Research Article

Quality Evaluation of Ethiopian 100% Cotton Carded Ring Spun Yarn with Respect to USTER Standards

Biruk Fentahun Adamu , Desalegn Atalie , and Erkihun Zelalem Liyew

Textile Engineering, Ethiopian Institute of Textile and Fashion Technology, Bahir Dar University, Bahir Dar, Ethiopia

Correspondence should be addressed to Biruk Fentahun Adamu; birukfentahun2009@gmail.com

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Yarn quality influences both fabric production processes efficiency and export market. One method used to gauge competitiveness of an industry is to study its product quality. The aim of this research work is to evaluate the quality of Ethiopian textile spinning mills' 100% cotton carded ring spun yarns in terms of its evenness (coefficient of mass variation, CV_m), imperfections (thick and thin places, neps), and tensile properties with USTER Statistics 2018. Five spinning mills (B3, A0, A2, A4, and K3) of 15N, 20Ne, 25Ne, 30Ne, 35Ne, and 40Ne nominal yarn counts have been selected for the study. The yarn evenness and imperfections were measured using USTER tester 5 and tensile using a STATIMAT tester. The USTER statistical results showed 20.3Ne (mill B3), 32Ne (mill A4), and 36.2Ne (mill A2) had better overall quality, respectively. It was observed that most selected spinning mills had low evenness, imperfections, yarn strength, and good yarn elongation. Tensile properties of A2 (32.85Ne and 36.2Ne) had fallen under 5% USTER statistics percentile which indicates excellent yarn strength. Generally, from studied mills, it was seen that 61.5% of cotton yarn CV_m and thin places falls at above 95% and 15% of yarn tenacity falls at ≤5% of Uster statistical percentile.

1. Introduction

In recent years, textile industry has seen a major economy growth in developing countries. The Ethiopian government also has given priority to the textile and garment manufacturing sector starting from the last two decades to diversify the exports because it is environmentally suitable to grow cotton and there is cheap manpower. Ethiopia has a high potential to crop cotton and is producing and exporting part of its products to the international market. Now, existing textile mills in the country are almost based on cotton; however, the quality of raw material is not satisfying the growing demand [1].

The quality of yarn is determined by the constituent fibre properties that can be used to forecast partially the physical properties of yarn and the success of spinning [2]. 80% of Ethiopian cotton yarn is sold primarily to the local or domestic market, and 20% of the yarn is to export markets [3]. The Ethiopian spinning mills produce three types of cotton yarn: combed, carded, and open end with the yarn count

ranging from 10 s to 20 s on open end and up to 60 s count in the ring frame with the available technology [4].

The quality of yarn and the associated testing of those yarn properties will determine the yarn quality and are crucial to meet yarn requirements for subsequent fabric manufacturing and end product [5]. Spinning technique, machine parameters, operation stages, processing conditions, and the physical characteristics of fibre determine its processing behaviour, production efficiency, and final yarn and fabric quality [6]. The ring spinning system is considered a crucial process in producing yarns due to its flexibility and high quality of yarns produced which are considered by most yarn producers to have ideal structure and parameters [7].

In USTER statistics, a yarn whose all quality characteristics of USTER statistics mean values lie below 25% is referred as excellent-quality yarn that is made from an extremely expensive and special raw material. For improvement of the yarn's quality, the textile industry faced with many challenges in order to compete in a world class manufacturing program. For this, the benchmarks with

USTER statistics assure the top values as reference points needed to correspond with the requirements of spinning processing and the fabric's appearance, but always by knowing the requirements of the customers [8].

