

INTER LABORATORY TESTING SCHEME

ON

**"Testing of Chemical parameters
in Textile Material"**

TC/ILTS/021/CHEM/2017-18

Conducted by



**Proficiency Testing Provider
Laboratories**

TEXTILES COMMITTEE

(Ministry of Textiles, Government of India)

**P. Balu Road, Prabhadevi Chowk,
Prabhadevi, Mumbai – 400 025.**

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SCHEME : INTER LABORATORY TESTING SCHEME -TC/ILTS/21/CHEM/2017-18 -Testing of
Chemical parameters in Textile Materials

DATE OF ISSUE: 12th Feb,2019

CONFIDENTIALITY :

All the information furnished by the participants shall be kept confidential by the PT Provider and the same shall not be revealed to others. However, if the accrediting body, for example NABL, requests the PT provider to furnish the performance of any of the participants, the same shall be provided to them directly, after obtaining permission of the concerned participant

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Disclaimer: The PT Programmes are meant for evaluation of performance of the participants for the specified tests undertaken in the programme only and are voluntary in nature. Further, it is clarified that reasonable care has been taken to meet the requirement of ISO/IEC 17043:2010, while designing and conducting the programmes. Participants are expected to exercise due diligence while carrying out the tests and meet all safety, statutory and accreditation body's requirements. PT Provider and Textiles Committee will not be responsible for any claim/damages arising out of participating in this programme.

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Report on Inter Laboratory Testing Scheme (TC/ILTS/021/CHEM//2017-18)



Preamble:

Increasing awareness on textile quality and the buyer requirements are forcing textile manufacturers and traders to test textile products from reputed laboratories. Reputation of any laboratory depends upon the result it produces. The test report given by the laboratory should be precise, accurate, repeatable and reproducible. This means, a set of results obtained within a laboratory by testing a representative sample at any time interval should be comparable. And also, the result obtained over testing a representative sample in any laboratory should compare with that of other laboratory and fall within the statistical tolerance limit. In other words, the laboratory should be able to generate comparable results by performing the same test.

The repeatability and reproducibility of any test result involves the laboratory's competence in doing an assigned task/testing including the testing equipment, the skill and knowledge of technical manpower working in the laboratory, the testing conditions and test method adopted. In this pursuit, the laboratory has to meet a requirement of maintaining its own management system as per ISO/IEC 17025 as also, participate in Inter Laboratory Comparison (ILC) and/or Inter Laboratory Proficiency Testing Scheme (ILPT).

Inter laboratory Comparison is defined as' *“Organization, performance and evaluation of tests on the same or similar test items by two or more laboratories in accordance with predetermined conditions.”* The goal of the Inter-laboratory Comparisons (ILC) is to provide verification of each participating laboratory's technical capability by obtaining a measurement that agrees with all other Laboratories using different make & model of testing equipment and man-power. The requirement for inter laboratory comparisons remains in place today, and has been further entrenched into metrology management systems by its incorporation in the requirements of ISO/IEC 17025.

Textiles Committee:

Textiles Committee is a statutory organization under the Ministry of Textiles, Government of India, established in the year 1963. The Committee has set up 19 laboratories throughout the country for catering to the testing requirements of the textile trade and industry in different centers. Fourteen laboratories of Textiles Committee are accredited as per ISO/IEC 17025 by National Accreditation Board for testing & calibration Laboratories (NABL), India.

PT-Provider:

The Laboratory, Textiles Committee at Mumbai conducts Inter Laboratory Comparisons (ILC) schemes by including its own laboratories and inviting other laboratories. In order to offer ILPT schemes professionally as a PT Provider, the laboratory of Textiles Committee at Mumbai is implementing the Management System in accordance with the requirements stipulated in ILAC G13 and ISO/IEC 17043. The PT Provider has conducted **23** schemes since 2007. The details are given in Table – 1.

Table – 1 ILPT schemes conducted by the PT Provider

S.No	Identity of the ILPT	Year	Field	PT items	No. of test parameters	No. of Labs participated
1	TC/ILTS/MECH/01/07	2007	Mechanical	Fibre, Yarn & Fabric	17	70
2	TC/ILTS/CHEM/02/07	2007	Chemical	Fabric	13	70
3	TC/ILTS/MECH/03/08	2008	Mechanical	Fabric	11	60
4	TC/ILTS/CHEM/04/08	2008	Chemical	Fabric	10	60
5	TC/ILTS/MECH/05/09	2009	Mechanical	Fabric	11	50
6	TC/ILTS/MECH/06/09	2009	Mechanical	Yarn	12	31
7	TC/ILTS/MECH/07/09	2009	Mechanical	Fibre	15	14
8	TC/ILTS/CHEM/08/09	2009	Chemical	Fabric	7	51
9	TC/ILTS/CHEM/09/09	2009	Chemical	Fabric	4	45
10	TC/ILTS/CHEM/10/09	2009	Chemical	Fabric	2	20
11	TC/ILTS/MECH/11/10-11	2010-11	Mechanical	Fabric	10	65
12	TC/ILTS/CHEM/12/10-11	2010-11	Chemical	Fabric	10	70
13	TC/ILTS/MECH-1/2012-13	2012-13	Mechanical	Yarn and Fabric	13	42
14	TC/ILTS/Chem -1/2012-13	2012-13	Chemical	Fabric & Metal clothing accessories	12	56
15	TC/ILTS/15/MECH-2/2014	2014	Mechanical	Fabric	8	50
16	TC/ILTS/16/CHEM-2/2014	2014	Chemical	Fabric	8	45
17	TC/ILTS/17/MECH-3/2015	2015	Mechanical	Fabric	8	24
18	TC/ILTS/18/CHEM -3/2015	2015	Chemical	Fabric	9	51
19	TC/ILTS/19/CHEM -3/2015	2015	Chemical	Fabric	2	30
20	TC/ILTS/20/MECH/2017-18	2017-18	Mechanical	Fabric	7	35
21	TC/ILTS/21/CHEM/2017-18	2017-18	Chemical	Fabric	8	29
22	TC/ILTS/22/MECH/2017-18	2017-18	Mechanical	Fabric	7	28
23	TC/ILTS/23/CHEM/2017-18	2017-18	Chemical	Fabric	8	36

The Present Program:

Design: In order to assess the re- producibility of the test results being reported by the various textile testing laboratories, a Proficiency Testing Scheme for Mechanical testing - **TC/ILTS/021/CHEM//2017-18** was designed. The test parameters thus covered in the present PT Scheme are given in Table – 2.

Table – 2 : Tests covered in TC/ILTS/21/CHEM/2017-18

S.No.	Test parameter	Standards suggested
1	Identification of Fibre	IS 667 1981 RA 2017
2	Percentage Composition of Fibers by Chemical Separation	Relevant IS or AATCC Method
3	Identification of Fiber	IS 667 1981 RA 2017
4	Percentage Composition of Fibers by Physical Separation	AATCC 20A 2017 / In House Method
5	Water Soluble Matter	IS 3456 1966 RA 2016
6	Dimensional Changes to Soaking in Water	IS 2977 1989 RA 2016 ASTM D 2261-13 (2017)
7	Dimensional Changes to Laundering	AATCC 135-2018
8.	pH of aqueous extract	IS 1390 1983 RA 2017 ISO 3071 2005

While designing the Scheme the following objectives were considered.

- (1) Each accredited participant laboratory should get benefit so that at least one parameter may be covered under the lab's scope of accreditation.
- (2) Both geometry and performance verifying parameters to be included.
- (3) Both trade and industry oriented parameters to be included.
- (4) Test methods of ISO, ASTM and Indian Standards may be covered.

To satisfy the above objectives (1) Scope of accreditation of about 50 laboratories were consulted. (2) To enable the participant laboratories in *evaluation of the performance for specific tests or measurements and monitoring laboratories' continuing performance* (Ref: ISO/IEC 17043), the geometric parameters viz., width of fabric, weight per square meter and performance parameters Fabric breaking force by grab method,. (3) To satisfy Trade and industry requirements, performance parameters viz., tear strengths by different methods and Resistance of yarns at Seam were included.

Advisory Group:

As per the requirements stipulated in ILAC G13 and ISO/IEC 17043, an **Advisory Group** comprising the following internal and external experts having the necessary expertise in testing and/or statistics was constituted for designing and operating Proficiency Testing scheme in the field of Mechanical & Chemical testing of textiles:

Table – 3 : Constitution of Advisory Group

S.No	Expert	Affiliation	Field of expertise
1.	Mr. Kartikay Dhanda Director (Labs), Textiles Committee, Mumbai	Chairman	Textile testing
2.	Dr. K.S.Muralidhara Joint Director (Lab), Textiles Committee, Mumbai	Member	Textile testing
3.	Mr.K.Selvaraj Joint Director (Lab), Textiles Committee, Mumbai	Member	Textile testing & Statistics
4.	Dr.P.Ravichandran Deputy Director (Lab), Textiles Committee, Mumbai	Member	Textile testing & Statistics
5.	Mr. S.P. Singh Asst. Director (Lab), Textiles Committee, Jaipur.	Member	Textile testing
6.	Mr. Govind Prasad Asst. Director (EPQA), Textiles Committee, Mumbai	Member	Textile testing
7.	Mr.Venu B Quality Assurance Officer (Lab), Textiles Committee, Kochi	Member	Textile testing & Statistics
8.	Mrs. Sandhyarani Kamble Quality Assurance Officer (Lab) Textiles Committee, Mumbai	Member	Textile testing

The terms of reference of the Advisory Group were as follows:

- a) Planning requirements
- b) Identification and resolution of any difficulties expected in the preparation and maintenance of homogeneous proficiency test items, or in the provision of stable assigned value for a proficiency test item;
- c) Preparation of detailed instructions for participants
- d) Comments on any technical difficulties raised by participants
- e) Provision of advice in evaluating the performance of participants
- f) Comments on the results and performance of participants as a whole and, where appropriate, groups of participants or individual participants;
- g) Provision of advice for participants (within limits of confidentiality), either individually or within the report;
- h) Responding to feedback from participants; and
- i) Planning or participating in technical meetings with participants.
- j) Arbitration of any dispute(s) between participating laboratory(ies) and the PT provider.

