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Designing of weave on Arha Software and Garment construction with Milkweed/ Lyocell blended fabric

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*Abstract :*The present study is an endeavor to usemilkweed floss/ lyocell blended yarns for weaving of fabric. Milkweed floss/ lyocell fibres blended in 70: 30, 50: 50 and 30: 70 ratios and spun into yarn to explore its use for conventional textile applications. Properties of prepared pure and blended fabrics were evaluated for fabric count, fabric thickness, fabric weight, bending length, crease recovery, tearing strength, tensile strength and elongation and fabric drape. Six harness weaves were designed with the help of arha weave software and evaluated by 30 weavers with respect to colour combination, appearance of fabric and drape of the fabric on evaluation sheet. Weighted mean score was calculated after evaluation of weave designs. Selected weave design was taken for preparation of fabric and fashion garments (tunic and skirt) were developed.

Keywords: Blended yarns, Milkweed floss, unconventional fibres and weave design

1. Introduction

Agro based fibres like jute, cotton, hemp, ramie etc. are gaining significance in contemporary days due to environmentalist’s progress throughout the world for environment protection from pollution. Today, fibre yielding plants are regarded as most important crops after cereals. In fact, plant fibres are the raw material for many industries sustaining the economy of our nation. Despite the competition from the development of synthetic fibres, many of the plant species continued to be of commercial importance.

There is abundance of unconventional fibrous plants in Uttarakhand state and which are neglected by local people as resource due to deficit knowledge. These natural plants can also be used for extraction of dyes so as to dye or embellish the textile material. Unfortunately the people are still using conventional fibres for various purposes due to the lack of insight regarding the use of unconventional fibres. Currently, one of the major challenges in textile industries is related to the environmental problem. Most of the textile industries are facing great pressure to reduce pollutant emissions. This drives textile manufacturers to seek new approaches to produce environment friendly products. The present study is a clear indictment on the issue of environmental awareness to reduce pollution and to produce ecologically sound product by using the eco- friendly and bio- degradable fibres.

2. Methodology

2.1 Preparation of woven samples

Pure lyocell fabrics as well as milkweed: lyocell fabrics were woven on handloom using plain weave. In blended fabrics, blended yarns were used in both warp and weft directions whereas in pure fabrics, pure yarns were used in both warp and weft directions. Woven samples prepared during course of investigation are shown in Table 1.

Table 1: List of prepared pure and blended woven samples

S. No.	Fabric Samples	Blend ratios
1.	Milkweed/ lyocell	70/ 30
2.	Milkweed/ lyocell	50/ 50
3.	Milkweed/ lyocell	30/ 70
4.	Milkweed/ lyocell	0/ 100

2.2 Evaluation of physical properties of woven sample

The woven fabric samples were tested by using methods given in ISI Hand book of Textile Testing (1982)to study the effect of different blend ratios of fibres used in warp and weft direction on physical parameters of fabrics. The parameters were thread count, fabric thickness, fabric weight, bending length, crease recovery, tearing strength, tensile strength and elongation and fabric drape.

2.3 Development of weave designs with software

Twelve designs of weave with six harness were developed by the researcher using Arha weave software. These designs were represented with one repeat of design along with lifting and drafting plan.

2.4 Visual evaluation of developed weave designs and preparation of fabric

Developed weave designs were shown on paper as well as on computer to weavers and assessed by 30 weavers from Haldwani, Kashipur and Mahuadabra village of Jaspur with respect to colour combination, appearance of fabric and drape of the fabric on evaluation sheet because the weavers were able to visualize the effect of weave design on fabric to be prepared on handloom. In evaluation sheet points were given to each parameter according to 5 point rating scale by weavers. Weighted mean score was calculated after evaluation of weave designs. Weave design which got the highest score was taken for weaving the fabric. Milkweed: lyocell (50:50) blended yarns were used for weaving of fabric because it had higher strength than other milkweed: lyocell blended yarns in ratios of 70: 30 and 30: 70 and to see the consequence of milkweed: lyocell (50: 50) blended yarn on fabric appearance.