The USTER corporation periodically issues a very comprehensive statistical analysis of worldwide data under the title USTER statistics [2]. The UUSTER statistics are the only global benchmarking tool based on the global collection and testing of fibre, sliver, roving, and yarn samples that have been produced in every part of the world. The statistics were first introduced in 1957 and are periodically updated. The UUSTER statistics are recognized throughout the global textile industry as an essential tool for comparing key characteristics along the entire yarn production chain, from raw fibre, sliver, roving, and yarn. Today, fibre purchasing and yarn development and trading would be virtually unthinkable without USTER Statistics. According to USTER statistics, the most widely used quality parameters for yarn are its evenness (coefficient of mass variation (CV), imperfections (thin places, thick places, and neps) and strength [8]. Yarn tensile properties are one of its most vital quality physical characteristics which determine the efficiency of yarn conversion into fabric and tensile properties of the final product. Yarn tensile properties include yarn breaking strength and extension or elongation at yarn break [5].

Ethiopia is a potential cotton manufacturer and exporter of cotton yarn to the international market, so its yarn quality must be evaluated and known with respect to worldwide benchmarks. In this research work, we evaluated the quality level of Ethiopian 100% cotton ring spun yarn with UUSTER standard benchmarks and also compared with each other.

2. Materials and Methods

2.1. Materials. Thirteen 100% cotton carded ring spun yarn samples were collected from five textile spinning mills in Ethiopia. The mills were selected based on their age, high production capacity, wide range of yarn count, and location that can represent different regions of Ethiopia.

2.2. Methods

2.2.1. Data Collection

(1) *Secondary Data.* Secondary data for each mill such as number of ring and rotor spinning machines, production capacity, yarn count range, and material type (cotton or other fibre) were collected from all Ethiopian cotton processing spinning mills as seen in Table 1. Also, data related to cotton lint samples from the selected mills were collected (Table 2 gives the details of the cotton lint properties). As illustrated in Table 1, there are 18 active spinning factories in Ethiopia, and they produce short staple yarns for local and global market.

Table 2 shows cotton lint properties such as length, strength micronaire, and maturity processed by different spinning mills. The properties of cotton fibre have an influence on determining spinning performance but are alone not determinantal factors in final yarn quality parameters.

To produce high-quality ring spun yarns, fine and sufficient strength of fibres is necessary to endure spinning preparations and spinning processing [9]. Typical cotton fibre quality parameters are staple length, fineness, moisture regain/content, tensile strength, and whiteness properties [10].

2.2.2. Yarn Sample Collection and Sampling. There are eleven spinning mills that have ring spinning mills and processing 100% cotton carded yarns, from which five mills (45.45% of the ring spinning mills) are selected for this study considering having wide count range, processing 100% cotton, having a ring frame, and being active at the time of data collection periods. The yarn counts were selected based on the availability of yarn count in the selected mills. There were 15Ne, 20Ne, 25Ne, 30Ne, 35Ne, and 40N yarn counts, and from each types of yarn package, 20 carded spun ring yarn packages have been sampled. The yarn package collection method used was the random sampling method with probability in the sense that each member of the population has a known nonzero probability of being selected.

2.2.3. Yarn Testing. Before conducting yarn property testing, the yarn samples were conditioned at 65% relative humidity and 20°C temperature as stated in ES ISO 139 standard [11]. The yarn CVm (coefficient of variation in mass), hardness, neps, thin places, and thick places characteristics were determined using USTER tester 5 [12]. Ten tests from each package were conducted for yarn evenness and imperfections according to the ASTM D1425 test method [13]. The yarn strength and elongation were determined by using a STATIMAT tensile strength tester. In total, 50 tests were performed for each sample for yarn strength and elongation as per ISO 2062 standard [14].

2.3. Data Analysis. To categorize the Ethiopian 100% cotton carded ring spun yarn quality, USTER statistics percentile (USP™ 2018, version 1.4.1) application was used and to determine whether there was a significant difference between the same yarn counts produced from different spinning mills. The ANOVA test was conducted using SPSS version 25 statistical software. The analysis was conducted for yarn used for weaving application after same process selection which is cotton, 100%, carded, ring yarn, and package form.

