Round Test 2017-2 on

stickiness characterization methods

- FINAL REPORT –

date: March 15, 2018

Stickiness Task Force of the ’International Committee on Cotton Testing Methods’ (ICCTM) of the ’International Textile Manufacturers Federation’ (ITMF)

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Round Test on stickiness characterization 2017-2 - FINAL REPORT -

Stickiness Task Force of the ’International Committee on Cotton Testing Methods’ (ICCTM) of the ’International Textile Manufacturers Federation’ (ITMF)
Introduction

Confidentiality and use of information from this report

This report is both public and confidential:

- It is public as it will be released on the internet website of the ITMF (www.itmf.org) without providing any private information.

- It also is confidential as we provide Participating Laboratories with their own confidential laboratory LabID code that gives access to understanding each piece of information of the report; indeed with this LabID code number, more information can be extracted from the report. Please note that this LabID will be changed for each test.

The Authors will not be held responsible to any degree for dissemination of the laboratory ID code number after the confidential distribution of their LabID code.

Preparation of cottons and samples

A range of three cottons was selected for their stickiness potential range as measured by SCT. Basically, the stickiness level of these cottons is not known a priori and their level will be better known after the test, respecting that these three cottons cover a range of stickiness.

All cottons in this test got a similar level of homogenization using an homogenizing machine developed during CFC/ICAC/33 project ‘CSITC’ project (so called CSITC homogenizing machine). The main goal of this preparation is to ensure that any drawn sample from the original mass would carry the “same” stickiness potential as any other sample for evaluating the laboratory performance, but without affecting too much the size of individual sticky points that could affect some measurement methods.

The degree of this preparation affects the distribution of sticky points within the mass of the fibers. When homogenization is ‘perfectly performed’, then the sticky point distribution follows Poisson’s distribution within the fibers; in other cases, sticky point distribution follows over-dispersed distributions, such as negative binomial distributions. In these conditions, many repetitions of measurements are required to statistically compare laboratory performances or method performances.

From the beginning, we knew that homogenizing some of the cottons would induce ‘preparation’, and this was several times reported to us with the results. However, this has been the only way to ensure that all samples would be alike for any given cotton in order to compare method performances or laboratory performances within methods.

Once the cottons were homogenized, samples were drawn from their original cotton mass, and ranges of cottons were constituted for each participating laboratory, whatever the method used. Envelopes were sent out to laboratories mid-December 2017.
All laboratories were supposed to send their results back by February 14, 2018. Practically, due to sample dispatch problems, an INTERIM REPORT was first prepared with results available at that date, and this FINAL REPORT is prepared after March 15 when most Laboratories who received the material lately (strike in Post services) sent back their results.

Organizing this round-test, at present running for free, takes time and uses precious materials; therefore we really appreciate when all registered Laboratory who receive RT samples provide us with results.

Organization of this report

As stated in the Contents,

• Individual results provided by Participating Laboratories are reported, cotton by cotton, sorted by method and then by LabID. A mail was sent out in a confidential manner to each participating laboratory for reading this public report, and therefore getting more out of it.

• Statistics are then presented in summary tables or in boxplot charts, cotton by cotton, sorted by method and then by LabID. This section allows the comparison of results by LabID within each method. Both the mean results and the variation of individual results are then highlighted.

• Correlation matrix are given for comparing LabID Mean results cotton by cotton, and sorted by method.

• Charts linking the within-laboratory variances of LabIDs for each method to the calculated mean results per LabID are displayed. Precision and accuracy of individual LabID performance can be deduced from these charts.

• Finally, distances between LabID mean result to the Grand Mean are displayed by method, sorted by method and by LabID.
Conversion of ‘laboratories raw records’ into numeric data for use in this report

Answers to this round-test were provided **freely** by laboratories in a table having 3 columns (one per cotton) and six lines (for potentially recording six results for each cotton) for a total of 18 table cells.