The following documents pertaining to the PT Schemes, "Testing of Mechanical parameters in textile material - **TC/ILTS/MECH/20/2017-18** & **TC/ILTS/MECH/22/2017-18** and "Testing of Chemical parameters in textile material - **TC/ILTS/Chem/21/2017-18** & **TC/ILTS/Chem/23/2017-18** were vetted by the Advisory Group on 5th February 2019:

- (i) Draft Protocol incorporating test parameters covered, suggested test methods, participation fees payable, expected schedule of the scheme, etc
- (ii) Draft instructions to the participants
- (iii) Draft format for reporting the test results

Participants:

29 laboratories were participated in this scheme and the laboratories are accredited by the *National Accreditation Board for testing and calibration Laboratories (NABL)*, India

Proficiency Test Proceedings:

The laboratory of Textiles Committee (PT Provider), Mumbai, procured sufficient quantity of fabric (PT item) from a reputed textiles mill for designing and conducting Inter Laboratory Testing Scheme, on the basis of expected number of participants.

Population of PT items: On receipt of the procured materials, PT items meant for (i) homogeneity testing, (ii) stability testing, (iii) distribution among the participant laboratories, (iv) additional reserve samples for replacement in case of loss or damage, were prepared. While preparing the PT items for the above, it was ensured that the quantity of each PT item is adequate for the testing of all the parameters included in the scheme. The PT items thus prepared from the material procured were numbered serially. The prepared PT items were packed in polyethylene bags and labeled bearing the PT item identity such that the same are ready for dispatch. Thus a *finite population* of PT item was produced.

Sampling of PT items: Allotments of PT items were done by following appropriate Sampling procedures adopted by using Random Numbers generated by using computer. Sampling procedure for Homogeneity testing, Stability testing and for distribution among participant laboratories are provided in Table – 4:

Table – 4: Sampling procedure adopted for different purpose

1	Homogeneity testing,	<i>Systematic random sampling without replacement</i>
2	Stability Testing	<i>Systematic random sampling without replacement from the remaining population after homogeneity testing</i>
3	Distribution to participant laboratories	<i>Simple random sampling without replacement from the remaining population after homogeneity and stability testing.</i>

The remaining part of the population was kept as reserve for replacement in case of loss or damage. Henceforth, the allotted PT items can be referred as *sample*.

Homogeneity testing: To verify the homogeneity of the population of PT items homogeneity testing was conducted at the laboratory of Textiles Committee at Mumbai for all the test parameters covered in the scheme by adopting one of the suggested methods. However, while conducting performance evaluation of the participants, the “between- samples SD” calculated during homogeneity testing by a particular method was used for calculating “SD of PT assessment” for different methods adopted by the participants, as the inherent variation in the sample (degree of non homogeneity) is independent of the test method adopted. The procedure given in ISO 13528 was followed for conducting homogeneity testing.

The homogeneity of population was found to be satisfactory based on *analysis of variance* conducted on the test results obtained in homogeneity testing.

Stability testing: In order to verify the stability of the PT items, stability testing was conducted in accordance with ISO 13528, after the lapse of a week from the last date of conducting homogeneity testing. The stability was confirmed by testing the hypothesis that the difference between the average values obtained for each of the test parameters during homogeneity testing and stability testing were insignificant.

Estimation of Parameters: Population parameters viz., mean μ and standard deviation σ were estimated by using the results obtained in homogeneity and stability testing. Table - 5 consists of the estimates of population parameters.

Dispatch of PT items: The Proficiency Testing items were dispatched to the respective participant laboratories on 4th May 2018, along with the following:

- (a) Instructions to the participants in the Inter Laboratory Testing Scheme
- (b) Form for reporting test results by the participants in the Inter Laboratory Testing Scheme

The participant laboratories were requested to send the test results by 5th June 2018.

The participant laboratories were also requested to

- Treat the samples in the same manner as regularly tested samples and accordingly, codify the samples such that the technical staff testing them are not aware that they are meant for PT purposes;
- Adopt the latest test method which is routinely used by the laboratory for the testing of regular samples which may be any standard or validated in-house method;
- Forward (i) copy of the in-house method adopted (if applicable) for testing any parameter and also (ii) specify the standard method against which the validation has been done; and,
- Forward photo copy of NABL accreditation certificate as a proof of accreditation for the test method adopted (applicable to accredited laboratories only).

Table-5 : Estimates of population parameters

Estimates Summary

S.No	Test		Parameter	Estimation
1	Identification of Fibre		NA	NA
			NA	NA
			NA	NA
2	Percentage Composition of Fibers by Chemical Separation	Polyester	Population mean (μ) =	55.41
			Population SD (σ) =	0.84
			95% confidential limits for Population mean =	55.09 $\leq \mu \leq$ 55.74
		Viscose	Population mean (μ) =	18.95
			Population SD (σ) =	0.80
			95% confidential limits for Population mean =	18.64 $\leq \mu \leq$ 19.25
		Wool	Population mean (μ) =	25.64
			Population SD (σ) =	1.11
			95% confidential limits for Population mean =	25.22 $\leq \mu \leq$ 26.07
3	Identification of Fiber		NA	NA
			NA	NA
			NA	NA
4	Percentage Composition of Fibers by Physical Separation	Polyester	Population mean (μ) =	61.4
			Population SD (σ) =	0.93
			95% confidential limits for Population mean =	61.04 $\leq \mu \leq$ 61.76
		Cotton	Population mean (μ) =	38.6
			Population SD (σ) =	0.93
			95% confidential limits for Population mean =	38.24 $\leq \mu \leq$ 38.96
5	Water Soluble Matter		Population mean (μ) =	3.44
			Population SD (σ) =	0.58
			95% confidential limits for Population mean =	3.20 $\leq \mu \leq$ 3.69
6	Dimensional Changes to Soaking in Water		Population mean (μ) =	-3.25
			Population SD (σ) =	0.61
			95% confidential limits for Population mean =	-3.49 $\leq \mu \leq$ -3.00
7	Dimensional Changes to Laundering		Population mean (μ) =	-5.71
			Population SD (σ) =	1.12
			95% confidential limits for Population mean =	-6.19 $\leq \mu \leq$ -5.23
8	pH of aqueous extract		Population mean (μ) =	7.10
			Population SD (σ) =	0.31
			95% confidential limits for Population mean =	6.98 $\leq \mu \leq$ 7.22

The participant laboratories were informed that, in the absence of proof of accreditation, the laboratory's value will not be considered for arriving at "Assigned Value" for the concerned test parameter, although, performance of the laboratory will be evaluated for this parameter. Further, it was also informed that the test results that may be inappropriate for statistical evaluation, for example, gross errors, miscalculations and transpositions may be excluded for calculation of summary statistics and performance evaluation of participants.

 **Compilation of the Test Results:**

In order to maintain the confidentiality of the participants of the PT Scheme, the individual participant laboratories were given Code numbers which are generated by using computer. Subsequently, the test results reported by the participant laboratories were tabulated and statistically analyzed for the basic statistics viz., Mean, Median, Mode, Maximum, Minimum, Standard Deviation, etc., While doing so, test results that were found to be inappropriate for statistical evaluation, for example, **gross errors, miscalculations and transpositions** were excluded.

The list of such exclusions is placed in Table – 6.

Table 6: Details of Exclusions of Test Results from Analysis (Gross Error)

S.No	Test	Assigned Value	Result Reported by the participant	Lab Code
1	Percentage composition of Fibre by Chemical Separation (3 Component)	Polyester- 55.5 Viscose- 19.0 Wool- 25.4	Acrylic- 51.4 Viscose- 18.8 Wool- 29.8	43
2	Percentage composition of Fibre by Physical Separation (2 Component)	Polyester- 61.5 Cotton- 38.5	Polyester- 63.33 Viscose- 36.67	44

The Laboratory Code No 43 had wrongly identified the fibre content of the sample No - 03 as Wool, Viscose and Acrylic where as the assigned value of the proficiency testing is Polyester, Viscose and Wool. Hence Lab code **43** was excluded from considering for percentage composition by chemical separation.

