ESSENTIAL QUALITY ASSESSMENT OF SOME SELECTED FLAT BED-SHEETS FROM FOREIGN AND LOCALLY MADE - MATERIALS

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ABSTRACT
A comparative analysis was carried out for essential quality parameters of five different bed sheets fabrics; Two foreign and three locally produced flat bedsheet fabrics. These fabrics were compared on parameters such as fabric thickness, air permeability, water absorption, fabric flammability, abrasion resistance, tensile strength, crease recovery, fabric shrinkage, stain removal, fabric handle, fabric sett, fabric drape, yarn count and yarn crimp using the appropriate techniques and apparatus. The results obtained show that the locally produced fabric exhibited comparably better end-use performance characteristic in terms of air permeability, water absorption, flammability, and drape. The foreign flat bed sheets are better in terms of crease recovery, handle, tensile strength, yarn crimp and shrinkage. These fabrics are therefore valued for their end-use performance.

Keywords: *air permeability, abrasion resistance, flammability, crease recovery, handle, yarn crimp and shrinkage*

INTRODUCTION
The quality of a textile material depends largely on the nature of raw material used and also the kind of manufacturing processes it has undergone (Adokwu, 2016). Generally, the quality of a textile fabric is judged by its physical appearance, handle and to some extent price, however, technically, the structure and properties of the fabric have to be considered in quality assessment of a textile fabric.

Nigerian people generally prefer foreign (textile) goods over the home made materials. This is because of the belief that the performance properties of the foreign made textiles are better than those produced locally (Raji et al., 2007). The quality (value) of a textile material is often determined by the feel (handle), aesthetic properties, comfortability during use, serviceability and probably past experience (Musa et al 2011). The main objective of the present work is to determine the basis or otherwise for the Nigerian's preference of foreign goods over locally made materials from technical point of view.

In this work, analysis and comparism of essential quality parameters of five flat bed sheet (two foreign and three locally produced) materials were carried out using standard procedures.

MATERIALS AND METHODS

MATERIAL
Five bed sheet materials were analysed and used in this research work, two foreign textile bed sheet and three locally produced textile bed sheet. All the textile fabrics are cotton materials, they are designated as $\mathbf{F^1}$, $\mathbf{F^2}$, $\mathbf{L^1}$, $\mathbf{L^2}$ **and** $\mathbf{L^3}$ throughout this work.

$$Foreign\ produced\ bed\ sheet \begin{cases} F^1 \dfrac{17\times 17}{1.7\times 1.7}\ Plain \\ F^2 \dfrac{14\times 13}{1.72.1}\ Plain \end{cases}$$

$$Localy\ produced\ bed\ sheet \begin{cases} L^1 \dfrac{18\times 14}{1.3\times 2.6}\ Plain \\ L^2 \dfrac{19\times 17}{1.2\times 4.4}\ Plain \\ L^3 \dfrac{19\times 16}{1.3\times 4.1}\ Plain \end{cases}$$

EQUIPMENT
Shirley Air Permeability Tester, Martindale Wear Abrasion Tester, Shirley Crease Recovery Instrument, Cussick Drape Tester, Shirley Crimp Tester, Essdiel Thickness Gauge, Instron Tensile Strength Tester Model 1026, Digital Weighing Balance, Microscopic Lens, Stop Watch, Counting Glass, Stirring Rod, Beakers, Grey Scale for assessing Stain, Bunsen Burner, Meter Rule, Scissors, Dissecting Needle, Thermometer, Volumetric Flask, Measuring Cylinder, Burette.

EXPERIMENTAL METHODS
The five samples were evaluated for those properties required for satisfactory end use performance. All the tests were carried out in accordance with the British Standard Hand Book II (1974), after conditioning the samples in an atmosphere for textiles i.e. 65 ± 2% relative humidity and temperature of $20 \pm 2\ ^{O}C$ for at least 24 hours.

FABRIC THICKNESS
The test for fabric thickness was carried out in accordance with British Standard Hand book II (1974), the apparatus used was *Essdiel thickness guage.* Five tests were carried out for each sample and the mean value calculated, as show in Figure 1.

AIR PERMEABILITY

Air permeability test was carried out in accordance with the British Standard Hand Book II. The apparatus used was the *Shirley air permeability tester*. For each sample five tests were carried out on different portions. The test area was 5.02cm^2 and at the pressure head of 10 mm of water. The air permeability was obtained using the following formula;

$$\text{Fabric air permeability} = \frac{\text{mean rota meter reading}}{\text{test area}} \quad .... (1)$$

The average value of the rotameter readings was calculated and the average volume of air and the air resistance was calculated and shown in Table 2

WATER RESISTANCE

The test for water resistance for the five flat bed sheets under study were carried out in accordance with British Standard Hand Book II (1974). The test (sample) fabric was mounted onto an embroidery hoop and placed to face upper most on the hoop support. 250 ml of water contained in a beaker was poured onto the surface of the fabric inclined at an angle of 45^o through a funnel with tiny holes. The water was poured quickly and steadily to ensure a continuous flow of spraying once it has commenced.

