A COMPARATIVE STUDY ON DYED AND UNDYED SOYA BLEND MATERIAL USING NATURAL EXTRACT

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ABSTRACT

Soya Protein Fiber (SPF) is the only protein fiber made from soybean cake. Their physical properties are similar to that of synthetic fiber.

Properties like smoothness/luster/comfort/absorbency/strength/shrinkage shows tremendous range when blended with other fibers. Recent studies shows that when soybean fibers blended with cashmere, it gives smooth quality with an enhancement of easy care properties. As a wool/soy protein fiber, it reduces shrinkage and increases ease of care. As a silk blend, it improves the properties of silk with the prevention of the fabric from sticking to the skin when wet. In this study soya cotton blended fabric is dyed with Indian madder with lime bark as a mordant which is a extract of a plant. A comparative study between dyed and undyed soya cotton blended fabric is tested and evaluated as per Drapablity, Abrasion resistance, Sinking test, Capillary rise and shrinkage.

Key words: Dyeing, Mordant, Lime bark, Soya Fabric

INTRODUCTION

Soya bean protein fibre is the only botanic protein fibre in the world, a newly born guard to mankind's skin says. It is feeling like: skin on skin ". Anew green textile fibre , and it possesses the superiorities of many natural fibre and synthesized ones. Soya bean fibre inexpensive in price. The production of soya bean protein fibre will not bring pollution to the environment. Which contains about 40% protein and 21% oil expressed. there are over 2500 varieties in cultivation, producing beans of many sizes, shapes and colours. In the united states they are now a leading crop, and brazil, Argentina and Paraguay also are significant soya bean- exporting nations China and Japan are by far the largest importers of soya bean.

Soya bean functional fibre has not only the superiorities of the natural fibre but also the physical properties of synthetic ones.

Four Health Protective Functions:

- Negative ox anion function
- Four infrareds function

- Anti- ultraviolet function
- Anti- bacterial function

People can improve the small environments around himself at any time , more benefit to keep a good health: when the far-infrared ray effect on humans skin, the resonated activation of cell in human body will be produced , which can adjust the micro circulation of capacity vessel in skin , good to adjust the status of cell in human body. Soya bean functional fibre is the unique functional fibre in the world fibre history that won four functions in it, so it named the " soya bean functional fibre " in textile. In soya functional fibre , there are many substance that could control kinds of germinal like staphylococcus aureus , bacillus coil and Candida albicans etc.

The count of protein in the fibre is up to 45 % soya bean protein contains 18 kind of active materials which are necessary to human body. SPF has breaking strength higher than that of wool, cotton and easy. Its boiling water shrinkage is low and its has outstanding anti-crease , easy – wash and fast – dry property. The fibre strength strength decreases greatly and the colour becomes pale yellow at 160 c . at 110 c, the fabric handle becomes harsh. It can be dyed with acid dye, cationic dyes , metal complex dyes , reactive dyes and vat dyes. The weaved garments made from SPF has strong UV absorption (195-380 mm) almost 100% and hence can effectively prevent the incidence skin cancer. Promoting blood circulation and strengthening immunity

Dyeing is a process of colouring textile materials by immersing them in an aqueous solution of dye liquor. The theory of dyeing is the interaction between dye, fabric , water and dye auxiliary . Dyeing is an ancient art which predates written records. It was practiced since Bronze Age. The widely and commercially used synthetic dyes impart strong colors but causes carcinogenicity and inhibition of benthic photosynthesis .

OBJECTIVES

- To study soya blended cotton yarn.
- To convert the soya blended cotton yarn into fabric.
- To dye the bleached soya blended fabric using vegetable dyes.
- To study about difference between dyed and undyed fabric and evaluate.

COTTON

Cotton most important of the vegetable fibres, and the plant from which the fibre is harvested. The family of the cotton is Malvaceae (mallow family). Cotton fibre is creamy colour and easily spun. Cotton is classified in the division Magnoliophyta , class Magnolioside, and order Malvales, family Malvaceae .

