Prospects for Naturally Colour Cotton Blends

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Abstract

Naturally coloured cotton is inherently pigmented fibre cultivated in shades of brown and green. These cottons being short in staple length eventually produce coarser yarn that is most suitable for hand- spun, hand woven, coarser and thicker khadi fabrics, that inturn reduces consumer acceptability. To overcome this problem, Naturally coloured cotton can be blended with other natural and synthetic fibres that certainly impart positive qualities like strength, fineness, evenness and reduce the total yarn imperfection. Hence the present study was designed to produce naturally color cotton/ polyester blended yarns of varied counts. Naturally coloured cotton (medium brown-225) and polyester fibre were blended in the proportion of 67:33, were mill spun into varied counts *viz:* 40s, 60s and 2/60s. Control sample (20s mill spun) and blended samples were subjected to various test parameters reveled that, the strength and elongation were inversely related to the yarn count i.e finer the yarn lesser the strength, and coarser the yarn better the elongation. Further, yarn count and twist per inch were directly related i.e. finer the yarn higher the twist per inch of the blended and control samples. Yarn evenness values showed that, blended yarns of different counts were found to be more uniform, even and greater CSP (count, strength for product). Blended fabric with varied count showed lesser colour difference than the control.In the nut shell, blended yarns exhibited better performance than the 100% cottons, which can be further suitable for production of better quality textile made-ups *viz:* shirting, dress material and sarees.

Key words: Naturally coloured cotton, Blended yarn, Tenacity, Elongation, CSP

Introduction

Genetically inherited colour of natural colour cotton is a boon both to the textile industry and the health conscious consumers. A wide range of colours of natural colour cotton are available of which brown and green hirsutums and arboreums are genetically modified to achieve better fiber qualities with respect to the length, strength and colour. Basically, all the varieties are very short stapled and to date researches are able to achieve staple lengths upto 28mm that yield coarser yarn and ultimately thicker fabrics. Such fabric have lower consumer acceptance that intern reduce the utility prospectus of Naturally color cotton.

Achieving desirable comfort/aesthetic properties in a fabric, requires mixing two different fibres, so as to extend the advantages of particular fibre and subdue the disadvantages of another. Blending is the outcome of such intentions to achieve better qualities in the ultimate fabrics. Since ages polyester is the most suitable and compatible with cotton for polyester / cotton is the most popular blend available and widely accepted in the market.

It is noticed that the very short staple length of naturally color cotton fibre, it is hardly put for mill spinning since mill spinning produce even and finer counts than and NMC(New Model Charaka) spinning. Mill spinning yields finer and even yarns. But Natural colour cotton can hardly be mill spun because of the drawback of very short staple length and weaker fibre. To wider the horizon and prospects for Natural colour cotton, it is necessary to produce medium and light weight fabrics suitable as clothing.

Blending in the fibre stage, yields yarn of finer counts suitable for weaving fabric of required set and thickness. However, efforts are made to produce finer counts of Natural colour cotton/polyester blended yarns. Therefore, the present study was undertaken with an aim to produce Natural colour cotton/ polyester yarns of finer and to assess the physical

properties for the Natural colour cotton /Polyester yarn.

Materials and methodss

Natural Colour Cotton

Naturally colour cotton (G. arborium) lint was procured from Agriculture Research Station (ARS) Hebbli, UAS, Dharwad.

Polyester

Polyester staple fibre obtained from Bombay Textile Mill. Test results for fineness, length, strength and elongation properties of the polyester staple fibres.

Production of cotton/ polyester blended yarns

Blending proportion

The naturally colour cotton and polyester fibres were blended in the ratio of 67:33 Cotton: Polyester

Production of Blended yarns

Spinning was accomplished by the traditional blow room method wherein both cotton and polyester in the respective quantities were mixed thoroughly by blow/air-flow method. The lap of the mixture was later subjected to carding, combing, roving, drawing and spinning. Processes resembling the commercial mill spinning of blended yarns.

Counts produced (Spun)

Control sample (Naturally colour cotton): 20s

NCC/polyester Blended yarns : 40s, 60s and 2/60s(30s)

III: Assessment of physical parameters: fallowing physical properties were accessed

1. Yarn evenness
2. Twist per Inch/meter
3. Tenacity (kgf) and Elongation (%)

1. Yarn evenness

Unevenness in the yarn can arise due to both external and internal variations and directly affects on yarn quality.

The evenness of pure and blended (naturally colour cotton / polyester 67:33 per cent) yarns were tested under "Uster Evenness Tester" recording the number of thin places (- 50%), thick (+50)and neps (+200%) presents in the yarn.

2. Twist per inch /Meter

Twist is the measurement of spiral turns given to a yarn in order to hold the constituent fibres together. The amount of twist per inch of pure and blended yarns was determined by using "electronic" twist tester.

3. Tenacity (kgf) and elongation (%)

The maximum load (force) supported by specimen in a tensile test carried out to rapture is the breaking load or the tensile strength of the yarn. The breaking strength of a yarn determined under certain specific conditions is usually taken as an index of yarn quality and is expressed in grams/ pounds. The reading for elongation at break was recorded simultaneously and expressed in turns of percentage. This was determined by using Hounfield Universal Testing Machine (UTM).

4. Determination of colour strength (K/S value)

The K/S values of control and blended sample were assed by measuring the reflectance of the pure and blended samples using the instrument Minolta CM-600/700d computer colour matching spectrophotometer.