3. Results and Discussion

3.1. Yarn Evenness Property. The yarn evenness result revealed that mill B3 has better CVm (mean CVm of 16.293 and 15.237 for yarn count 19.8Ne and 20.3Ne, respectively) as compared to others, as shown in Table 3 and Figure 1. The standard deviation also confirmed that 100% cotton yarn evenness of mill B3 showed less standard deviations. This may be because fibres used for mill B3 have good fineness and maturity properties, which is similar to the work of Faulkner et al., who analysed that fibre fineness and

TABLE 1: Ethiopian spinning mills.

Ethiopian spinning mill	Raw material (fibres)	Spinning machines		Capacity	Yarn count range produced (Ne) by ring spinning	Remark
		Ring frame	Open end			
1	100% cotton	15 ring (18000 spindles)	11 open end (2640 rotors)	6,825,000 Kg/year	18–60	
2	100% cotton	13200 spindles		10 ton, Kg/day	10–40	
3	100% cotton	8 ring (2204 spindles)	4 rotor; 320 rotors/machines	10.7	6–60	
4	100% cotton	5 ring (6000 spindles)	6 open end (2400 rotors)	15 ton Kg/day	20–40	
5	100% cotton	10 rings	2400 rotors	8000 ton/year	20–60	
6	100% cotton	10 ring (12000 spindles)	2 open end (480 rotors)	1872 ton/year	16–40	
7	Cotton and polyester	25 rings; 600 spdl/ring	6 open end	1300 ton/year	21–60Ne	Mostly 40Ne
8	100% cotton	5 rings (5000 spdls)	—	900 ton/year	6–40	Average 21
9	Cotton yarn	—	Carded rotor	840 ton/year		Not having ring spinning
10	Cotton	Ring	Open end	5616 ton/year		Not manufactured now
11	100% cotton	—	3 open end (1440 rotors)	4032 ton/year	6–30	Not having ring
12	Cotton and acrylic		Worsted	9000 ton/year		Not manufactured now
13	Cotton and polyester	Ring spun	—	3600 ton/year		Texturing and blending in yarn form
14	Cotton, acrylic, viscose, and wool	40 rings	—	2121 ton/year	10–40	
15	100% cotton	—	1440 rotors	2300 ton/year	6–24	Not having ring
16	Wool	—		600 ton/year		Not cotton
17	Nylon	15120 spindles	2400 rotors	7000000 Kg/year		Not cotton
18	Regenerated yarn	—	Open end	2184 ton/year		Not cotton

sufficient strength are crucial to produce high-quality ring spun yarns to endure spinning preparations and spinning processing [9]. Next to mill B3, CVm of mill A4 with 32Ne yarn count and mill K3 with 15.28Ne yarn count had moderate evenness and a mean CVm of 17.184 and 17.277, respectively. On the other hand, mill A2 with yarn count 32.85Ne, mill K3 with yarn count 32.85Ne, and mill A0 with a yarn count of 21.6Ne and 30Ne have low yarn evenness as compared to others.

3.2. Yarn Imperfection Properties. Yarn imperfections are yarn thin places, thick places, and neps which are decisive factors on the external appearance of yarns and the products obtained from them. USTER tester 5 allows 30%, –40%, –50%, and –60% sensitivity thresholds for thin places, +35%, +50%, +70%, and +100% sensitivity thresholds for thick places, and +140%, +200%, +280%, and +400% sensitivity thresholds for neps. Standard setting values taken for test are –50%, +50%, and +200% for thin places, thick places, and neps, respectively, by UUSTER statistics reference values. Yarn imperfections are normally assessed by measuring the number of thin places, thick places, and neps per kilometer of yarn. Yarn imperfections are

caused by defects in materials (fibre) or improper machine settings. A reliable analysis of these “imperfections,” therefore, will not only make possible the achievement of optimum conditions during the various manufacturing processes but also can provide some reference to the quality of the raw material used.

As illustrated in Figure 2 and Table 4, the yarn from mill A0 (30Ne) scored the highest number of thin place per kilometer with mean value 1112.6, and the lowest thin place is found at mill B3 (20.3Ne) with mean value 2. Therefore, mill B3 with yarn count 20.3Ne is producing excellent yarn in terms of thin place.

