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DESIGN DEVELOPMENT OF UNDERARM PADS USING LINEN FABRIC

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Abstract - In order to avoid sweat stains on expensive clothing and to lessen skin irritation caused by perspiration, many teenagers and adults use underarm pads. The goal of this study is to offer a new product and alternative absorbent layer for reusable sweat underarm pads. The goal of this research is to create materials that can be utilised as sweat absorbent pads. The provided sweat underarm pad has three layers and is made of linen, a natural fibre that is biodegradable, eco-friendly, and better at absorbing moisture. The thickness, absorption, air permeability, wickability, spray ratting tester, and handle characteristics of the fibres and absorbent layer, on the other hand, were assessed in accordance with the final product.

***Key Words*:** Underarm Sweat Pad, 3 Layer , Absorbency, Linen Fabric , Comfort Properties, Natural Fiber

1.INTRODUCTION

A flax-based textile with a wide range of applications is linen. Although linen and cotton are similar, linen is created from fibres that come from the stems of the flax plant as opposed to the bolls that develop around cotton seeds. In hot and humid areas, linen clothing is preferred. In contrast to cotton, which has a propensity to retain moisture for an extended period of time, linen dries fast, assisting in the reduction of heat retention in excessively heated environments. But because producing linen requires far more time and resources than producing cotton, its use has steadily declined since the development of the cotton gin. Nevertheless, the distinctively attractive qualities of linen have prevented the total abolition of this textile's global production, and some nations, like China, still produce linen in a sizable volume. Natural fabric known as linen offers unmatched qualities like a feeling of freshness and a wonderful shine. It is exceedingly hygienic and gives the wearer a sense of satisfaction and style. The weather during a plant's growth has a big impact on the quality of the linen that is produced. In keeping with the fashion movement toward natural, cosy yet sophisticated fabrics, linen and linen-blend fabrics have become more prestigious and well-known. It is therefore necessary to raise awareness among users of the unmatched qualities of linen and its blends, to promote its production as well as its usage.[4] Sweat pads are pads that attach directly to the skin or armpits and absorb sweat. Also called garment guards, sweat shields or armpit pads, sweat pads come in a few forms. The most popular sweat pads are peel-and-stick disposable pads. Others are washable, reusable cloth pads. They work best when applied to dry, clean-shaven armpits. Most pads come in a few colors, including nude, black and white. You can find them online or in the health and beauty section of retail stores. Inconvenience of using for long time may cause Irritation, itching, roughness, and the pad may loss absorption ability. To prevent from this problem am using natural fabric with infusing layer of natural fibre.

2. LITERATURE REVIEW

Although it generates discolouration and a damp sensation, sweating is a sign of health. The modern man looks for answers to these issues. The design, manufacture, and performance evaluation of a brand-new disposable underarm pad are covered in this article. Instead of preventing perspiration, this pad absorbs perspiration and leaves the user feeling dry. The underarm pad consists of nonwoven fabrics and a polyethylene film. To evaluate the performance of the pad, both objective and subjective tests were performed. A strength test, a strike-through test, an absorption test, and a wetback test were among the objective testing. Male and female test volunteers were used for the subjective evaluations. The participants tried the pads and assessed how well they suited the body, whether they deformed while being worn, and how dry they felt .[1]

Fabrics comprising linen were treated with oxygen, air, and nitrogen plasmas at atmospheric pressure, and the effects of the plasma treatment conditions on the surface chemistry and topography were assessed. The hydrophilic characteristics of treated substrates significantly enhance after plasma treatment thanks to the formation of new functional groups and a discernible rise in their attraction for future H2O2 bleaching. The plasma gas, which should be oxygen > air > nitrogen > none, and the discharge power, which should be oxygen > air > nitrogen > none, determine how much the wettability and subsequent bleachability will improve. The extent of the change was shorter and greater the higher the power supply. An environmentally friendly alternative to conventional scouring of linen-based

textiles, oxygen or air plasma treatment greatly improves the hydrophilicity, improves the subsequent bleachability, saves time, water, and energy, as well as prevents or minimises pollution at the source .[2]

