International Journal of Home Science 2016; 2(2): 232-234

International Journal of Home Science

ISSN: 2395-7476
IJHS 2016; 2(2): 232-234

www.homesciencejournal.com
Received: 08-03-2016
Accepted: 09-04-2016

Shalini Juneja
Clothing and Textiles, Faculty of Home Science Banasthali University, Rajasthan-304022, India.

Suman Pant
Clothing and Textiles, Faculty of Home Science Banasthali University, Rajasthan-304022, India.

Correspondence
Shalini Juneja
Clothing and Textiles, Faculty of Home Science Banasthali University, Rajasthan-304022, India.

Effect of blending soyabean fiber with wool fiber on dimensional properties of fabrics

Shalini Juneja and Suman Pant

Abstract
Effect of blending soyabean fiber with wool fiber on dimensional properties of fabrics has been reported in this research paper. Soyabean fibre (S) has been blended with merino wool (M) in three different ratios, viz 80:20, 70:30 and 50:50 and yarns were prepared on ring spinning system. Woven fabric samples were prepared on simple handloom. Knitted fabric samples were prepared on flat bed hand knitting machine. Dimensional properties of fabrics were determined. Blending of soyabean with merino wool fiber has reduced thickness and weight of woven fabrics and thickness of knitted fabrics. Cloth cover and tightness factor of blended fabrics is little less than that of pure fabrics.

Keywords: weight, thickness, cloth cover, tightness factor

Introduction
Soyabean is a new vegetable based fibre. Soyabean fibre is a kind of reproducible plant protein fibre, which uses the residual cake after oil is extracted from the soybean. High polymer from soybean cake is extracted and protein spinning solution of a certain concentration is prepared. After obtaining the spinning solution, a filament bundle of a single fibre 0.9-3.0 dtex is spun with the use of the wet- spinning process (Li-yi-you,2004). It is an eco- friendly fibre using in-exhaustible natural resource as raw material.
It has combination of unique properties. Its softness and absorbency makes it comfortable to skin. It is light in weight, lustrous with anti-ultraviolet property, good crease recovery and drapability. Tensile strength of the single soyabean protein fiber is higher than that of wool, cotton and silk. Moreover, unlike wool it does not felt.
Among the different kind of animal fibers used by textile industry, wool from sheep is commercially most important. Its inherent unique properties of resiliency and elasticity, wrinkle recovery, drapability, thermal insulation, moisture absorbency make it ideal for numerous applications in apparels, interior and other uses (Trotman, 1964) [3].
Present study was planned to explore the possibility of blending soyabean fiber with wool with the aim to produce blended yarn and fabric of improved quality. This paper reports preliminary findings of dimensional properties of blended fabrics.

Methodology
Soyabean fibre and merino wool were purchased from R.S.W.M. New Product Development, Banswara. Blending and spinning of fibers was done at R.S.W.M., New Product development, Banswara on ring spinning system. Soyabean and merino fibers were blended in three different ratios viz.80/20,70/30,50/50 of soyabean/merino wool. Yarns of 30 Ne count were prepared. 100% soya and 100% merino yarn were also prepared for base reference. Thus total five yarn samples were prepared. Five knitted and five woven samples were prepared from these blended yarns ie Soya 100, Merino 100, Soya 80: Merino 20, Soya 70: Merino 30, Soya 50: Merino 50. Woven fabric samples were prepared on simple hand loom in the width of 34 inch. Plain weave was used for weaving. Reed and pick (44x36) was kept constant in all woven samples. Knitted fabric samples were constructed on 10-12 gauge, flat bed hand knitting machine.
Following properties of developed fabrics were determined by standard procedure - Fabric Count (BIS: 1963-1969), Wales per Inch and Course per Inch (ASTM 231-62), Weight per Square Metre (BIS: 1964 -1970), Thickness (BIS: 7702 - 1975), Cloth Cover, Tightness Factor (Padman and Subramaniam, 2003) [2], Stitch Length (Ajgaonkar, 1998) [6].

Result and Discussion

Fabric count

Table 1: Fabric count

S. No.	Blend Ratio	Woven (Threads /inch)		Knitted (Threads /inch)	
		Warp	Weft	Wales	courses
1	S100	45	46	21	27
2	M100	43	47	20	25
3	S80: M20	42	45	21	25
4	S70: M30	44	46	22	26
5	S50: M50	47	48	22	27

The Table 1 depicts thread count of soya/wool pure and blended (Woven & Knitted) fabrics. In case of woven fabrics, the thread count of Soya 100 is 45 × 46 and it is 43×47 for Merino 100 fabric. Among blended woven fabrics, it is maximum for S50: M50 followed by S70: M30 and is minimum for S80: M20 fabric. Thus there is slight variation in end and pick density of different woven fabrics.