Mill B3 with yarn count 38.2Ne and mill A0 with yarn count 30Ne have the greatest number of thick place per kilometer with mean of 1245.2 and 2213.8, respectively, as shown in Figure 3. In the same manner as thin and thick place, the neps of mill B3 of yarn count 38.2Ne and mill A0 of yarn count 30Ne exhibited the highest number of neps per kilometer (Figure 4), whereas mill B3 of yarn count 20.3Ne has the lowest neps per kilometer with mean of 244.4.

From evenness and imperfection results, we can observe that mill A0 of yarn count 30Ne has low evenness, high thick

TABLE 2: Characteristics for cotton lint.

Spinning mill code	Cotton origin	Lot number	L (mm)	Str (g/tex)	Micronaire	Mat ratio
A0	Lu	19	25.75	25.08	4.39	0.85
		21	24.22	25.31	4.34	0.81
		22	25.57	24.44	4.28	0.84
		25	24.87	23.15	4.21	0.83
		26	22.92	19.99	4.16	0.82
		29	22.61	24.28	3.85	0.73
		31	24.20	20.81	4.05	0.80
		33	25.33	22.00	4.41	0.85
		35	24.26	23.02	4.27	0.77
		36	23.67	21.98	3.65	0.73
		37	23.39	23.56	4.28	0.82
		Mean	24.25	23.53	4.17	0.80
B3	W	39	21.7342	25.7	4.06	0.86
		64	23.4425	29.2	3.86	0.85
		Mean	22.666	27.45	3.96	0.855
A2	M	42	25.6576	28.6	4.03	0.85
		27	24.0448	29.8	3.96	0.85
		Mean	24.8467	29.2	3.995	0.85
K3	M	49	29.10	23.00	4.50	
	WE	30	28.20	21.00	4.50	0.85
	A A	28	28.80	20.00	4.60	0.85
	YO	44	28.70	20.00	4.50	0.85
	YO	65	29.40	24.00	4.40	0.85
	YO	69	28.80	21.0	4.30	0.85
	YO	68	27.70	22.00	4.40	0.85
	YO	72	29.30	23.00	4.50	0.85
	Nh	19	29.30	23.00	4.50	0.85
	Mean		28.81	21.89	4.47	0.85
A4	A	4	29.12	22.4	4.24	0.85
		14	28.88	22.1	4.35	0.85
		21	29.40	23.2	4.28	0.84
		35	28.96	23.8	4.61	0.86
		Mean	29.09	22.87	4.37	0.85

L = length, Str = strength, SFC = short fibre content, Mat = maturity.

TABLE 3: Descriptive analysis of yarn evenness.

Property	Mill code	Yarn count (Ne)	N	Mean	Std. deviation	Std. error	Min.	Max.
CVm	B3	19.8	10	16.293	0.6250	0.1977	15.24	17.06
		20.3	10	15.237	0.4679	0.1480	14.48	15.79
		38.2	10	20.552	0.3525	0.1115	19.76	20.91
		23.47	10	19.230	2.3547	0.7446	16.90	24.10
	A2	32.85	10	20.164	1.7762	0.5617	17.58	22.69
		36.2	10	18.665	0.9124	0.2885	17.56	20.10
		15.28	10	17.277	0.7503	0.2373	16.54	18.67
	K3	21.21	10	18.545	1.7500	0.5534	17.10	23.26
		32.85	10	19.651	0.5964	0.1886	18.93	20.68
	A0	21.6	10	20.231	2.8038	0.8866	15.38	23.31
		30	10	24.812	0.7629	0.2412	24.08	26.66
	A4	32	10	17.184	0.5417	0.1713	16.22	17.80
		40	10	20.057	0.7467	0.2361	19.36	21.56

place, and high neps, whereas mill B3 of yarn count 20.3Ne has the lowest number of thin places, thick places, and neps with good evenness characteristics.

