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DESIGN AND DEVELOPMENT OF PANTY WITH DETACHABLE GUSSET USING BAMBOO FABRIC

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Abstract - *This research is concerned with the creation of new product for adults and elderly people with disabilities and in seek of others help. In this paper, a detachable gusset panty is developed to make it easy for the disabilities. To develop this product 100% bamboo fabric is used because of its antibacterial property to avoid rashes and itchiness. Breathability of a fabric is an important property for a panty so Air permeability test was carried out and the results were analysed. The term "sustainability" refers to the development of biodegradable, environmentally friendly, and pollution-free products. In this way, a natural dye is used for dyeing the fabric. Because of naturally dyed bamboo fabric, colour fastness properties such as rubbing, sublimation and wash fastness were tested and the results were analysed. This study significantly results in the eco-friendly, biodegradable and easy detachable gusset panty.*

***Key Words*:** bamboo fabric, natural dyeing, biodegradable, eco-friendly, colour fastness, detachable panty gusset.

1.INTRODUCTION

Adaptive clothing is clothing that is designed to meet the needs and abilities of people with various degrees of disability, such as congenital disabilities, acquired disabilities (as a result of an injury, illness, or accident), temporary disabilities, and physical disabilities. Age, disability type(s), level of independence, mobility, and dexterity, as well as whether a person requires assistance with dressing, such as from a caregiver, all influence adaptive clothing.

Despite popular belief, adaptive clothing is used by people with a wide range of disabilities, include wheelchair users but are still limited by the construction of typical clothing. Adaptive design, a key component of adaptive clothing design and construction, addresses these anticipated limitations by adapting clothing to the wearer.

Any cloth, yarn, or clothing made from bamboo fibers is referred to as a bamboo textile. Previously used only for structural elements such as bustles and corset ribs, different technologies have been developed in recent years that allow bamboo fiber to be used for a wide range of textile and fashion applications.

The current fashion generation is focusing on dyeing sustainability. To make my research more sustainable, bamboo fabric is dyed with a natural herbal dyeing technique that uses Annatto and neem to produce an orange colour.

In this study, a panty with detachable gusset, which is adaptive clothing, is designed and constructed in such a way that people with wheelchair disabilities can use it comfortably.

2. LITERATURE REVIEW

Bamboo is also known as regenerated cellulosic fibre, it has exceptional properties such as superior comfort, desirable strength properties, high moisture absorbency, antimicrobial and antifungal and high breathability. Bamboo has the fastest growth rate among the various types of renewable natural fibres, bamboo fabric requires less dyestuffs than cotton fabrics in order to be dyed to the level desired, as they absorb the dye stuffs better and faster (1).

Natural dyes or colourants are those derived from plants, invertebrates, or minerals. The majority of natural dyes come from plant sources such as roots, berries, bark, leaves, and wood, as well as other organic sources such as fungi and lichens. Natural dyes are classified into three types based on their origin: vegetable, mineral, and animal. About 500 dyes of vegetable origin, colourants derived from plant roots, leaves, bark, trunks, or fruits (2).

Chemical processing of textiles, from preparation to dyeing and finishing, is critical for adding value in terms of fashion and function. However, these processes are water, energy, and chemical intensive, and they pollute the environment severely. Because of increased global awareness of environmental pollution, demand for natural fiber-based textiles dyed with natural dye and finished with various bio-molecules has recently grown in academic, research, and industrial circles. As a result of the presence of the inherent colouring compound,

dyeing of textiles has been carried out using various plant extracts (3).

Annatto is a form of food colouring made from achiote tree seeds (Bixa orellana). While it may not be well known, it is estimated that 70% of natural food colours are extracted from it. Annatto has long been used in many parts of South and Central America as a cosmetic product and to treat different medical conditions. Annatto is an orange-red food colouring or condiment made from achiote tree seed (Bixa orellana) which grows in the tropical regions of South and Central America.

This is most widely used as a natural food colouring as it has a vivid colour that ranges from yellow to dark orange-red, similar to saffron and turmeric. Colour fastness test is carried out by measuring the change with two sets of regular grey scales, one for colour change and the other for degree of staining. Colour fastness for washing, colour fastness to the rubbing is carried out to assess the colour fastness (4).