For comparing results between laboratories, results were expected to be reported in a coordinated and harmonized manner within each method. However, for this test also, laboratories reported results the way they probably are used to do in their every day practice: the observation is that the report was not always harmonized within methods (and we know that is is not harmonized between methods).

For allowing a comparison, we were obliged to convert some laboratory records into harmonized numeric values by applying the following rules. When Method was used in the RT, here are the applied conversions:

- For Benedict: grades were converted into numeric values as follows:
  - ‘none’: 0
  - ‘none to little’: 1
  - ‘little’: 2
  - ‘little to medium’: 3
  - ‘medium’: 4
  - ‘medium to high’: 5
  - ‘high’: 6.

- For Caramelization: one measurement = one cell. No transformation of the data.

- For Clinitest: >1: was converted into 1.5.

- For Contest: no transformation of the data.

- For Fibermap: one measurement = one cell. No transformation of the data.
- Contest and Fibermap are using the same technology (the following preliminary conversion rule according to the Manufacturer can be used to convert counts into ‘stickiness degrees’): this was not used in this report.
  - 0-50: No Stickiness,
  - 51-100: Low Stickiness,
  - 101-160: Medium Stickiness,
  - 161-250: High Stickiness,
  - 251-500: Very High Stickiness,
  - 500: Not Spinnable

- For H2SD: one measurement = one cell. No transformation of the data.

- For HSI-NIR: one measurement = one cell. No transformation of the data.

- For Kotiti: grades were converted into numeric values as follows:
- A: 0
- A+=B-= 1
- B: 2
- B+=C-= 3
- C: 4
- C+=D-= 5
- D: 6
- D+=E-= 7
- E: 8
- E+: 9.

- For minicard: ITMF grades 0 to 3 were used for reporting, one measurement = one cell. No transformation of the data.

- For SCT: one measurement = one record = reading of top foil + reading of bottom foil (could reduce the number of recorded cells when needed).
All results per Method and LabID for cottons A, B and C

All results for cotton A

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Footnote

1. RStudio: Version 1.1.419.
2. R : version 3.4.3 (2017-11-30).
4. Results sorted by Method and then by LabID.
5. NA or NaN : no results provided.
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* Var=variance taking care of all available readings per LabID (NA excluded).
* CV = CV between reading per LabID expressed in percent.
* GMean = Grand Mean of all laboratory means, calculated by Method.
* Delta = LabID Mean - GMean.
* NA or NaN : no results provided.
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## Means, variances, CV%, Grand Mean and Delta per Method and LabID for cotton C

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Data presented by boxplots per Method, LabID for cottons A, B and C

Boxplots per Method and LabID for cotton A

Footnote
* NA excluded.
* In each box, the bolded line represents the median of all individual results for the considered LabID.
* The square represents the upper 75% (Q75) and lower 25% (Q25) percentiles of the individual results.
* The whiskers represent the quantiles that included in +/- 1.5 * (Q75-Q25).
* Extreme points may additionally be displayed by a X further out from the whiskers.
Cotton = A
Method = Fibermap
Cotton = A
Method = GB/T13785−1992

GB/T13785−1992 (Color degree)

LabID

0 1 2 3 4 5
Cotton = A
Method = H2SD
Cotton = A
Method = HSI−NIR
Cotton = A
Method = KOTITI

KOTITI (Kotiti grade)
Cotton = A
Method = Minicard
Cotton = A
Method = Quantitative method

LabID
Quantitative method (Percent)
Cotton = A
Method = Reactive Spray
Cotton = A
Method = SCT
Boxplots per Method and LabID for cotton B

Cotton = B
Method = Caramelization
Cotton = B
Method = Clinitest
Cotton = B
Method = Contest
Cotton = B
Method = Fibermap
Cotton = B
Method = GB/T13785−1992
Cotton = B
Method = HSI–NIR
Cotton = B
Method = KOTITI