All parts of the cotton plant are useful.linder also are incorporated into high quality paper products and processed into batting for padding mattresses , furniture and automobile cushions. The

cotton seed is crushed in order to separate is three products – oil, meal and hulls. the stalks and leaves of the cotton plant are ploughed under to enrich the soil. Some cotton seed also is used as high-protein concentrate in baked goods and other food products.

CHARECTERISTICS OF COTTON

- comfortable soft hand
- good absorbency
- colour retention
- prints well
- machine-washable
- dry-cleanable
- good strength
- drape well
- easy to handle and sew

SOYA BEAN

Soya bean protein fibre is the only botanic protein fibre in the world, a newly born guard to mankind's skin says. It is feeling like: skin on skin ". Anew green textile fibre , and it possesses the superiorities of many natural fibre and synthesized ones. Soya bean fibre inexpensive in price. The production of soya bean protein fibre will not bring pollution to the environment. Which contains about 40% protein and 21% oil expressed. there are over 2500 varieties in cultivation, producing beans of many sizes, shapes and colours.

Functions of soya bean such as antibiosis function, bacteriostasis function , far infrared function, negative oxyanion function and anti ultraviolet radiation function. Its plant may reach 1.25 m of height and have spare or dense branches, depending on cultivars growing

conditions. The embryo contains two pieces of cotyledons that function as food reserve structures . The seed coat is marketed with a helium or seed scar that varies in shape from linear to oval . That coat protects the embryo from fungi and bacterial infection before and planting . Soya bean functional fibre has good affinity to human body's skin and possesses many kind of amino acid , which make it , has good health protection effects..

- The content of protein 1 the fibre is up to 45%
- Soya bean protection contains 18 kind of materials which are necessary to human body.
- The presence state of protein : hinge type and covered type.

- Cross section of fibre is like dumbbell.
- Vertical shear of fibre has longitude grooves
- Peninsula – like frameworks spread equably on the surface of fibre.

Soya bean protein is an advanced textile fibre. The microscopic of the soya bean protein fibre shows a skin core structure. The skin layer is irregular , close with lower degree of orientation along the fibre axis and with moisture absorbing grooves. Its micro porous structure makes it air and moisture permeable says. The fibre is white to light than in colour and has the appearance and texture similar to wool and silk, is warm and soft to feel . its 20 amino acids are healthy and nutritional to human skin.

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named the " soya bean functional fibre " in textile. In soya functional fibre , there are many substance that could control kinds of germinal like staphylococcus aureus , bacillus coil and Candida albicans etc.

THREE COMFORTABLE FUNCTION OF SOYA FABRIC

- Press comfortable function
- Touch comfortable function

- Quick wet permeability and moisture transmission function

FABRIC FROM PURE SOYA BEAN PROTEIN FIBRE:

Its colour is natural and pure with abundant fluff on the surface without pilling , excellent hand and drape and softness.

FABRIC FROM SOYABEAN PROTEIN BLENDED WITH CASHMERE:

Soya bean protein stable has abundant fluffs similar to the feelings of cashmere.

FABRIC FROM SOYA BEAN PROTEIN FIBRE BLENDED WITH MERCERISED WOOL:

As its shrinkage is less , it is easier to wash and preserve. Suitable for wool sweater, interlock underwear and blanket

FABRIC FROM SOYABEAN PROTEIN FIBRE BLENDED WITH SILK:

it has not only lustre and elegance of silk but also a good draping. suitable for printing silk, weaving underwear , sleepwear, shirts and evening dress.

FABRIC FROM SOYA BEAN PROTEIN FIBRE BLENDED WITH COMBED COTTON:

It has soft hand , better moisture absorption and ventilation , better bacteria resistance , more comfort for wearing . suitable for men's and women's underwear, T-shirt , infant's wear , towel and beddings.

