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Properties of Okra/cotton blended yarns

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Abstract
Biodegradable materials are need of the hour. In this regard present study has been conducted to produce okra/cotton blended yarns. Okra fibre was obtained from bast portion of okra plant. Okra is coarser fibre hence an attempt has made to produce good quality yarn by blending with cotton fibre. The results showed that single yarn strength and elongation per cent of O: C 25/75 yarn was found be higher than cotton yarn and comparatively slightly higher lea strength was observed. However, Count Strength Product (CSP) of cotton yarn recorded significantly higher value than okra/cotton yarn. Further, Okra/Cotton blended yarns exhibited higher hairiness values and maximum unevenness per cent was recorded in blended yarns compared to pure cotton yarn.

Keywords: blending, elongation per cent, lea strength, count strength product, hairiness, unevenness

1. Introduction
Natural fibres served a vital role to cater the needs of farming community especially in making ropes However, with the advent of synthetic fibres natural fibres lost their existence due to their laborious retting and extraction methods. Due to the low cost, high service and expected qualities of synthetic products, the defects of natural fibres have become prominent (Alam and khan, 2007) [2] but, the synthetics are non-biodegradable they are causing serious pollution problems. Hence a step was taken to search alternate source of biodegradable fibre, *i.e* okra bast fibre can be obtained from discarded stem of okra plant after harvest of okra fruits as vegetables. Okra (Abelmoschus esculentus) is the major vegetable crop in India belonged to Malvaceae family. It is an oligo purpose crop, but it is usually consumed for its green tender fruits as a vegetable in a variety of ways. It is known as ladies finger in english, bhendi in hindi, bendakaya in telugu, vendaikaay in tamil, belendri in manipuri and Dheros in bengali (Frank, 2005) [9]. *Abelmoschus esculentus* is cultivated throughout the tropical and warm temperate regions of the world for its fibrous fruits or pods containing round, white seeds.
Okra fibre alone cannot be spun in to yarn due to its less elasticity. Hence blending can be the best alternative technology. Blending is a technique to combine fibre which emphasize good qualities (Bhardwaj and Juneja, 2012) [3]. Okra being coarser fibre, when blended with cotton which has wider choice of improving its physical properties. Hence an attempt has been made to blend okra fibre with cotton in different blend proportions to form okra/cotton yarns.

2. Methodology
2.1 Materials
The okra variety MAHY-28 is popularly grown in Dharwad for vegetable purpose. It grows up to 2m tall with thick stem. After harvesting the pods, stalks are considered as agricultural waste and used either in composting or as fuel. These stalks were collected from farmer's field and utilized for the study.
From the collected stalks, fibre was extracted by tank water retting method and used for the study. Bt- cotton was used for blending purpose which was collected from Jayalakshmi auto spin limited, Chitradurga.

2.2 Methods
Pretreatment
Bast fibres are lingo-cellulosic in nature. Presence of non –cellulosic materials *viz*., lignin, pectin and hemicelluloses in the fibre affects their spinnability and absorption. Hence, improvement in fibre properties can be achieved by means of chemical processing's like scouring and bleaching. Procedure used for processing of 1kg each of fibre okra is explained as under.

Recipe

Soda ash (Sodium carbonate)	50gm (0.25%)
Sodium silicate ($Na_2O_2Si.9H_2O$)	50ml
Teapol	50ml
H_2O_2	50ml
MLR	1:20
Temperature	Boiling temperature
Time	30min

Procedure

Scouring cum bleaching was carried out simultaneously in single bath using non-corrosive steel vats. Okra fibres were pre-soaked separately in plane water for 15 minutes. Presoaked fibres were treated with processing liquor for 30 minutes with boiling temperature. Samples were stirred often for proper wet processing. Further, the sample was washed thoroughly under tap water and dried under shade.