After the spraying from the funnel had stopped, the test fabric was tapped twice with a solid object with the fabric faced down in a horizontal position. After the tapping, with the fabric still on the hoop, a spray rating was then assigned to the tested fabric by visually comparing the appearance of the sprayed sample with that of the nearest corresponding standard ratings given. The resultsare shown in Table 3.

FABRIC FLAMMABILITY

The vertical strip test principle was employed in this work. The test fabric was cut to a dimension of 21 cm X 2.5 cm and was suspended in a drought free cabinet (where air does not flow freely) and held at the top end over the top most wire by clips. The flame from a candle stick was put below the lower end of the fabric. Using: *asbestos platform, clip wire a stop watch*, the time (seconds) it took the flame to consume the fabric from its lower to top end was noted and used for fabric flammability grading. The results for five fabric sample were as shown in Table 4.

ABRASION RESISTANCE

The abrasion resistance test of each sample was carried out using the break method as outline in the British Standard Hand Book II (1974). *Using the Martindale abrasion tester*. The average loss in weight per 50 rubs was obtained from the graph figure, and the reciprocal of percentage loss in weight was used as the resistance to abrasion. The results are shown in Figure 2.

TENSILE STRENGTH

The tensile strength test was carried out in accordance with British Standard Hand book II (1974),using the *zwick/Roel Tensile testing machine.* For each test fabric, five strips from sample were cut each of dimension 12 cm X 2.5 cm. Each sample was axially extended until it broke under the applied load. Readings were taken and the values are shown in Table 5

CREASE RECOVERY

This test was carried out in accordance with the British Standard Hand Book II (1974), with the aid of *Shirley Crease instrument.* 3 rectangular strips of 3 cm X 7 cm dimensions were cut from each of the samples in both weft and warp directions. The Crease load was 20 Newton for 30 seconds; the results are shown in Figure 3.

FABRIC SHRINKAGE

The percentage shrinkage of a fabric is an indication of its dimensional stability. The specimen was conditioned and a pen was used to mark out the dimension of 10 cm X 10 cm. The sample was then immersed in a tray of 10 cm square and 2 cm deep containing water at room temperature. The specimen was submerged for 2 hours and was carefully removed, and laid on a piece of glass and dabbed with an absorbent cloth, so as to remove excess water. It was then allowed to dry in open air. After being thoroughly dried, the dimensions were re-measured and the percentage shrinkage for both warp and weft direction was calculated and the results presented in Figure 4

FABRIC STAIN REMOVAL.

The stain removal test for the five samples under investigation were carried out using the *ISO 105-A03: 1987,BS 1006-A03:1990 SDC* Standard Methods 5th Edition A03 Grey scale for assessing change in colour. The samples were stained with palm oil, groundnut oil and engine oil and placed in a container containing 2.5 g/l soap and 2.5 g/l Na_2CO_3 solution previously heated to a temperature of 60 ± 2^{O}C, so as to give a liquor ratio of 50:1. The specimen was removed, rinsed, dried and assessed. The assessment of the staining of the adjacent fabric was carried out using Grey scale. The results obtained are shown in Table 6.

FABRIC HANDLE

The pieces of five different samples were given to about 22 people to comment on the feel and physical appearance. Their view were compared and used to determine the fabric handle and visual assessment and the results obtained are shown in table 7.

FABRIC SETT

The *1cm counting glass* method as outlined in British Standard Hand Book II (1974) was used. With this method, the number of warp and weft thread per centimeter for each fabric under analysis were determined by placing the glass on the fabric before counting. Ten determinations were carried out on each sample and the mean value were calculated and recorded in Table 8

FABRIC DRAPE

A piece of five fabric 30 cm in diameter each were cut out from each sample and tested for drape characteristics on a *Cussick drape tester* according to

British Standard Specification. The fabric pieces were allowed to hang under the action of gravity,and then the shadow of the fabric on the ring paper was traced out. The weight of the ring paper (M_2)was determined.The outline was traced and then cut and the inner part weighed to give (M_1). The average values of M_1 and M_2 were obtained. The drape coefficient was therefore calculated thus:

Drape coefficient = M_2/M_1 X 100 (%)................. (2)

YARN COUNT

This was carried out in accordance with British Standard Hand Book II (1974). The apparatus used was the *Digital weighing Balance* and *Dissecting pin.* Here 10 cm X 10 cm strips of the samples were prepared from the fabrics under investigation. Ten threads each from warp and weft directions were removed from the strips using the *dissecting pin*. The crimp of the yarn was removed by the crimp tester. The weight of each group was determined and this was used to calculate the yarn count as follows;

$$Tex\ count = \frac{W}{L}\ X\ 100 \quad (3)$$

where W =weight of yarns (grain), L =Length (meters) The result is shown in table 9.