The Laboratory Code NO 44 had wrongly identified the fibre of the sample No- 02 as Polyester and Viscose where as the assigned value of the proficiency testing is Polyester and Cotton. Hence Lab code **44** was excluded from considering for percentage composition by Physical separation.

 **Determination Assigned Value:**

To ensure the measurement traceability, only **accredited laboratories** are considered for evaluating the Assigned Values. Thus due weightage is given to the accredited laboratories. However, this weightage is given only when the laboratory has submitted their Scope of accreditation and accredited for the specific test in which the ILPT is conducted.

Initially, the robust average and the standard deviation of values reported by the accredited laboratories (in respective tests) were determined for each parameter in accordance with the procedure given in ISO 13528. Subsequently, robust Z Score were calculated on the basis of the above. The test results of those laboratories which were found to be outliers (Z score more than +3 or less than -3) were deleted and Robust Average of the remaining expert laboratories was again calculated. This Robust average is treated as the assigned value for the concerned parameter.

The Assigned Value of both the parameters thus arrived are given in **Table-7**.

Table 7: Assigned Values

S.No.	Test	Assigned Value		Robust SD of Assigned Value	Uncertainty of Assigned Value	No. of Accredited Laboratories contributed	Total number of participants *
1	Identification of Fibre (Chemical separation)	One Direction- Polyester+ Wool		NA	NA	14	28
		Other Direction- Polyester +Viscose					
2	Percentage Composition of Fibers by Chemical Separation	Polyester	55.5	0.574	0.18	10	26
		Viscose	19.0	0.652	0.2	15	26
		Wool	25.4	0.815	0.14	13	26
3	Identification of Fiber (Physical separation)	One Direction- Polyester		NA	NA	17	29
		Other Direction- Cotton					
4	Percentage Composition of Fibers by Physical Separation	Polyester	61.5	1.0	0.23	17	26
		Cotton	38.5	1.0	0.23	17	26
5	Water Soluble Matter	3.56		0.35	0.09	11	22
6	Dimensional Changes to Soaking in Water	-3.37		0.12	0.036	12	24
7	Dimensional Changes to Laundering	-5.32		0.747	0.8	13	21
8	pH of aqueous extract	7.14		0.287	0.07	21	29

 **Determination of Standard Deviation for Proficiency Assessment (σ):**

The robust average and the robust standard deviation (σ_1) of all qualified values reported by the participant laboratories were calculated for each of the test separately in accordance with the procedure given in ISO 13528. Subsequently, the “between-samples standard deviation (S_s)” of homogeneity testing data was compared with the standard deviation of all the participants. If $S_s \leq 0.3 \sigma_1$, then the sample is considered as homogeneous and the robust standard deviation of all the participant laboratories is treated as Standard Deviation for Proficiency Testing. That is $\sigma = \sigma_1$.

If $S_s > 0.3 \sigma_1$, then the sample is considered as heterogeneous and Standard Deviation for Proficiency Assessment is calculated by adding allowance for heterogeneity of the sample as stipulated in ISO 13528, by using the formula

$$\sigma = \sqrt{\sigma_1^2 + S_s^2}$$

 **Performance Evaluation of Participants:**

The performance of the individual laboratory was evaluated by adopting Robust Z score technique given in ISO 13528, as per the following formula:

$$Z = \frac{x - X}{\sigma}$$

where x is the test result reported by the individual laboratory; X is the Assigned Value and σ is the standard deviation of the Proficiency Assessment.

In case of Subjective test the deviation of laboratory result by more than ½ grade compared to Assigned Value is taken as unsatisfactory (and outliers) and all other results are taken as satisfactory.

Interpretation of Performance comment:

Table – 8: Interpretation of Performance comment

Range	Performance of Laboratory
Objective Tests	
$ Z - \text{Score} \leq 2$	Satisfactory
$2 < Z - \text{Score} \leq 3$	Straggler
$ Z - \text{Score} > 3$	Outlier
Subjective Test	
$ \text{Reported Value} - \text{Assigned Value} \leq \frac{1}{2} \text{ grade}$	Satisfactory
$ \text{Reported Value} - \text{Assigned Value} > \frac{1}{2} \text{ grade}$	Outlier

Outliers and Stragglers:

Overall performance of all the laboratories is good. Outliers and Stragglers are very rare and far. The Outlier and Straggler Analysis is given in Table – 9.

Table – 9: Outlier and Straggler Analysis

S. No	Test	No. of Labs Participated*	Valid Results	No. of Stragglers	% of Stragglers	No. of Outliers	% of Outliers	
1	Identification of Fibre (Chemical separation)	28	28	0	0	3	10.7	
2	Percentage Composition of Fibers by Chemical Separation	Polyester	27	26	3	11.5	1	3.8
		Viscose	27	26	1	3.8	1	3.8
		Wool	27	26	1	3.8	1	3.8
3	Identification of Fiber (Physical separation)	29	29	0	0	2	6.9	
4	Percentage Composition of Fibers by Physical Separation	Polyester	26	26	0	0	0	0
		Cotton	26	26	0	0	0	0
5	Water Soluble Matter	22	22	2	9.1	0	0	
6	Dimensional Changes to Soaking in Water	24	24	2	8.3	1	4.2	
7	Dimensional Changes to Laundering	21	21	2	9.5	0	0	
8	pH of aqueous extract	29	29	1	3.4	0	0	
Total		286	283	12	4.2	9	3.2	

Parameter-wise the outliers and stragglers are listed below:

Table – 10: List of Outliers and Stragglers

S. No	Test	Straggler Lab codes	Outlier Lab codes
1	Identification of Fibre (Chemical separation)	--	24, 44, 43
2	Percentage Composition of Fibers by Chemical Separation	Polyester	24, 33, 47
		Viscose	33
		Wool	26
5	Identification of Fiber (Physical separation)	--	24, 44
4	Percentage Composition of Fibers by Physical Separation	Polyester	--
		Cotton	-
5	Water Soluble Matter	26, 10	--
6	Dimensional Changes to Soaking in Water	13, 36	33
7	Dimensional Changes to Laundering	49, 43	--
8	pH of aqueous extract	42	--

General|Advise to the Laboratories on the performance:

If the laboratory is found to be “**Outlier**”, necessary corrective action should be taken after thorough investigation of the root cause of the problem. In case the laboratory is found to be “**Straggler**”, the method of testing, personnel error, use of correct materials / equipment, maintenance of environmental conditions etc., have to be re-examined to ensure that the test results being reported for the concerned test parameters are satisfactory.

PERFORMANCE EVALUATION OF EACH LABORATORY- TEST WISE

1. IDENTIFICATION OF FIBER – 3 COMPONENT

Lab code	Reported value	Test method adopted	Performance Remark
13	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory
36	One Direction- Polyester+ Viscose Other Direction-Polyester+ Wool	IS 667 1981	Satisfactory
24	One Direction- Polyester, Viscose& Wool Other Direction- Polyester, Viscose& Wool	IS 667 1981	Outlier
33	One Direction- Polyester & Wool Other Direction-Polyester & Viscose	IS 667 1981	Satisfactory
17	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory
47	One Direction- Polyester+ Viscose Other Direction- Polyester+ Wool Polyester+ Viscose	IS 667 1981	Satisfactory
44	One Direction- Polyester Other Direction- Viscose Wool	IS 667 1981	Outlier
38	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory
43	One Direction- Wool & Acrylic Other Direction- Viscose & Acrylic	IS 667 1981	Outlier
26	One Direction- Polyester+ Viscose Other Direction-Polyester+ Wool	IS 667 1981	Satisfactory
10	One Direction- Polyester+ Viscose Other Direction-Polyester+ Wool	IS 667 1981	Satisfactory
29	One Direction- Polyester+ Viscose Other Direction-Polyester+ Wool	IS 667 1981	Satisfactory
15	One Direction- Polyester / Wool Other Direction-Polyester / Viscose	IS 667 1981	Satisfactory
42	One Direction- Polyester / Wool Other Direction-Polyester / Viscose	IS 667 1981	Satisfactory
46	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory
39	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory
30	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory
16	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory
22	One Direction- Polyester+ Viscose Other Direction-Polyester+ Wool	IS 667 1981	Satisfactory
21	One Direction- Polyester+ Viscose Other Direction-Polyester+ Wool	IS 667 1981	Satisfactory
31	One Direction- Polyester+ Viscose Other Direction-Polyester+ Wool	IS 667 1981	Satisfactory
37	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory
40	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory

23	One Direction- Polyester+ Viscose Other Direction-Polyester+ Wool	IS 667 1981	Satisfactory
18	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory
27	One Direction- Polyester+ Viscose Other Direction-Polyester+ Wool	IS 667 1981	Satisfactory
32	One Direction- Polyester+ Wool Other Direction-Polyester+ Viscose	IS 667 1981	Satisfactory
19	One Direction- Polyester+ Viscose Other Direction-Polyester+ Wool	IS 667 1981	Satisfactory
No. of participants	28		

SUMMARY

Assigned Value	One Direction- Polyester + Viscose Other Direction- Polyester + Wool
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2a. Percentage Composition by chemical separation- Polyester