Hand stapling

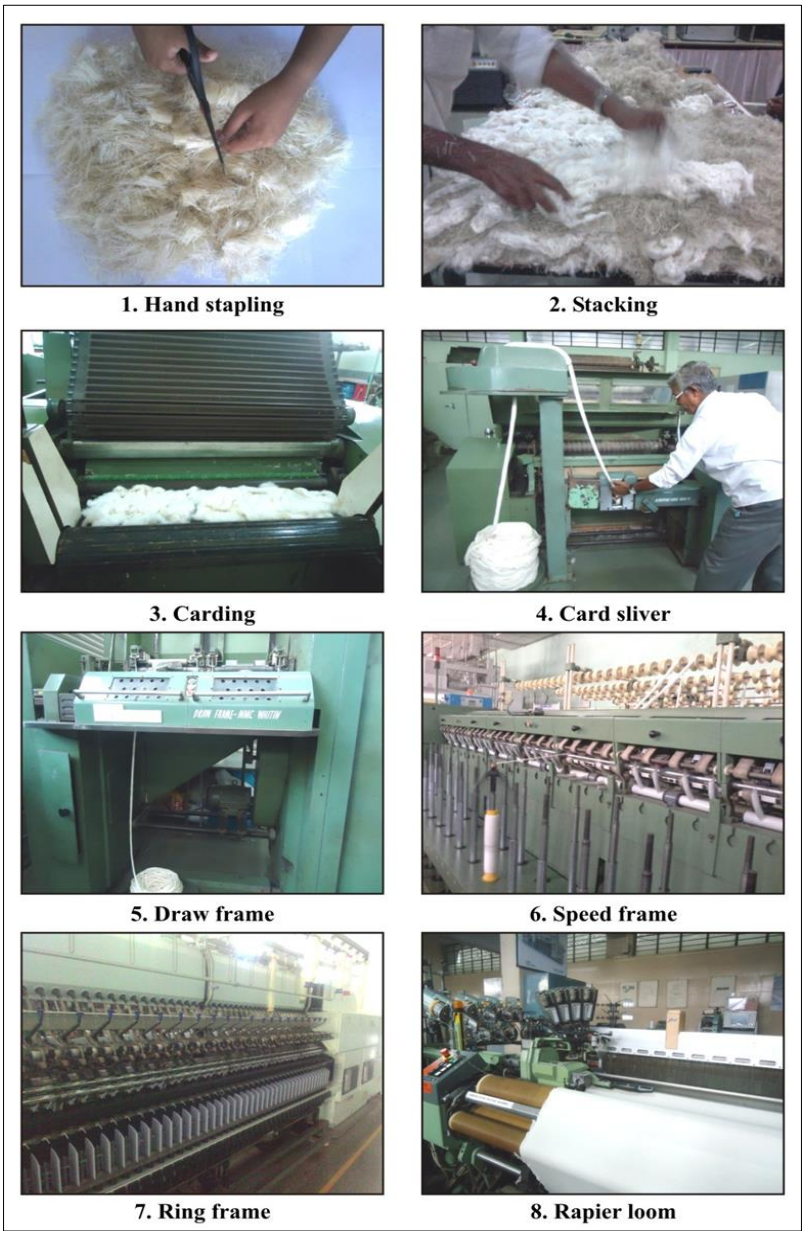
Okra fibres are longer compared to cotton which affect spinning. Okra fibres were cut approximately to 1 inch of length by hand stapling method using scissor.

Blending

Stack method of manual blending was adopted for the study. Two different blend proportions of Okra / cotton (30/70, 50/50,) were tried. Layers of cotton and okra fibres are stacked and then sliced vertically for proper mixing and fed to the carding machine for getting sliver.

Spinning

Spinning of blended yarn (okra/cotton) was carried out in cotton spinning system. The blended yarns of okra / cotton (30:70 and 50:50) were spun in the spinning section, DKTE's Textile and Engineering Institute, Ichalkaranji, Maharashtra, using Zincer 351, Model No. C3. Blend proportion of 30/70 and 50/50 Okra/Cotton could not be produced because of lots of yarn breakages occurring due to intervening of okra fibres. Hence, blend ratio of only 25:75 Okra/Cotton was produced. Schematic flow chart of spinning was as follows. Detailed procedure narrated in flow chart as under.