The main pigment present is cis-bixin; minor constituents include trans-bixin, cis-norbixin, and trans-norbixin. Heat is commonly used to reduce solvent residue within tolerable limits in extracts; however, the bixin is unstable and degrades when exposed to high temperatures. Particle attrition and impact are two alternative methods for extracting this pigment from seeds. These methods make use of simple tools such as a ball mill or a spouted bed. The benefit of a spouted bed is improved process control (5).

Natural products with therapeutic properties are increasingly popular in textiles. The current research is focused on isolating tannin from neem bark. When compared to chemical mordants, ISO colour fastness standards show that herbal-based bio-mordants improved the rating from good to excellent (6).

Waist grith, waist to hip measurement, hip grith, crotch depth, and gusset length are all required measurements for a basic adult panty. In addition, the basic drafting procedure for panty is referred to (8).

3. OBJECTIVES

- To develop a detachable panty gusset for adults.
- To make the product user friendly and eco-friendly.
- To develop a convenient product for the adult usages.
- To protect the consumer from rashes related problems.

4. MATERIALS

4.1 BAMBOO FABRIC

Bamboo fabric has many excellent properties. The most surprising feature is that bamboo fabric is exceptionally soft, light and strong, almost silky in feel, has excellent wicking property. This makes it breathable and cool to wear. It is also incredibly hydrophilic, absorbing more water.

Bamboo is also very sustainable to grow as it does not require the use of pesticides and grows very quickly in favourable conditions. Bamboo fabric may have an anti-bacterial property that is maintained in fabric,(ie) bamboo fabric does not require the use of chemical antibacterial agents. Bamboo fabric is more antistatic than other types of fabric, and it also performs better in terms of odours because it has a natural deodorising property.

4.2 NATURAL DYEING

DYE COLOUR – ORANGE

INGREDIENTS:

1. Annatto
2. Neem

4.2.1 Annatto

It is a natural dye made from the annatto tree. Annatto has a high affinity for bamboo and produces an orange colour. Annatto is an orange-red food colouring or condiment made from the seeds of the achiote tree (Bixa orellana), which grows in South and Central America's tropical regions. Other names for it include achiote, achiotillo, bija, urucum, and atsuete. Its colour is derived from carotenoids, which are pigments found in the seed's outer layer.

4.2.2 Neem leaf

Neem has numerous medicinal properties. Immunomodulatory, anti-inflammatory, antihyperglycemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic, and anticarcinogenic properties have been demonstrated for neem leaf and its constituents. This review summarises neem leaf's diverse pharmacological activities.

Procedure for dye preparation:

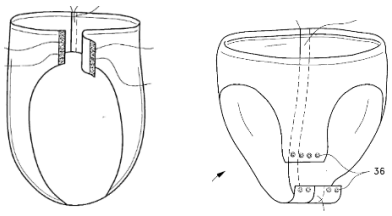
- Fabrics is dipped into The Cold Water For 15 Minutes, On the other Side Dye was Prepared Using Natural Ingredients Without Modarant and It Is Filtered to Remove the residues.
- Then the Fabric is dipped into the Dye Bath in Hot Condition For 30 Mins.
- After 30 Mins , the Fabric Undergoes Cold Wash for 3 Times.
- At Last Soap nut is Used to wash the Fabric in Hot Boiling Condition. Then The Fabric Is Dried.

5. METHODOLOGY

5.1 Flow chart

6. DESIGN AND DEVELOPMENT:

6.1 DESIGN



Existing product new product

6.2 PATTERN DRAFTING

6.3 PRODUCT

7. TESTING

7.1 Air permeability

An air tronic tester with model number 3240A and ASTM D737 is used to test air permeability. It has a volumetric counter with a minimum capacity of 50 litres per hour and a maximum capacity of 5800 litres per hour. Different testing areas are available which is of 2, 5, 10, 20 cm^2. bamboo fabric is tested using a test area of 10 cm^2 with a pressure drop of 100 Pa and a measuring volume of 10 litres per minute, and readings were recorded.