3 Results and discussion

3.3 Evaluation of physical properties of pure and blended fabrics

Prepared pure lyocell and mulberry silk fabrics as well as Mw/ L blended fabrics were tested for physical properties and results are discussed from Table 2.

3.3.1 Thread count

It is evident from Table 2 thatThread count of pure lyocell fabric and Mw/ L blended fabrics in the proportions of 70/ 30, 50/ 50 and 30/ 70 was found to be 34×32 threads per inch whereas thread count of pure mulberry silk fabric and Mw/ Ms blended fabrics in the proportions of 50/ 50, 70/ 30 and 30/ 70 was found to be 32×31 threads per inch.

According to **Hollen and Saddler (1973)**, thread count is an indication of the quality of the fabric and can be used in judging ravelling, shrinkage and durability. Higher count also means less potential shrinkage and less ravelling of seam edges.

3.3.2 Fabric weight g/ m^2

Table 2 shows that fabric weight g/m^2 of Mw/ L blended fabric in proportions of 70/ 30, 50/ 50 and 30/ 70 was found to be 130, 137.83 and 137 respectively whereas weight g/m^2 of pure lyocell fabric was observed as 137.64.

It is evident from Figure 4.8 that maximum weight g/ m^2 was observed in 50/ 50 Mw/ L blended fabric due to the more yarn count (32.74 Tex) as compared to other blended fabric. Minimum weight g/ m^2 of 130 was observed for 70/ 30 Mw/ L blended fabric. It may be attributed to high ratio of milkweed floss in both types of yarns as specific gravity of milkweed is lowest.

Results of ANOVA showed that there was significant difference among weight g/m^2 of Mw/ L blended fabrics and pure lyocell fabric at five per cent level of significance.

3.3.3 Fabric Thickness

Table 2 exhibits that thickness value of blended fabrics in proportions of 70/ 30, 50/ 50 and 30/70 Mw/ L was found to be similar as 0.40 mm whereas thickness value of pure lyocell fabric was 0.41 mm. It is evident from Figure 4.9 that thickness of Mw/ L blended fabrics was slightly more due to high fabric count of Mw/ L blended fabric (34× 32).

Angappan and Gopalkrishnan (2002) reported that fabric thickness is mainly used in checking fabric properties such as thermal insulation, resilience, fabric stiffness and abrasion etc. in the study of fabric geometry.

3.3.4 Fabric Strength and Elongation

It is apparent from Table 2 that maximum tensile strength of 28.00 Kg/ cm^2 (warp) and 34.60 Kg/ cm^2 (weft) were observed for 50/ 50 Mw/ L blended fabrics whereas minimum tensile strength of warp way (22.50 Kg/ cm^2) and weft way (30.10 Kg/ cm^2) was observed for 70/ 30 Mw/ L blended fabrics. Tensile strength of pure lyocell fabric was found to be 29.20 Kg/ cm^2 (warp) and 39.70 Kg/ cm^2 (weft).

Maximum elongation of warp (25.70 per cent) and weft (26 per cent) directions were observed for 50/ 50 Mw/ L and 30/ 70 Mw/ L blended fabrics respectively whereas minimum elongation of warp (22.70 per cent) and weft (21 per cent) directions were observed for 30/ 70 Mw/ L and 50/ 50 Mw/ L blended fabrics respectively. Elongation of pure lyocell fabric was observed as 22.80 per cent warp way and 23 per cent weft way.

Weft way tensile strength value of pure and blended fabrics was higher than warp way tensile strength.Thisresult is alsoin closepropinquity with statement of **Anandan *et al.* (2006)** whoreported thatduring weaving, the opening and closing of the warp shed impose cyclic stress and strains that causes hardening of the warp yarns. This is the reason for greater loss in tensile strength in warp way specimen as compared to the weft way specimen.

Results of ANOVA showed that there was significant difference among tensile strength and elongation (warp and weft way) of Mw/ L blended fabrics and pure lyocell fabrics at five percent level of significance.

