The finding of this research work (using analysis of variance, ANOVA) showed that, there is no significant difference in length distribution among the studied samples. This will allow the spinners to classify the bales into the same categories during HVI fiber selection and laydowns arrangements. Classification of cotton bales with similar length distribution will minimize the undesirable laydown variability in critical properties such as short fibers contents which are the main sources of yarn unevenness.

In this study the HVI tenacity for the studied three commercial varieties fall within the range of 26.94-28.28cN/tex. According to USDA system of cotton classification this range is categorized in the descriptive designation “average” strength group.

FAVIMAT+ elongation in percent fall within the range 6.41-7.01. For the studied samples Acala SJ-2 variety has a relatively better elongation property. This can be used as information for the spinners to increase the proportion by weight of Acala SJ-2 during the preparation of a cotton mix desired for relatively better yarn and greige fabric elongation.

In this research work the following modified fiber quality index (MFQI) was produced to instrumentally characterize the studied commercial Ethiopian cotton varieties. Both single and bundle fiber testing instruments were used to characterize the studied commercial cotton varieties.

$$MFQI = \frac{[UHML_H \times UI_H \times (1\text{-}SFI_H) \times SFS_M \times (1+EL_M)]}{MIC_H}$$

Statistical Analysis and Instrumental Characterization of Commercial Ethiopian Cotton Varieties

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35th International Cotton Conference

March 17 - 18, 2021

Bremen, Germany

Table 1 Quality Index values for the three Ethiopian commercial cotton varieties

Cotton Varieties	Cotton Fibre Quality Indexes		
	FQI	SCI	MFQI
Acala (SJ-2)	149.6	126.0	130.9
Arba	150.2	121.4	113.7
DP-90	138.6	110.0	105.7

Table 2 Quality Index values for the US UPLAND , PIMA and Egypt Giza 87

Cotton Varieties	Cotton Fibre Quality Indexes		
	FQI	SCI	MFQI
US PIMA	479.9	230.4	549.5
US UPLAND	170.2	134.3	145.4
Giza 87	472.2	228.0	516.9

Where, MFQI is the modified fiber quality index, $UHML_H$ is the HVI upper half mean length (mm), UI_H is the HVI uniformity index (%), SFI_H is the HVI short fiber index (%), MIC_H is the HVI fiber fineness (micronaire), SFS_M is FAVIMAT+ single fiber tenacity (cN/tex), EL_M FAVIMAT+ single fiber elongation (%).

In order to compare different cottons, their work of rupture should be evaluated so that it is possible to take account of the various masses of different varieties. Hence, specific work of rupture, which is the amount of energy needed to break a sample of unit mass, should be used.

Thus, the MFQI which considers both the single fiber tenacity and elongation is more consistent for the comparison between different cotton varieties.

The values obtained by applying the new modified fiber quality index are compared with the values of the usually used fiber quality index and spinning consistency index formulas which do not consider the fiber elongation property. The result demonstrated that the new modified fiber quality index shows a good predicting power to predict the quality of competitor commercial cottons. For example, the performance of Acala SJ-2 is known to be better than that of Arba during the back-trace history spinning processes. This is clearly shown by comparing them using the new MFQI, while, the usual FQI failed to predict it (see table 1).

The applicability of the new modified fiber quality index to predict the quality of US UPLAND, US PIMA and Egyptian Giza 87 is also presented in table 2.