Lab code	Reported value (%)	Test method adopted	Z- Score	Performance Remark
13	53.5	IS 2006& IS 3416 1988	-3.135	Outlier
36	55.5	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.000	Satisfactory
24	57		2.351	Straggler
33	57.2	IS 2006 1988 (RA 2013) & IS 1889 -1 1976 RA 2016)	2.665	Straggler
17	55.8	IS 6503 1988	0.470	Satisfactory
47	53.9	IS 2006 1988 (RA 2013)& IS 3416-1 1988 (RA 2013)	-2.508	Straggler
38	55.1		-0.627	Satisfactory
26	55	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.784	Satisfactory
10	54.4	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-1.724	Satisfactory
29	55.4	AATCC 20A 2014	-0.157	Satisfactory
15	55.4	IS 6503 1988	-0.157	Satisfactory
42	56.6	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	1.724	Satisfactory
46	54.6	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-1.411	Satisfactory
39	56.6		1.724	Satisfactory
30	55		-0.784	Satisfactory
16	55.5	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.000	Satisfactory
22	55.5	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.000	Satisfactory
21	55.4	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.157	Satisfactory
31	55.6		0.157	Satisfactory
37	55.6		0.157	Satisfactory
40	54.8	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-1.097	Satisfactory
23	55.6		0.157	Satisfactory
18	55.7	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.313	Satisfactory
27	55.2	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.470	Satisfactory

32	55	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.784	Satisfactory
19	55.8	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.470	Satisfactory
No. of participants	26			
Maximum	57.2			
Minimum	53.5			
Mean	55.4			
Std Deviation	0.84			
Median	55.4			

SUMMARY

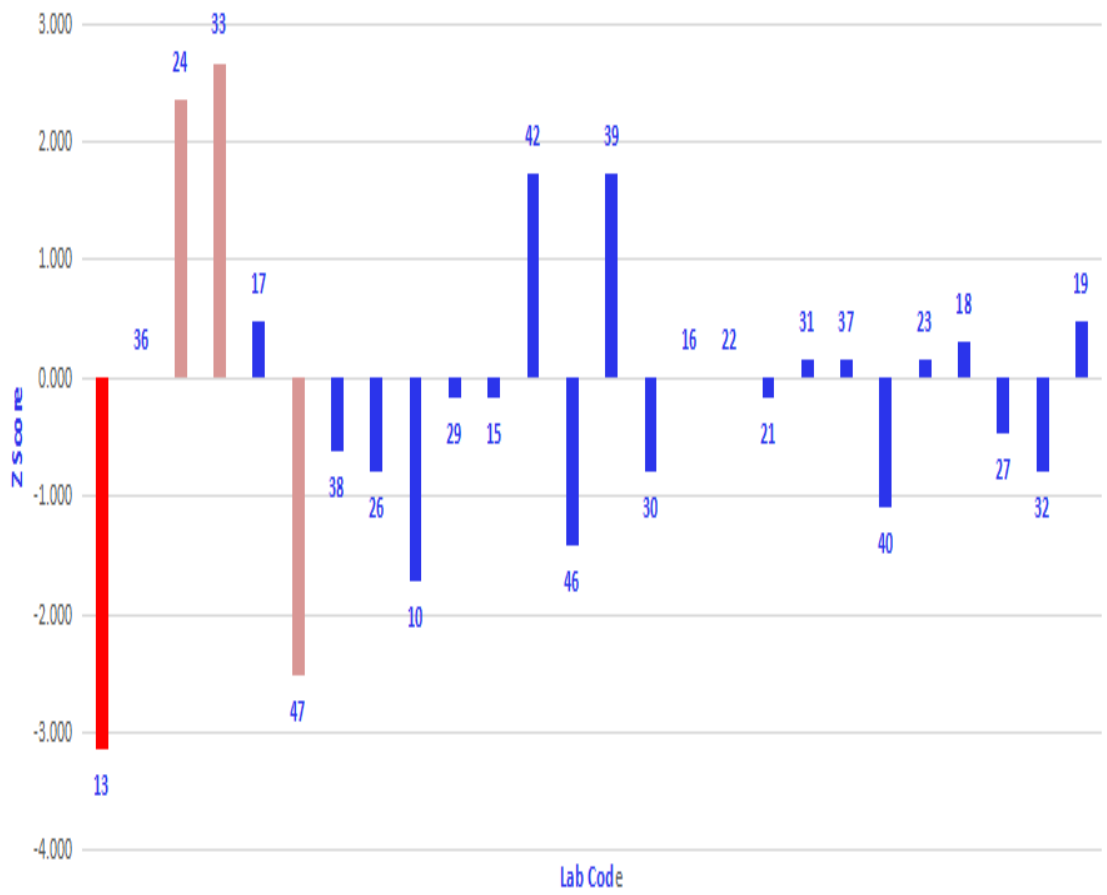
Robust Average (%) =	55.5
Robust SD for all valid participants (σ_1) =	0.574

Between sample SD of Homogeneity testing (S_s) =	0.278
SD for PT Scheme with allowance for the heterogeneity if any (σ) =	0.638

Heterogeneity observed

Assigned Value (X) =	55.5
SD of PT Scheme (σ) =	0.638

Chemical Composition 3 component Polyester



2b. Percentage Composition by chemical separation- Viscose

Lab code	Reported value (%)	Test method adopted	Z- Score	Performance Remark
13	17.7	IS 2006& IS 3416 1988	-1.740	Satisfactory
36	19.7	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.937	Satisfactory
24	18		-1.339	Satisfactory
33	17.5	IS 2006 1988 (RA 2013) & IS 1889 -1 1976 RA 2016)	-2.008	Straggler
17	19.4	IS 6503 1988	0.535	Satisfactory
47	19.5	IS 2006 1988 (RA 2013)& IS 3416-1 1988 (RA 2013)	0.669	Satisfactory
38	19		0.000	Satisfactory
26	16.6	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-3.213	Outlier
10	19	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.000	Satisfactory
29	19	AATCC 20A 2014	0.000	Satisfactory
15	19	IS 6503 1988	0.000	Satisfactory
42	19.6	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.803	Satisfactory
46	20.3	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	1.740	Satisfactory
39	19		0.000	Satisfactory
30	18.8		-0.268	Satisfactory
16	19.1	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.134	Satisfactory
22	19.5	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.669	Satisfactory
21	18.7	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.402	Satisfactory
31	19.7		0.937	Satisfactory
37	19.5		0.669	Satisfactory
40	19.4	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.535	Satisfactory
23	18.3		-0.937	Satisfactory
18	19.5	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.669	Satisfactory
27	19.4	IS 2006 1988 (RA	0.535	Satisfactory

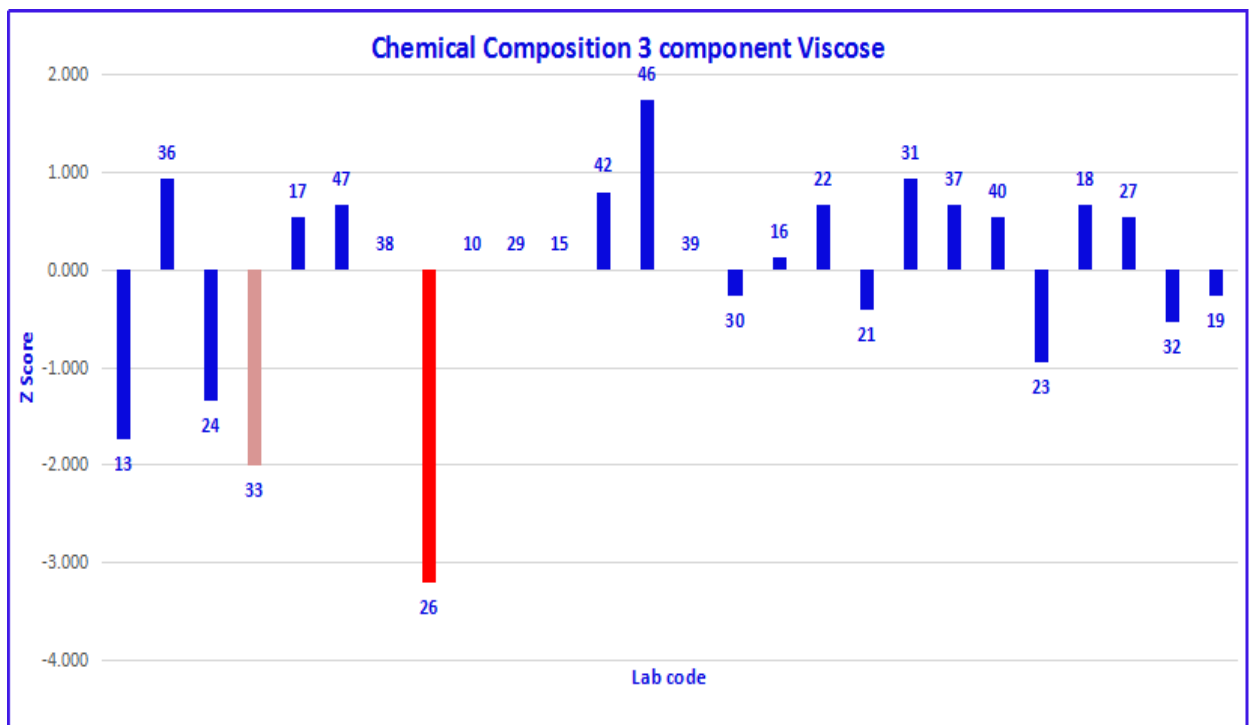
		2003)& IS 3416-1 1988 (RA 2003)		
32	18.6	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.535	Satisfactory
19	18.8	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.268	Satisfactory
No. of participants	26			
Maximum	20.3			
Minimum	16.6			
Mean	18.9			
Std Deviation	0.8			
Median	19.0			