YARN CRIMP

The test was carried out in accordance with British Standard Hand book II (1974), using the *Crimp tester* and *dissecting pin*. The fabrics were laid flat, free from tension and creases. A rectangular strip of about 20cm X 20cm was marked out along the warp and weft directions, the yarn samples were carefully removed using a dissection needle. The yarns were tensioned as recommended ten readings were taken for each series of threads and the mean calculated. The percentage crimp was calculated as followed

$$\%\ Crimp = \frac{\text{Straightened yarn length} - \text{lengt of yarn in fabric}}{\text{Length of yarn in fabric}}\ X\ 100 \quad (4)$$

The results obtained are shown in table 3.14

RESULTS AND DISCUSSION

FABRIC THICKNESS

Thickness of a fabric is a factor which depends on the structure of the fabric mass/unit area, and the type of yarn used. Various parameters such as abrasion resistance, dimensional stability, stiffness and thermal insulation are affected by fabric thickness (Musa et al, 2011). The results in the Table 1 were the average thickness values calculated for the respective test fabric. The test sample $\mathbf{L^1}$ and $\mathbf{L^2}$ showed the highest value for fabric thickness of **0.384** both, followed by $\mathbf{L^3}$ with **0.364,** other values were **0.322, and0.332,** for $\mathbf{F^1}$ and $\mathbf{F^2}$ respectively. The test sample $\mathbf{F^1}$ has the least mean thickness of **0.322.** Coefficient of variations of the result were calculated (Table 1) and it was found that the sample $\mathbf{F^1}$ has the highest values in percent followed by $\mathbf{F^2}$, $\mathbf{L^3}$, $\mathbf{L^1}$ and $\mathbf{L^2}$ in that order. This shows that sample $\mathbf{L^1}$ and $\mathbf{L^2}$can best be used during cold to provide the maximum warmth needed. Due to its high thickness values, it can be used in a situation where fabrics are to be subjected to frequent rubbing with another object. The order of fabric thickness increases as follows: $\mathbf{F^1 < F_2 < L^3 < L^1 < L^2}$ as shown in Figure 1

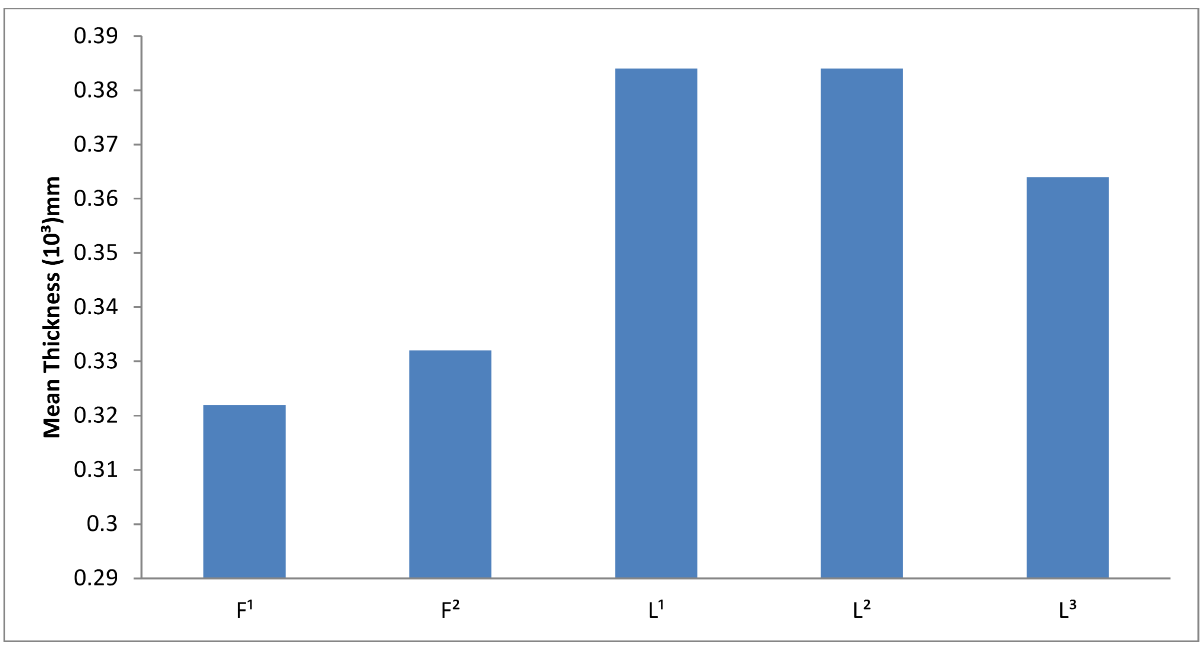

Figure 1: Fabric thickness

Table 1: Thickness coefficient of variation (%)