FABRIC FROM SOYA BEAN PROTEIN FIBRE BLENDED WITH ELASTIC FIBRE:

Adding a small portion of elastic fibre makes fabrics more elastic and easier for washing ad caring . it is quite active and charming.

FABRIC FROM SOYA BEAN PROTEIN FIBRE BLENDED WITH POLYESTER ANOTHER SYNTHETIC FIBRE:

Suitable for spring and summer fashion apparels , underwear , shirt and sportswear .

METHODOLOGY

CHARACTER AND PERFORMANCE OF SOYA BLEND

Weaving fabric from pure soybean protein fibre or with a little spandex/lycra/cotton added to , has a soft and comfortable handle and is used for underwear , T- shirt , casual wear , sports wear , Women's fashion wear , which is fashionable .

NATURAL DYES :

There are three different types of natural dyes namely

a) Vegetable dyes

b) Animal dyes

c) Mineral dyes

The natural dye chosen for the study is vegetable dye .

Vegetable dyes:

Vegetable dyes are extracted from the leaves , barks , pods, flower , fruits and some trees. The soya fibre extracted from the leaves of soya seed is eco friendly and it is fully bio-degradable natural fibre. Hence the investigator selected soya yarn of 40's count for study. After weaving process , The natural dye selected for the study is Indian madder which is commonly known as madder with 6 per cent of dye concentration. The natural mordant is lime bark with 2 per cent concentration for the study.

SELECTION OF YARN

The soya fibre extracted from the leaves of soya seed is eco friendly and it is fully bio-degradable natural fibre . The fine texture of the soya fibre takes dyes easily and offers largest range of dye colours. Hence , the investigator selected soya yarn of 40's count for the study.

CONVERSION OF YARN INTO FABRIC

The soya yarn is converted into fabric using weaving technique. Weaving is a textile production method in which two distinct sets of yarns are interlaced at right angles to form a fabric or cloth. The way the warp and filling threads interlace with each other is called the weave.Then the fabric is bleached and dyed.

SELECTION OF NATURAL DYE

The natural dye selected for the study is Indian madder [PLATE1] which is commonly known as madder with 6 per cent of dye concentration.

SELECRTION OF MORDANT

The investigator selected the natural mordant lime bark [PLATE 2] with 2 per cent concentration for the study. Lime bark is used as mordant as it contains 90 per cent natural tannin. It is an extract of a plant

DYEING PROCESS:

In the dyeing process . for 5 kg soya fabric 270g of lime bark natural mordant, mixed with 16.5 litter of water . boil that for about 40 minutes and maintain the temperature of 100 c . After desired time filter that solution with a muslin cloth. Taking into the fabric for the process of pre-mordanting process. The fabric stirred the fabric into the solution continuously. Maintaining the temperature of 60 c . After desired time thoroughly rinsed in soft water and dried under shade.

PREPARATION OF DYE SOLUTION:

The dye solution of Indian madder dye powder was taken based on the weight of the material. Mixed soft water in M:L ratio, and maintain the temperature of 100c and bring the M:L

ratio to 1:20 to form a thick viscous dye solution. After the desired process it was filtered with the muslin cloth.

DYEING THE PRE-MORDANTED SOYA FABRIC:

Fabric was steeped into the dye bath containing the Indian madder dye solution. Stirred continuously to avoid patchy dyeing. Maintaining temperature of 50 c to 55 c . After 15 minutes, a pinch of glober salt was added to the dye solution . After the desired time thoroughly rinsed to soft water to remove the excess dye stuff and the fabric was dried under shade.