SUMMARY

Robust Average (%) =	19.0
Robust SD for all valid participants (σ_1) =	0.652
Between sample SD of Homogeneity testing (S_s) =	0.37
SD for PT Scheme with allowance for the heterogeneity if any (σ) =	0.747

Heterogeneity observed

Assigned Value (X) =	19.0
SD of PT Scheme (σ) =	0.747



2c. Percentage Composition by chemical separation- Wool

Lab code	Reported value (%)	Test method adopted	Z- Score	Performance Remark
13	28.8	IS 2006& IS 3416 1988	3.301	Outlier
36	24.8	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.583	Satisfactory
24	25		-0.388	Satisfactory
33	25.3	IS 2006 1988 (RA 2013) & IS 1889 -1 1976 RA 2016)	-0.097	Satisfactory
17	24.8	IS 6503 1988	-0.583	Satisfactory
47	26.6	IS 2006 1988 (RA 2013)& IS 3416-1 1988 (RA 2013)	1.165	Satisfactory
38	25.9		0.485	Satisfactory
26	28.4	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	2.913	Straggler
10	26.6	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	1.165	Satisfactory
29	25.6	AATCC 20A 2014	0.194	Satisfactory
15	25.6	IS 6503 1988	0.194	Satisfactory
42	23.8	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-1.553	Satisfactory
46	25.1	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.291	Satisfactory
39	24.4		-0.971	Satisfactory
30	26.2		0.777	Satisfactory
16	25.4	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.000	Satisfactory
22	25	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.388	Satisfactory
21	25.9	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.485	Satisfactory
31	24.7		-0.680	Satisfactory
37	24.9		-0.485	Satisfactory
40	25.8	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.388	Satisfactory
23	26.1		0.680	Satisfactory
18	24.8	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	-0.583	Satisfactory
27	25.4	IS 2006 1988 (RA	0.000	Satisfactory

		2003)& IS 3416-1 1988 (RA 2003)		
32	26.4	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.971	Satisfactory
19	25.4	IS 2006 1988 (RA 2003)& IS 3416-1 1988 (RA 2003)	0.000	Satisfactory
No. of participants	26			
Maximum	28.8			
Minimum	23.8			
Mean	25.6			
Std Deviation	1.11			
Median	25.4			

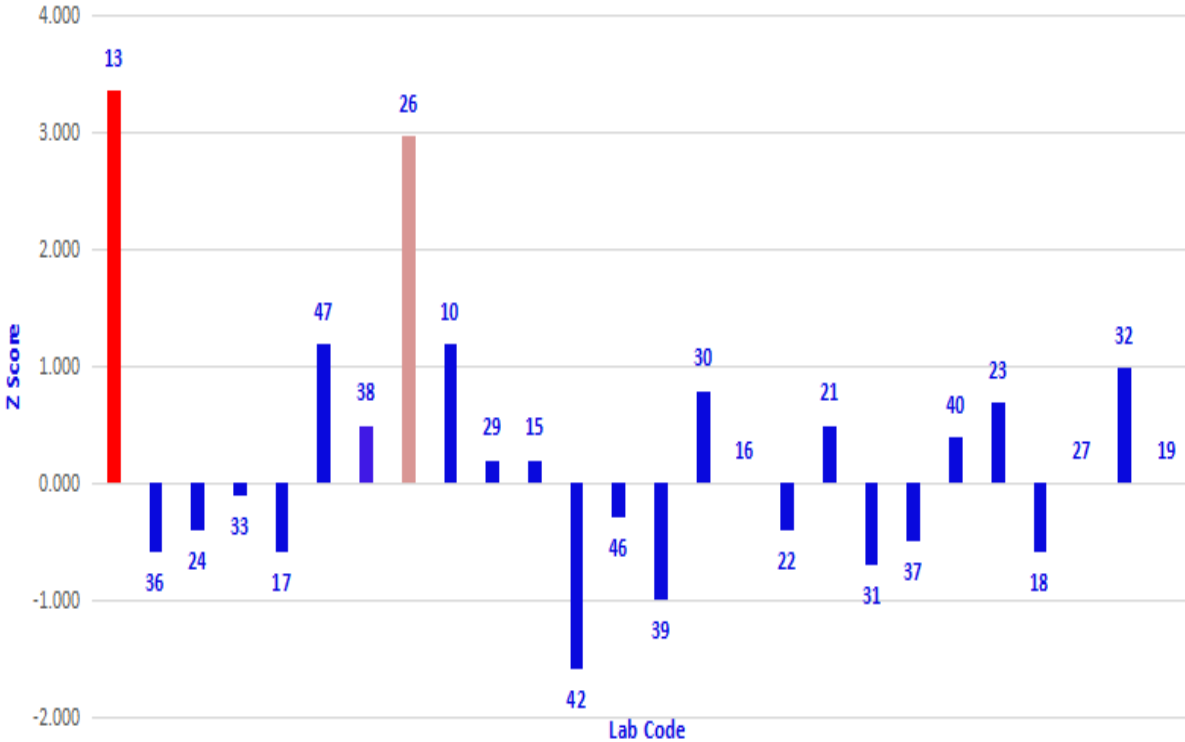
SUMMARY

Robust Average (%) =	19.0
Robust SD for all valid participants (σ_1) =	0.815
Between sample SD of Homogeneity testing (S_s) =	0.37
SD for PT Scheme with allowance for the heterogeneity if any (σ) =	1.03

Heterogeneity observed

Assigned Value (X) =	19.0
SD of PT Scheme (σ) =	1.03

Chemical Composition 3 component Wool



3. IDENTIFICATION OF FIBER – 2 COMPONENT

Lab code	Reported value (%)	Test method adopted	Performance Remark
13	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
36	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
24	One Direction- Polyester and Cotton Other Direction- Polyester and Cotton	IS 667 1981	Outlier
49	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
33	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
17	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
47	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
44	One Direction- Polyester Other Direction- Viscose	IS 667 1981	Outlier
38	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
43	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
26	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
10	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
29	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2014	Satisfactory
15	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
42	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
46	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
39	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
30	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
16	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
22	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
21	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
31	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
37	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
40	One Direction- Polyester	IS 667 1981	Satisfactory

	Other Direction- Cotton		
23	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
18	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
27	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
32	One Direction- Polyester Other Direction- Cotton	IS 667 1981	Satisfactory
19	One Direction- Polyester Other Direction- Cotton	AATCC TM 20 2013	Satisfactory
No. of participants	29		