Compared to materials from other origins, linen fabrics are noted for their outstanding comfort qualities. They do, however, have a very high propensity to wrinkle when being used and laundered. Easy-care treatments are applied to linen during or after fabric production in order to solve this issue. During use and cleaning, these substances are partially discharged. Furthermore, detrimental effects are seen on the materials' strengths. There is an increasing need for an environmentally friendly alternative due to rising ecological concerns and public awareness process.The number of wrinkles on fabrics may be reduced by delicate washing, but the wrinkle-reduction features of the new generation of washing machines do not work as well on linen fabrics as was anticipated. This study examined how linen clothes wrinkled.By choosing the proper levels of processing parameters, such as temperature, rate of mechanical action (ED), revolution per minute (rpm), and water amount applied during laundering, problems encountered during washing action in washing machines with steam generators are improved. Between the adjacent laundering steps, steaming steps were added in order to further reduce the wrinkling behaviour of linen fabrics while still maintaining the gentle washing action. Laundered linen fabric's shrinkage and wrinkling traits were measured and examined. Among the others, the top four profiles were chosen, and they will be used to create a washing procedure that focuses on gently washing linen products .[3]

Few would contest the incredible worth of linen, one of nature's greatest gifts. Given that linen falls within the longer-staple category, the fibre is spun using a long-fibre spinning machine. Fabrics made of linen undergo a vigorous bleaching process to lessen their stiffness due to the coarseness and stiffness of the fibre. Additionally, linen is combined with other complementary natural and synthetic fibres to obtain a range of structural and functional qualities as well as to cut costs. For handle and comfort qualities, 100% linen fabrics as well as blends with cotton and viscose have been researched. Excellent visual and draping qualities are produced by linen textiles. Fabrics made of linen are stronger than those made of cotton and other mixtures. However, under mild stress-loading circumstances, linen has the highest tensile resilience and the lowest friction coefficient. For Fukurami and Shari, linen cloth produces better primary hand. In terms of summer clothing, processed linen fabric has a higher total hand value (THV) than cotton fabric. The hand of linen fabric is enhanced by the viscose and cotton combining .[4]

The use of a mixture of pectinase and lipase for enzymatic scouring of linen fabric is described. A sample of linen cloth was customarily scrubbed in boiling alkaline solution as a point of reference. The weight loss of the enzymatically scoured linen cloth was less than that of the conventionally scoured one, but its drop penetration time was too long. After conventional bleaching, it was discovered that both the enzymatically and conventionally scrubbed linen fibres had comparable wettability and levels of whiteness. Contrary to the severe conditions used in alkaline scouring, a significant reduction in fibre damage occurs during the gentle enzymatic method, leading to better mechanical qualities, such as a higher degree of polymerization and an increased tensile strength. The suggested enzymatic treatment for linen fabric could be scaled up to achieve promising environmental and financial benefits .[5]