COLOUR FASTNESS TESTS:

The dyed soya fabric was futher tested for colour fastness

a) Colour fastness to sunlight
b) Colour fastness to washing
c) Colour fastness to dry crocking
d) Colour fastness to wet crocking
e) Colour fastness to perspiration

a) COLOUR FASTNESS TO SUNLIGHT:

To measure the colour fastness of soya blended fabric AATCC 16E standard is followed.This is an accelerated test method for testing of light fastness. There are different options in this method which are A, B, C, D, E, F, G, H, I, J. These options differ from each other on the basis of light source, panel temperature and humidity. Generally AATCC 16E method is widely used for testing purpose. In this method a test specimen is exposed under the condition specified in various test methods for 20hours, 40 hours or 60 hours and the factors affecting light fastness.Grading of light fastness in this method is given on the basis of grey scale with rating of 1-5. One being poor and the five being the best.Rating 3 is normally acceptable for most of the requirements.The dyed soya blend material showed moderate colour fastness to sunlight .

b) COLOUR FASTNESS TO WASHING

The method followed is ISO 105 C06/C08, AATCC: 61.the sample is collected from bulk and conditioned for 04.30 to 06 hours.then specimens are made of 04 cm*10 cm in size, following the specimen is sewed with multi-fibre fabric of same size at corner. Finally the specimen is immersed into the solution of 4gm/litre ECE detergent & 1 gm/litre sodium perborate, (If required SKFL use 0.15 gm/litre TAED) at temperature of $60^{O}C$/ $40^{O}C$ for 30 minutes. Then the

specimen is washed in hot water ,squeezed with cold water and dried in air not exceeding $60^{O}C$. The stitching is then broken out except on one of the shorter end and measured the staining and color change by grey scale & make a test report. The dyed soya blend material showed good colour fastness to washing .

c) COLOUR FASTNESS TO DRY CROCKING:

A crock test is used to determine the amount of color that may be transferred from a sample fabric to another fabric by rubbing. The test method adopted here is AATC 8 test method.There are two types of crocking namely:

i) Dry crocking
ii) Wet crocking

i) DRY CROCKING:

Strip of fabric 9”” x 3”” was taken and secured into fabric holder so there was a pull and the technical face is facing down . The holder was loaded into the crockmeter so the technical face is facing upwards. White test cloth was mounted and loaded into machine.The lid is lowered and the start button is pushed to begin the cycle. Machine will rub across the fabric 10 complete turns. The white test cloth was removed and evaluated as directed.The dyed soya blend material showed excellent colour fastness to dry crocking .

ii) WET CROCKING:

The wet white test cloth was mounted into the holder same as in the dry test.
The lid was closed and the machine was run to 10 complete turns. The wet white test cloth was removed and evaluated as directed. The dyed soya blend material showed excellent colour fastness to wet crockinh .

d) COLOUR FASTNESS TO PERSPIRATION:

Color fading and alteration can be caused by the reaction between dyes on garments and the constituents of human perspiration, such as skin waste. It varies for different individuals andconditions. Methods for testing fastness levels ofdyed materials against perspiration have been established by ISO, AATCC and various other standards.The standard procedure of

ISO 105-E04 was adopted .Both acid and alkaline perspiration are tested. The dyed soya blend material showed excellent colour fastness to both acid and alkaline perspiration test .

EVALUATION:

Objective based approaches relates outcomes to pre-specified allowing judgement to be made about their level of attainment unfortunately, the objectives are often not proven to be objectives are often not to proven to be important or they focus on outcomes too narrow to provide the basis for determining the value of an objectives.