Test Sample	Mean thickness (mm) x10^{-2}	Standard deviation x10^{-4}	Coefficient of variation (%)
F^1	0.322	0.0148	4.6
F^2	0.332	0.0116	3.49
L^1	0.384	0.00787	2.05
L^2	0.384	0.0036	0.94
L^3	0.364	0.00837	2.3

AIR PERMEABILITY

Air permeability is a factor which depends on the type of finish fibre and the diameter of yarn used to produce the fabric. The bigger the opening in a fabric, the higher the flow rate of air through the fabric, while the thicker a fabric is, the more difficult it is for air to flow through. Also the construction and finishing techniques affects the air permeability of fabrics such as hot calendaring which flattens the yarn.

Table 2: Air permeability

Sample	Average volume of air cm^3/s (V)	Air resistance x10^{-3} (Sec/cm)
F^1	109.2	0.076
F^2	109.2	0.416
L^1	109.2	0.458
L^2	109.2	0.494
L^3	109.2	0.458

The results shown in Table 2, are the respective average rate of flow of air through the test fabrics. The table also shows the air resistance values as calculated using the formulae for air permeability as given in equation 1. Test sample $\mathbf{L^2}$ showed the highest value of **0.494** followed by $\mathbf{L^1}$ and $\mathbf{L^3}$ with **0.458.** Sample $\mathbf{F^1}$**,** and $\mathbf{F^2}$ have values **0.076** and **0.416** respectively. The resistance for each of the test fabric calculated showed that sample $\mathbf{L^2}$ had the highest air resistance value of **0.494,** Sample $\mathbf{F^1}$ has the least of **0.076**. Air permeability is influenced by fabric density and probably the yarn fineness or yarn count, thus the high air permeability for sample $\mathbf{F^1}$ may be attributed to its yarn count while the low level of air permeability for sample $\mathbf{L^2}$ could be attributed to its high fabric density and its coarser weft yarn.

WATER RESISTANCE

The results in Table 3 was obtained from a scale mockrain shower produced by pouring water through a spray nozzle. Samples L^1, L^2, and L^3, gave a spray rating of '0', indicating a complete wetting of the whole sprayed surface, that is, thus, the local bed sheets have very poor (low) water resistance. While the foreign bed sheets (F^1 and F^2) gave spray rating of 25 indicating wetting of about75 % of the sprayed surface. In other words the local bed sheets have better water absorption as compared to the foreign bed sheets hence better in terms of comfort particularly in temperate environment or during summer periods.

Table 3: Water Resistance

Test Sample	Spray rating
F^1	25
F^2	25
L^1	0
L^2	0
L^3	0

FABRIC FLAMMABILITY

Result shown in Table 4 gave the average burning time of the respective fabric and their flammability grades. It can be observed that the samples are graded **D** with the exception of sample $\mathbf{F^1}$ which is foreign. Test sample $\mathbf{F^1}$ is highly flammable, while the entire local test samples are graded **D** and this refers to the grade assigned to flame proof self-extinguishing fabrics. Thus, the local flat bed sheets are shown to have good flammability rating. This probably was as a result of chemical finishing treatment done to the fabrics which made them to become flame retardant or proof, since all cotton fabrics are flammable.

Table 4: Fabric flamability

TEST SAMPLE	AVERAGE BURNING TIME (Seconds)		FLAMMABILITYGRADE
	Warp direction	Weft direction	
F^1	5.78	5.50	A
F^2	14.00	12.50	D
L^1	18.50	18.25	D
L^2	16.75	14.75	D
L^3	15.75	12.19	D

KEY:
A= Highly flammable 5 seconds B= Flammable 6 – 10 seconds
C= Flame Retardant 10 seconds D= Flame proof self extinguishing above 10 seconds

ABRASION RESISTANCE

Abrasion resistance is a property that allows a material to resist wear. The abrasion resistance of a material helps to withstand mechanical action and tends to protect the removal of materials from its surface (Adokwu, 2016). Fabric abrasion resistance is a factor which affects the durability and performance characteristic of fabrics. The assessment of abrasion of fabrics, usually provides the fabric with the conditions similar to those it will be subjected to, while in use. The results in Figure 2 show that sample **L^2** had the highest abrasion resistance of **1.234 %** weight loss, while **L^3** has the least abrasion resistance with **6.139** weight loss(%) other results are **5.454, 3.649,** and **3.479** for **F^1, L^1** and **F^2** respectively. Sample **L^2** has the highest abrasion resistance indicating that it will be more durable comparably. This shows that in places where the bed sheets are to be subjected to frequent use, sample **L^2** which lost only very small mass after a considerable number of rubs will be the best.