Spinning process

Schematic flow chart of spinning was as follows

Cotton carding machine

↓

Draw frame I (For proper alignment of fibres in sliver/parallelization)

↓

Speed frame (Rover formation with little twist)

↓

Ring frame (Rover converted in to yarn at 6000 rpm)

The yarns produced are coded and details of which are furnished as under

Sample code	Sample description	Actual yarn count (Ne)	Twist direction
Control	Cotton	24.5	Z
O:C (25/75)	Okra/Cotton::25/75	16	Z

Assessment of quality parameters of blended yarns

Okra/cotton blended yarns were assessed for their physical properties like turns per inch, single yarn strength, lea strength, CSP, yarn hairiness and yarn evenness

3. Results and Discussion

Twist per inch of Okra / Cotton blended yarn

It is apparent from the Table-1 that turns per inch of pure cotton yarn was more (17.6) than okra blended yarn (16.08) which found to be significant at 5 per cent level. Twist is usually expressed as the number of turns per unit length. Twist of yarn determines the strength, hand and feel of woven product. With the increase in twist, the yarn strength increases till it reaches maximum and then further increase leads to decrease (Saville, 2004) [10]. Twist varies with yarn thickness or count. It is observed that Okra/ Cotton (O: C) blended yarns had lower turns per inch compared to cotton yarn. This may be due to variation in fineness and count of yarn.

Single yarn strength (kgf) / elongation (%) / lea strength (lbs)/ CSP of Okra /Cotton blended yarn

It is elucidate from the Table-2 that single yarn strength of O:C 25/75 yarn was 17.14 g/tex which found to be significantly higher than cotton yarn (11.39 g/tex). Likewise elongation per cent of O:C 25/75 blended yarn (7.54 %) was maximum compared to cotton yarn (4.02 %). Further, okra blended yarn exhibited slightly higher lea strength (102.54 lbs) than cotton yarn (100.47 lbs) which found to be non-significant. Count Strength Product (CSP) of cotton yarn recorded significantly higher value (2442.20) than okra/cotton yarn (1767.68).

Single yarn strength is an important physical property which determines yarn quality. Strength of a yarn is measure of its resistance to gradually increasing force, usually expressed in terms of tenacity (Booth, 1996) [4]. From the results of strength revealed that single yarn strength of O:C (25/75) blended yarns found to be increased at lower blend ratio. This may be due to the fact that natural bast fibres are lignocellulosic in nature and offers good strength. However, higher per cent of bast fibre decreased the strength due to lack of cohesiveness. These results are on par with the study conducted by Dhanalaxmi *et al*. (2012) [5].

Elongation is the increase in length of the specimen from its initial length expressed in units of length (Goswamy *et al*.) [8].

It is observed that O: C (25/75) exhibited increased elongation per cent. Reason for increased elongation may be the better variety of cotton with more staple length and fineness, giving more number of cotton fibres in a cross section overlapping the okra fibres for better grip. Results are on par with experiment on corn husk fibre, conducted by Reddy *et al*. (2006) where stated that fibres are stretched before breaking, the higher elongation of cornhusk fibres make the yarns to have an increased elongation. Increase in yarn elongation at lower blend ratio may be due to the slippage of fibres in heterogeneous blend later, it is arrested at higher blend ratio as narrated by Doke and Behara, (2004) [6] in study on 'Cotton Sunhemp blended yarns on microprocessor based ring frame'. Similar results observed in Gokarneshan *et al*. (2009) [7].

Lea strength is tensile strength of a skein of 80 revolutions on the wrap reel, comprising 120 yards. The lea strength is probably the most useful indicator of single yarn strength since it depends upon variability as well as single thread strength (Saville, 2004) [10]. Okra/Cotton (25/75) blended yarn depicted non-significant increase in lea strength. Similar trend of results observed by Dhanalaxmi *et al.* (2012) [5].