3.3.5 Tearing Strength

Maximum tearing strength of 6.10 Kg (warp) and 5.90 Kg (weft) were observed for 30/ 70 Mw/ L blended fabric whereas minimum tearing strength for 70/ 30 Mw/ L blended fabric was found to be as 4.50 Kg (warp) and 4.20 Kg (weft). Tearing strength of lyocell fabric was observed as 6.41 Kg (warp) and 6.30 Kg (weft). It is evident from Table 2 that 30/ 70 Mw/ L blended fabrics showed higher strength may be due to high proportion of lyocell and may be attributed to more closeness of yarns in fabric as compared to other blended fabrics. As all the pure and blended fabrics were made on hand loom and all the processes were controlled manually. According to **Tortora (1978)**, tear strength is more closely related to the serviceability of fabrics than is tensile strength. In testing tensile strength, all of the yarns share equally in the stress applied, but in tear strength testing a few yarns, at most are subject to stress. Fabric construction in which groups of yarns are woven together, such as basket or rib weaves, will have the greatest tear strength, since more yarns will group together to share the stress. Any construction that restricts the ability of yarns to function together will decrease tear strength.

Results of ANOVA showed that there was significant difference among the tearing strength (warp and weft way) of Mw/ L blended fabrics and pure lyocell fabrics at 5 per cent level of significance.

3.3.6 Crease Recovery

Table 2 depicts that maximum crease recovery angle of both directions 66.90^0 (warp) and 67.30^0 (weft) were observed for 70/ 30 Mw/ L blended fabric whereas minimum crease recovery angle of 44.30^0 (warp) and 50.70^0 (weft) were noted for 30/ 70 Mw/ L blended fabric. Crease recovery angle was observed as 49.40^0 warp way and 52.80^0 weft way for pure lyocell fabric.

Crease recovery angle was decreased with decrease in milkweed ratio in Mw/ L blended yarns. In case of Mw/ L blended fabrics, crease recovery angle in both ways was decreased with decrease in proportion of milkweed floss. Mw/ L blended fabric in proportion of 70/ 30 had high crease recovery angle may be attributed to limpness of fabric due to presence of high proportion of milkweed floss. **Tortora (1978)** reported that loosely woven fabrics generally allow more fibre distribution and motion and therefore have better crease recovery.

Results of ANOVA showed that there was significant difference among the crease recovery of Mw/ L blended fabrics and pure lyocell at five per cent level of significance.

Table 2: Physical properties of pure and blended fabrics

S. No.	Blend Ratio	Thread count/inch^2	Fabric weight g/ m^2	Thickness (mm)	Tensile Strength (Kg/cm^2)		Elongation (%)		Tearing Strength (Kg)		Crease recovery (angle)		Bending length (cm)		Drape coefficient (%)
					Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft	Warp	Weft	
1.	70/ 30 (Mw/ L)	34×32	130.00	0.40	22.50	30.10	23.75	22	4.50	4.20	66.90	67.30	1.91	1.74	60.42
2.	50/ 50 (Mw/ L)	34×32	137.83	0.40	28.00	34.60	25.70	21	5.99	5.10	46.60	54.80	2.12	1.81	65.77
3.	30/ 70 (Mw/ L)	34×32	137.00	0.40	23.70	33.70	22.70	26	6.10	5.90	44.30	50.70	2.42	2.43	67.45
4.	0/ 100 (Mw/ L)	34×32	137.64	0.41	29.20	39.70	22.80	23	6.41	6.30	49.40	52.80	2.90	1.99	67.19

Mw: Milkweed and L: Lyocell

3.3.7 Bending length

Table 2depicts that maximum bending length of 2.42 cm warp way and 2.43 cm weft way were observed for 30/ 70 Mw/ L blended fabric whereas minimum bending length of 1.91 cm warp way and 1.74 cm weft way were noted for 70/ 30 Mw/ L blended fabric. Bending length of pure lyocell fabric was observed as 2.9 cm warp way and 1.99 cm weft way.

