Round Test 2019-1 on
Stickiness Characterization Methods

- FINAL REPORT –

date: June 28, 2019

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

Gourlot Jean-Paul (1)
Drieling Axel (2)
Froese Karsten (3)
Lassus Serge (1)

(1) CIRAD, France, (2) FIBRE, Germany, and (3) ICA Bremen, Germany
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Round Test on stickiness characterization 2019-1

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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 is changed for each test.

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

Preparation of cottons and samples

A range of five cottons was selected for their stickiness potential range. Basically, the stickiness level of these cottons is not known a priori and their level is being better known after the test, expecting that these 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 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 in end of March 2019.
All laboratories were supposed to send their results back by May 24, 2019. Practically, this date was reported to June 17, 2019. This FINAL REPORT is prepared after this date when most Laboratories who received the material lately 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 Laboratories who received RT samples provided us with results.

Organizing 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 five columns (one per cotton) and six lines (for potentially recording six results for each cotton) for a total of 30 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 everyday practice: the observation is that the report was not always harmonized within methods.

For allowing a comparison, we were obliged to convert some laboratory records into harmonized numeric values by applying the following rules when needed (most acronyms are explained in the ‘Frequently asked questions’ section):

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

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

- For Contest and Fibermap: Since RT2018-1 included: these devices are using the same technology for characterizing stickiness and their results are grouped together into one single ‘Contest-Fibermap’ category. No transformation of the data.

- For GB/T13785-1992: one measurement = one cell. No transformation of the data.

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

- For HSI-NIR: one measurement = one cell. No transformation of the data that has been calibrated to H2SD count at the beginning.

- 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 Qualitative:
– NIL: 0
– Trace: 1
– Light: 2

• For SCT: one measurement = one record = sum of reading of top foil + reading of bottom foil.
• For TDM-A: one measurement = one record. No transformation of the data.
All individual results per Method and LabID for each cotton $^1$

$^1$Footnote
* Results sorted by Method and then by LabID.
* NA or NaN: no results provided.
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Statistics per Method, LabID for each cottons

\(^2\)Footnote
* Mean of all readings per LabID (NA excluded, expressed in Unit).
* 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 result provided.
## Table for Cotton A

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<td>479.6</td>
<td>93.1</td>
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<td>Contest-Fi</td>
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<td>13176.4</td>
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<td>396.5</td>
<td>C/F Grade</td>
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<td>33.2</td>
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<td>32.3</td>
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<td>Sticky point</td>
<td>16.3</td>
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<td>63.0</td>
<td>20.3</td>
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<td>38.6</td>
<td>10.0</td>
<td>42.0</td>
<td>20.1</td>
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<td>130</td>
<td>38.7</td>
<td>Sticky point</td>
<td>7.1</td>
<td>6.9</td>
<td>38.7</td>
<td>0.0</td>
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<td>65</td>
<td>8.0</td>
<td>KOTITI Grade</td>
<td>0.0</td>
<td>0.0</td>
<td>8.0</td>
<td>0.0</td>
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<td>25</td>
<td>2.6</td>
<td>ITMF grade</td>
<td>0.3</td>
<td>20.1</td>
<td>2.1</td>
<td>0.5</td>
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<td>0.7</td>
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<td>0.3</td>
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<td>-1.4</td>
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<td>0.0</td>
<td>0.0</td>
<td>2.1</td>
<td>0.9</td>
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<tr>
<td>Qualitativ</td>
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<td>2.0</td>
<td>Grade</td>
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<td>100</td>
<td>0.9</td>
<td>Percent</td>
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<td>2.3</td>
<td>0.9</td>
<td>0.0</td>
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<td>Reactive S</td>
<td>15</td>
<td>7.3</td>
<td>Spray Grade</td>
<td>0.3</td>
<td>7.9</td>
<td>7.3</td>
<td>0.0</td>
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<tr>
<td>SCT</td>
<td>5</td>
<td>88.3</td>
<td>Sticky point</td>
<td>240.3</td>
<td>17.6</td>
<td>82.8</td>
<td>5.6</td>
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<tr>
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<td>30</td>
<td>57.8</td>
<td>Sticky point</td>
<td>778.6</td>
<td>48.2</td>
<td>82.8</td>
<td>-24.9</td>
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<tr>
<td>SCT</td>
<td>40</td>
<td>100.8</td>
<td>Sticky point</td>
<td>55.8</td>
<td>7.4</td>
<td>82.8</td>
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<td>1.0</td>
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<td>82.8</td>
<td>-81.8</td>
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<td>55</td>
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<td>5786.3</td>
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<td>108.6</td>
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<td>SCT</td>
<td>60</td>
<td>52.3</td>
<td>Sticky point</td>
<td>34.3</td>
<td>11.2</td>
<td>82.8</td>
<td>-30.4</td>
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<tr>
<td>SCT</td>
<td>70</td>
<td>108.2</td>
<td>Sticky point</td>
<td>93.4</td>
<td>8.9</td>
<td>82.8</td>
<td>25.4</td>
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<td>SCT</td>
<td>110</td>
<td>31.0</td>
<td>Sticky point</td>
<td>32.8</td>
<td>18.5</td>
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<td>-51.8</td>
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<td>SCT</td>
<td>155</td>
<td>114.0</td>
<td>Sticky point</td>
<td>403.0</td>
<td>17.6</td>
<td>82.8</td>
<td>31.2</td>
</tr>
</tbody>
</table>
Data presented by boxplots per Method, LabID for each cotton \(^3\)

This section is appearing for the last time (RT2019-1) as the same information is given in the next section in a much more concise way; therefore next section only will remain in future reports.

