated posture belt was tested for its efficacy under standard test methods.

## 2. MATERIALS AND METHODS

### 2.1. Selection of Fabric

#### 2.1.1. Lycra Cotton

Lycra cotton fabric has a smoother surface and is more elongation and flexible. Fabric made of Lycra is procured from the Tirupur knitting industry.

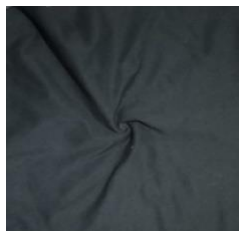


Fig .1 Lycra Cotton

### 2.2. Selection of Herb

#### 2.2.1. *Calotropis Gigantea*

It is a large shrub growing to 4 m tall. It has clusters of waxy flowers that are either white or lavender in colour. Each flower consists of five pointed petals and a small "crown" rising from the center which holds the stamens. The aestivation found in *calotropis* is valvate i.e. sepals or petals in a whorl just touch one another at the margin, without overlapping. The plant has oval, light green leaves and milky stem. The latex of *Calotropis gigantea* contains cardiac glycosides, fatty acids, and calcium oxalate [7]. Street flower *Calotropis gigantea* is known for its many health advantages, chief among them being the relief of back discomfort. These blooms are typically seen along village roadsides (fig 2). The flowers for this study were collected in and around the locality of Tirupur district.



Fig .2 *Calotropis Gigantea*

### 2.3. Herbal oil Extraction

The collected flowers were washed with clean tap water and weighted for 200gms. Wooden crushed sesame oil was taken as 100ml. Boil the weighted *Calotropis* plant flowers with sesame oil for 20 mins till it reduces to 60ml. Leave the oil for one day to cool at room temperature. Filter the flowers from the oil and store it in a glass bottle.



Fig.3a. *calotropis*



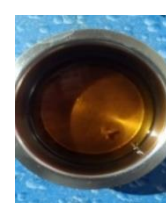
3b. Sesame



3c. Sesame oil



3d Extracted herbal oil



3e. Filtered herbal oil

### 2.4. Herbal oil finishing on fabric (Extract Application)

- After extract oil from the flower apply the oil on the 50cms of fabric through pad dry cure method takes 3 hours to complete.
- After the cloth gets dried the herbal oil finished fabric is attached to the posture belt at the skin contact layer.

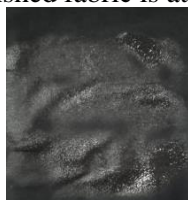


Fig. 4 Herbal oil extract finished black Lycra cotton fabric

### 2.5. Evaluation of Fabric

#### 2.5.1 Antimicrobial Test

##### Preparation of the bacterial inoculum

Stock cultures were maintained at 4° C on slopes of nutrient agar and potato dextrose agar. Active culture for experiments were prepared by transferring a loop full of cells from stock cultures to test tubes of 50ml nutrient broth

bacterial cultures were incubated with agitation for 24 hours and at 37°C on shaking incubator and fungal cultures were incubated at 27°C for 3-5 days. Each suspension of test organism was subsequently streaked out on nutrient agar media and potato dextrose agar. Bacterial cultures then incubated at 37°C for 24 hours and fungal incubated at 27°C for 3-5 days. A single colony was transferred to nutrient agar media slants were incubated at 37°C for 24 hours and potato dextrose slant were incubated at 27°C for 3-5 days. These stock cultures were kept at 4°C. For use in experiments, a loop of each test organism was transferred into 50ml nutrient broth and incubated separately at 37°C for 18-20 hours for bacterial culture.

### Well Diffusion method

The antibacterial activity and antifungal activity of crude extract extracts was determined by Well Diffusion method (Bauer *et al.*, 1996). MHA plates were prepared by pouring 20ml of molten media into sterile Petri plates. After solidification of media, 20-25µl suspension of bacterial inoculums was swabbed uniformly. The sterile paper discs were dipped into required solvents then placed in agar plates. Then 10-50 µl of plant extract was poured into the wells. After that, the plates were incubated at 37°C for 24 hours. Assay was carried into triplicates and control plates were also maintained. Zone of inhibition was measured from the edge of the well to the zone in mm. The tested cell suspension was spread on mullerhintonagar plate and potato dextrose agar. well were put into the agar medium using sterile forceps. Plant extract was poured on to wells. Then plates were incubated at 37°C for about 24 hours and control was also maintained. Zone of inhibition was measured from the clear zone in mm.