Mw/ L blended fabrics in ratio of 70/ 30 exhibited lower bending length which may be attributed to high proportion of milkweed floss in the yarn. Higher bending length of pure lyocell fabric may be due to the high interaction between fabric weight and its stiffness.

Results of ANOVA showed that there was significant difference among the stiffness of Mw/ L blended fabrics and pure lyocell at five per cent level of significance.

3.3.8 Drapability

It is evident from Table 2 that maximum drape coefficient of 67.45 % was observed for 30/ 70 Mw/ L blended fabric whereas minimum drape coefficient value was found to be 60.42% for 70/ 30 Mw/ L blended fabric as compared to drape coefficient of pure lyocell fabric which was observed as 67.19%.

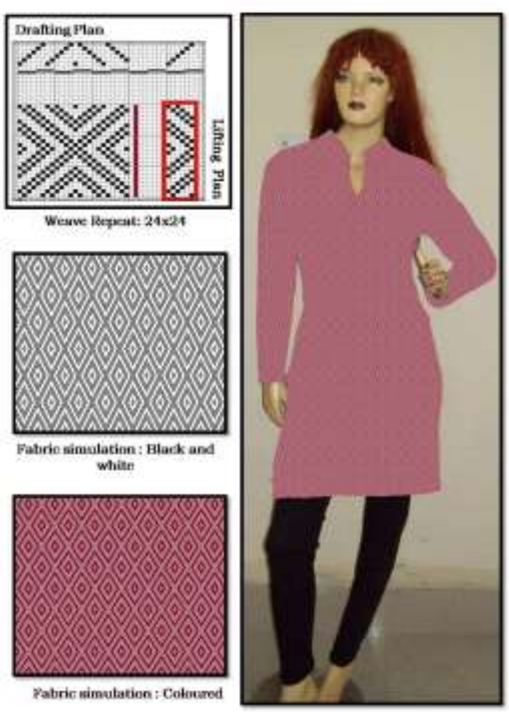
Drape coefficient was increased with decrease in proportion of milkweed floss in case of both types of blended fabrics. Results show that value of drape coefficient was higher in general for both types of blended fabric which may be attributed to plain weave used for fabric construction. **Angappanand Gopalkrishnan (2002)** stated that small value of drape coefficient indicates the better drapability of the fabric and the large value of drape coefficient indicates the bad drapability. The drapability of a fabric can be improved by providing the more float length by reducing the number of interlacements in the weave repeat and by reducing the number of picks per inch.

Results of ANOVA showed that there was significant difference among the drapability of Mw/ L blended fabrics and pure lyocell fabrics at five per cent level of significance.

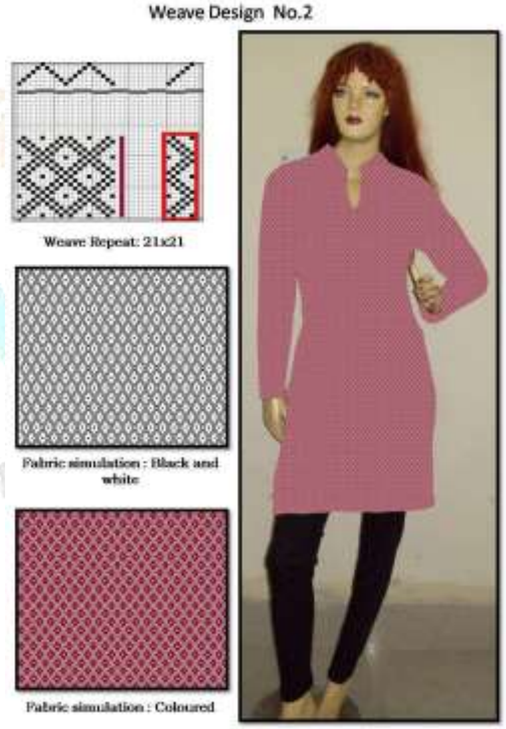
3.4 Weave designing with CAD and their assessment

Weave designs made with the help of arha software were assessed by using proforma with the parameters i.e. colour combination, appearance of the fabric and drape of the fabric and shown in weave design no. 1 to 12. Table 3 depicts that weave design 7 got maximum scores 4.4, 4.1 and 4.2 for parameters colour combination, appearance of the fabric and drape of the fabric respectively whereas weave designs 11 and 12 got minimum scores 1.6, 1.8 and 2.1 for parameters i.e. colour combination, appearance of the fabric and drape of the fabric respectively. It can be inferred from the results that weave design 7 was accepted more by the respondents.