- Drapablity
- Abrasion resistance
- Sinking test
- Capillary rise
- Shrinkage

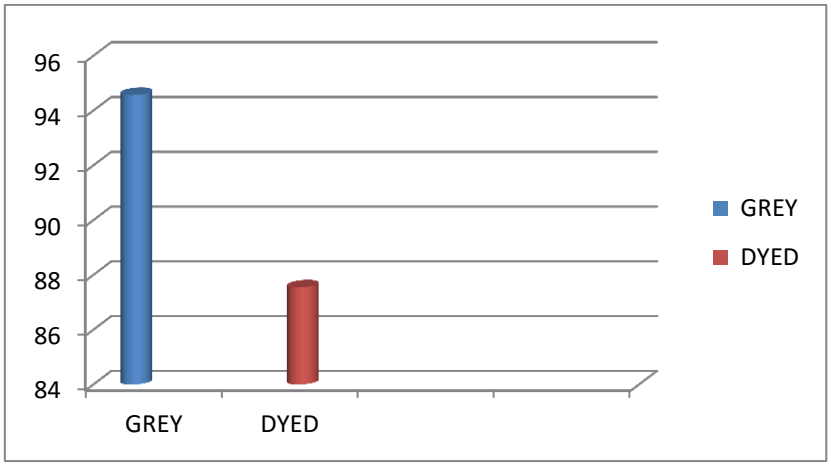
RESULT AND DISCUSSION

DRAPABILITY

TABLE I

SOYA MATERIAL	MEAN DRAPE(per cent)	SD	CV%
GREY	94.5674	0.3896	0.4065
DYED	87.5432	0.0948	0.1045

FIGURE I



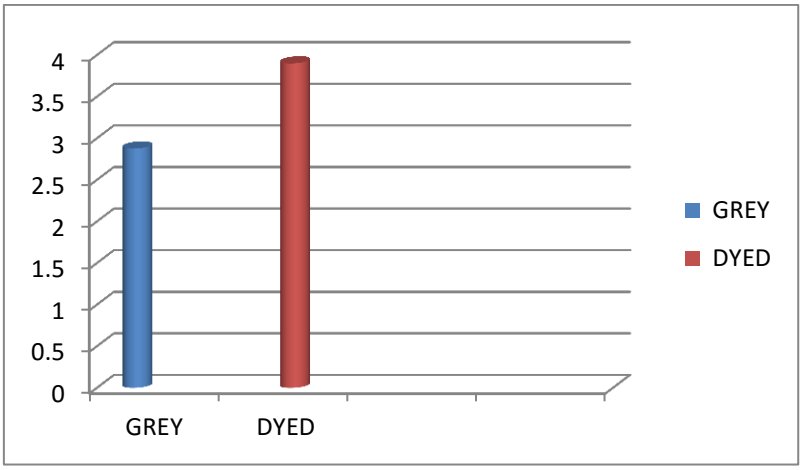
From the above table I and figure I , it was found that the drapabilityof dyed soya material has been decreased than grey material

ABRASION RESISTANCE

TABLE II

SOYA MATERIAL	MEAN ABRASION (gm)	SD	CV%
GREY	2.876	0.1564	5.3272
DYED	3.9000	0.1754	3.5073

FIGURE II



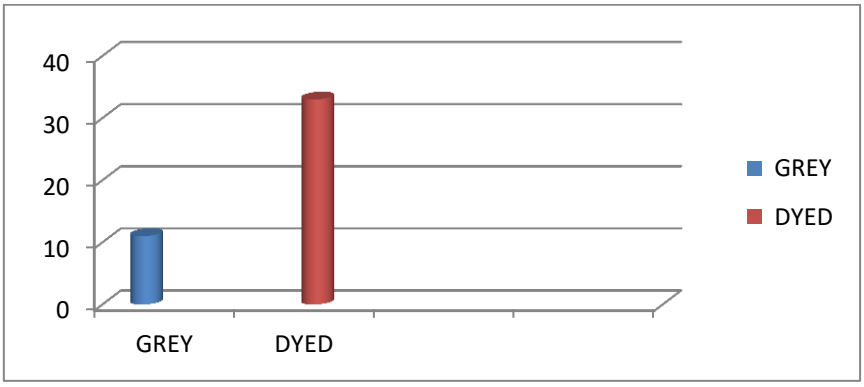
From the above table II and figure II , it was found that the abrasion resistance of dyed soya material has been increased than grey material