KOTITI (Koti grade)

LabID
Cotton = B
Method = Minicard
Cotton = B
Method = Quantitative method
Cotton = B
Method = Reactive Spray
Cotton = B
Method = SCT
Boxplots per Method and LabID for cotton C

Cotton = C
Method = Caramelization

LabID

Caramelization (Color degree)
Cotton = C
Method = Clinitest
Cotton = C
Method = Contest

LabID

Contest (Contest grade)

C

Method = Contest
Cotton = C
Method = GB/T13785–1992
Cotton = C
Method = H2SD

H2SD (Sticky points) vs. LabID
Cotton = C
Method = HSI–NIR
Cotton = C
Method = KOTITI
Cotton = C
Method = Minicard
Cotton = C
Method = Quantitative method
Cotton = C
Method = Reactive Spray
Cotton = C
Method = SCT
Charts of individual readings per Method and LabID for cottons A, B and C.

Individual readings per LabID with Method = Caramelization

Footnote:
* NA excluded
* In the contrary to other charts, LabID are given in the abscissa axis at the bottom of the chart in the following charts.
* Black dashed line = Method GrandMean per cotton A, B, or C.
* Red + = Laboratory mean for the given method and for the given cotton.
* Black x = Laboratory individual reading for the given method and for the given cotton.
Individual readings per LabID with Method = Clinitest

LabID (Color Chart)

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190

0
1
2
3
0
1
2
3

LabID

0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190

0
1
2
3
0
1
2
3

LabID
Individual readings per LabID with Method = Contest

LabID
Contest  ( Contest grade )
Individual readings per LabID with Method = Contest

LabID
Contest  ( Contest grade )
Individual readings per LabID with Method = Contest

LabID
Contest  ( Contest grade )
Individual readings per LabID with Method = Contest

53
Individual readings per LabID with Method = Fibermap

LabID
Fibermap  (Fibermap grade)
Individual readings per LabID with Method = Fibermap

LabID
Individual readings per LabID with Method = GB/T13785−1992

LabID

GB/T13785−1992 (Color degree)
Individual readings per LabID with Method = H2SD
Individual readings per LabID with Method = HSI–NIR

LabID
HSI−NIR  (Sticky points)
Individual readings per LabID with Method = HSI−NIR
Individual readings per LabID with Method = KOTITI

LabID

KOTITI (Kotiti grade)

Individual readings per LabID with Method = KOTITI

KOTITI (Kotiti grade)
Individual readings per LabID with Method = Minicard
Individual readings per LabID with Method = Quantitative method

LabID

Quantitative method (Percent)
Individual readings per LabID with Method = Reactive Spray

LabID
Reactive Spray (Spray Grade)
Individual readings per LabID with Method = Reactive Spray

LabID
Reactive Spray (Spray Grade)
Individual readings per LabID with Method = SCT
Correlation charts and correlation values between LabID using a same Method for for cottons A, B and C.  

Correlations between instruments for Method = Caramelization

* A correlation matrix of charts is provided only when two or more instruments were used for a given method.  
* Based on Means of available results (NA excluded)  
* Points in red for Cotton A, points in green for Cotton B, points in blue for Cotton C.  
* The lower left corner of the matrix provides the correlation charts, while the upper right corner of the matrix provides the corresponding raw correlation coefficients. Higher the correlation coefficient, larger the font size of the corresponding text.
Correlations between instruments for Method = Contest

1.00
1.00
0.99
120
Correlations between instruments for Method = Fibermap

- 75
- 1.00
- NA
- 1.00
- 90
- NA
- 1.00
- 125
Correlations between instruments for Method = Minicard

5 | 0.88 | 0.76 | 0.85

20 | 0.97 | 1.00

135 | 0.99

145
Correlations between instruments for Method = SCT

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Charts Variance = f(Mean) for each Cotton and Method, taking care of LabIDs