Boxplots for Cotton A

\(^3\)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 point further out from the whiskers.
Cotton = A
Method = Clinitest
Cotton = A
Method = Contest-Fibermap
Cotton = A
Method = H2SD
Cotton = A
Method = HSI–NIR
Cotton = A
Method = KOTITI

KOTITI (KOTITI Grade)

LabID
Cotton = A
Method = Minicard

LabID
Minicard (ITMF grade)
Cotton = A
  Method = Minicard

0
1
2
3
25 50 105

20
Cotton = A
Method = Qualitative method
Cotton = A
Method = Quantitative method

LabID
Quantitative method (Percent)

0.00
0.25
0.50
0.75
1.00
1.25

0.50
Cotton = A
Method = Reactive Spray
Cotton = A
Method = SCT
Boxplots for Cotton B

Cotton = B
Method = Caramelization

Caramelization (Color degree)

LabID
Cotton = B
Method = Clinitest
Cotton = B
Method = Contest–Fibermap
Cotton = B
Method = H2SD
Cotton = B
Method = HSI–NIR
Cotton = B
Method = KOTITI
Cotton = B
Method = Minicard
Cotton = B
Method = Qualitative method
Cotton = B
Method = Quantitative method
Cotton = B
Method = Reactive Spray
Cotton = B
Method = SCT
Boxplots for Cotton C

Cotton = C
Method = Caramelization

Caramelization (Color degree)

LabID

115 135 140 145 150
Cotton = C
Method = Clinitest
Cotton = C  
Method = Contest-Fibermap
Cotton = C  
Method = H2SD
Cotton = C
Method = HSI−NIR
Cotton = C
Method = KOTITI

KOTITI (KOTITI Grade)

LabID

0.0
2.5
5.0
7.5

47
Cotton = C
Method = Qualitative method
Cotton = C
Method = SCT

LabID

SCT (Sticky points)
Boxplots for Cotton D

Cotton = D
Method = Caramelization
Cotton = D
Method = Clinitest

LabID

Clinitest (Color chart)
Cotton = D
Method = Contest−Fibermap
Cotton = D
Method = HSI–NIR
Cotton = D
Method = KOTITI
Cotton = D
Method = Minicard

LabID

Minicard (ITMF grade)
Cotton = D
Method = Qualitative method
Cotton = D
Method = Quantitative method
Cotton = D
Method = Reactive Spray

LabID

0
2
4
6
8
15

Reactive Spray (Spray Grade)
Boxplots for Cotton E

Cotton = E
Method = Caramelization

LabID

Caramelization (Color degree)
Cotton = E
Method = Clinitest
Cotton = E
Method = Contest−Fibermap
Cotton = E
Method = H2SD
Cotton = E
Method = HSI−NIR
Cotton = E
Method = KOTITI

KOTITI (KOTITI Grade)

LabID

0.0
2.5
5.0
7.5
Cotton = E
Method = Minicard
Cotton = E
Method = Qualitative method
Cotton = E  
Method = Quantitative method
Cotton = E
Method = Reactive Spray
Charts of individual readings per Method and LabID for each cotton

Footnote
* NA excluded
* LabID are given in the abscissa axis at the bottom of the chart in the following charts.
* Black dashed line = Method GrandMean per cotton.
* 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
Individual readings per LabID with Method = Contest−Fibermap

LabID

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

0
200
400
600
0
200
400
600
0
200
400
600
0
200
400
600
0
200
400
600
0
200
400
600

LabID

77
Individual readings per LabID with Method = H2SD
Individual readings per LabID with Method = HSI–NIR
Individual readings per LabID with Method = KOTITI
Individual readings per LabID with Method = Minicard

LabID

ABCDE

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

0
1
2
3
0
1
2
3
0
1
2
3
0
1
2
3
0
1
2
3
0
1
2
3

LabID

81
Individual readings per LabID with Method = Qualitative method
Individual readings per LabID with Method = Quantitative method
Individually readings per LabID with Method = Reactive Spray

LabID

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

0
2
4
6
8
0
2
4
6
8
0
2
4
6
8

LabID

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

0
2
4
6
8
0
2
4
6
8
0
2
4
6
8

LabID

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

0
2
4
6
8
0
2
4
6
8
0
2
4
6
8

LabID

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

0
2
4
6
8
0
2
4
6
8
0
2
4
6
8

LabID

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

0
2
4
6
8
0
2
4
6
8
0
2
4
6
8

LabID
Individual readings per LabID with Method = SCT
Correlation charts and correlation values between LabID using a same Method for all cottons

A correlation matrix of charts is provided only when two or more instruments were used for a given method.