Table 5 shows ANOVA of evenness and imperfections of the same yarn count (20Ne as nominal count) produced from mills B3, A2, A0, and K3. The results showed that yarns' CVm, thin places (−50%), thick places (+50%), and

neps (200%) properties are significantly different. This significance may most probably due to raw material difference and process errors.

3.3. Yarn Strength Properties. From Table 6 and Figure 5, it can be seen that the maximum tensile strength is for mill A2

FIGURE 1: Yarn evenness analysis.

FIGURE 2: Yarn thin place (-50%).

of yarn count 32.85Ne and 36.2Ne with a mean tensile strength of 18.87 cN/tex and 19.32 cN/tex, respectively, and the minimum is found at mill A0 of yarn count 30Ne and 21.6Ne, mill A4 of yarn count 32Ne, and mill A2 of yarn count 23.47Ne. Taking only raw material as a factor, mill A2 used a good fibre quality (fibre strength, maturity, and fineness) as compared to others; in fact, other factors for yarn tensile strength are not known here. Figure 6 shows that the highest yarn elongation is found for mill A2 and the lowest yarn elongation is for mill A0.

The previous report showed the CV of tenacity for various yarns, and the best cotton yarns vary from about 4% for 6Ne carded ring yarn to about 9% at 50Ne count (≈ 12 tex). The worst yarns have CVs of the order of 10%. Combed cotton yarns have CVs varying from 4.5% at 15Ne count (≈ 40 tex) to 12% at 120Ne count for the best yarns. The worst yarns vary from 8.5% CV to 15% CV for corresponding counts (≈ 5 tex), and worsted yarns have high CVs of tenacity. It should be

noted that the CVs of tenacity measured at higher testing speeds tend to be a little higher than those quoted [2].

For the yarn count 20Ne, yarn tensile strengths and elongations were significantly different at a P value of 0.001 (see Table 7), and P value or sig. value is less than 0.05.

4. Ethiopian Cotton Yarn Quality Based on USTER Statistics 2018 Analysis

Table 8 shows Ethiopian spinning mills' yarn quality level against USTER statistics percentile (USP) for weaving application. Actually, the USP value range can be between 5% (the best possible) and 95% (the worst possible). Since the raw material in a spinning mill account for 50–60% of the total manufacturing costs, it is important to set the quality characteristic limits, benchmarking for yarns, according to customer demands. In this point, 5% USP for yarns means excellent in terms of yarn quality but also very expensive

TABLE 4: Descriptive analysis of yarn imperfections.