In case of knitted fabrics, the construction is evaluated by number of course and wales. Trend similar to woven fabric is observed in knitted fabrics. Little variation in wales and courses count of different knitted fabrics (pure and blended) is found. Three way ANOVA has been calculated to find out the effect of construction parameter, blend ratios and different direction of fabric on thread count of the fabric. Significant difference at one percent level is found between construction parameters (F= 7063). Significant difference at one percent level is found in ratio (13.27) and direction of fabric (F=183.75). Interaction of the three factors is significant at five percent level. (F=2.475).

Table 2: Weight and thickness of fabrics

S. No.	Blend Ratio	Weight (gm/sq m)		Thickness (mm)	
		Woven	Knitted	Woven	Knitted
1	S100	90	137	0.369	0.614
2	M100	152	240	1.106	1.647
3	S80 : M20	84	288	0.326	1.25
4	S70 : M30	95	266	0.372	1.26
5	S50 : M50	91	223	0.398	1.37

Weight

Among pure (woven and knitted) fabrics, weight of merino 100 has been found more than soya100 fabric. The reason may be difference in density of soya and wool fibres. Density of soya fibre is 1.29 (Li, 2004). It is less than that of wool fibre (1.33) that is why Soya100 is lighter in weight than merino 100. Tortora (1982) [8] stated that density and specific gravity of silk and wool fibres tend to be lower than other fibres.

Some of the other factors like yarn count, thread density, stitch density, thickness also affect the weight of the fabric. Among woven fabrics, weight of S80: M20 is minimum. This may be accounted to lowest thread density of this blend (Table 4.11).

Slight decrease in weight of S50: M50 woven fabric and considerable decrease in S50: M50 knitted fabric is found. Gahlot (2007) [9] found that finer counts resulted in light weight fabrics as compared to coarse count yarns. Shakyawar (2002) [4] reported in his work that increase in weight is due to coarse blended yarn. This may be the reason for decrease in weight of S50: M50 fabrics as yarn of S50: M50 blend is finest (Table 4.8).

In case of blended woven fabrics, it is seen that blending of merino wool fiber has not resulted in drastic increase in weight of fabrics. On the other hand, weight of blended knitted fabrics has increased noticeably after incorporation of merino fiber; it is more than pure soya and merino fabrics. Loop/stitch length of blended knitted fabrics might have affected the weight of blended fabrics. Stitch length of S80: M20 is highest followed by 70S: 30M in case of knitted fabrics (Table 5).

It is clear from table that knitted fabrics have more weight than the woven fabrics. Due to fineness of the yarn, it was breaking frequently during knitting. Therefore, two yarns have been used together in knitting. That is why weight of knitted fabrics is more than woven fabrics. The present investigation reveals that weight increases with increase in fabric thickness in case of pure fabrics. Thickness of knitted fabrics is more than woven fabrics.

Two way ANOVA is calculated to find out the effect of blend ratios and construction parameters on weight of the fabric. Constructional parameter is found significant at 1% level of significance (F=185473). Different blend ratio is found significant at one percent level of significance (F=9777). Interaction between factor A (constructional parameter) and factor B (blend ratio) is found significant at one percent level of significance. (F=8888.17).

Thickness

It is clear that among pure fabrics (woven and knitted), thickness of merino 100 is more than soya100. Among blended fabrics, the maximum value of thickness has been found for S50: M50 which is 0.39 mm and 1.37 mm for woven and knitted fabrics respectively. Minimum thickness has been found for S80: M20. This may be due to difference in thread density i.e. highest of S50: M50 and lowest of S80: M20 (Table 2). It can be deduced that as merino component in the blend increases, the thickness also increases and vice-versa.

Also it is observed that thickness of knitted fabric is more than woven fabric. One reason may be the fact that knitted fabrics has loops which make these fabrics thicker than woven fabrics. Other reason is the fact that two yarns have been used together in knitting, as mentioned before. That is why thickness of knitted fabrics is more than the woven fabrics. The present investigation also reveals that thickness increases with the increase in fabric weight in case of pure fabric and blended woven fabrics. Thickness and weight of the fabric are co-related, as the thickness increases weight increases and vice-versa. The co-relation was calculated between thickness and weight of fabric. It is significant at .01 level of significance (r= 0.361).

Two way ANOVA calculated to find out the effect of blend ratios and construction parameters on thickness of the fabric shows that constructional parameter has significantly affected thickness at 1% level of significance (F=11.20). Different blend ratio has also affected thickness (F=11.80) Interaction between constructional parameter and blend ratio is found significant at one percent level of significance (F=4.43).