**Footnote**

* Based on Means of available results (NA excluded)
* LabIds are given in the diagonal of the matrix.
* Squares in red for Cotton A, rounds in green for Cotton B, triangles in blue for Cotton C, + in black for cotton D, and x in purple for cotton E.
* 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–Fibermap

20
0.91
0.91
0.95

75
0.97

85
0.99

90
Correlations between instruments for Method = H2SD
Correlations between instruments for Method = Minicard
Correlations between instruments for Method = SCT

<table>
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<tr>
<th></th>
<th>5</th>
<th>0.97</th>
<th>0.99</th>
<th>30</th>
<th>0.95</th>
<th>0.60</th>
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<th>0.93</th>
<th>0.97</th>
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<td>0</td>
<td>0.93</td>
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<td>0</td>
<td>0.81</td>
<td>0.97</td>
<td>0.85</td>
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<td>0</td>
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<td>0.80</td>
<td></td>
<td>0.99</td>
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<td>0.98</td>
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<td></td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td>0.88</td>
<td></td>
</tr>
</tbody>
</table>
This type of chart is devoted to displaying the ability of laboratories to reproduce themselves for each cotton, based on the \( n \) readings (up to six) they provided for each cotton sample. Stickiness has the reputation to be heterogeneously distributed within samples (whatever the efforts we made for homogenizing cotton masses before dispatching representative samples); therefore, if methods are sensitive enough, then a certain level of variance (displayed on the vertical axis in the following charts) is to be seen when the number of measurements exceeds 1 in this test.

Cotton A : Variance between individual measurements = f(Mean) for all concerned labs

[1] “For Cotton = A and for method = Caramelization , 3 LabID (LabID being , 135, 140, 150) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”
Cotton = A
Method = Clinitest (Color chart)

X : LabID
-0.4
-0.2
0.0
0.2
0.4
0 2 4 6

Mean
Variance

10
Cotton = A
Method = Contest–Fibermap ( C/F Grade )

X : LabID
1000
2000
3000
4000
0 200 400 600
Mean
Variance
Cotton = A
  Method = Contest–Fibermap ( C/F Grade )

85
75
20
90
Cotton = A
Method = H2SD (Sticky points)

X : LabID

Variance

Mean

94
Cotton = A
Method = HSI–NIR (Sticky points)

X : LabID

Mean

Variance

Cotton = A
Method = HSI–NIR (Sticky points)
Cotton = A  
Method = KOTITI (KOTITI Grade)
Cotton = A
Method = Minicard (ITMF grade)
Cotton = A
Method = Qualitative method (Grade)

X : LabID

Mean

Variance
Cotton = A
Method = Quantitative method (Percent)

![Graph showing a point at X: LabID = 100, Variance = 0, Mean = 0.5.](image)
Cotton = A
Method = Reactive Spray (Spray Grade)

X : LabID
−0.4
−0.2
0.0
0.2
0.4
0 2 4 6 8
Mean
Variance

15

100
Cotton = A 
Method = SCT (Sticky points)

X : LabID

Variance

Mean

0
50
100
150

0
50
100
150
Cotton B: Variance between individual measurements = f(Mean) for all concerned labs

Cotton = B
Method = Caramelization (Color degree)

115
0.4
0.3
0.2
0.1
0.0

X : LabID

[1] “For Cotton = B and for method = Caramelization, 3 LabID (LabID being 135, 140, 150) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”
Cotton = B
Method = Clinitest (Color chart)
Cotton = B  
Method = Contest–Fibermap (C/F Grade)
Cotton = B
Method = H2SD (Sticky points)
Cotton = B
Method = HSI−NIR (Sticky points)
Cotton = B
Method = KOTITI (KOTITI Grade)

X: LabID

Mean
Variance

Cotton = B
Method = KOTITI (KOTITI Grade)
Cotton = B
Method = Minicard (ITMF grade)

X : LabID

Mean

Variance

25
50
105

108
Cotton = B
Method = Qualitative method (Grade)

X : LabID

Mean

Variance
Cotton = B  
Method = Quantitative method (Percent)
Cotton = B
Method = Reactive Spray (Spray Grade)
Cotton = B
Method = SCT (Sticky points)
Cotton C : Variance between individual measurements = f(Mean) for all concerned labs

For Cotton = C and for method = Caramelization , 3 LabID (LabID being , 135, 140, 150) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.
Cotton = C
Method = Clinitest (Color chart)
Cotton = C
Method = Contest−Fibermap ( C/F Grade )

X : LabID

<table>
<thead>
<tr>
<th>Mean</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>75</td>
</tr>
<tr>
<td>85</td>
<td>90</td>
</tr>
<tr>
<td>75</td>
<td>100</td>
</tr>
</tbody>
</table>
Cotton = C
Method = H2SD (Sticky points)
Cotton = C
Method =  HSI−NIR ( Sticky points )

X : LabID

Mean

Variance

Cotton = C

Method =  HSI−NIR ( Sticky points )
Cotton = C 
Method = KOTITI (KOTITI Grade)
Cotton = C
Method = Minicard (ITMF grade)

Mean

Variance

X : LabID

25
50
105

0.0
0.1
0.2
0.3

0 1 2 3

119
Cotton = C
Method = Qualitative method (Grade)

X : LabID

−0.50
−0.25
0.00
0.25
0.50

0 1 2 3 4

Mean

Variance

95

120
Cotton = C
Method = Quantitative method (Percent)

X : LabID

Mean
Variance

100
Cotton = C
Method = Reactive Spray (Spray Grade)

X : LabID

Mean

Variance

Cotton = C
Method = Reactive Spray (Spray Grade)
Cotton = C
Method = SCT (Sticky points)
Cotton D : Variance between individual measurements = f(Mean) for all concerned labs

For Cotton = D and for method = Caramelization, 3 LabID (LabID being 135, 140, 150) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.
Cotton = D  
Method = Contest–Fibermap ( C/F Grade )
Cotton = D
Method = H2SD (Sticky points)
Cotton = D
Method = HSI−NIR (Sticky points)

X : LabID

9.1
9.3
9.5
9.7
9.9
10.1
0 50 100 150
Mean
Variance
Cotton = D
Method = HSI−NIR (Sticky points)
Cotton = D
Method = KOTITI (KOTITI Grade)