Property	Mill code	Yarn count (Ne)	N	Mean	Std. deviation	Std. error	Min	Max
Thin places –50%	B3	19.8	10	8.00	7.6012	2.4037	0.00	26.00
		20.3	10	2.00	1.8856	0.5963	0.00	6.00
		38.2	10	194.80	26.9683	8.5281	144.00	248.00
		23.47	10	74.70	161.7275	51.1427	10.00	534.00
	A2	32.85	10	160.10	140.3776	44.3913	13.00	365.00
		36.2	10	56.90	48.9999	15.4951	16.00	160.00
		15.28	10	14.10	6.60724	2.0894	4.00	26.00
		21.21	10	75.10	161.6453	51.1167	10.00	534.00
	K3	32.85	10	140.20	35.8881	11.34881	88.00	190.00
		21.6	10	239.40	179.40903	56.7341	0.00	506.00
		30	10	1112.60	215.7057	68.2121	844.00	1600.00
		32	10	25.60	16.2289	5.1320	9.00	63.00
	A4	40	10	166.00	73.1832	23.1426	102.00	339.00
Thick places +50%	B3	19.8	10	357.40	104.3245	32.9903	212.00	568.00
		20.3	10	190.00	46.1303	14.5877	110.00	258.00
		38.2	10	1246.20	88.7015	28.0499	1052.00	1362.00
		23.47	10	758.90	383.8835	121.3946	485.00	1803.00
	A2	32.85	10	997.00	216.9475	68.6048	742.00	1284.00
		36.2	10	827.60	174.9706	55.3306	583.00	1132.00
		15.28	10	520.10	155.0824	49.0414	363.00	814.00
		21.21	10	756.00	385.3907	121.8712	464.00	1803.00
	K3	32.85	10	807.20	79.64616	25.1863	679.00	956.00
		21.6	10	1011.60	454.17354	143.6223	176.00	1606.00
		30	10	2213.80	251.07316	79.3963	1884.00	2746.00
		32	10	404.00	73.13762	23.1282	281.00	490.00
	A4	40	10	893.90	100.25795	31.7044	798.00	1071.00
Neps +200%	B3	19.8	10	375.80	138.62323	43.8365	164.00	618.00
		20.3	10	244.40	52.04955	16.4595	166.00	312.00
		38.2	10	2122.20	90.86473	28.7340	2050.00	2354.00
		23.47	10	890.30	302.93235	95.7956	611.00	1523.00
	A2	32.85	10	1567.90	267.69985	84.6541	1246.00	1958.00
		36.2	10	1277.30	190.97065	60.3902	924.00	1479.00
		15.28	10	751.50	187.74051	59.3688	412.00	1127.00
		21.21	10	896.90	298.22678	94.3076	611.00	1523.00
	K3	32.85	10	1676.10	177.56404	56.15068	1451.00	1918.00
		21.6	10	922.60	327.07872	103.4314	258.00	1328.00
		30	10	3051.60	245.64256	77.6790	2734.00	3508.00
		32	10	1042.00	166.88319	52.7731	814.00	1319.00
	A4	40	10	1676.00	138.00242	43.6402	1513.00	1877.00

FIGURE 3: Yarn thick place (+50%).

FIGURE 4: Nep (+200%) of different yarns.

TABLE 5: Analysis of variance results of yarn evenness and imperfection (20Ne nominal count).

		Sum of squares	df	Mean square	F	Sig.
CVm	Between groups	686.641	2	57.220	31.598	0.000
	Within groups	211.870	117	1.811		
Thin places	Between groups	10251597.631	12	854299.803	69.046	0.000
	Within groups	1447630.100	117	12372.907		
Thick places	Between groups	30717111.000	12	2559759.250	46.898	0.000
	Within groups	6386032.700	117	54581.476		
Neps	Between groups	68952137.769	12	5746011.481	124.494	0.000
	Within groups	5400117.800	117	46154.853		

TABLE 6: Decriptive analysis of yarn strength and elongation.

Yarn property	Mill code	Yarn count (Ne)	N	Mean	Std. deviation	Std. error	Min.	Max.
Tensile strength (cN/tex)	B3	19.8	50	13.32	0.8973	0.1269	11.61	15.51
		20.3	50	13.14	0.9415	0.1331	11.34	15.96
		38.2	50	12.75	1.2845	0.1817	10.40	15.07
	A2	23.47	50	9.49	1.1225	0.1587	5.97	11.74
		32.85	50	18.87	2.3791	0.3365	13.20	25.78
		36.2	50	19.32	2.2138	0.3131	15.49	24.01
	K3	15.28	50	13.38	0.8752	0.1238	11.26	16.20
		21.21	50	11.86	1.0619	0.1502	9.37	15.11
		32.85	50	12.99	1.3935	0.1971	9.39	15.67
	A0	21.6	50	8.67	1.1427	0.1616	6.47	11.01
		30	50	7.61	0.8255	0.1168	6.14	9.54
	A4	32	50	9.91	1.0815	0.1529	7.38	12.17
		40	50	12.23	1.1274	0.1594	9.65	15.03
Elongation (%)	B3	19.8	50	6.07	0.3683	0.0521	5.33	7.12
		20.3	50	6.11	0.4052	0.0573	5.26	7.10
		38.2	50	5.17	0.4673	0.0661	4.24	6.12
	A2	23.47	50	4.28	0.4441	0.0628	2.45	5.07
		32.85	50	8.54	0.7065	0.0999	6.46	9.95
		36.2	50	9.04	0.8804	0.1245	6.76	11.04
	K3	15.28	50	6.62	0.3388	0.0479	5.77	7.50
		21.21	50	5.59	0.3722	0.0526	4.82	6.76
		32.85	50	5.08	0.4697	0.0664	3.95	6.04
	A0	21.6	50	6.88	0.5431	0.0768	5.71	8.03
		30	50	5.90	0.4912	0.0695	4.85	6.99
	A4	32	50	4.12	0.3137	0.0444	3.35	4.65
		40	50	5.21	0.4352	0.0615	4.07	5.99