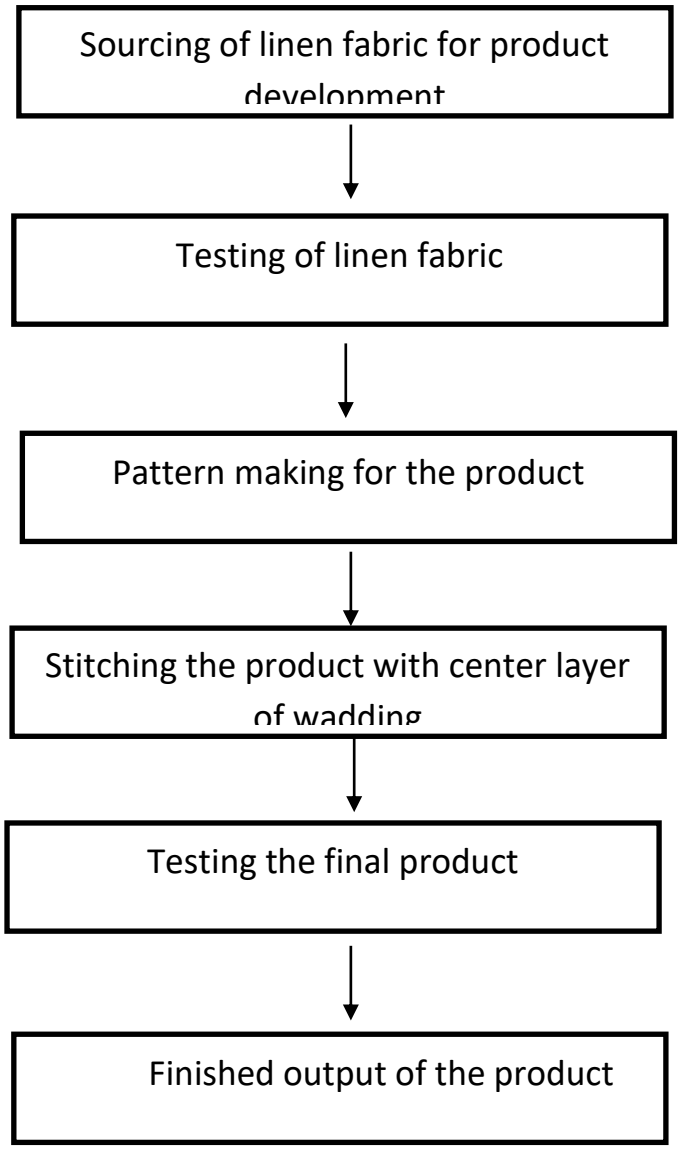
Investigated was how linen and linen blends affected the comfort capabilities of bedding materials. The same warp (100 percent cotton) and several weft yarns were used to create 10 different fabric kinds. Comparisons were made between 100% cotton and 100% linen fabrics that had been woven with two different ratios of cotton/linen, viscose/linen, and lyocell/linen blended weft yarn. The findings demonstrated that the thermal properties of the fabric made with linen weft were comparable to those of other materials. Additionally, the usage of linen and man-made cellulosic fibre blend fabrics increased air permeability, bending, and shear ability but did not significantly change thermal absorptivity. However, compared to 100% cotton fabrics, the 80% lyocell/20% linen weft fabric had the highest values for heat and vapour passage, formability, and elongation qualities. The findings of this study demonstrated that a fabric made with a warp of 100% cotton and a weft of 80% lyocell and 20% linen would offer bedding fabrics with good thermal and handling comfort .[6]

A natural way for the body to cool itself is by sweating, which is produced by glands in the skin and is transparent and salty. A typical newborn has between 2 and 4 million sweat glands Physical heat and emotional stress are the two conditions that activate our sweat glands and cause us to perspire. The main areas of our bodies where we sweat emotionally are the palms of our hands, the bottoms of our feet, our armpits, and even our foreheads. This perspiration contains bacteria that converts it to acids over time, giving off a foul smell. Because the major clothing we wear gets moist from underarm sweat, it is uncomfortable. The primary garment becomes soggy in the underarm region due to the sweat-induced damp level. Itchiness and a foul odour are brought on by prolonged wetness in the underarm area. Mostly water, sweat also contains small amounts

of salt, potassium, calcium, and magnesium minerals. the acids lactic and urea. Long-term perspiration exposure can damage the fabric's fibres and discolour the fabric, which can lead to discoloration. [7]

In order to increase the softness and hand of linen and linen-containing fabrics like cotton/linen and polyester/linen blends, large-scale production employed the combination of chemical-mechanical and enzymatic-chemical-mechanical finishing processes. From the greige fabric until the final finishing stage, fabric samples were taken one at a time and characterised. The results show that mechanical treatment significantly affects fabric stiffness, as opposed to Application of enzymes results in fabrics with a luxuriant hand and beautiful appearance. Although both mechanical and enzymatic treatments significantly degrade the linen, they have no effect on the breaking load of the cotton and polyester components. With finishing, linen and linen/cotton textiles' crease recovery only modestly improves, whereas polyester/linen end products have good crease recovery characteristics. [8]

3. METHODOLOGY:



4.MATERIALS:

4.1LINEN FABRIC :

Linen fabric is exceptionally breathable, absorbent, very strong and moisture wickability is also high, making it a great summer fabric. It is also skin-friendly as it is made entirely of natural fibers harvested from the flax plant. Linen shirts, gowns, kurtas, palazzos, tank tops, skirts, overcoats, and other garments can be made from this unisex fabric**.**

Linen is a sturdy and resilient fabric that is usually discovered and used as a bedding fabric because it is soft, comfy, and dries considerably faster than cotton. It also has other distinctive characteristics, notably its tendency to wrinkle.

Linen fabrics are one of the few that are produced from absolutely natural raw materials. Linen has valuable hygienic properties, for example, the ability to remove heat and moisture. In hot weather, a person dressed in linen clothes has a body temperature 3-4 degrees below that of clothes made from other fabrics (especially synthetics).