SINKING TEST

TABLE III

SOYA MATERIAL	MEAN SINKING (sec)	SD	CV%
GREY	11.0000	3.8960	25.8925
DYED	33.0000	5.5430	14.7783

FIGURE III



From the above table III and figure III , it was found that the sinking test

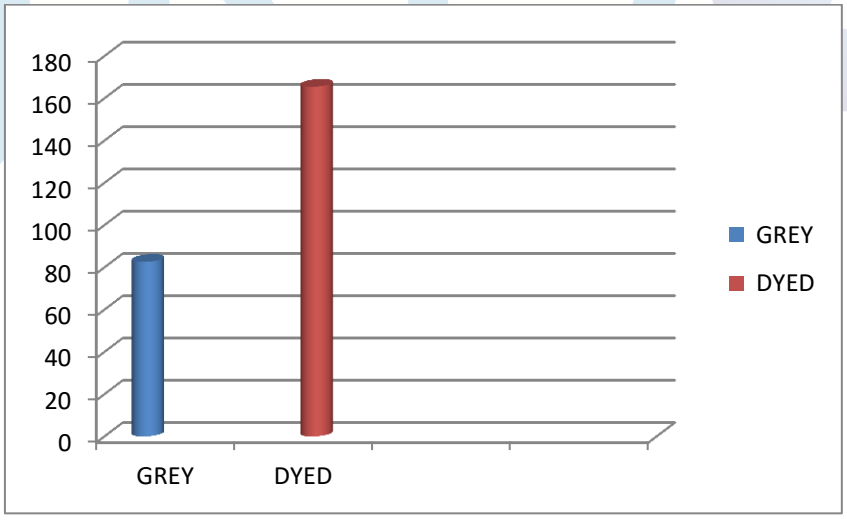
of dyed soya material has been increased than grey material

CAPILLARY RISE TEST

TABLE IV

SOYA MATERIAL	MEAN CAPILLARY RISE(sec)	SD	CV%
GREY	82.6000	7.1678	7.6778
DYED	165.5000	6.6374	3.5626

FIGURE IV



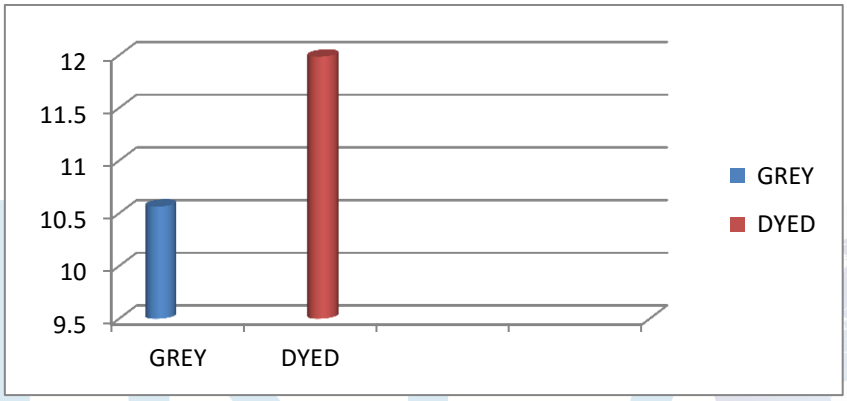
From the above table IV and figure IV, it was found that the capillary test of dyed soya material has been increased than grey material