Antibacterial activity was performed by agar diffusion method. Van der Watt *et al.*, 2001. The stock culture of bacteria (*E. coli*, *S. aureus* and *Candida albicans*) were received by inoculating in nutrient broth media and grown at 37 °C for 18 hours.

The agar plates of the above media were prepared. Each plates were inoculated with 18 hours old cultures the bacteria were swab in the sterile plates. Placed the extract treated cloth and untreated cloths were placed. All the plates were incubated at 37°C for 24 hours and the diameter of inhibition zone was noted in cm.

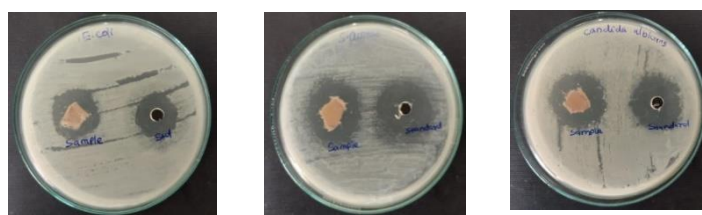


Fig.5a *E. coli*      Fig. 5b *S. aureus*      Fig.5c *Candida albicans*

### 2.5.2. Bursting Strength

Burst Strength of materials regulates about the property of the material to tolerate the stress when an external pressure is applied to it. The bursting strength of knitted fabrics is the minimum amount of force that is vital to break the fabric. Whenever a fabric is subjected to an extreme force or pressure from the vertical direction, it is called bursting. The force that is required to rupture the fabric in this setting is called bursting strength. The diameter of the specimen disc is kept equal to or more than the outer diameter of the rubber diaphragm. The cutted fabric specimen is placed and tighten by the screw wheel. The machine is operated till the fabric bursts under pressure and the measurement is noted.

### 2.5.3. Determination of Elasticity of Selected Fabrics (ISO 14704-1)

The result of maximum elongation of a fabric without deforming. Elasticity is measured as a percentage per meter or inch. The elasticity of the fabric can be measured in a broad sense, in the long sense or through the bias of the fabric. The standard describes test methods using strips of fabric in the form of straight strips or loops, which can be used to measure the elasticity and related properties of fabrics, excluding narrow fabrics.

### 2.6 Attachment of Developed herbal Patch on Health (Posture belt) product

Procedure:

- i. Total length of the posture belt – 55 cms
- ii. Total waist width of the posture belt-76.2 cms
- iii. Total length of the herbal patch- 10 cms
- iv. Total width of the herbal patch- 10 cms
- v. Attach the herbal patch to posture belt at the centre, located to cover mid spine.
- vi. Attachment is made with single needle lock stitch.

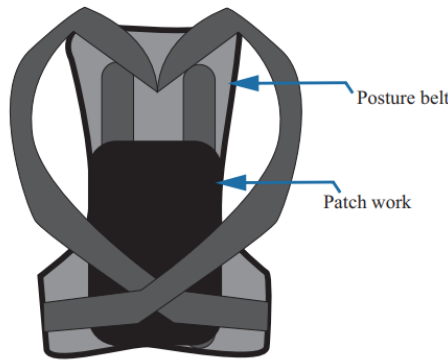


Fig 6: Diagrammatic representation of Posture Belt



Fig 7: Final herbal health Product

**2.6 Subjective Analysis**

A population of people who are suffering from back pain and posture problem due to long time usage of laptop and driving vehicles were selected. The prepared questionnaire was referred to complete by them and analysed for the developed herbal health product.

**3. RESULT AND DISCUSSION**

**3.1. Evaluation of Antimicrobial Efficacy**

Agar well diffusion method has been used to determine the antimicrobial activities and minimum inhibitory concentrations or plant extracts against Gram positive and Gram negative bacteria also with fungus *Candida albicans*.