TENSILE PROPERTIES

Tensile properties are affected by many factors such as chemical composition and internal structures of the fibre. The tensile property is of non-linear type because mostly the less extensible fibre, breaks before an extensible fibre reached its breaking load. Result from Table 5 show that sample **F^2** gave the highest value of breaking load followed by **F^1, L^3, L^2** and **L^1** in that order respectively. The breaking load of the foreign fabric is slightly higher than those of the local ones, which may obviously be attributed to the variations in the strength of the yarns components in the individual samples. This result slightly vary with what was obtained in abrasion resistance both of which may be related to wear life of the fabric. Sample **F^2** with highest breaking strength and higher modulus may remain the most promising in terms of tensile properties.

CREASE RECOVERY

Fabric crease recovery determines the ability of a fabric to recover from deformation. Crease recovery depends on the plastic behavior of the fibre and the geometry of yarn and fabric. The crease recovery angle given in Figure 3 of the test sample showed that sample **F^2** with the highest angle of recovery of **14.6^O** in warp directions while sample **F^1** showed the highest angle of recovery of **12^O** in weft direction. Other results are **14, 9, 6** and **3.33**. for **F^1, L^3, L^2** and **L^1** respectively in warp direction. The crease recovery angle in weft direction for samples **F^2, L^2, L^3** and **L^1** are **10.8, 7.3, 4.5** and **2.03** respectively. Generally, the foreign flat bed sheets recovered better from creasing in both weft and warp direction in relation to their local counterparts thus, will have better easy care property and do not need much ironing after laundering.

FABRIC SHRINKAGE

The percentage shrinkage of a fabric is an indication of its dimensional stability. Figure 4 indicates that both the fabrics samples have low percentage shrinkage highest being 3% which is indeed negligible. However, the foreign bed sheets have relatively better dimensional stability in both warp and weft directions with only 1% shrinkage in both directions. For the local bed sheets the fabric shrinkage is better in the warp directions with the exception of **L^2** indicating that it is more dimensionally stable as compared to **L^1** and **L^3**.

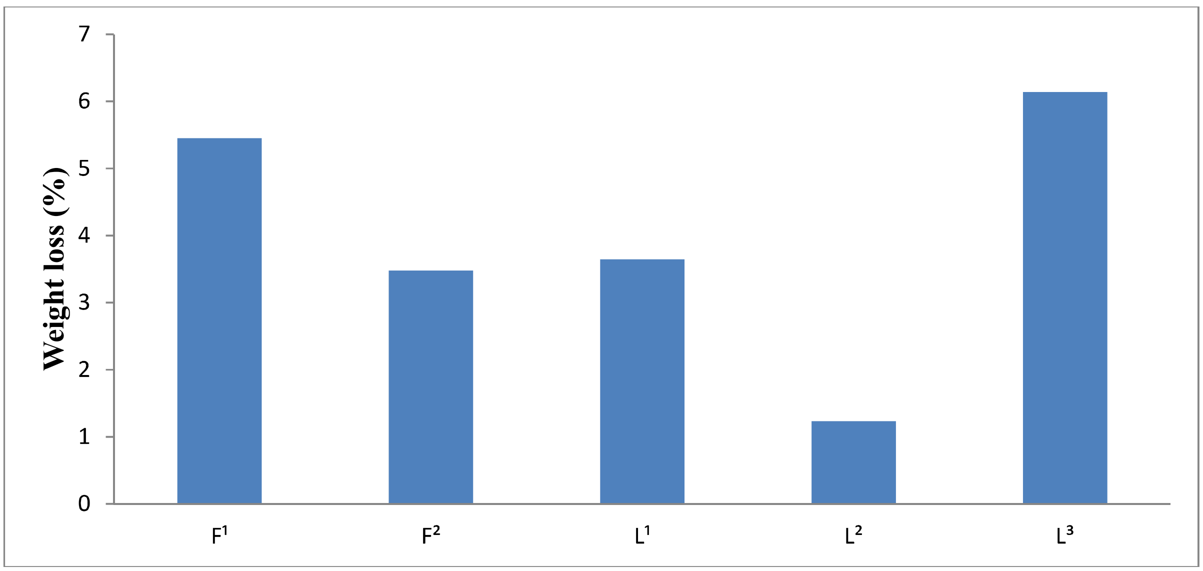

Figure 2: Abrasion Resistance

Table 5: Tensile properties

TEST SAMPLE	BREAKING LOAD (KG)	Applied force (N)	Elongation x10^{-3} (m)	Stress X10^{-5}(n/m^2)	Strain X10^{-2} (M)	Initial modulus (N/M^2)
F^1	14.6	143.1	126.67	4.77	1.267	3.765
F^2	18.16	177.92	64	5.93	0.64	9.265
L^1	9.04	88.6	243.5	2.953	2.435	1.213
L^2	11.84	116.84	188.25	3.868	1.883	2.054
L^3	13.44	131.74	129.42	4.391	1.294	3.393