SUMMARY

Assigned Value	One Direction- Polyester Other Direction- Cotton
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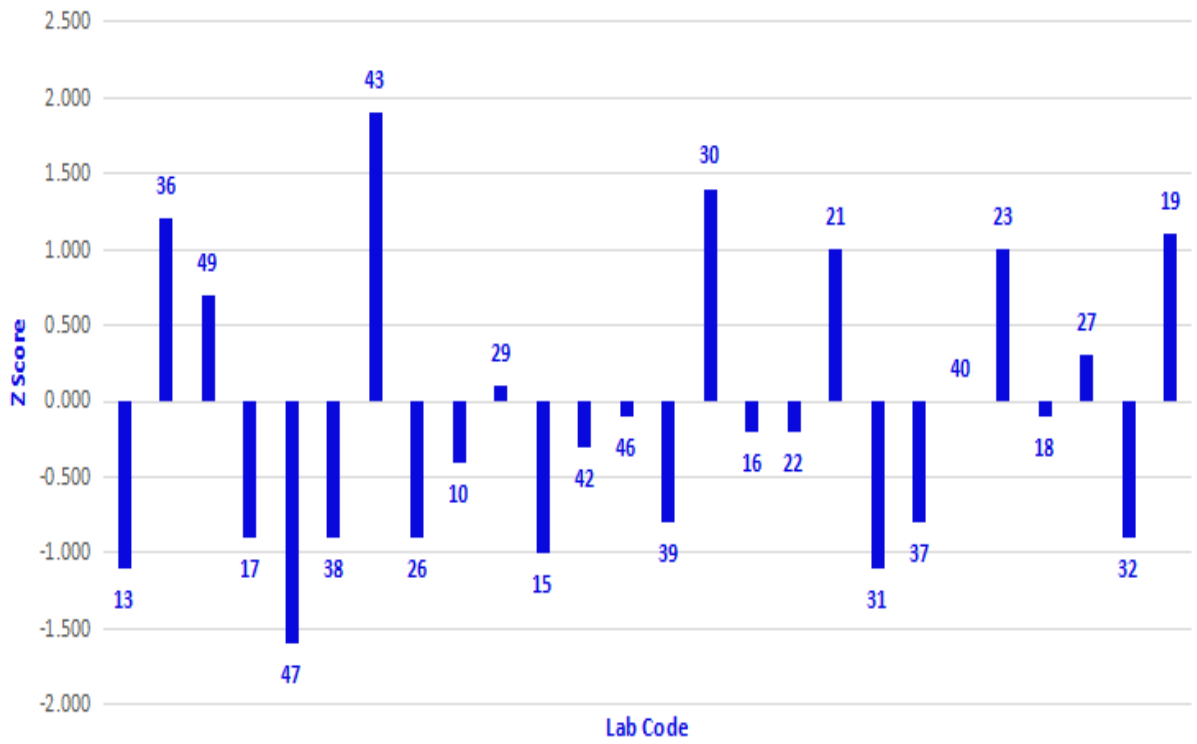
4a. Percentage Composition by Physical separation- Polyester				
Lab code	Reported value (%)	Test method adopted	Z- Score	Performance Remark
13	60.4	AATCC 20A	-1.100	Satisfactory
36	62.7	AATCC 20A 2014	1.200	Satisfactory
49	62.2	AATCC 20A 2017	0.700	Satisfactory
17	60.6	AATCC 20A 2018	-0.900	Satisfactory
47	59.9	AATCC 20A 2015	-1.600	Satisfactory
38	60.6		-0.900	Satisfactory
43	63.4	AATCC 20A 2017	1.900	Satisfactory
26	60.6	AATCC 20A 2014	-0.900	Satisfactory
10	61.1	AATCC 20A 2017	-0.400	Satisfactory
29	61.6	AATCC 20A 2014	0.100	Satisfactory
15	60.5	AATCC 20A 2017	-1.000	Satisfactory
42	61.2	AATCC 20A 2018	-0.300	Satisfactory
46	61.4	TC/LAB TM 14	-0.100	Satisfactory
39	60.7	AATCC 20A 2017	-0.800	Satisfactory
30	62.9	AATCC 20A 2014	1.400	Satisfactory
16	61.3	TC/LAB TM 15	-0.200	Satisfactory
22	61.3	TC/LAB TM 14	-0.200	Satisfactory
21	62.5	AATCC 20A	1.000	Satisfactory
31	60.4	TC/LAB TM 14	-1.100	Satisfactory
37	60.7	TC/LAB TM 15	-0.800	Satisfactory
40	61.5	TC/LAB TM 14	0.000	Satisfactory
23	62.5	AATCC 20A 2017	1.000	Satisfactory
18	61.4	TC/LAB TM 14	-0.100	Satisfactory
27	61.8	AATCC 20A 2017	0.300	Satisfactory
32	60.6	TC/LAB TM 15	-0.900	Satisfactory
19	62.6		1.100	Satisfactory
No. of participants	26			
Maximum	63.4			
Minimum	59.9			
Mean	61.4			
Std Deviation	0.93			
Median	61.3			

SUMMARY

Robust Average (%) =	61.5
Robust SD for all valid participants (σ_1) =	1.0
Between sample SD of Homogeneity testing (S_s) =	0.29
SD for PT Scheme with allowance for the heterogeneity if any (σ) =	1.0

No Heterogeneity observed	
Assigned Value (X) =	61.5
SD of PT Scheme (σ) =	1.0

Physical composition 2 component Polyester



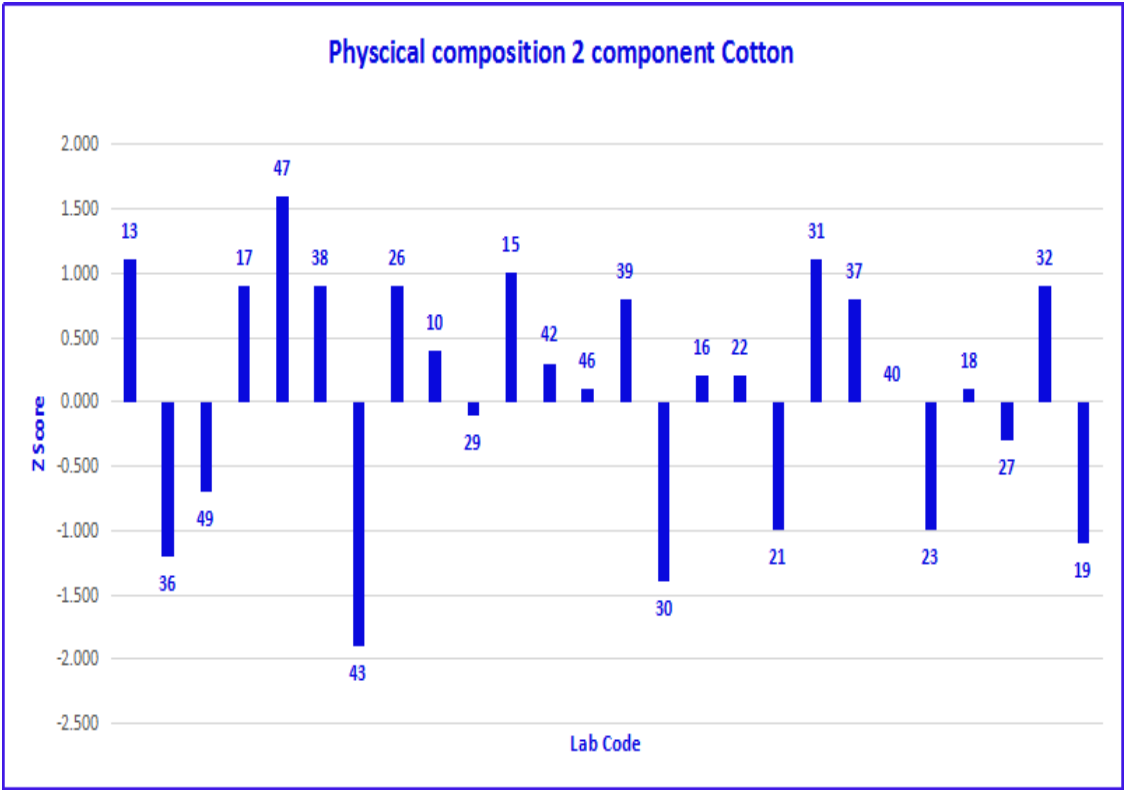
4b. Percentage Composition by Physical separation- Cotton

Lab code	Reported value (%)	Test method adopted	Z- Score	Performance Remark
13	39.6	AATCC 20A	1.100	Satisfactory
36	37.3	AATCC 20A 2014	-1.200	Satisfactory
49	37.8	AATCC 20A 2017	-0.700	Satisfactory
17	39.4	AATCC 20A 2018	0.900	Satisfactory
47	40.1	AATCC 20A 2015	1.600	Satisfactory
38	39.4		0.900	Satisfactory
43	36.6	AATCC 20A 2017	-1.900	Satisfactory
26	39.4	AATCC 20A 2014	0.900	Satisfactory
10	38.9	AATCC 20A 2017	0.400	Satisfactory
29	38.4	AATCC 20A 2014	-0.100	Satisfactory
15	39.5	AATCC 20A 2017	1.000	Satisfactory
42	38.8	AATCC 20A 2018	0.300	Satisfactory
46	38.6	TC/LAB TM 14	0.100	Satisfactory
39	39.3	AATCC 20A 2017	0.800	Satisfactory
30	37.1	AATCC 20A 2014	-1.400	Satisfactory
16	38.7	TC/LAB TM 15	0.200	Satisfactory
22	38.7	TC/LAB TM 14	0.200	Satisfactory
21	37.5	AATCC 20A	-1.000	Satisfactory
31	39.6	TC/LAB TM 14	1.100	Satisfactory
37	39.3	TC/LAB TM 15	0.800	Satisfactory
40	38.5	TC/LAB TM 14	0.000	Satisfactory
23	37.5	AATCC 20A 2017	-1.000	Satisfactory
18	38.6	TC/LAB TM 14	0.100	Satisfactory
27	38.2	AATCC 20A 2017	-0.300	Satisfactory
32	39.4	TC/LAB TM 15	0.900	Satisfactory
19	37.4		-1.100	Satisfactory
No. of participants	26			
Maximum	40.1			
Minimum	36.6			
Mean	38.6			
Std Deviation	0.93			
Median	38.7			

SUMMARY	
Robust Average (%) =	38.5
Robust SD for all valid participants (σ_1) =	1.0
Between sample SD of Homogeneity testing (S_S) =	0.29
SD for PT Scheme with allowance for the heterogeneity if any (σ) =	1.0