For Cotton A
Cotton = A
Method = Clinitest (Color Chart)

X : LabID

Variance

Mean
Cotton = A
Method = Fibermap (Fibermap grade)

X : LabID

<table>
<thead>
<tr>
<th>Mean</th>
<th>Variance</th>
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<tbody>
<tr>
<td>200</td>
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</tbody>
</table>
Cotton = A
Method = GB/T13785-1992 (Color degree)
Cotton = A  
Method = H2SD (Sticky points)
Cotton = A
Method = HSI–NIR (Sticky points)
Cotton = A
Method = KOTITI (Kotiti grade)
Cotton = A
Method = Minicard (ITMF Grade)
Cotton = A
Method = Quantitative method (Percent)

X : LabID

Mean

Variance

Cotton = A

Method = Quantitative method (Percent)
Cotton = A
Method = SCT (Sticky points)
For Cotton B

Cotton = B  
Method = Caramelization (Color degree)
Cotton = B
Method = Clinitest (Color Chart)

X: LabID

Mean
Variance

Cotton = B
Method = Clinitest (Color Chart)
Cotton = B
Method = Contest (Contest grade)
Cotton = B
Method = Fibermap (Fibermap grade)

X : LabID

Variance

Mean

\[
\begin{array}{c}
\text{Variance} \\
\text{Mean}
\end{array}
\]
Cotton = B
Method = GB/T13785-1992 (Color degree)
Cotton = B
Method = H2SD (Sticky points)

X: LabID

Mean

Variance

Cotton = B
Method = H2SD (Sticky points)
Cotton = B
Method = HSI–NIR ( Sticky points )

X : LabID

170
Cotton = B
Method = KOTITI (Kotiti grade)
Cotton = B
Method = Minicard (ITMF Grade)
Cotton = B
Method = Quantitative method (Percent)

X : LabID
Mean
Variance
Cotton = B
Method = Quantitative method (Percent)

130

Mean

0.0 0.5 1.0 1.5 2.0

0.0 0.5 1.0 1.5 2.0

0.00

0.50

0.00

−0.25

0.50

0.00

−0.25
Cotton = B
Method = Reactive Spray (Spray Grade)

X : LabID

Variance

Mean

70
Cotton = B
Method = SCT (Sticky points)
For Cotton C

Cotton = C
Method = Caramelization (Color degree)
Cotton = C
Method = Clinitest (Color Chart)

X : LabID

Variance

Mean

Variance

Mean
Cotton = C
Method = Contest (Contest grade)
Cotton = C
Method = Fibermap (Fibermap grade)
Cotton = C
Method = GB/T13785-1992 (Color degree)
Cotton = C
Method = H2SD (Sticky points)
Cotton = C
Method = HSI−NIR (Sticky points)
Cotton = C
Method = Minicard (ITMF Grade)
Cotton = C
Method = Quantitative method (Percent)
Cotton = C
Method = Reactive Spray (Spray Grade)

X : LabID

Mean
Variance

Cotton = C 
  Method =  Reactive Spray ( Spray Grade )
Cotton = C  
Method = SCT (Sticky points)
CSITC type charts: distance of LabID readings to the Grand Mean by Method, and by LabID

\[ \text{LabID} = 40 \quad \text{Method} = \text{Caramelization (Color degree)} \]
\[ \text{Delta} = \text{Lab Mean} - \text{Method Mean} \]

---

Footnote

\* GMean = Grand Mean of all laboratory means, calculated by Method.
\* Chart abscissa axis is given in the original individual readings scale.
LabID = 140   Method = Caramelization (Color degree)
Delta = Lab Mean − Method Mean
LabID = 155     Method = Caramelization (Color degree)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Caramelization (Color degree)
LabID = 160  Method = Caramelization (Color degree)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Caramelization (Color degree)