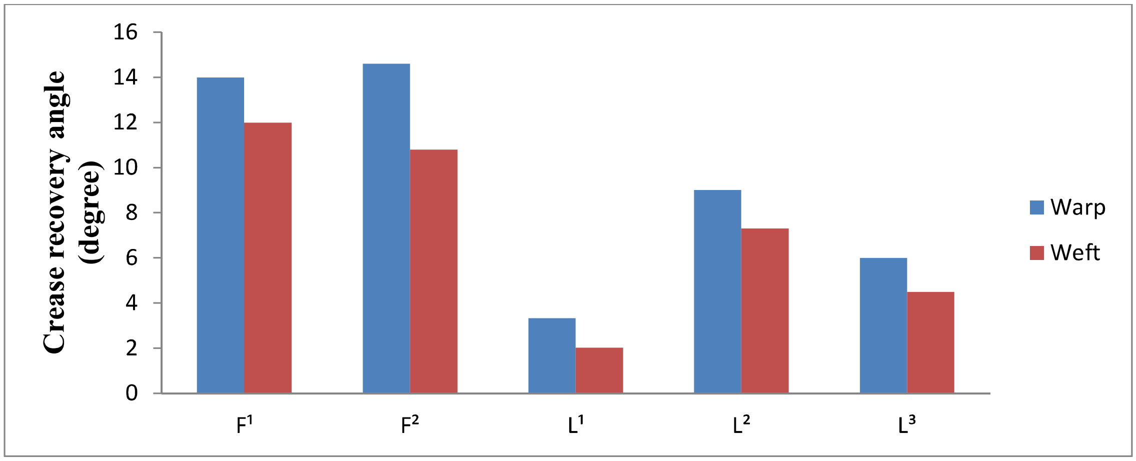

Figure 3: Crease recovery

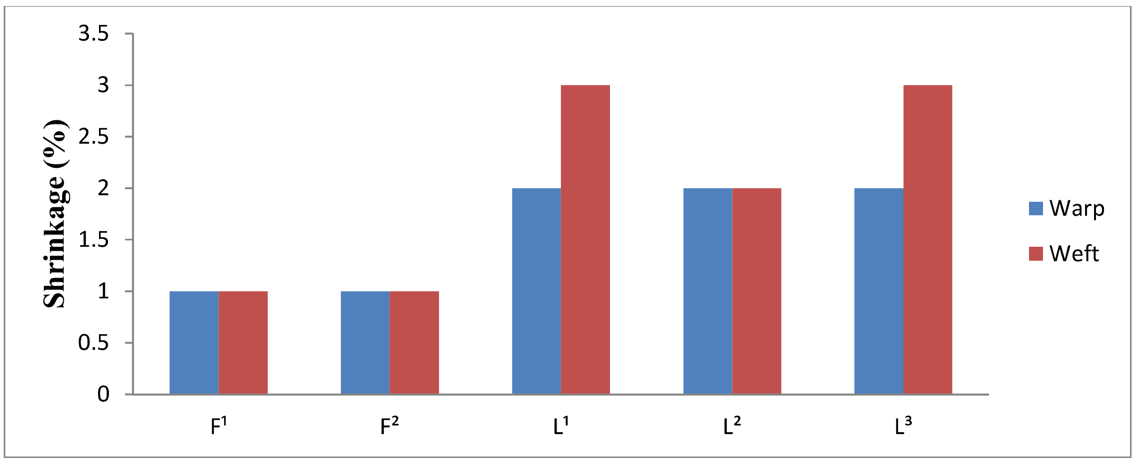

Figure 4 Fabric Shrinkage

STAIN REMOVAL

Table 6: Stain removal

samples	Type of stain	Grade	Remarks
F1	Groundnut oil	1-2	Poor
	Palm oil	2	Fair
	Engine oil	1	v. poor
F2	Groundnut oil	1-2	Poor
	Palm oil	2	Fair
	Engine oil	1	v.poor
L1	Groundnut oil	4	v.good
	Palm oil	3-4	v.good
	Engine oil	1	v.good
L2	Groundnut oil	3-4	v.good
	Palm oil	2-3	Fairly good
	Engine oil	3	Good
L3	Groundnut oil	3	v.good
	Palm oil	2-3	Fairly good
	Engine oil	4	v.good

KEY

5 = excellent, 4 = very good, 3/4 = very good, 3 = good, 2/3 = fairly good, 2 = fairly poor, ½ = poor, 1 = very poor

The results obtained for stain removal are shown in table 6 which is based on the effect of fibre on fabric staining and stain removal efficiency. The fabrics specimens after washing and drying, were kept under a standard atmospheric conditions for 24 hours and then compared. Using soap to wash the fabrics, groundnut oil stain is the easiest to remove while engine oil proved difficult especially in the foreign flat bed sheets in the following order.