The Count Strength Product is the product of yarn count and the lea (hank) strength. The strength is usually measured in pounds (lb) (Saville, 2004) [10]. Count Strength Product of Cotton yarn was the highest compared to blended yarns. This may be due to the homogeneity of Cotton, which increases cohesiveness and provide better compactness to yarn. However, different fibres reduce cohesiveness and compactness. Variation in count of blended yarns and cotton yarn may also be one of the reasons. Finer the yarn higher the count and better the strength. Similar trend was observed in Doke and Behera, (2004) [6].

Yarn hairiness (number of hairs/km) of Okra /Cotton blended yarns

Results of yarn hairiness from the Table-3 revealed that S3 values of Okra/Cotton blended yarn was higher (1769.33 hairs/km) than cotton (1692.67 hairs/km) which was found to be non-significant. Higher number of 3 mm length of hair was observed in cotton yarn (1449.67 hairs/km) compared to Okra/Cotton blended yarn (1344 hairs/km) which was statistically non-significant. Whereas, significantly higher 4 mm length of hair was observed in Okra/Cotton blended yarn (121.33 hairs/km) compared to pure cotton yarn (53.33 hairs/km). Similarly higher number of 6mm (244 hairs/km), 8mm (40 hairs/km) and 10 mm (16 hairs/km) length of hair was observed in okra blended yarn compared to cotton (167 hairs/km, 21.67 hairs/km and 0.67 hairs/km respectively). However, only 4 hairs/km of 15 mm was noticed in Okra/Cotton blended yarn

Yarn hairiness in most circumstances an undesirable property, giving rise to problem in fabric production (Saville, 2004) [10]. It is clear that blended yarns of O:C 25/75 found to depict non-significant hairiness. This may be due to lesser proportion of okra in blend ratio. Hairiness may increase with increased proportion of bast fibre. Similar results were observed by Gokarneshan *et al*. (2009) [7] where mesta/cotton blended yarns produced more loose fibres with much hairiness.

Yarn evenness (%) of Okra/Cotton blended yarns

The data in the Table- 4 indicate that O: C 25/75 blended yarn possessed higher thin (293 /km), thick (1740 /km) and neps (2157 /km) compared to thin (175 /km), thick (1062 /km) and neps (913 /km) of pure cotton yarns. It was also observed that

total imperfections (4190) and uneven per cent (17.31 %) of O: C 25/75 blended yarns found to be maximum than total imperfections (2150) and unevenness per cent (14.2 %) of control yarns which found to be statistically significant at 5 per cent level.

Yarn evenness of Okra/Cotton blended yarns revealed that blended yarns are comparatively more uneven than pure Cotton yarns. This may be due to the fact that homogeneous material cohesively brings better compactness. Whereas when two different fibres are blended, their cohesiveness reduces as well as compactness and hence yarn uniformity reduces due to more number of thin and thick places (Doke and Behera, 2004) [6]. Similar observations were made by Ahmed *et al.* (2004) [1] wherein unevenness of cotton/ramie blended yarn was found to be higher than that of cotton yarn.

Table 1: Twist per inch of Okra/Cotton blended yarns

Mean	Twist per inch (tpi)	
	C	O:C 25/75
	17.60	16.08*
SD	0.895	0.426
SEm ±	0.42	
CD (5%)	1.26	
CD (1%)	NS	
CV (%)	7.98	

Table 2: Single yarn strength (Kgf) / elongation (%)/ lea strength (lbs) / Count Strength Product (CSP) of Okra / Cotton blended yarns

Mean (kgf) g/tex	Single yarn strength (Kgf)		Elongation (%)		Lea strength (lbs)		CSP	
	C	O:C 25/75	C	O:C 25/75	C	O:C 25/75	C	O:C 25/75
	0.28 (11.39)	0.63** (17.14)	4.02	7.54**	100.47	102.54^{NS}	2442.20	1767.68**
SEm ±	0.01		0.19		0.93		21.95	
CD (5%)	0.04		0.57		NS		71.59	
CD (1%)	0.05		0.79		NS		104.17	
CV (%)	9.78		10.63		2.05		2.35	