WARP SHRINKAGE

TABLE V

SOYA MATERIAL	MEAN WARP SHRINKAGE (per cent)	SD	CV%
GREY	10.564	0.3091	2.2418
DYED	11.987	0.2449	1.9129

FIGURE V



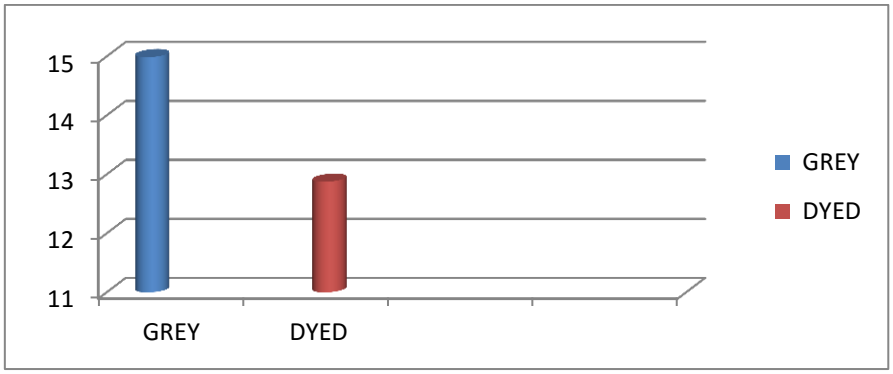
From the above table V and figure V, it was found that the warp shrinkage of dyed soya material has been increased than grey material

WEFT SHRINKAGE

TABLE XVI

SOYA MATERIAL	MEAN WEFT SHRINKAGE (per cent)	SD	CV%
GREY	14.9876	0.2516	1.7321
DYED	12.8760	0.2234	1.4181

FIGURE XVI



From the above table VI and figure VI, it was found that the weft shrinkage of dyed soya material has been decreased than grey material

SUMMARY AND CONCLUSION

Soya bean protein fibre is the only botanic protein fibre in the world , a newly born guard to mankind's skin. The fee such as softness , comfort and smoothness would have never been felt before it is feeling like "skin on skin" . it is an active fibre , a new green textile fibre , and it possesses the superiorities of many natural fibre and synthesized ones. Dyeing with natural dyes is traditional craft of India . The menacling back drop of impending ecological disaster and toxic disease of synthetic dyes has prompted researches to look for eco friendly , bio-degradable , non toxic natural dyes.

Findings of the Study

- From the above table I and figure I , it was found that the drapability of grey material is higher than dyed soya material.
- From the above table II and figure II , it was found that the abrasion resistance of dyed soya material is higher than grey material**.**
- From the above table III and figure III , it was found that the sinking test of dyed soya material is greater than grey material.
- From the above table IV and figure IV, it was found that the capillary test of dyed soya material is higher than grey material
- From the above table V and figure V, it was found that the warp shrinkage of dyed soya material has been increased than grey material
- From the above table VI and figure VI, it was found that the weft shrinkage of dyed soya material has been decreased than grey material

Soya bean protein fibre is a healthy , comfortable and environment friendly textile fibre says. We can feel its smoothness at that of a child's skin. Its moisture absorption capacity is similar to cotton and moisture transmission is better than cotton . SPF can be blended with other common fibres like cashmere, wool, combed cotton, elastic fibre, polyester and synthetic fibres. Soya protein fibre not only has excellent optic effect but outstanding features in wearing .

Knitting fabric of soya bean fibre has soft. The original colour of soya bean protein is light yellow like that of tussah silk. Also fabric of soya bean protein fibre has outstanding anti- crease , easy – wash and fast- wash property.. The count of protein in the fibre is up to 45 % soya bean protein contains 18 kind of active materials which are necessary to human body. SPF has breaking strength higher than that of wool, cotton and easy. Its boiling water shrinkage is low and its has outstanding anti-crease , easy – wash and fast – dry property. The fibre strength strength decreases greatly and the colour becomes pale yellow at 160 c . at 110 c, the fabric handle becomes harsh. It can be dyed with acid dye, cationic dyes , metal complex dyes , reactive dyes and vat dyes. The weaved garments made from SPF has strong UV absorption (195-380 mm) almost 100% and hence can effectively prevent the incidence skin cancer. Promoting blood circulation and strengthening immunity. Soya bean functional fibre has not only the superiorities of the natural fibre but also the physical properties of synthetic ones.

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