FABRIC HANDLE

The result obtained recorded and tabulated inTtable 7, from No1-5. The second batch of the fabric handle was carried out in front of Ribadu Hostel 4 female students were able to assess the fabrics. The result were recorded and tabulated from No_6-8 The third batch of fabric handle assessment was carried out in the Department of Polymer and Textile Science where 5 female and 5 male students assess the fabrics based on the handle and appearance and the results obtained were tabulated from No_9-22. All at Ahmadu Bello University, Zaria, Nigeria. Out of the people that assessed the fabric only 10 assessors were male while the rest assessors were female. From the result obtained fabric sample **F1** and

F² has the best handle. This implies that they are the most soft and smooth of all the fabric samples. Never the less the result shows that the handle of the tested sample for both foreign and locally produced bed sheets fabric do not show any significant difference

Table 7: Fabric handle

	SAMPLES/ GRADES				
SAMPLES	**F¹**	**F²**	**L¹**	**L²**	**L³**
1	4	4	3	3	3
2	3	4	4	3	3
3	4	3	3	3	3
4	4	4	3	3	3
5	4	4	3	3	4
6	4	3	3	3	3
7	3	4	3	3	3
8	4	4	3	3	3
9	4	4	3	4	3
10	4	3	3	3	3
11	3	3	3	3	3
12	4	4	4	3	4
13	3	3	3	3	3
14	3	4	4	3	3
15	4	3	3	3	3
16	3	4	3	3	3
17	4	4	3	3	3
18	3	3	3	3	4
19	4	4	3	3	3
20	3	4	3	3	3
21	3	3	3	3	3
22	4	4	3	3	3
Total	79	80	69	67	69
Average	3.59	3.63	3.13	3.04	3.13

Key:
4= fabric is softest in term of handle and appearance
3= fabric is soft interm of handle and appearance
2= fabric is harshest interm of handle and appearance
1= fabric is harsh interm of handle and appearance

.

FABRIC SETT

Table 8: Fabric density

Test sample	End per centimeter (epcm)	Pick per centimeter (ppcm)	epcm x ppcm
F¹	17	14	238
F²	14	13	182
L¹	18	14	252
L²	19	17	323
L³	19	16	304

The cover factor controls the density of a fabric, in relation to air permeability, the higher the fabric sett, the lower the air permeability. Table 8, shows that for all the samples epcm is higher than the ppcm, since the epcm and ppcm are not equal, the fabric samples are unbalanced and the greater numbers of yarns are usually in the warps. Sample **L²** has a high fabric sett, while sample **F²** has low values of epcm and ppcm sett,. The foreign fabrics have a relatively low fabric sett, while the locally produced flat bed sheets have high fabric density.

3.12 FABRIC DRAPE

Fabric drape is the extent to which a fabric will deform, when allowed to hang under its own weight. It is largely affected by the yarn twist. The thicker the yarn, the lower the drapeability. The drape coefficient expresses the drapeability of the fabric, and the higher the value of drape coefficient the poorer its drapeability. Figure 5, Shows that sample **L¹** is the stiffest which could be probably attributed to its higher fabric density and probably high yarn twist, sample **F¹** is the smoothest with the list drape coefficient, and will therefore assume a graceful appearance compare to the others.