**Table 1: Antimicrobial Activity**

Organisms	<i>E. Coli</i>	<i>S. aureus</i>	<i>Candida albicans</i>
Plant extract	1.2 cm	1.4 cm	1.6 cm
Standard (Bacteria-Chloramphenicol) (Fugues- Fluconazole)	1.5 cm	1.5 cm	1.5 cm

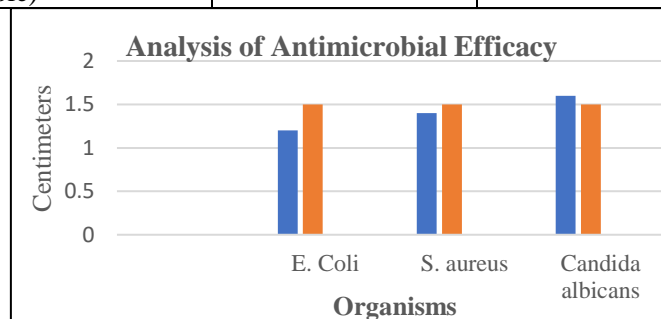


Fig 8: Analysis of Antimicrobial Efficacy

The result finds oil treated fabric having antimicrobial activity against the *E. Coli*, *S. aureus* and *Candida albicans* tested with comparison of standards Chloramphenicol and Fluconazole. The result shows the given oil treated fabric heaving Anti-bacterial activity against S.aureus have higher zone of inhibition as 1.4cm compared to E.Coli found to be 1.2cm and fungus *Candida albicans* have more higher zone as 1.6cm compared to the bacterial inoculums Thus the herbal finished lycra knitted fabric have good Antimicrobial activity.

**3.2. Bursting strength**

**Table 2: Evaluation of Bursting strength**

S.no	Size of the sample	Bursting speed	Bursting Strength	Average weight loss
1.	10 cm X 10 cm	435.5 kpa	172 kpa	5 %

The above table shows that the 10X10cm of size herbal finished sample obtained 173Kpa of bursting strength at the speed rate of 435.5kpa. As per the result it shows that the fabric has good strength against physical stress or strains with the average weight loss of 5%.

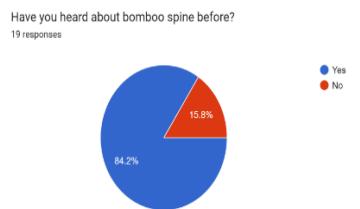
**3.3. Determination of Elasticity of Selected Lycra cotton Fabrics**

**Table 3: Determination of Elasticity of Fabrics (ISO 14704-1 Standard)**

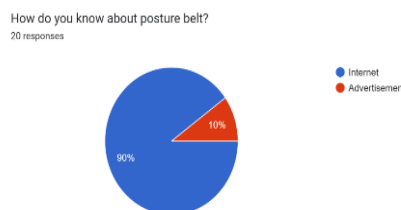
S.no	Size of the sample	Weight load	% of the Elasticity of Fabrics
1.	250 cm X 50 cm	10 kg	15 %

From the above table the elasticity of the fabric is determined after the fabric finishing. It results as 15% of elasticity finds more compared to normal knit fabrics on 10kg of load tested on sample of 250cmx50cm. This is due to the presence of lycra synthetic fibre knitted along the cotton fibre, and the herbal finishing on fabric have not altered its physical or comfort components.

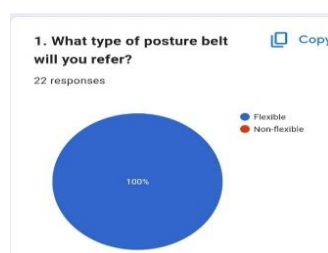
**3.4. Quantitative (Subjective) Analysis**



This fig 9 demonstrates that among 19 respondents 84.2% heard about bombo spine before and 15.4% not heard about bombo spine.



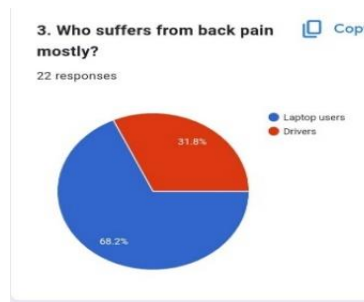
This fig 10 demonstrates that among 20 respondents 90% know about posture belt through Internet and 10 % come to know through advertisement.