X: LabID

<table>
<thead>
<tr>
<th>Mean</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>2.5</td>
</tr>
<tr>
<td>5.0</td>
<td>7.5</td>
</tr>
</tbody>
</table>

65
Cotton = D
Method = Minicard (ITMF grade)
Cotton = D
Method = Qualitative method (Grade)

X: LabID

95

Mean

Variance

Cotton = D
Method = Qualitative method (Grade)
Cotton = D
Method = Quantitative method (Percent)

X : LabID

Variance
0.00

Mean

100
Cotton = D  
Method = Reactive Spray (Spray Grade)
Cotton = D
Method = SCT (Sticky points)
Cotton E : Variance between individual measurements = f(Mean) for all concerned labs

For Cotton = E and for method = Caramelization, 3 LabID (LabID being, 135, 140, 150) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.
Cotton = E
Method = Clinitest (Color chart)
Cotton = E
Method = Contest−Fibermap ( C/F Grade )
Cotton = E
Method = H2SD (Sticky points)
Cotton = E
Method = HSI-NIR (Sticky points)

X : LabID

Mean

Variance

6.6
6.8
7.0
7.2
7.4
0 50 100 150

130

139
Cotton = E
Method = KOTITI (KOTITI Grade)

X : LabID

Variance

Mean
Cotton = E
Method = Minicard ( ITMF grade )

Mean

Variance

X : LabID

0.0
0.1
0.2
0.3

0 1 2 3

25

105
Cotton = E
Method = Qualitative method (Grade)
Cotton = E
Method = Quantitative method (Percent)

X : LabID

<table>
<thead>
<tr>
<th>Mean</th>
<th>Variance</th>
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<td>0.00</td>
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</tr>
<tr>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>0.50</td>
<td>0.50</td>
</tr>
<tr>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1.25</td>
<td>1.25</td>
</tr>
</tbody>
</table>

100
Cotton = E
Method = Reactive Spray (Spray Grade)
Cotton = E
Method = SCT (Sticky points)
CSITC type charts: distance Delta of Lab readings to the Grand Mean by Method and by LabID

This type of chart is devoted to displaying the ability of any Method and any LabID to not deviate from the observed GrandMean of any given characteristic whatever the measured levels of the participating cottons, and then covering the range of stickiness of the participating cottons in this case. If only one LabId is using a given Method, then all Delta points (one point per participating cotton) will be positioned at Delta = 0 (Y axis) and at the GrandMean values of the cottons (X axis). If two labs are using a given Method, then their respective Delta points will be positioned in symmetry of the X axis at the respective Delta values (Y axis) and at the GrandMean values of the cottons (on the X axis).

CSITC type chart for Method Caramelization

---

Footnote

* GMean = Grand Mean of all laboratory means, calculated by Method.
* Chart abscissa axis is given in the original individual readings scale.
LabID = 135     Method = Caramelization ( Color degree )
Delta = Lab Mean − Method Mean

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

Cotton
A
B
C
D
E

LabID = 135     Method = Caramelization ( Color degree )
Delta = Lab Mean − Method Mean

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

Delta = Lab Mean − Method Mean

Cotton
A
B
C
D
E
LabID = 140  Method = Caramelization (Color degree)

Delta = Lab Mean - Method Mean

Grand Mean = Method Mean, Method = Caramelization (Color degree)
LabID = 145     Method = Caramelization (Color degree)
Delta = Lab Mean − Method Mean

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

Cotton
A
B
C
D
E

\[ Delta = \text{Lab Mean} - \text{Method Mean} \]
LabID = 150     Method = Caramelization ( Color degree )
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Caramelization  ( Color degree )
Delta  ( Color degree )
Cotton
A
B
C
D
E
LabID = 150     Method = Caramelization ( Color degree ) 
 Delta = Lab Mean − Method Mean
LabID = 10     Method = Clinitest ( Color chart )

Delta = Lab Mean − Method Mean

Cotton
- A
- B
- C
- D
- E

Grand Mean = Method Mean, Method = Clinitest ( Color chart )

Delta (Color chart)

0.00

−0.50

0 2 4 6

LabID = 10     Method = Clinitest ( Color chart )

Delta = Lab Mean − Method Mean

Cotton
- A
- B
- C
- D
- E

Grand Mean = Method Mean, Method = Clinitest ( Color chart )

Delta (Color chart)
CSITC type chart for Method Contest-Fibermap

LabID = 20     Method = Contest−Fibermap ( C/F Grade )
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Contest−Fibermap ( C/F Grade )
Delta  ( C/F Grade )

Cotton
- A
- B
- C
- D
- E

Δ = Lab Mean − Method Mean
LabID = 75  
Method = Contest–Fibermap ( C/F Grade )

Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Contest–Fibermap ( C/F Grade )
LabID = 85     Method = Contest−Fibermap ( C/F Grade )
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Contest−Fibermap ( C/F Grade )
LabID = 90  Method = Contest–Fibermap ( C/F Grade )
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Contest–Fibermap ( C/F Grade )

LabID = 90     Method = Contest−Fibermap ( C/F Grade )
 Delta = Lab Mean − Method Mean
CSITC type chart for Method H2SD

LabID = 35   Method = H2SD (Sticky points)
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = H2SD (Sticky points)

Delta (Sticky points)

