DRAFT TANZANIA STANDARD

Textiles – Test Method for Colour Measurement of Hemp and Flax Fibre

TANZANIA BUREAU OF STANDARDS

0. FOREWORD

In the commercial transactions and application of hemp and flax fibre, the Colour is an important factor for their quality. Their Measurements reflects some aspect of fibre quality during the grading process and trading.

The colour variation of hemp and flax fibre depends on species, regions of cultivation, stages and retting methods. The evaluation is done through the comparison of raw fibres and reference samples to provide uniform colour distribution. To produce an accurate and precise colour, Spectrophotometric data is used. Colorimetric data are obtained through specimen measurement by combining specimen spectral data with data representing a CIE standard observer and a CIE standard illuminant.

In reporting the results of a test made in accordance with this Draft Tanzania Standard; if the final values observed or calculated is to be rounded off; it shall be done in accordance with TZS 4: (see subclause 2.2).

In the preparation of this Draft Tanzania Standard, assistance was derived from:

ASTM D6961M − 2015 Standard Test Method for Color Measurement of Flax Fiber

1. SCOPE

This test method covers the instrumental color measurement of Hemp and flax fiber only. This method is applicable to fibres taken from raw or partially processed flax fibre, but not to fibres taken from blends of flax yarns of fabrics.

2. NORMATIVE REFERENCES

For the purpose of this Draft Tanzania Standard the following references shall apply: -

a) TZS 534: 2017 Textiles – Standard atmospheres for conditioning and testing

b) TZS 325– *Textile fibres – some methods of sampling for testing.*

3. TERMS AND DEFINITION

For all terminology related to this Draft Tanzania method, see Flax and Hemp fibre- Glossary of terms (TZS…)

4. SUMMARY OF TEST METHOD

4.1 The samples of fibre are analyzed by colour spectrophotometer. The measurement of colour variation is done through an aperture port of 25.4 millimeter diameter. The instrument, CIELAB L*, a*, and b* measurements are taken and are instrumentally calculated from tristimulus X, Y and Z data, observer function, and illuminant data.

5. APPARATUS

5.1 A visible range spectrophotometer (minimum of 20-point) is recommended because it provides greater accuracy than colorimeters, spectro-colorimetres, or 10-point colour spectrophotometers.

5.1.1 Instrument Configuration and Settings

Either a 0/45 or spherical instrument/specimen geometry may be used and the selected geometry should be included in the report. Unless otherwise specified, it is recommended to use a CIE Illuminant D65 or If an alternate illuminant is used, its specifications should be included in the report.

5.1.1.1 Unless otherwise specified, it is recommended to use CIE 10-degree observer or if an alternate illuminant is used, its specifications should be included in the report.

5.1.1.2 A fibre compression cell capable of applying air pressure of 206,843 Pa [30 psi] or 275,790 Pa [40 psi] is recommended for assuring consistent pressure among the specimens presented for measurements.

6. **SAMPLING AND SAMPLE PREPARATION**

6.1 For acceptance testing, take a lot of samples from shipping containers as directed in an applicable specification, or as agreed upon between the purchaser and supplier.

6.2 Take the measurement at a minimum of five sites within a specimen and three measurements at each site. Means of the three readings constitute the site reading. For each specimen, report means of the five site readings.

6.3 Sample Handling and Preparation:

6.3.1 In addition to natural color variation within a sample, other variables that may influence the color measurements are fibre orientation and the relative compactness of the sample. Some specimens may be totally randomly oriented, while in some specimens there may be areas in which fibers are parallel. In selecting measurement sites, care should be considered to avoid areas in which there are obvious changes in fiber orientation that could result in shadows that might contribute to error in measurement.

6.3.2 Users are advised that moisture may influence the color of hemp, flax and linen. Samples should be conditioned prior to measurement as described in **TZS 534**.

6.3.3 Bundles of flax fiber presented for measurement are rather open-structured, capable of being easily compacted through pressure. Care should be taken in applying the same pressure to samples during measurement, because the density of the sample may influence readings. The sample should be compressed firmly against the glass-covered aperture to assure that the entire aperture is covered by fibre. Consistency in pressure can be achieved through the use of a fiber compression cell that consists of a cup fiber specimen holder and clamp that is pressed against the specimen through application of compressed air. Air pressure of 206,843 Pa [30 psi] or 275,790 Pa [40 psi] is recommended.

8. Procedure

8.1 Specimens are compressed at a pressure of 206,843 Pa [30 psi] or 275,790 Pa [40 psi] and presented to the instrument aperture so that the entire area of the aperture is filled with the specimen.

8.2 CIELAB L*, a*, and b* measurements are taken from five sites within a specimen, and three measurements are taken at each site. Specimens are repacked and rotated 90° between each of the three measurements taken at one site to reduce variability with respect to fiber orientation. Mean of the three readings constitute the site reading.

9. Calculation and Expression of results

9.1 Five readings per specimen of CIELAB L*, a*, and b* shall be calculated. The readings should indicate variation in lightness (L*), redness-greenness (a*), and yellowness-blueness (b*).

9.2 Calculations of differences in lightness, in redness-greenness, and yellowness-blueness between specimens may be reported as ΔL*, Δa*, and Δb* values. Overall color differences, ΔE*, may also be calculated, where ΔE CIELAB = [ΔL*2 + Δa*2 + and Δb*2]

TABLE 1-Precision and Bias analysis for CIELAB a*, b* and L*

Sample	Average x			Repeatability Standard Deviation Sr			Reproducibility Standard Deviation S_R			Reproducibility Standard Limit r			Reproducibility limit, R		
	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*
1	2.87	12.81	59.03	0.1393	12.81	2.1655	0.4673	0.4700	8.7004	0.3902	1.3160	0.3902	1.3084	5.7933	24.3612
2	2.90	12.77	53.24	0.0854	12.77	1.0664	0.4837	0.1721	6.9831	0.2391	0.4819	0.2391	1.3543	6.0248	19.5526
3	2.97	11.23	51.81	0.1373	11.23	2.9932	0.5212	0.3604	8.3534	0.3844	1.0092	0.3844	1.4593	5.6707	23.3896
4	2.95	8.69	56.23	0.2137	8.69	4.3230	0.5185	0.7160	8.9706	0.5984	2.0048	0.5984	1.4518	15.4012	25.1177
5	2.83	12.61	58.64	0.0535	12.61	1.0370	0.4271	0.1345	6.6149	0.1498	0.3767	0.1498	1.1960	4.9355	18.5217
6	5.31	19.33	54.81	0.1764	19.33	0.3935	0.7411	0.6487	5.1631	0.4939	1.8165	0.4939	2.0750	10.5341	14.4568

10. TEST REPORT

The test report shall include the following particulars:

a) A reference to this Tanzania – Draft Standard.

b) The method used for preparation of the specimens (see clause 7)

c) The test results should indicate:

   i. Differences in lightness, ΔL^*, redness- greenness, Δa^*, and Yellowness-blueness, Δb^* between specimens

   ii. Overall colour differences, ΔE^*

   iii. Details of any operations not specified in this Draft Tanzania Standard or incidents likely to have had an influence on the results.