This fig 11 demonstrates that among 22 respondents all of them referred for flexible posture belt for comfort and non of them referred nonflexible belt.



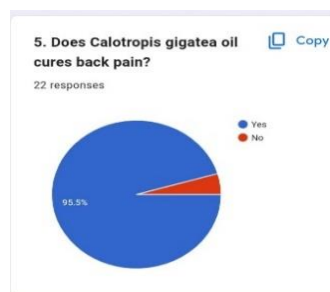
This fig 12 demonstrates that among 22 respondents 86.4% believes calotropis gigantea flower oil gives fragrance and 13.6% not believes that this oil gives fragrance.



This fig 13 demonstrates that among 22 respondents 68.2% of laptop users are affected by back pain and 31.8% drivers are affected by back pain.



This fig 14 demonstrates that among 22 respondents 18.2 % know about herbal finish posture belt and 81.7 % don't know about herbal finish posture belt.

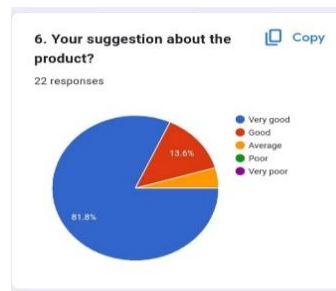


This fig 15 demonstrates that among 22 respondents 95.5% believes calotropis gigantea oil cures back pain and 5% doesn't believe that calotropis gigantea oil cures back pain.





This fig 16 demonstrates that among 22 respondents all of them recommended this posture belt for health and comfort for pain free days.



This fig 17 demonstrates that among 22 respondents 81.8% gave very good suggestion and 13.6% gave good, and 5% gave average.

#### 4. CONCLUSION

Good posture reduces head, neck, and back pain. If people are spending most of their days slouched at a computer desk, they could begin suffering from a stiff neck or sore back. This will affect their sleep and their focus and, as mentioned before, their overall mood. During correct posture, the shoulder's elevation, drooping, or movement does not occur. The middle back has a slightly concave curve, and there is no big hunch in the correct posture. Thus, the herbal finish posture belt is developed and tested according to the given test standards. This product poses antimicrobial properties. This product is body friendly and sustainable. The product is developed using medicated *Calotropis gigantea* oil finished on lycra cotton fabric. Hence it is proved that this product is best in curing back pain. People's posture can be improved using a posture belt made of lycra cotton fabric treated with herbal extract, especially those who use laptops and computers frequently for work. People will benefit greatly from this product. *Calotropis gigantea*, a natural extract that relieves back discomfort and aids in the treatment of bamboo spine, is used as a finishing touch on this posture belt. The developed product provides a healthy healing environment for spinal structures, increasing function during daily activity. Reduce muscle tension and low back pain, improve posture to redistribute weight in the spine.

#### REFERENCES:

1. Stella Bard, Joanne Lewsley (2022) "Bamboo spine: Causes and treatments" Medical News Today, March 30,
2. JC Woldstad, BR Sherman, (2000) "The effects of a back belt on posture, strength, and spinal compressive force during static lift exertions" International journal of industrial ergonomics,
3. CD McKinnon, CR Dickerson - Ergonomics, (2013) The effects of police duty belt and seat design changes on lumbar spine posture, driver contact pressure and discomfort. MWR Holmes.
4. F Tlili, R Haddad, R Bouallegue, R Shubair - Internet of Things, (2022) Design and architecture of smart belt for real time posture monitoring
5. F Jin, D Lv, W Shen, W Song, R Tan - Sensors and Actuators A: Physical, (2022) High performance flexible and wearable strain sensor based on rGO and PANI modified Lycra cotton e-textile
6. PS Kumar, E Suresh, S Kalavathy - Scholars Academic Journal, (2013) - Review on a potential herb *Calotropis gigantea* (L.)
7. Wang, Zhu-Nian; Wang, Mao-Yuan; Mei, Wen-Li; Han, Zhuang; Dai, Hao-Fu (4 December (2008). "A New Cytotoxic Pregnanone from *Calotropis gigantea*". *Molecules*. **13** (12): 3033–3039.
8. AK Pathak, A Aargal - Fitoterapia, (2007). Analgesic activity of *Calotropis gigantea* flower.