Cotton
- A
- B
- C
- D
- E

LabID = 35     Method = H2SD (Sticky points)
Delta = Lab Mean − Method Mean

156
LabID = 80  Method = H2SD (Sticky points)
Delta = Lab Mean − Method Mean
LabID = 120     Method = H2SD ( Sticky points )
Delta = Lab Mean − Method Mean
LabID = 125     Method = H2SD ( Sticky points )
Delta = Lab Mean − Method Mean

Cotton
A
B
C
D
E

Grand Mean = Method Mean, Method = H2SD ( Sticky points )
CSITC type chart for Method HSI-NIR

LabID = 130  Method = HSI–NIR (Sticky points)

Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = HSI–NIR (Sticky points)

Cotton
- A
- B
- C
- D
- E

LabID = 130, Method = HSI–NIR

Delta = Lab Mean − Method Mean

Cotton
- A
- B
- C
- D
- E
CSITC type chart for Method KOTITI

LabID = 65     Method = KOTITI ( KOTITI Grade )
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = KOTITI ( KOTITI Grade )

Delta  ( KOTITI Grade )

Cotton

LabID = 65     Method = KOTITI ( KOTITI Grade )
Delta = Lab Mean − Method Mean

Cotton

A
B
C
D
E
CSITC type chart for Method Minicard

LabID = 25     Method = Minicard ( ITMF grade )
Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Minicard  ( ITMF grade )
Delta  ( ITMF grade )
Cotton
A
B
C
D
E
LabID = 25     Method = Minicard ( ITMF grade ) 
 Delta = Lab Mean − Method Mean

162
LabID = 50    Method = Minicard (ITMF grade)
Delta = Lab Mean − Method Mean

Cotton
- A
- B
- C
- D
- E

Grand Mean = Method Mean, Method = Minicard (ITMF grade)
LabID = 105  
Method = Minicard ( ITMF grade )

Delta = Lab Mean − Method Mean

Cotton
A
B
C
D
E

Grand Mean = Method Mean, Method = Minicard ( ITMF grade )
CSITC type chart for Method Qualitative method

LabID = 95     Method = Qualitative method ( Grade )

Delta = Lab Mean − Method Mean

Grand Mean = Method Mean, Method = Qualitative method ( Grade )

Cotton

A

B

C

D

E

Δ = Lab Mean − Method Mean
LabID = 100     Method = Quantitative method ( Percent )
Delta = Lab Mean − Method Mean

Cotton
A
B
C
D
E

Delta (Percent)
CSITC type chart for Method Reactive Spray

LabID = 15  Method = Reactive Spray (Spray Grade)
Delta = Lab Mean − Method Mean

LabID = 15  Method = Reactive Spray (Spray Grade)
Delta = Lab Mean − Method Mean

Cotton
A
B
C
D
E

Grand Mean = Method Mean, Method = Reactive Spray (Spray Grade)
CSITC type chart for Method SCT

LabID = 5  Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean

Cotton
A
B
C
D
E

LabID = 5     Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean
Grand Mean = Method Mean, Method = SCT (Sticky points)

Delta = Lab Mean − Method Mean

LabID = 30     Method = SCT (Sticky points)

Cotton
A
B
C
D
E

Delta (Sticky points)
LabID = 40     Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean
LabID = 45     Method = SCT ( Sticky points )
Delta = Lab Mean − Method Mean
Delta (Sticky points)

LabID = 55, Method = SCT (Sticky points)

Δ = Lab Mean - Method Mean

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

Cotton
- A
- B
- C
- D
- E
LabID = 60 Method = SCT (Sticky points)
Delta = Lab Mean – Method Mean

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

Cotton
A
B
C
D
E

Delta (Sticky points)

0 50 100 150

-100
-50
0
50
100

173
LabID = 70     Method = SCT ( Sticky points )
Delta = Lab Mean − Method Mean
LabID = 110     Method = SCT ( Sticky points )
Delta = Lab Mean − Method Mean

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

Cotton
A
B
C
D
E
LabID = 155  Method = SCT (Sticky points)
Delta = Lab Mean − Method Mean

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

Cotton
A
B
C
D
E

Delta (Sticky points)
CommonScale

Principle

In ITMF-ICCTM meeting organized in March 2018 in Bremen, it was envisaged to compare results from various stickiness methods to check how close are the gained results. A proposal using a pro-rata approach was made as one way to achieve this comparison. The following table gives the numeric values to which each and all results from this round-test were calculated with the following formula:

\[ \text{CommonScale} = \frac{\text{LabID reading} \times 100}{\text{MaxEver for this method}} \]

with MaxEver being the maximum value that any given method could read for the most sticky cotton ever. This will continue as long as necessary.

During this ITMF-ICCTM meeting in March 2018, it was also mentioned that MaxEver may not be the best way to base the provided calculations for CommonScale. We then expect Participating Laboratories to propose an other calculation method(s), which then would be added to this report in the future.