7.2 Rubbing fastness

A rubbing fastness test is performed on dry and wet fabric with the ASTM D1776-90. The test specimen is placed on the Crock meter's base, and the Crock meter finger is used to rub a square of white test cloth on the coloured specimen. Number of rubbing cycles could be adjusted according to our need.

7.3 Sublimation fastness

Natural dyes are commonly teste d for staining and shade change at 150 degree Celsius for 30 seconds, and the results are graded on a 1 to 5 grey scale. The AATCC test method 117-2004 standard ISO 105-P01 and the MAG presohot tester were used to test the sublimation fastness.

7.4 Wash fastness

This standard test consists of a series of five washing tests, prescribes a method for determination of colour fastness of the fabric to the action of soap at 40°C. The standard ISO 105 and the MAG washfast XT 215 tester were used to test the wash fastness. The fabric specimen is evaluated with the grey scale for change in colour.The grey scale consists of nine pairs of standard grey chips, each pair representing the difference un colour corresponding to the numerical rating. These ratings may be described in qualitative terms.

8. RESULTS AND DISCUSSION

8.1 AIR PERMEABILITY:

The air permeability of the fabric samples was tested and the results are given in table no 1. The result shows that the bamboo fabric has higher air permeability characteristics when compared to the dyed bamboo fabric samples.

S.NO	BLEACHED BAMBOO FABRIC (l/min)	DYED BAMBOO FABRIC (l/min)
1	18.2	13.6
2	18.5	14.5
3	18.6	13.7
4	17.8	13.9
5	18.8	13.0
Average	18.38	13.74

TABLE NO 1: Air permeability of bamboo fabric

8.2 RUBBING COLOUR FASTNESS:

Table 2 shows the result of colour change in the dyed fabric using rubbing colour fastness. The result shows that rating of 5 in dry state condition which represents there is no change in colour, it means the fabric retains the same colour without any shade variation during the rubbing action and rating of 4/5 in wet state condition, where there is a slight change in colour with rubbing action.

S.NO	RUBBING CYCLE	GRADE (CHANGE IN COLOUR)	RATING ON GREY SCALE FOR CHANGE IN COLOUR (ORGANIC COTTON FABRIC)
1	20 (dry state)	5	Negligible or no change in color
2	20(wet state)	4/5	Change in color equivalent to grey scale step 4/5

TABLE 2: Result for rubbing fastness (change in colour)

8.3 SUBLIMATION FASTNESS:

Table 3 shows the result of colour change in the dyed fabric using sublimation colour fastness. The result shows that rating of 5 in dry state and in damp condition which represents there is no change in colour, it means the fabric retains the same colour without any shade variation during the sublimation and rating of 4 in wet state condition, where there is a slight change in colour and light staining with sublimation action.

S.no	temperature	Grade (colour change)	Rating of grey scale for change in colour (for bamboo fabric)
1	150°C (dry state)	5	Negligible or no change in colour
2	150°C (wet state)	4	Change in colour equivalent to grey scale step 4
3	150°C (damp state)	5	Negligible or no change in colour

TABLE 3: Results of sublimation Fastness (change in colour)

8.4 WASH FASTNESS:

Table 4 shows the result of colour change in the dyed fabric using laundrometer for colour fastness. The standard ISO 105 and the MAG washfast XT 215 tester were used to test the wash fastness. The result shows that rating of 4 after 5 consequent washes. which represents there is a slight change in colour.

S.NO	Temperature	No of washes	Change in colour	Rating of grey scale for changes in colour
1	40°C	5	4	Change in colour equivalent to grey scale step 4

TABLE 4: Appearance of the bamboo fabric after 5 wash

9. CONCLUSION

According to the results, colour fastness demonstrated a good result of rubbing and sublimation, with no change in colour during the dry state and a slight change in colour during the wet and damp states. As a result, air permeability is an important property of the panty for its breathability, resulting in comfort and breathable property. This generation is working toward sustainability, with the goal of developing eco-friendly and biodegradable products. As a result, eco-friendly natural dyed panty with detachable gusset is developed. Where the gusset part can be removed easily with the help of press buttons.

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