Results and Discussion

Yarn Evenness Properties of Naturally Coloured Cotton/Polyester Blended yarns

Yarn evenness of pure and blended yarns was measured in terms of Thin places (-50%). Thick places (+50%) and neps (+200%) and results revealed that, among the test samples blended yarn of 2/60s showed lesser number of thin places (44.00) thick places (316.00) and neps (769.00) compared to control (205), blended yarns of 405 and 605 (Table 3). 2/60s sample exhibited more even in quality with the results of total imperfection (1129) than the rest i.e. blended yarn of 60s (3077.00), control (2525.00) and blended yarn of 40s (2336.00) respectively. This may be due to ply effect. In general ply yarns exhibited better properties than the single yarn.

Physical Properties of Naturally Coloured Cotton/Polyester Blended yarns

The strength and elongation results are depicted in the Table. 1 viewed that (0.358) and elongation (8.49%)

than the other samples i.e. control sample (0.332 kg/and 6.29%), 40s sample (0.195 kgf, 6.71%) and 60s sample (0.117 kgf and 6.35%) respectively. These results are directly influenced by the results of yarn evenness i.e. greater the yarn uniformity, higher is the strength or more uneven a yarn, lesser is the strength (Grover and Hamby 1988). This is attributed that blended yarn of 2/60s sample exhibited more evenness, higher strength and better elongation and CSP (Count Strength Product) than the rest. Further, elongation percentage is higher in case of blended yarns compare to control. When the yarn is subjected to a force, the fibres of both components will be elongated as the force increases, until the cotton fibres with smaller elongation breaks first and then polyester fibres are exposed to entire load because of PET fibres have more elongation property than the cotton. This result is consistent with findings (Pmar Duru Baykal et al. 2006) experimental results showed that, when the polyester ratio changes from 10-90% the breaking elongations of the blended yarn increases. Since, the breaking elongation of polyester is better than those of cotton fibres in the blend.

Twist per Inch

Among the test samples control sample showed lesser TPI (09) than the blended yarns of 40s sample (16), 60s sample (18) and 2/60s sample (23) respectively. Further, increase in the yarn TPI with increases in the yarn evenness and strength. Similar results were observed by Das et al. (2007) for cotton/Acrylic bulked yarns. Among the blended yarns PC Blended

Table 1: Fibre properties of Naturally Colour Cotton (*G. Hirsutum*)

Sl No	Parameters	Naturally Colour Cotton Fibre
1.	Span Length 2.5% (g/inch)	23.00 mm
2.	Micronniare Value	4.00
3.	Uniformity Ratio (%)	52.00
4.	Fibre Strength (g/tex)	14.14
5.	Elongation (%)	8.11

Table 2: Fibre properties of Polyester staple fibre

Sl No	Parameters	Polyester staple fibre
1.	Fibre Fineness dtex	1.4
2.	Cut length (mm)	30.0
3.	Fibre Strength gf/tex	30.1
4.	Elongation (%)	9.2

Table 3: Yarn Evenness Properties of Naturally Coloured Cotton/Polyester Blended yarns

Sl No	Parameters	Control	Blended yarns (67:33)		
		20s Count	40s Count	60s Count	2/60s
1.	**Yarn Evenness (1000 mts)**				
a.	Thin Places (-50%)	266.0	179.0	174.0	44.0
b.	Thick Places (+50)	637.0	698.0	1041.0	316.0
c.	Neps (+200)	1632.0	1456.0	1862.0	769.0
d.	Total Imperfection	2525.0	2336.0	3077.0	1129.0

Table 4 : Colour Strength (K/S)

Sl. No.	Sample	K/S	ΔE	L*	a*	b*
1.	Control (A)	4.311	--	56.19	9.65	21.4
2.	2/60s x 40s (B)	2.505	8.21	64.39	9.79	21.84
3.	2/60s x 60s (C)	2.470	8.53	64.71	9.67	21.88
4.	2/60s x 2/60s (D)	2.448	7.24	64.04	9.54	21.78

ΔE : Colour difference = $\Delta a^2+\Delta l^2+\Delta b^2$
L : Lightness or darkness
a : redness/greeness
b : yellowness/ blueness

2/60s sample exhibited higher TPI than the rest due to combined effect of yarn evenness, strength, elongation and ply effect.

Determination of colour strength (K/S value)

Table 5 records the K/S, L*, a* b* values of the pure and blended samples of different counts. It is evident from the table that, the K/S values of control sample showed significantly higher (4.311) than the blended samples of varied counts i.e. B sample (2.505), C (2.470) and D(2.448) sample respectively. However, L*, a* b* values elucidate that samples became lighter, redder(less greener), yellower and brighter than the standard due to 33 percent of white polyester mixing during spinning stage to impart better yarn properties.

Conclusion

Naturally coloured cottons are environmentally friendly materials. The increased concern of environmental protection has promoted the development of these naturally coloured cottons. However, chemical additives such as dyestuffs are not needed in the textile processing. Owing to their fibre properties, naturally coloured cotton possessed shorter, weaker and courser eventually produces courser and thicker variety fabrics. These factors make commercial production difficult. To meets the need of dynamic consumer, commercialization of naturally colour cottons are of acute important. Through blending would enable the textile industry to produce fabrics of different shades to meet the consumers demand and could enhance the commercial value of naturally colour cotton.

The present investigation revealed that the shorter, weaker and coarser naturally colour cottons can blended with finer and stronger polyester in the blend ratio of 67:33 with varied counts to produce more even and stronger yarns.

Tenacity of the yarn increases with the increase in the yarn evenness and twist level in case of 2/60s sample. In general breaking extension of the blended yarn were found be more than the control and twist level increases with the increase in the yarn count. Blended yarn of 2/60s sample performed better results than the pure and other blended yarns and aptly used as warp yarn in the fabric construction. Further, colour strength values exhibited duller and lighter than the control. Further, Research team has been made efforts to design and development of variegated made-ups from the blended yarns for commercialization.

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