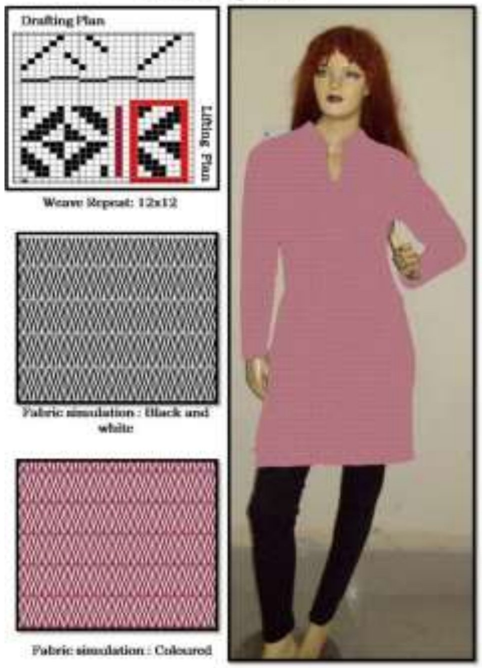
Weave Design No.1



Weave Design No.2

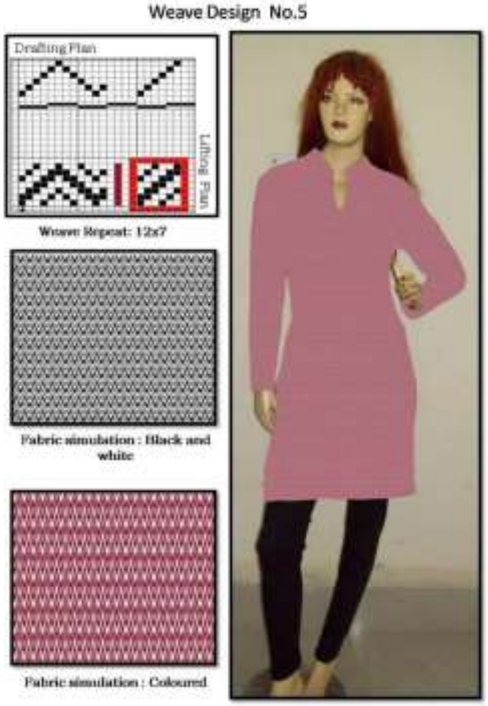


Weave Design No.3



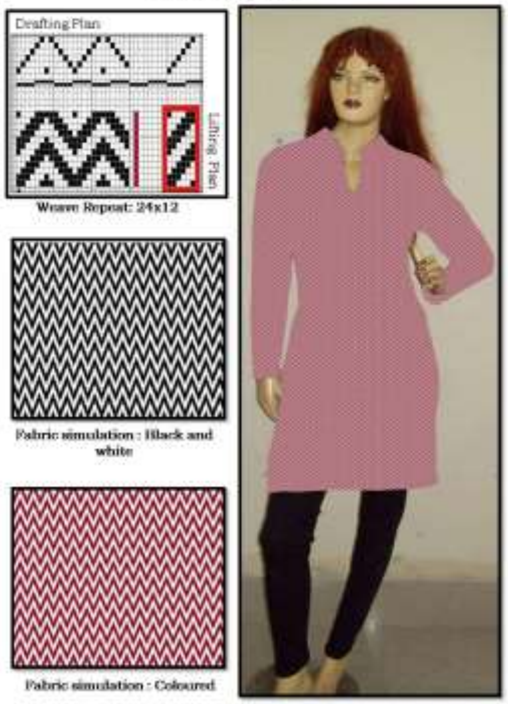
Weave Design No.4

Weave Design No.5



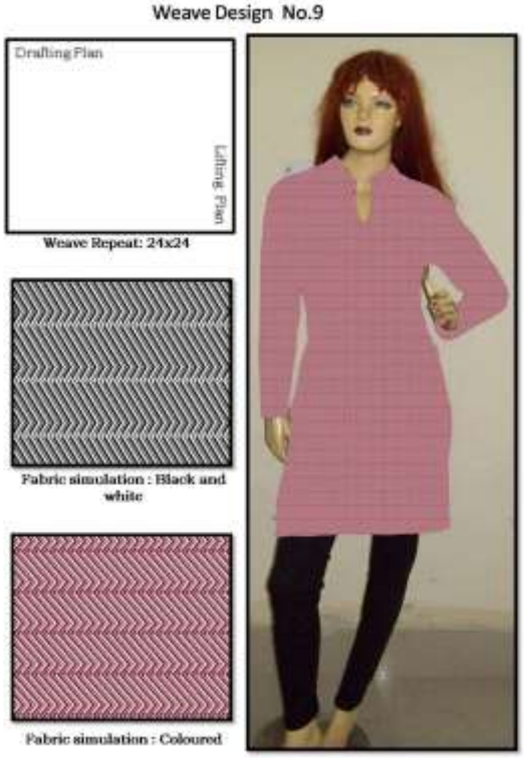
Weave Design No.6

Weave Design No.7

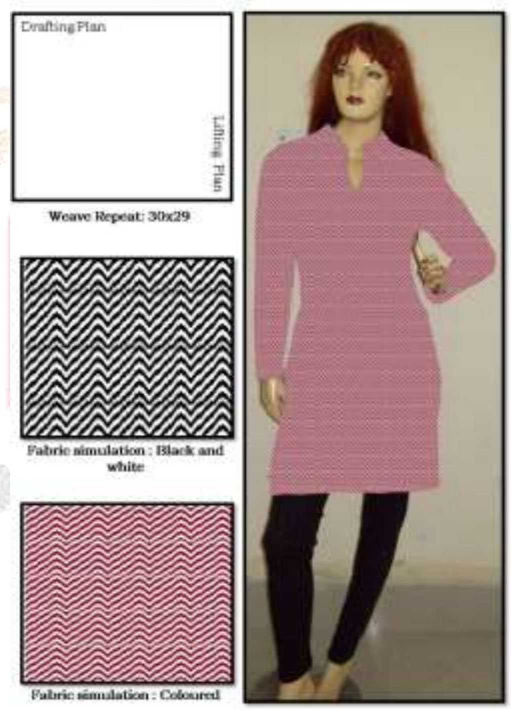


Weave Design No.8

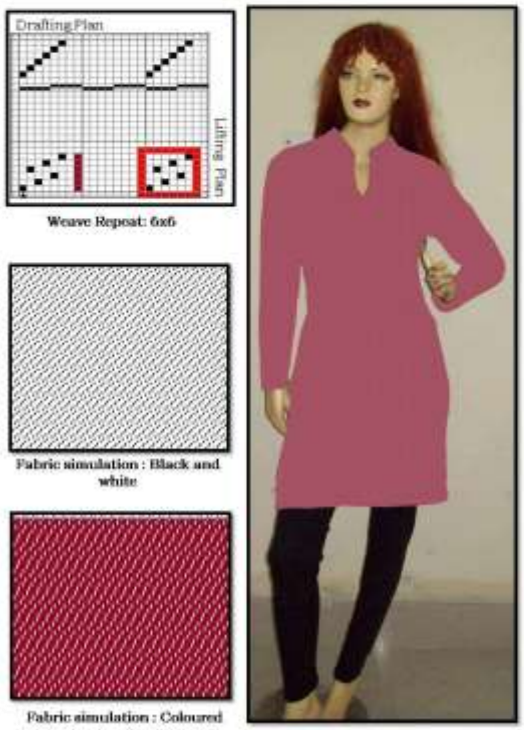
Weave Design No.9



Weave Design No.10



Weave Design No.11



Weave Design No.12

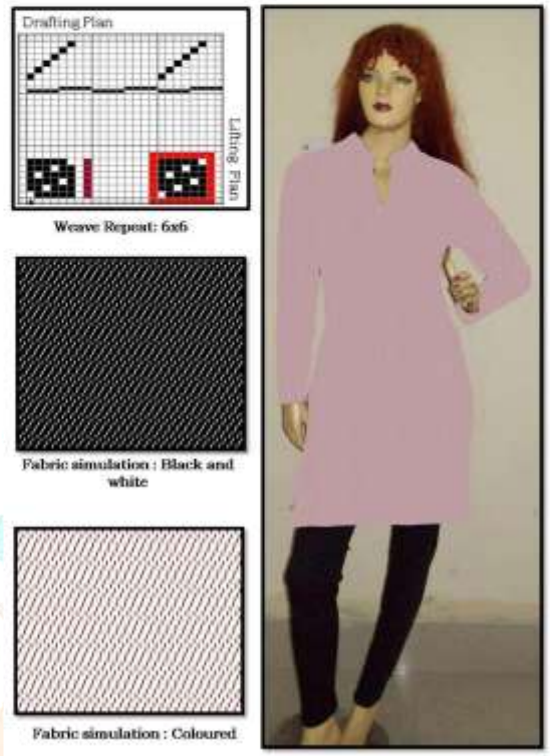


Table 3: Assessment of weave designs

S.No.	Weave Designs	Parameters	Point Rating Scale					WMS
			Excellent	Very good	Good	Fair	Poor	
1.	**Design 1**	Colour combination	-	4	14	12	-	2.05
		Appearance of fabric	4	12	14	-	-	3.66
		Drape of the fabric	-	18	12	-	-	3.6
2.	**Design 2**	Colour combination	4	20	6	-	-	3.9
		Appearance of fabric	3	15	12	-	-	3.7
		Drape of the fabric	3	20	7	-	-	3.8