C- Cotton O- Okra

Values in the parenthesis indicate grams/tex

Table 3: Yarn hairiness (number of hairs/km) of Okra/Cotton blended yarn

Mean	Yarn hairiness (S_3)															
	3 mm		4 mm		6 mm		8 mm		10 mm		12 mm		15 mm		S_3	
	C	O:C25/75	C	O:C25/75	C	O:C25/75	C	O:C25/75	C	O:C25/75	C	O:C25/75	C	O:C25/75	C	O:C25/75
	1449.67	1344	53.33	121.33**	167	244**	21.67	40**	0.67	16**	0	0	0	4**	1692.67	1769.33
SEm ±	71.61		8.7		11.38		3.78		1.02		-		0.67		178.66	
CD (5%)	NS		28.38		37.14		12.33		3.32		-		2.18		NS	
CD (1%)	NS		41.30		54.04		17.94		4.84		-		3.18		NS	
CV (%)	11.46		22.29		12.39		27.42		45.58		-		75		23.08	

C- Cotton O- Okra

S3-Length of hairs (3-15mm)

Table 4: Yarn evenness (%) of Okra/Cotton blended yarn

	Yarn unevenness (%)				
	Thin/km (-50)	Thick/km (+50)	Neps/km (+200)	Total imperfections	U (%)
Control	175	1062	913	2150	14.2
O:C 25/75	293**	1740**	2157**	4190**	17.31**
SEm ±	14.8	16.74	31.53	89.27	0.28
CD (5%)	48.28	135.32	99.36	291.13	0.94
CD (1%)	70.25	196.91	141.33	423.61	1.37
CV (%)	14.15	6.62	4.59	6.29	4.09

C- Cotton O- Okra

4. Conclusion

- Cotton yarn was relatively finer with higher turns per inch than Okra/Cotton blended yarns and hence higher CSP was observed in pure cotton yarns
- Okra/Cotton blended yarns exhibited higher hairiness values compared to pure cotton yarn.
- Maximum unevenness per cent was noticed in Okra/Cotton blended yarns compared to control
- With these results we can recommend okra stalks can be effectively utilized in producing blended yarns.

5. References

1. Ahmed M, Chattopadhyay SK, Chaphekar AK, Gaikwad RS. Characteristics of degummed ramie fibre and its cotton blended yarns. Indian J. Fibre and Textile Res. 2004; 29(1):362-365.
2. Alam S, Khan A. Chemical analysis of okra bast fibre (*Abelmoschus esculentus*) and its physico-chemical properties. J. Textile and Appar. Technol. Mngt. 2007; 5(4):1-9.
3. Bhardwaj S, Juneja S. Performance of jute, viscose, polyester and cotton blended yarns for apparel use. Stud home Com Sci. 2012; 6(1):33-38.
4. Booth JE. Principles of Textile Testing: An introduction to physical methods of testing textile fibres, yarns and fabrics. CBS publisher and distributors, New Delhi, 1996, 209-451.
5. Dhanalaxmi RK, Vastrad JV, Pujari M. Mesta/organic cotton blended yarns for diversified end uses. Asian J. Home Sci. 2012; 7(2):396-398.
6. Doke SS, Behera S. Cotton sunhemp blended yarns on microprocessor based ring frame. The Textile Industry and Trade J. 2004; 42(5-6):29-34.
7. Gokarneshan N, Jegadeesan N, Manikanand C, Premkumar S, Shanmugam B, Ganesh kumar M.

Blending of mesta with cotton by using short staple spinning. The Indian Textile J. 2009; 119(12):30-32.
8. Goswamy BC, Martindale JG, Scardino FL. Textile yarns- Technology Structure and Applications. Wiley India Pvt. Ltd., New Delhi, 2011, 137-145.
9. Frank RR. Bast and other plant fibres. Wood head publishing limited, Cambridge, England, 2005 20-30.
10. Saville BP. Physical testing of textiles. Woodhead publishing Ltd. Cambridge England, 2004, 85-108.