

Soyabean Fibre – A Substitute to Silk Fibre

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ABSTRACT : The manufacturing process and the characteristics of soyabean fibre have been illustrated in this article. It is shown that this fibre has some characteristics which are as like as silk fibre. So, it can be said that this fibre can be used as a substitute to silk fibre.

Keywords -Soyabean fibre, Soya Glycine Max, Manufactured fibre, Dyeability, Comfortability.

I. INTRODUCTION

Soybean protein fibres (SPF) are manufactured fibres, produced from regenerated soya *Glycine Max* soybean proteins in combination with synthetic polymer (polyvinyl alcohol) as a predominant component [1]. Polyvinyl alcohol is used for improving strength of fibre. It is a kind of reproducible plant protein fibre. At first the oil is extracted from soyabean, then a high polymer residual cake is found. Then a spinning solution of certain concentration is prepared and a filament bundle of single fibre is spun from the solution by wet spinning method. The fibre performance is stabilised through hydroformylation and then it undergoes winding, heat setting and cutting. In this way, soybean fibre of various lengths and specifications for spinning can be manufactured [2].

II. CHARACTERISTICS OF SOYBEAN PROTEIN FIBERS

2.1. Lusture: The soya-bean protein fibre is lustrous like silk.

2.2. Drape ability: This fibre has also excellent drape ability.

2.3. Comfortability: Knitted fabric of soybean protein fiber has soft, smooth and light handle which is same as that of fabrics made from silk blended with cashmere and the fabric has the same moisture absorption as that of cotton and better moisture transmission than that of cotton, which make it comfortable [3].

2.4. Color: The color of soyabean fibre is light yellow as like as silk.

2.5. Dyeability: Weak acid dye, reactive dye and substantive dyes can be used for dyeing soyabean fibre while due to the low color fastness to wash, the substantive dyes are usually not used to soybean fiber except very few colors [3].

2.6. Function of Health [3]: Soybean Protein Fiber possesses many amino acids necessary to human's body, so this sole botanic protein fiber has the function of health that no other fiber processes. Meeting people's skin, the amino acid in soybean protein can activate the collagen protein in the skin, resist tickling and evaporate the skin. Bacteria resistant elements are integrated in fiber's molecule chain, which makes the fabrics keep the property of resisting *coli bacillus*, *staphylococcus aureus* and *candida albicans* permanently, this avoids the shortcoming of not permanent effect when the anti-bacteria function is added to the yarn when finishing.

2.7. Breaking strength: Breaking strength of the single soybean protein fiber is over 3.0cNdtex, which is higher than silk. By now, 1.27dtex fiber can be spun into 6dtex yarn with high quality, which can be used for high-quality and high-density fabrics [3].

2.8. Elastic recovery: Soyabean fibre has 55.4% elastic recovery [3].

2.9. Resistance Properties to Alkali, Acid, Moth and Fungus [3]:

Fibre Property	Soybean fiber	Silk
Resistance to acid	Resistant to thin- acid (good).	Resistant to thin- acid (good).
Resistance to alkali	Resistant to thin-alkali (soda), not resistant to caustic soda.	Resistant to thin-alkali (soda), not resistant to caustic soda.
Resistance to moth / fungus	Resistant to moth and fungus.	Resistant to fungus, not resistant to moth.

2.10. Sanitarian property:

Soybean fiber has good biocompatibility and is beneficial to the human health. Furthermore, the anti-bacterial agents, which were added to the soybean fiber in spinning process, can restrain the growth of colon bacillus, impetigo bacterial and sporothrix. Therefore, soybean fiber is a kind of sanitarian fiber [3].

2.11. Some physical properties [3]:

Property	SPF	Silk
Dry breaking extension (%)	18-21	14-25
Initial Modulus (kg/mm ²)	700-1300	650-1250
Loop strength (%)	75-85	60-80
Knot strength (%)	85	80-85
Moisture regain (%)	8.6	11.0
Density (g/cm ³)	1.29	1.34-1.38
Heat endurance	Yellowing and tacking at about 120° C (Bad)	Keep stable When temperature <=148° C (Good)
Ultraviolet resistance	Good	Bad

2.12. Wet Permeability and Moisture Vapor Transmission Characteristics [3]:The wet permeability of Soybean is lower than that of PP and PE but higher than PAN, PA and silk; while the moisture vapor transmission property of soybean sample is better than silk, PP, PE, PA, PAN. Therefore, soybean fiber is a kind of comfortable fiber with relatively good wet permeability, excellent moisture vapor transmission property and dry touch.

2.13. Frictional, flexural and draping properties[3]:**Frictional property:**

The sequence of the frictional property of some yarn is as below:

Silk>Soybean fiber/spandex >cotton>soybean>Chrysalis fiber

Flexural property:

The sequence of the soft handle property of some yarn is as below:

Chrysalis fiber >Soybean fiber> Silk > cotton

Draping property:

The sequence of the draping property of some yarn is as below:

Chrysalis fiber >Soybean fiber> Silk

2.14.Light fastness property[3]:

The light fastness of soybean fiber was tested under outdoor condition for two months. After the test, the color of soybean fiber fades a little, the strength decreases 11% and no mold fungus appears. Furthermore, the strength of soybean fiber decreases only 9.8% under the ultraviolet irradiation for 120 hours. The test results indicate that the soybean fiber has good light fastness property and good resistance to ultraviolet radiation, which is better than cotton, viscose and silk.

III. CONCLUSION

From the above discussions it is clear that soyabean protein fibre shows comparable lusture, comfortability, color, dye ability, breaking strength, resistance properties to acid, alkali, moth and fungus, light fastness property, sanitarian property, wet permeability and moisture vapor transmission, frictional, flexural and draping properties which are comparable to silk fibre. So it can be said that this fibre can be used as a substitute to silk fibre.

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