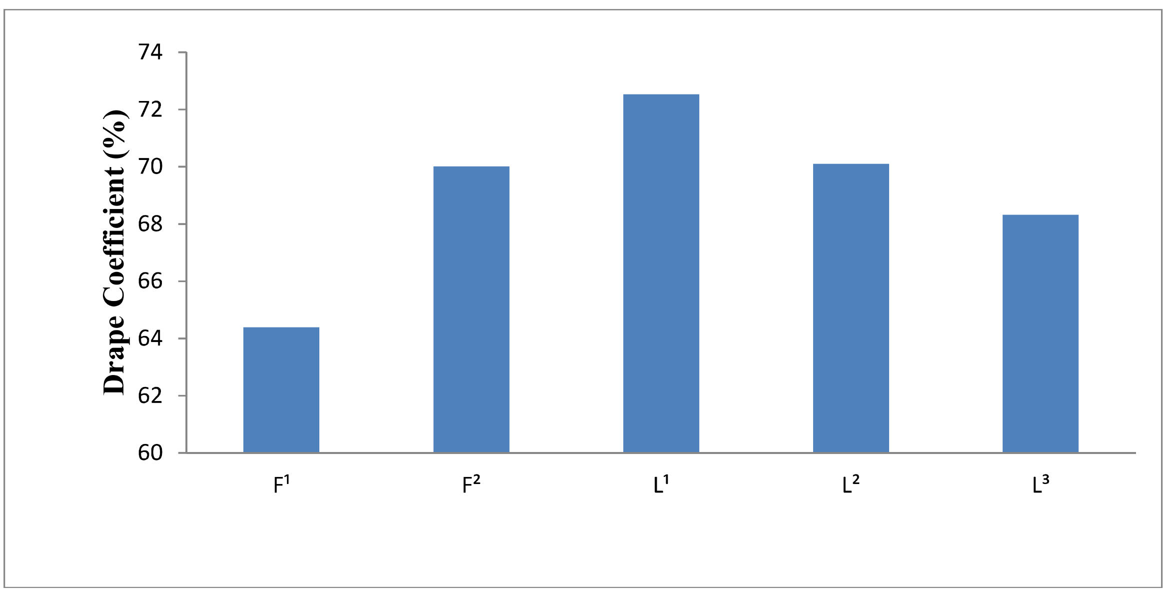

Figure 5: Fabric Drape

YARN COUNT

Table 9: Yarn count

Test sample	Warp Mean Tex	S.D	C.V (%)	Weft Mean Tex	S.D	C.V (%)
F^1	1.7	0.8	7.4	1.7	1.1	10.28
F^2	1.7	0.8	8.27	2.1	1.1	9.91
L^1	1.3	0.316	3.13	2.6	0.5	4.76
L^2	1.2	0.1	3.13	4.4	1.2	10.71
L^3	1.3	0.2	1.96	4.1	0.4	3.84

Key: C.V = Coefficient of Variation, S.D = Standard Deviation

The result in Table 9, shows that sample **F^1** having the least mean tex value of 1.7 tex in both warp and weft directions is made from a finer warp and weft threads, which explain the good handle and appearance of sample **F^1** as indicated by the fabric handle.

YARN CRIMP

Crimp tends to affect certain fabric characteristic such as cover factor, and thickness, it is a very important parameter in the designing of fabrics for specific end uses. Crimp in either directions, is dependent on fabric structure, though it is largely affected by yarn count and thread density. Figure 6 shows that the weft crimp is generally higher than the warp crimp for all the fabric samples with the exception of sample **L^3**. This is in agreement with what was obtained in literature (Musa et al, 2011), the higher value of weft crimp is due to the fact that the warp yarn was under greater tension during weaving process on the loom as compared to the weft yarn. So also the weft yarn was more flexible relative to the stiffer warp yarn which was coated with size so as to withstand tension and frictional effects of the healds during weaving action. The crimp of the foreign flat bed sheets is higher than that of the locally produced bed sheets, given the foreign bed sheets a fuller and more compressible feel.

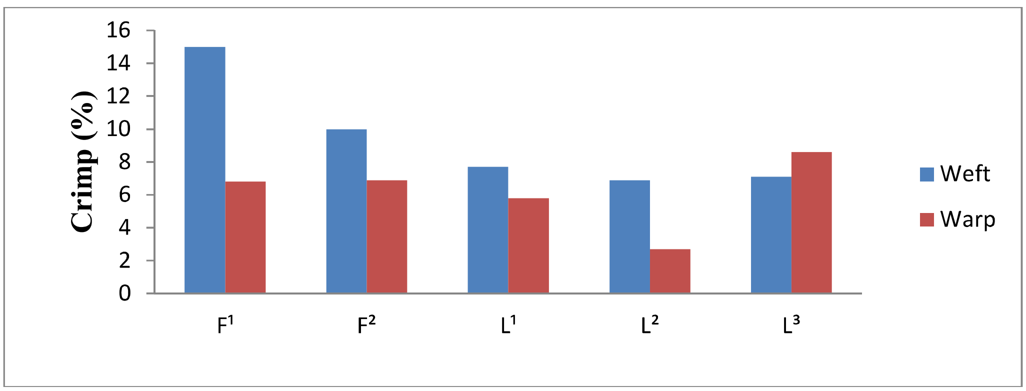

Figure 6: Yarn Crimp

CONCLUSION

The study of the quality parameters of five different materials was carried out successfully. The foreign flat bed sheets are better in terms of crease recovery, tensile properties, handle, drape, yarn crimp and shrinkage, while the locally produced flat bed sheets compete favourably in terms of air permeability, flammability, fabric sett and yarn count. However, the locally produced flat bed sheets are comparably the same with the foreign fabrics considering their abrasion resistance, thickness, and stain removal. Our locally produced flat bed sheets are produced with the aim of suiting our own climatic conditions, usage and aesthetic desires.

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