It is also proved that wearing linen clothes protects against some diseases, since linen has rare bacteriological properties – neither fungus nor bacteria could live on it. This completely environmentally friendly fabric is considered a natural antiseptic. Also, linen kills microbes and various infections, wounds heal faster with linen dressings. Linen contains silica, which retard development of bacteria.

4.2COTTON WADDING

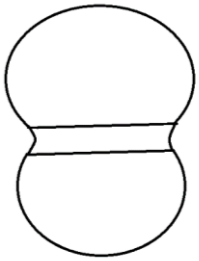
Cotton wadding comes in natural grey**.** Cotton is a popular choice of wadding for many products because it is soft and comfortable. It is thin, usually about 1/8″ thick. Polyester Wadding Polyester wadding is a synthetic fiber that is used in place of wool, cotton and other natural fibers. It is made from plastic and has the appearance and feel of cotton. Cotton wadding for products is easy to work with when using a machine to sew the quilt.

5. PHYSICAL PROPERTIES:

Properties / fabric	Plain linen fabric
Thickness (mm)	18
Fabric GSM (g/m2)	150
Fabric weave type	Tabby weave

6. PATTERN AND PRODUCT:

6.1 DESIGN



6.2 PATTERN

6.3 PRODUCT

7.TESTING METHOD

7.1Air 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. It is also available with different testing areas of 20, 20, 10, 5, 2 cm2. I tested linen fabric that had been plasma treated and untreated fabric using a test area of 10 cm2 with a pressure drop of 100 Pa and a measuring volume of 10 litres per minute, and readings were recorded.

7.2wickability:

The wickability test was conducted manually. In this test, astrip of fabric is suspended vertically in distilled water withits lower edge exposed. The rate of rise of the water's leading edge is then measured at various intervals. The test fabric's capacity to wick moisture is directly measured by the height of the rise that is observed over time. One way to account for this is to weigh the fabric after the test to find out how much water it has absorbed. After that, the readings were evaluated and the mass, which is equivalentto the measured height of water rise, could be expressed asa percentage of the mass of the length of dry fabric.

7.3Spray rating tester:

Spray Rating Tester is used to determine the surface wetting resistance of fabrics. Testing Standards:ISO 4920, BS EN 24920, BS 3702, GB/T 4745, AATCC 22,M&S P23.The Spray Tester comprises a metal framework allowing distilled water to be sprayed through a nozzle onto a test specimen at 45° and 150mm below.The appearance of the specimen is compared against an optional photographic scale to rate.

8. RESULT AND DISCURTION:

8.1AIR PERMIABILITY:

The air permeability of the fabric samples was tested and the results are given.The result shows that the linen fabric has slightly higher air permeability characteristics to absorb wetness. Also after inserting the cotton wadding layer in between the linen the result show that it also has good breathable property.

Air permeability Standards – ASTMD737

LINEN FABRIC:

67.2
67.2
65.4
64.7
63.6
AVERAGE 65.62

AFTER COTTON WADDING LAYER:

31.3
30
25.7
24
32.8
AVERAGE 28.76

8.2WICKABILITY:

The wickability of the fabric samples was tested, and the results of warp and weft direction are given .The result shows that linen fabric has a higher wickability property.

1 MIN	3 MIN	5MIN	1 MIN	3 MIN	5 MIN
3.28	4.92	5.88	3	4.9	6.3

8.3SPRAY RATTING TESTER:

The spray ratting of the fabric sample was tested and the results of linen fabric and cotton wadded sample are given. The result shows that they have slight variation on absorbing property.

FOR LINEN FABRIC	FOR COTTON WAD LAYED SAMPLE
Water spray ratting - 50 ISO 1 Standards – ISO 139	Water spray ratting- 30 ISO 3 Standard – ISO139

9.CONCLUSION:

From this study, linen underarm sweat pad have good absorbency, liquid retention ratio, good handle properties, high air permeability, and low cost, linen fabric is the most appropriate material for use in production of absorbent layers for underarm sweat pads and It does not cause any rashes and infection because it is a chemical free substance This linen underarm sweat pad is contain 3 layer and It is washable , reusable and odor free product. It help to prevent embarrassment, and protect your clothing from stains.

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