<table>
<thead>
<tr>
<th>Method</th>
<th>MaxEver</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caramelization</td>
<td>7.0</td>
<td>Color degree</td>
</tr>
<tr>
<td>Clinitest</td>
<td>7.0</td>
<td>Color chart</td>
</tr>
<tr>
<td>Contest-Fibermap</td>
<td>750.0</td>
<td>C/F Grade</td>
</tr>
<tr>
<td>H2SD</td>
<td>70.0</td>
<td>Sticky points</td>
</tr>
<tr>
<td>HSI-NIR</td>
<td>150.0</td>
<td>Sticky points</td>
</tr>
<tr>
<td>KOTITI</td>
<td>9.0</td>
<td>KOTITI Grade</td>
</tr>
<tr>
<td>Minicard</td>
<td>3.0</td>
<td>ITMF grade</td>
</tr>
<tr>
<td>Qualitative method</td>
<td>4.0</td>
<td>Grade</td>
</tr>
<tr>
<td>Quantitative method</td>
<td>1.2</td>
<td>Percent</td>
</tr>
<tr>
<td>Reactive Spray</td>
<td>8.0</td>
<td>Spray Grade</td>
</tr>
<tr>
<td>SCT</td>
<td>150.0</td>
<td>Sticky points</td>
</tr>
</tbody>
</table>

For instance,

- a reading of 2 at the minicard, with a MaxEver set at 3, will convert into a CommonScale reading of:
  \[ 67 = \frac{2 \times 100}{3} \]

- a reading of 63 at the SCT, with a MaxEver set at 150, will convert into a CommonScale reading of:
  \[ 42 = \frac{63 \times 100}{150} \]

- etc.

Footnote

* In the following charts, ML stands for the code Method x LabID.
* In the following charts, LM stands for the code LabID x Method.
* NA excluded
* Black dashed line = Method MeanInterLab per cotton and per Method.
* Red + = Laboratory mean for the given method and for the given cotton.
* Black x = Laboratory or CommonScale reading or individual reading for the given method and for the given cotton.
Limitations of the CommonScale approach

This approach has potential limitations:

- The resolution of CommonScale results is not equivalent for methods having a discrete scale, especially when the number of levels is low (for instance, levels for minicard stickiness grading is limited to 4 [0, 1, 2 and 3]) letting the corresponding CommonScale only limited to 0, 33, 67 and 100 results. In the same time, other methods having counts expressed in sticky points on extended scales for instance have lot more possibilities, as well as method being able to measure according to a continuous scale.

- **It only is safe to compare methods that are measuring the same single phenomenon, stickiness, or phenomenons that are related to stickiness.** At this point in time, it is not given that all present methods are measuring ‘stickiness’ or criterion that are related to stickiness.

- This CommonScale approach provides results that still are cotton dependent.

- This CommonScale approach may squeeze the scale for lower or highly stickiness contaminated cottons.

- This CommonScale approach may therefore have incidence on precision and accuracy of gained results.

As a conclusion, as said earlier, CommonScale will be experimented at least for some round-tests in order to see if it could help Manufacturers and Users to get closer and closer results for each method for the same cottons over time. On the long run, the ability of each method to characterize stickiness in its strict sense will have to be evaluated to go further in the harmonization process; this could be by restricting some method(s) to be present in this round-test if they do not predict well enough stickiness troubles: a procedure has to be developed accordingly.
CommonScale charts
Individual CommonScale readings per Method and LabID

ML
Individual CommonScale readings per LabID and Method
Individual readings in their original scale per Method and LabID

ML
Individual readings in their original scale per LabID and Method

Original Scale

LM
Overall statistics per Cotton and Method

The following tables provide information about observed variations between results of various instruments within each method, for each of all used methods and for each and all cottons used in this round-test.

- Comparing the CVs between the lines of these tables - meaning comparing methods for each cotton - is not helpful at all, as units used are very different between methods (so different that it has been necessary to create the CommonScale approach just displayed above to get a way of comparing results).

- However seeing the evolution of these CV values over time, Method by Method, will inform about the degree of harmonization achieved for stickiness measurement. A decrease of the CV values between instruments for each Method - which is expected over time - will give indications about the degree of care taken by Laboratories and Manufacturers to harmonize results over time for their respective methods.

Footnote

* NA or NaN excluded from the original raw data
* NA appears in the following tables when less than two laboratories provided data for the given cotton and method
* Mean and Standard Deviation expressed in Unit, CV expressed in %
<table>
<thead>
<tr>
<th>Method</th>
<th>MeanInterLab</th>
<th>SdInterLab</th>
<th>CVInterLab</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caramelization</td>
<td>2.5</td>
<td>1.1</td>
<td>45.1</td>
<td>Color degree</td>
</tr>
<tr>
<td>Clinitest</td>
<td>1.2</td>
<td>NA</td>
<td>NA</td>
<td>Color chart</td>
</tr>
<tr>
<td>Contest-Fibermap</td>
<td>254.6</td>
<td>47.9</td>
<td>18.8</td>
<td>C/F Grade</td>
</tr>
<tr>
<td>H2SD</td>
<td>31.1</td>
<td>17.1</td>
<td>55.1</td>
<td>Sticky points</td>
</tr>
<tr>
<td>HSI-NIR</td>
<td>40.0</td>
<td>NA</td>
<td>NA</td>
<td>Sticky points</td>
</tr>
<tr>
<td>KOTTITI</td>
<td>8.3</td>
<td>NA</td>
<td>NA</td>
<td>KOTTITI Grade</td>
</tr>
<tr>
<td>Minicard</td>
<td>1.7</td>
<td>1.3</td>
<td>78.7</td>
<td>ITMF grade</td>
</tr>
<tr>
<td>Qualitative method</td>
<td>2.0</td>
<td>NA</td>
<td>NA</td>
<td>Grade</td>
</tr>
<tr>
<td>Quantitative method</td>
<td>0.5</td>
<td>NA</td>
<td>NA</td>
<td>Percent</td>
</tr>
<tr>
<td>Reactive Spray</td>
<td>1.3</td>
<td>NA</td>
<td>NA</td>
<td>Spray Grade</td>
</tr>
<tr>
<td>SCT</td>
<td>30.1</td>
<td>13.7</td>
<td>45.5</td>
<td>Sticky points</td>
</tr>
</tbody>
</table>
## Mean, standard deviation and CV between instruments by method, Cotton B