Delta (Color degree)
Cotton
A
B
C

LabID = 160  Method = Caramelization (Color degree)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Caramelization (Color degree)
LabID = 60  Method = Clinitest (Color Chart)
Delta = Lab Mean − Method Mean
LabID = 10  Method = Contest (Contest grade)
Delta = Lab Mean − Method Mean

Cotton

A
B
C

LabID = 10  Method = Contest (Contest grade)
Delta = Lab Mean − Method Mean
LabID = 115  Method = Contest (Contest grade)
Delta = Lab Mean − Method Mean

Cotton
A
B
C

Grand Mean = Method Mean, Method = Contest (Contest grade)
LabID = 120  Method = Contest (Contest grade)

Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Contest (Contest grade)
LabID = 75 Method = Fibermap (Fibermap grade)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Fibermap (Fibermap grade)
LabID = 90     Method = Fibermap (Fibermap grade)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Fibermap (Fibermap grade)
LabID = 125  Method = Fibermap  (Fibermap grade)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Fibermap  (Fibermap grade)

Cotton

LabID = 125  Method = Fibermap  (Fibermap grade)
Delta = Lab Mean − Method Mean

Cotton

LabID = 125  Method = Fibermap  (Fibermap grade)
Delta = Lab Mean − Method Mean

Cotton
LabID = 55  Method = GB/T13785–1992 (Color degree)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = GB/T13785–1992 (Color degree)
LabID = 15     Method = H2SD ( Sticky points )
Delta = Lab Mean − Method Mean

Cotton
A
B
C

Grand Mean = Method Mean, Method = H2SD ( Sticky points )
LabID = 100  Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean

Cotton

LabID = 100  Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean

Cotton

LabID = 100  Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean

Cotton

LabID = 100  Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean

Cotton
LabID = 165  Method = H2SD (Sticky points)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = H2SD (Sticky points)
LabID = 170  Method = HSI–NIR (Sticky points)
Delta = Lab Mean – Method Mean

Cotton

A
B
C

Grand Mean = Method Mean, Method = HSI–NIR (Sticky points)
LabID = 95    Method = KOTITI (Kotiti grade)

Delta = Lab Mean - Method Mean

Grand Mean = Method Mean, Method = KOTITI (Kotiti grade)
LabID = 5  Method = Minicard (ITMF Grade)
Delta = Lab Mean – Method Mean
LabID = 135  Method = Minicard (ITMF Grade)
Delta = Lab Mean − Method Mean
LabID = 145  Method = Minicard (ITMF Grade)
Delta = Lab Mean – Method Mean

Delta (ITMF Grade)

Grand Mean = Method Mean, Method = Minicard (ITMF Grade)

Cotton

A
B
C

LabID = 145  Method = Minicard (ITMF Grade)
Delta = Lab Mean – Method Mean
LabID = 130     Method = Quantitative method (Percent)
Delta = Lab Mean − Method Mean
LabID = 70  Method = Reactive Spray (Spray Grade)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Reactive Spray (Spray Grade)
LabID = 25     Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean
LabID = 30  Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = SCT (Sticky points)
Lab ID = 35  Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = SCT (Sticky points)
LabID = 45  Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = SCT (Sticky points)
Lab ID = 50  Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean

Cotton
A
B
C

Grand Mean = Method Mean, Method = SCT (Sticky points)
LabID = 65    Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = SCT (Sticky points)
LabID = 80    Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = SCT (Sticky points)

Cotton

A
B
C
LabID = 85  Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean
LabID = 105    Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = SCT (Sticky points)

Cotton
- A
- B
- C
LabID = 110  Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = SCT (Sticky points)

Delta (Sticky points)

Cotton

A
B
C

LabID = 110     Method = SCT ( Sticky points )
Delta = Lab Mean − Method Mean

Cotton

A
B
C

Grand Mean = Method Mean, Method = SCT ( Sticky points )
LabID = 150  Method = SCT (Sticky points)

Delta = Lab Mean − Method Mean