3.	**Design 3**	Colour combination	-	-	20	10	-	2.6
		Appearance of fabric	-	-	15	15	-	3.0
		Drape of the fabric	-	-	15	15	-	3.0
4.	**Design 4**	Colour combination	-	20	-	10	-	3.3
		Appearance of fabric	-	20	10	-	-	3.6
		Drape of the fabric	-	20	15	5	-	4.5
5.	**Design 5**	Colour combination	-	15	10	5	-	3.3
		Appearance of	-	15	10	5	-	3.3

		fabric						
		Drape of the fabric	-	15	10	5	-	3.3
6.	**Design 6**	Colour combination	5	15	10	-	-	3.8
		Appearance of fabric	-	15	15	-	-	3.5
		Drape of the fabric	-	20	10	-	-	3.6

3.5 Preparation of textile articles

Fabric was prepared by using the selected weave design. This prepared fabric was used for different draping styles and for development of a tunic and a skirt. Draped styles and constructed tunic as well as skirt were shown in Plate 1 to 4.

Plate 1: Draped Effect of Woven Fabric (Sari)

Plate 2: Draped Effect of Designed Woven Fabric (Western Outfit)

Plate 3: Article Prepared by Using Designed Woven Fabric (Tunic)

Plate 4: Article Prepared by Using Designed Woven Fabric (Skirt)

4 Conclusion

It is concluded from the study that fabric woven from the Milkweed/ lyocell blended yarns of 70:30, 50:50 and 30:70 ratio and tested for physical properties. The fabric woven from 50:50 Milkweed floss/ lyocell blended yarns exhibited good physical properties as compared to fabrics woven from 70: 30 and 30: 70 Milkweed/ lyocell blended yarns. Weave designs made with the help of arha software were assessed with the help of pro forma for colour combination, appearance of the fabric and drape of the fabric. Weave design number 7 received maximum scores for parameters colour combination, appearance of the fabric and drape of the fabric and selected weave design was used for weaving of fabric by using 50: 50 Milkweed floss/ lyocell blended yarns from which dresses were constructed.

5 References

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