<table>
<thead>
<tr>
<th>Method</th>
<th>MeanInterLab</th>
<th>SdInterLab</th>
<th>CVInterLab</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caramelization</td>
<td>2.1</td>
<td>1.1</td>
<td>51.3</td>
<td>Color degree</td>
</tr>
<tr>
<td>Clinitest</td>
<td>0.2</td>
<td>NA</td>
<td>NA</td>
<td>Color chart</td>
</tr>
<tr>
<td>Contest-Fibermap</td>
<td>320.1</td>
<td>64.3</td>
<td>20.1</td>
<td>C/F Grade</td>
</tr>
<tr>
<td>H2SD</td>
<td>30.1</td>
<td>5.9</td>
<td>19.6</td>
<td>Sticky points</td>
</tr>
<tr>
<td>HSI-NIR</td>
<td>33.2</td>
<td>NA</td>
<td>NA</td>
<td>Sticky points</td>
</tr>
<tr>
<td>KOTITI</td>
<td>8.0</td>
<td>NA</td>
<td>NA</td>
<td>KOTITI Grade</td>
</tr>
<tr>
<td>Minicard</td>
<td>1.9</td>
<td>1.0</td>
<td>53.9</td>
<td>ITMF grade</td>
</tr>
<tr>
<td>Qualitative method</td>
<td>1.0</td>
<td>NA</td>
<td>NA</td>
<td>Grade</td>
</tr>
<tr>
<td>Quantitative method</td>
<td>0.4</td>
<td>NA</td>
<td>NA</td>
<td>Percent</td>
</tr>
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<td>Reactive Spray</td>
<td>0.5</td>
<td>NA</td>
<td>NA</td>
<td>Spray Grade</td>
</tr>
<tr>
<td>SCT</td>
<td>40.5</td>
<td>22.4</td>
<td>55.4</td>
<td>Sticky points</td>
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</table>
## Mean, standard deviation and CV between instruments by method, Cotton C

<table>
<thead>
<tr>
<th>Method</th>
<th>MeanInterLab</th>
<th>SdInterLab</th>
<th>CVInterLab</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caramelization</td>
<td>3.2</td>
<td>1.3</td>
<td>42.0</td>
<td>Color degree</td>
</tr>
<tr>
<td>Clinitest</td>
<td>0.0</td>
<td>NA</td>
<td>NA</td>
<td>Color chart</td>
</tr>
<tr>
<td>Contest-Fibermap</td>
<td>50.0</td>
<td>24.5</td>
<td>49.1</td>
<td>C/F Grade</td>
</tr>
<tr>
<td>H2SD</td>
<td>8.5</td>
<td>12.8</td>
<td>150.7</td>
<td>Sticky points</td>
</tr>
<tr>
<td>HSI-NIR</td>
<td>17.7</td>
<td>NA</td>
<td>NA</td>
<td>Sticky points</td>
</tr>
<tr>
<td>KOTITI</td>
<td>4.3</td>
<td>NA</td>
<td>NA</td>
<td>KOTITI Grade</td>
</tr>
<tr>
<td>Minicard</td>
<td>0.6</td>
<td>0.5</td>
<td>79.5</td>
<td>ITMF grade</td>
</tr>
<tr>
<td>Qualitative method</td>
<td>1.0</td>
<td>NA</td>
<td>NA</td>
<td>Grade</td>
</tr>
<tr>
<td>Quantitative method</td>
<td>0.4</td>
<td>NA</td>
<td>NA</td>
<td>Percent</td>
</tr>
<tr>
<td>Reactive Spray</td>
<td>0.2</td>
<td>NA</td>
<td>NA</td>
<td>Spray Grade</td>
</tr>
<tr>
<td>SCT</td>
<td>8.3</td>
<td>5.8</td>
<td>70.1</td>
<td>Sticky points</td>
</tr>
</tbody>
</table>
Mean, standard deviation and CV between instruments by method, Cotton D

<table>
<thead>
<tr>
<th>Method</th>
<th>MeanInterLab</th>
<th>SdInterLab</th>
<th>CVInterLab</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caramelization</td>
<td>2.3</td>
<td>0.7</td>
<td>31.7</td>
<td>Color degree</td>
</tr>
<tr>
<td>Clinitest</td>
<td>2.2</td>
<td>NA</td>
<td>NA</td>
<td>Color chart</td>
</tr>
<tr>
<td>Contest-Fibermap</td>
<td>121.8</td>
<td>65.4</td>
<td>53.7</td>
<td>C/F Grade</td>
</tr>
<tr>
<td>H2SD</td>
<td>7.4</td>
<td>8.2</td>
<td>110.5</td>
<td>Sticky points</td>
</tr>
<tr>
<td>HSI-NIR</td>
<td>13.0</td>
<td>NA</td>
<td>NA</td>
<td>Sticky points</td>
</tr>
<tr>
<td>KOTTItI</td>
<td>8.0</td>
<td>NA</td>
<td>NA</td>
<td>KOTTItI Grade</td>
</tr>
<tr>
<td>Minicard</td>
<td>1.5</td>
<td>0.5</td>
<td>31.0</td>
<td>ITMF grade</td>
</tr>
<tr>
<td>Qualitative method</td>
<td>1.0</td>
<td>NA</td>
<td>NA</td>
<td>Grade</td>
</tr>
<tr>
<td>Quantitative method</td>
<td>0.5</td>
<td>NA</td>
<td>NA</td>
<td>Percent</td>
</tr>
<tr>
<td>Reactive Spray</td>
<td>2.2</td>
<td>NA</td>
<td>NA</td>
<td>Spray Grade</td>
</tr>
<tr>
<td>SCT</td>
<td>7.7</td>
<td>5.6</td>
<td>72.4</td>
<td>Sticky points</td>
</tr>
</tbody>
</table>
Mean, standard deviation and CV between instruments by method, Cotton E