FIGURE 5: Yarn tensile strength.

FIGURE 6: Yarn elongation.

TABLE 7: ANOVA results of yarn tensile and elongation for 20 Ne yarns.

		Sum of squares	df	Mean square	F	Sig.
Tensile	Between groups	7203.992	2	600.333	333.149	0.000
	Within groups	1147.869	637	1.802		
Elongation	Between groups	1279.669	2	106.639	421.680	0.000
	Within groups	161.092	637	.253		

ones. As it can be seen in Table 8, USTER statistics percentile has 6 quality levels such as ≤ 5 , 6–25, 26–50, 51–75, 76–95, and $\geq 95\%$. Based on this, the yarn evenness of mill B3 cotton yarn falls in the moderate UUSTER quality level which is 73%, 46%, and 34% USP for yarn count 19.8Ne, 20.3Ne, and 38.2Ne, respectively. This means that 73%, 46%, and 34% of

the world production of these particular yarns (19.8Ne, 20.3Ne, and 38.2Ne) had a CVM value of 16.2, 15.2, and 20.5, respectively.

As evident from Table 8, except mill A2 of yarn count 32.85Ne and 36.2Ne, the remaining spinners' yarn strength was found to be above 95% USP. This indicates that globally,

TABLE 8: USP Analysis of cotton yarns for weaving application.

Mill Code	Yarn Count (Ne)	USPTM						
		≤5%	6-25%	26-50%	51-75%	76-95%	>95%	
		CVm (%)	Thin -50%	Thick +50%	Neps +200%	H	Tenacity (cN/tex)	Elongation (%)
B3	19.8	73	50	85	74	93	>95	12
	20.3	46	10	58	54	>95	>95	39
	38.2	34	>95	>95	>95	67	>95	6
K3	15.28	>95	81	>95	>95	86	>95	24
	21.21	>95	>95	>95	>95	63	>95	68
	32.85	>95	>95	>95	>95	81	>95	69
A2	23.47	>95	>95	>95	>95	81	>95	>95
	32.85	>95	>95	>95	93	81	≤5	≤5
	36.2	93	83	>95	78	67	≤5	≤5
A0	21.6	>95	>95	>95	>95	>95	>95	7
	30	>95	>95	>95	>95	>95	>95	29
A4	32	72	62	72	79	94	>95	>95
	40	>95	>95	>95	81	73	>95	52

5% mills are producing yarn with cotton yarn strength similar to that of mill A2 (32.85Ne and 36.2Ne), which is excellent yarn quality in terms of yarn strength.

5. Conclusions

Most of the studied spinning mills had low overall yarn properties. The statistical analysis showed that mill B3 (20.3Ne), A4 (32 Ne), and A2 (36.2 Ne) cotton yarns had slightly better quality, respectively. The yarn tenacity and extension of mill A2 of yarn count 32.85Ne and 36.2Ne had fallen under 5% of USTER statistics percentile (USP 2018) which indicates higher yarn strength. In general, we can conclude that, in this particular study period from studied spinning mills, 61.5% of textile cotton yarn CVM and thin places (−50%) falls at above 95% and 15% spinning mill's yarn tenacity falls at less than 5% of USTER statistical percentile. Generally, authors advise that there must be an investigation or research starting from the raw material (fibre) to the process to know the causes *e* and spin yarn of better quality.

Data Availability

All data are included in the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest.

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