No Heterogeneity observed

Assigned Value (X) =	38.5
SD of PT Scheme (σ) =	1.0



5. Water Soluble Matter %

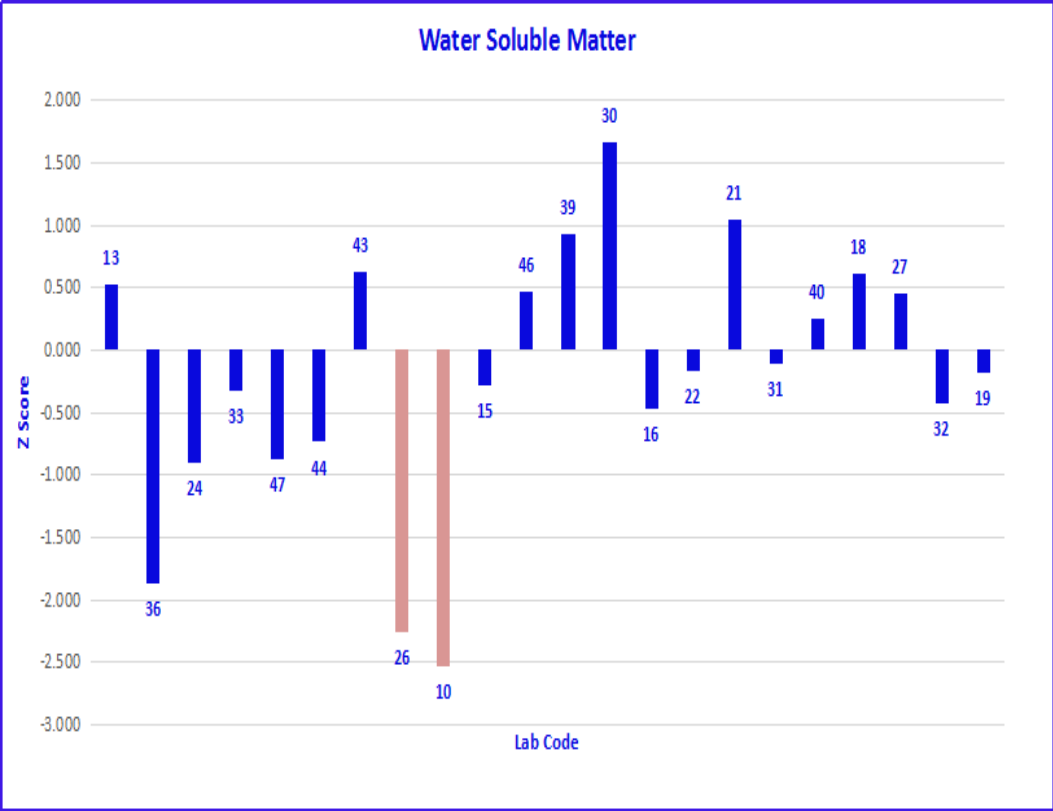
Lab code	Reported value (%)	Test method adopted	Z- Score	Performance Remark
13	3.85	IS 3456 1966 RA 2016	0.520	Satisfactory
36	2.52	IS 3456 1966 RA 2016	-1.864	Satisfactory
24	3.06	IS 3456 1966 RA 2016	-0.896	Satisfactory
33	3.38	IS 3456 1966 RA 2016	-0.323	Satisfactory
47	3.07	IS 3456 1966 RA 2016	-0.878	Satisfactory
44	3.15	IS 3456 1966 RA 2016	-0.735	Satisfactory
43	3.91	IS 3456 1966 RA 2016	0.627	Satisfactory
26	2.3	IS 3456 1966 RA 2016	-2.258	Straggler
10	2.15	IS 3456 1966 RA 2016	-2.527	Straggler
15	3.4	IS 3456 1966 RA 2016	-0.287	Satisfactory
46	3.82	IS 3456 1966 RA 2016	0.466	Satisfactory
39	4.08	IS 3456 1966 RA 2016	0.932	Satisfactory
30	4.49	IS 3456 1966 RA 2016	1.667	Satisfactory
16	3.3	IS 3456 1966 RA 2016	-0.466	Satisfactory
22	3.47	IS 3456 1966 RA 2016	-0.161	Satisfactory
21	4.14	IS 3456 1966 RA 2016	1.039	Satisfactory
31	3.5	IS 3456 1966 RA 2016	-0.108	Satisfactory
40	3.7	IS 3456 1966 RA 2016	0.251	Satisfactory
18	3.9	IS 3456 1966 RA 2016	0.609	Satisfactory
27	3.81	IS 3456 1966 RA 2016	0.448	Satisfactory
32	3.32	IS 3456 1966 RA 2016	-0.430	Satisfactory
19	3.46	IS 3456 1966 RA 2016	-0.179	Satisfactory
No. of participants	22			
Maximum	4.49			
Minimum	2.15			
Mean	3.4			
Std Deviation	0.58			
Median	3.46			

SUMMARY

Robust Average (%) =	3.56
Robust SD for all valid participants (σ_1) =	0.534
Between sample SD of Homogeneity testing (S_s) =	0.16
SD for PT Scheme with allowance for the heterogeneity if any (σ) =	0.558

Heterogeneity observed

Assigned Value (X) =	3.56
SD of PT Scheme (σ) =	0.558



6. Dimensional Changes to Soaking in water %

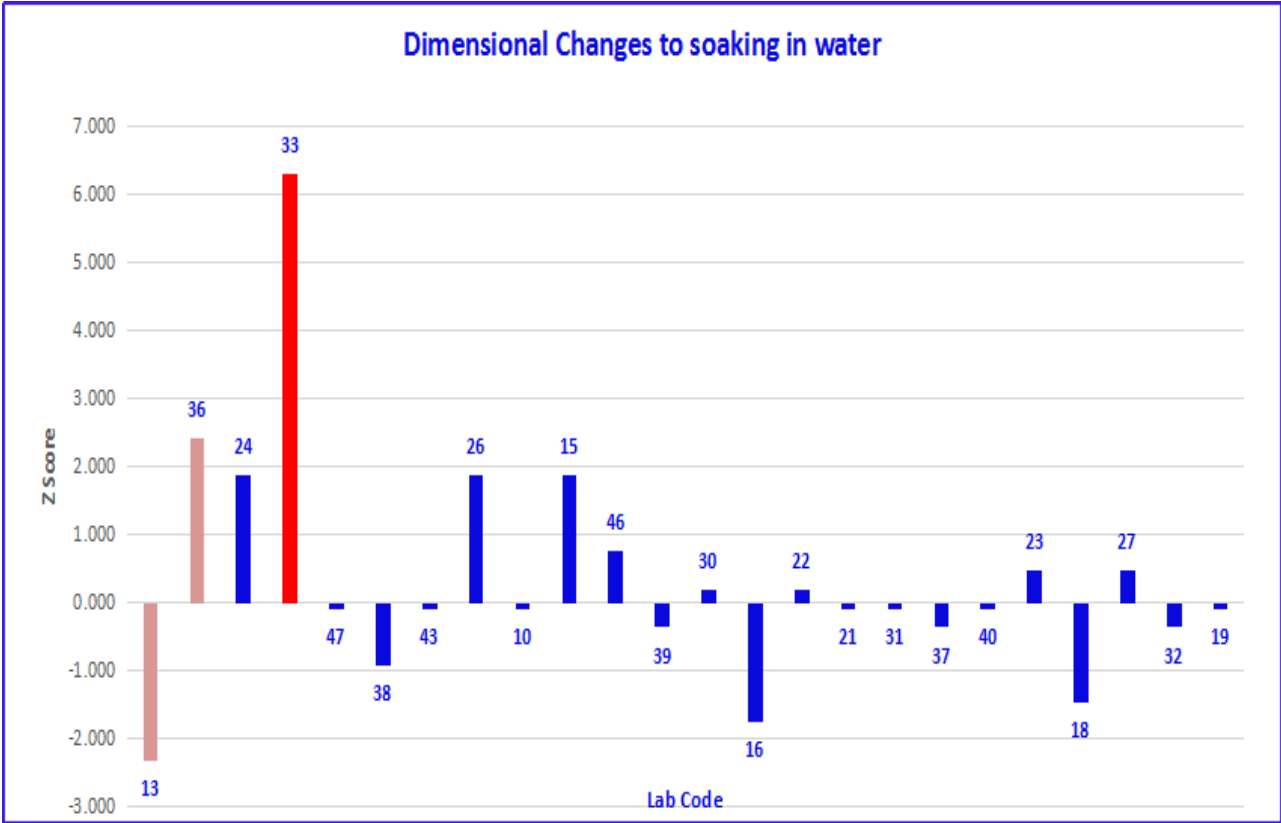
Lab code	Reported value (%)	Test method adopted	Z- Score	Performance Remark
13	-4.2	IS 2977 1989	-2.306	Straggler
36	-2.5	IS 2977 1989 RA 2016	2.417	Straggler
24	-2.7	IS 2977 1989	1.861	Satisfactory
33	-1.1	IS 2977 1989 RA 2016	6.306	Outlier
47	-3.4	IS 2977 1989 RA 2016	-0.083	Satisfactory
38	-3.7		-0.917	Satisfactory
43	-3.4	IS 2977 1989 RA 2016	-0.083	Satisfactory
26	-2.7	IS 2977 1989 RA 2016	1.861	Satisfactory
10	-3.4	IS 2977 1989 RA 2016	-0.083	Satisfactory
15	-2.7	IS 2977 1989 RA 2016	1.861	Satisfactory
46	-3.1	IS 2977 1989	0.750	Satisfactory
39	-3.5	IS 2977 1989 RA 2016	-0.361	Satisfactory
30	-3.3	IS 2977 1989 RA 2010	0.194	Satisfactory
16	-4	IS 2977 1989	-1.750	Satisfactory
22	-3.3	IS 2977 1989	0.194	Satisfactory
21	-3.4	IS 2977 1989	-0.083	Satisfactory
31	-3.4		-0.083	Satisfactory
37	-3.5	IS 2977 1989 RA 2016	-0.361	Satisfactory
40	-3.4	IS 2977 1989	-0.083	Satisfactory
23	-3.2	IS 2977 1989 RA 2016	0.472	Satisfactory
18	-3.9	IS 2977 1989 RA 2016	-1.472	Satisfactory
27	-3.2	IS 2977 1989 RA 2016	0.472	Satisfactory
32	-3.5	IS 2977 1989 RA 2016	-0.361	Satisfactory
19	-3.4	IS 2977 1989 RA 2016	-0.083	Satisfactory
No. of participants	24			
Maximum	-1.1			
Minimum	-4.2			
Mean	-3.2			
Std Deviation	0.61			
Median	-3.4			