Cover factor

Cloth cover is the area of cloth covered by one set of yarn. Fabric property such as air permeability is affected by cover factor

Table 3: Cover factor of woven fabric

S. No.	Blend Ratio	Cover factor
1.	S100	14.14
2	M100	14.16
3	S80: M20	13.59
4	S70: M30	13.86
5.	S50: M50	13.94

Table 3 indicates that cloth cover of merino 100 is marginally more than soya 100 woven fabric. Cloth cover of blended fabrics is little less than that of pure fabrics. Among blended fabrics, cloth cover increases as % of wool component in the blend increases. Cloth cover depends on yarn count and fabric count (Booth, 1968) [7]. Both these factors are responsible for variation in cloth cover of blended fabrics. The increasing trend of cloth cover of blended fabrics is due to increase in fabric count of woven fabrics. Fabric count is maximum for S50: M50 and minimum for S80: M20 blended fabric. This is one reason for increasing trend of cover factor of blended fabrics.

One way analysis shows that the effect of blend ratio on cover factor of fabric is significant at one percent level of significance (F=60.27).

Tightness factor

Table 4: Tightness factor of knitted fabrics

S. No.	Blend Ratio	Tightness factor
1.	S100	21.08
2.	M100	21.44
3.	S80 : M20	19.20
4.	S70 : M30	19.80
5.	S50 : M50	20.80

The above data reveals that tightness factor of pure soya and merino fabrics is almost same. Tightness factor of blended fabrics is less than pure soya and merino fabrics. It can be deduced that pure soya and merino fabric are tighter in construction compared to blended fabrics. In case of blended fabrics, the tightness factor of S50:M50 is little more than S70: M30 and S50: M50 blends. Tightness factor depends upon yarn count and loop length. There is variation in loop length (stitch length). For a given yarn count, as the stitch length of the fabric increases the tightness factor decreases (Blackenbury, 1992) [5]. Thus variation in stitch length has affected tightness factor of knitted fabrics. The co-relation is calculated between stitch length and tightness factor. Negative correlation significant at .01 level is found between stitch length and tightness factor (r= -0.65).

One way ANOVA is determined to see the effect of blend ratio on tightness factor of knitted fabrics. The results are found significant at one percent level of significance (F=18.67).

Stitch Length

Table 5: Stitch length of knitted fabric

S. No.	Blend Ratio	Stitch length
1.	S100	0.21
2.	M100	0.21
3.	S80 : M20	0.23
4.	S70 : M30	0.22
5.	S50 : M50	0.20

The Table 4.16 depicts the stitch length (loop length) of all the fabrics. For soya100 and merino100 fabrics, the stitch length is found to be same. Among blended fabrics, the highest value for stitch length is found for S80:M20 followed by S70:M30 and minimum value is for S50:M50. The reason for marginal variation may be variation in knitting machine setting parameters.

Conclusion

Significant difference has been found in properties of pure and blended fabrics as well as woven and knitted fabrics. Weight and thickness of woven and knitted merino100 fabrics has been found more than soya100 fabrics. Blending of soyabean with merino wool fiber has reduced thickness and weight of woven fabrics and thickness of knitted fabrics. Knitted fabrics are heavier in weight than the woven fabrics. Cloth cover of blended fabrics is little less than that of pure fabrics. Among blended fabrics, cloth cover increases as % of wool component in the blend increases. Tightness factor of blended fabrics is less than pure soya and merino fabrics. In case of blended fabrics, the tightness factor of S50:M50 is little more than S70: M30 and S50: M50 blends.

References

1. Li Yi. You the soybean protein fibre-A healthy and comfortable fibre for the 21st century Fibres and Textile in Eastern Europe 2004; 12(2):46.
2. Padman A, Subramaniam V. Pricniples of weft knitting, The Indian Textile Journal. 2003, 47-51.
3. Trotman ER. Understanding Textile (2nd Ed.). New York: Macmillan Publishing Company 1964, 413.
4. Shakyawar DB. Studies on Hand value of woven fabric products from Indian wools and their blends. Ph.D. Thesis, Indian Institute of Technology, New Delhi, India, 2002.
5. Bleckenbury T. Knitted clothing technology. Oxford: Blackwell Science, 1992.
6. Ajgaonkar DB. Knitting Technology. Bombay, universal Publishing Corporation, 1998.
7. Booth JE. Principles of textile testing. London: Butterworth, 1968, 583.
8. Tortora PG. *Understanding Textile* (2nd ed.). New York: Macmillan Publishing Co., Inc, 1982.
9. Gahlot, Manisha. Impact of blending oak tassar with viscose on performance. Ph.D. Thesis, Banasthali Vidyapith, Banasthali, 2007.