SUMMARY

Robust Average (%) =	-3.37
Robust SD for all valid participants (σ_1) =	0.254
Between sample SD of Homogeneity testing (S_s) =	0.248
SD for PT Scheme with allowance for the heterogeneity if any (σ) =	0.36

Heterogeneity observed

Assigned Value (X) =	-3.37
SD of PT Scheme (σ) =	0.254



. Dimensional Changes to Laundering %

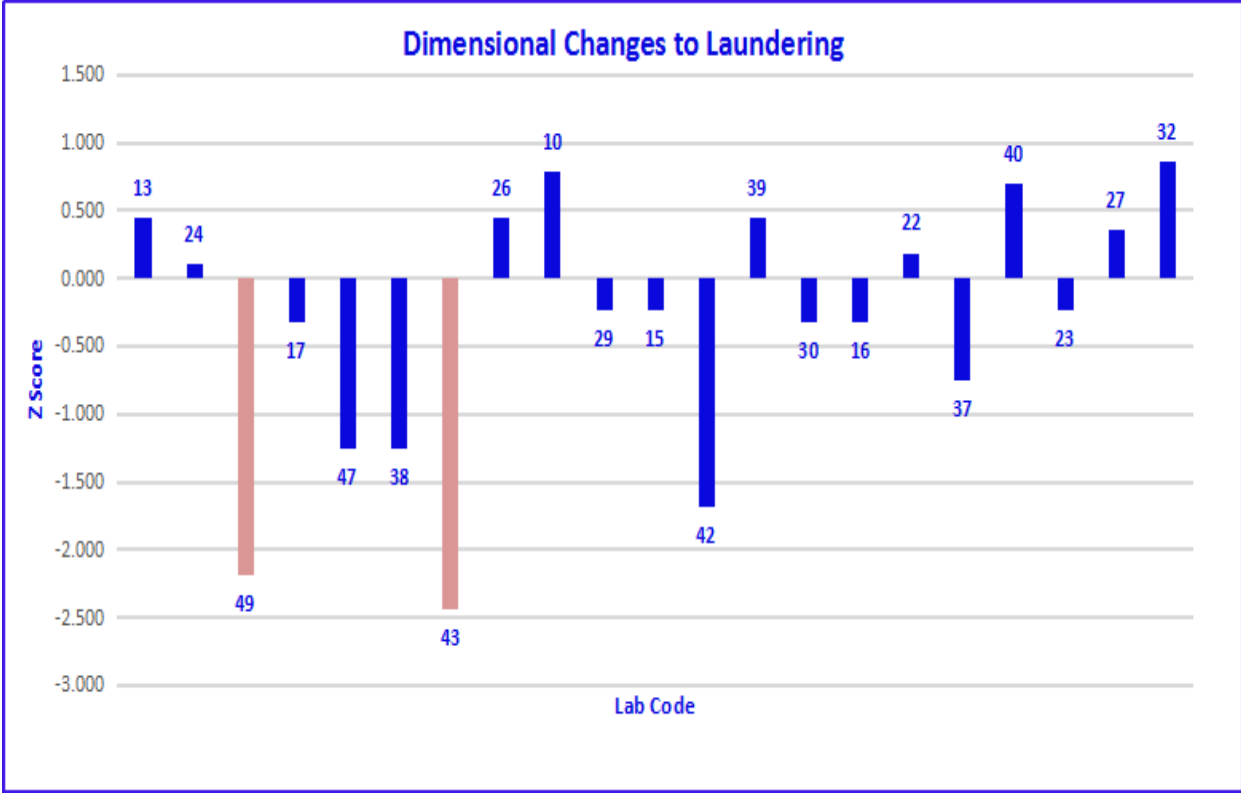
Lab code	Reported value (%)	Test method adopted	Z- Score	Performance Remark
13	-4.8	AATCC 135	0.441	Satisfactory
24	-5.2	AATCC 135	0.102	Satisfactory
49	-7.9	AATCC 135 2018	-2.186	Straggler
17	-5.7	AATCC 135 2018	-0.322	Satisfactory
47	-6.8	AATCC 135 2015	-1.254	Satisfactory
38	-6.8		-1.254	Satisfactory
43	-8.2	AATCC 135 2015	-2.441	Straggler
26	-4.8	AATCC 135 2018	0.441	Satisfactory
10	-4.4	AATCC 135 2018	0.780	Satisfactory
29	-5.6	AATCC 135 2015	-0.237	Satisfactory
15	-5.6	AATCC 135 2018	-0.237	Satisfactory
42	-7.3	AATCC 135 2018	-1.678	Satisfactory
39	-4.8	AATCC 135 2018	0.441	Satisfactory
30	-5.7	AATCC 135 2014	-0.322	Satisfactory
16	-5.7	AATCC 135 2014	-0.322	Satisfactory
22	-5.1	AATCC 135	0.186	Satisfactory
37	-6.2	AATCC 135	-0.746	Satisfactory
40	-4.5	AATCC 135	0.695	Satisfactory
23	-5.6		-0.237	Satisfactory
27	-4.9	AATCC 135 2018	0.356	Satisfactory
32	-4.3	AATCC 135 2018	0.864	Satisfactory
No. of participants	21			
Maximum	-4.3			
Minimum	-8.2			
Mean	-5.7			
Std Deviation	1.12			
Median	-5.6			

SUMMARY

Robust Average (%) =	-5.32
Robust SD for all valid participants (σ_1) =	1.107
Between sample SD of Homogeneity testing (S_s) =	0.41
SD for PT Scheme with allowance for the heterogeneity if any (σ) =	1.18

Heterogeneity observed

Assigned Value (X) =	-5.32
SD of PT Scheme (σ) =	1.18



8. pH of Aqueous extract (Cold Method)

Lab code	Reported value	Test method adopted	Z- Score	Performance Remark
13	6.69	IS 1390 1983	-1.480	Satisfactory
36	6.76	ISO 3071 2005	-1.250	Satisfactory
24	7.01	IS 1390 1983	-0.428	Satisfactory
49	6.56		-1.908	Satisfactory
33	7.47	IS 1390 1983	1.086	Satisfactory
17	7.04	ISO 3071 2005	-0.329	Satisfactory
47	6.93	IS 1390 1983	-0.691	Satisfactory
44	7.32	IS 1390 1983	0.592	Satisfactory
38	6.7		-1.447	Satisfactory
43	6.8	IS 1390 1983	-1.118	Satisfactory
26	6.58	ISO 3071 2005	-1.842	Satisfactory
10	7.07	IS 1390 1983	-0.230	Satisfactory
29	7.2	ISO 3071 2005	0.197	Satisfactory
15	7.3	ISO 3071 2005	0.526	Satisfactory
42	6.4	ISO 3071 2005	-2.434	Straggler
46	6.9	IS 1390 1983	-0.789	Satisfactory
39	7.24	IS 1390 1983	0.329	Satisfactory
30	7.64	IS 1390 1983	1.645	Satisfactory
16	6.76	IS 1390 1983	-1.250	Satisfactory
22	7.2	IS 1390 1983	0.197	Satisfactory
21	7.15	IS 1390 1983	0.033	Satisfactory
31	7.24	IS 1390 1983	0.329	Satisfactory
37	7.22	IS 1390 1983	0.263	Satisfactory
40	7.3	IS 1390 1983	0.526	Satisfactory
23	7.4	IS 1390 1983	0.855	Satisfactory
18	7.5	IS 1390 1983	1.184	Satisfactory
27	7.23	IS 1390 1983	0.296	Satisfactory
32	7.29	IS 1390 1983	0.493	Satisfactory
19	7.16	IS 1390 1983	0.066	Satisfactory
No. of participants	29			
Maximum	7.64			
Minimum	6.4			
Mean	7.1			
Std Deviation	0.31			
Median	7.16			

SUMMARY

Robust Average =	7.14
Robust SD for all valid participants (σ_1) =	0.271
Between sample SD of Homogeneity testing (S_s) =	0.138
SD for PT Scheme with allowance for the heterogeneity if any (σ) =	0.304

Heterogeneity observed

Assigned Value (X) =	7.14
SD of PT Scheme (σ) =	0.304