<table>
<thead>
<tr>
<th>Method</th>
<th>MeanInterLab</th>
<th>SdInterLab</th>
<th>CVInterLab</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caramelization</td>
<td>3.4</td>
<td>1.3</td>
<td>38.9</td>
<td>Color degree</td>
</tr>
<tr>
<td>Clinitest</td>
<td>6.7</td>
<td>NA</td>
<td>NA</td>
<td>Color chart</td>
</tr>
<tr>
<td>Contest-Fibermap</td>
<td>479.6</td>
<td>72.2</td>
<td>15.1</td>
<td>C/F Grade</td>
</tr>
<tr>
<td>H2SD</td>
<td>42.0</td>
<td>13.7</td>
<td>32.6</td>
<td>Sticky points</td>
</tr>
<tr>
<td>HSI-NIR</td>
<td>38.7</td>
<td>NA</td>
<td>NA</td>
<td>Sticky points</td>
</tr>
<tr>
<td>KOTITI</td>
<td>8.0</td>
<td>NA</td>
<td>NA</td>
<td>KOTITI Grade</td>
</tr>
<tr>
<td>Minicard</td>
<td>2.1</td>
<td>1.2</td>
<td>59.7</td>
<td>ITMF grade</td>
</tr>
<tr>
<td>Qualitative method</td>
<td>2.0</td>
<td>NA</td>
<td>NA</td>
<td>Grade</td>
</tr>
<tr>
<td>Quantitative method</td>
<td>0.9</td>
<td>NA</td>
<td>NA</td>
<td>Percent</td>
</tr>
<tr>
<td>Reactive Spray</td>
<td>7.3</td>
<td>NA</td>
<td>NA</td>
<td>Spray Grade</td>
</tr>
<tr>
<td>SCT</td>
<td>82.8</td>
<td>55.5</td>
<td>67.1</td>
<td>Sticky points</td>
</tr>
</tbody>
</table>
Frequently asked questions (Q) and answers (A)  

Q: Correlation matrix are sometimes difficult to read due to formatting; is there any improvement possible?  
A: We search for a solution, probably for next RT. Sorry for the inconvenience in the meantime.  

Q: For SCT, do we have to report the number of sticky points adhering to the top and the one adhering to the bottom aluminum foils in each cell of the provided Excel sheet, or do we have to report their sum?  
A: __ For SCT, please only report the sum of the counts observed on the top and bottom foils __ in each cell of the Excel sheet; thanks.  

Q: Why are the cells of the Excel form locked?  
A: The cells are locked to avoid modifications in the template to enable our importing system ‘to know’ where to get each piece of information for placing and pasting it into a devoted cell in the data base system. This saves time and secures the data in its original state (avoiding typing mistakes). So please __ make sure to use the proper Excel template: use the latest form that was sent together with the announcement of samples dispatch for sending back you results. __  

Q: What ‘GB/T13785-1992’ stands for?  

Q: What ‘H2SD’ stands for?  
A: H2SD stands for High Speed Stickiness Detector.  

Q: What ‘HSI-NIR’ stands for?  
A: HSI-NIR stands for Hyper Spectral Imaging based on Near Infra-red spectra.  

Q: What ‘SCT’ stands for?  
A: SCT stands for Stickiness Cotton Thermodetector.  

Q: What ‘TDM-A’ stands for?  
A: TDM-A stands for Thermo Detection Method, and A stands for a specific scale for designing the stickiness level.  

To be complemented on demand.

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Footnote

* Based on all round-tests carried out already.
Software components to realize this report

Software code version: June 28, 2019 by Jean-Paul Gourlot

R version 3.4.3 (2017-11-30) Platform: x86_64-w64-mingw32/x64 (64-bit) Running under: Windows 7 x64 (build 7601) Service Pack 1

Matrix products: default

locale: [1] LC_COLLATE=French_France.1252 LC_CTYPE=French_France.1252
[3] LC_MONETARY=French_France.1252 LC_NUMERIC=C
[5] LC_TIME=French_France.1252

attached base packages: [1] grid stats graphics grDevices utils datasets methods base

other attached packages: [1] rmarkdown_1.8 markdown_0.8 ggplot2_2.2.1 reshape2_1.4.3 [5] xlsx_0.5.7
xlsxjars_0.6.1 rJava_0.9-9 knitr_1.18
[9] readxl_1.0.0

loaded via a namespace (and not attached): [1] Rcpp_0.12.12 magrittr_1.5 munsell_0.4.3 colorspace_1.3-2
[5] rlang_0.1.2 rematch_1.0.1 highr_0.6 stringr_1.2.0
[9] plyr_1.8.4 tools_3.4.3 tibble_1.3.4 evaluate_0.10.1 labeling_0.3 stringi_1.1.5
[21] compiler_3.4.3 cellranger_1.1.0 backports_1.1.1 scales_0.5.0

* List of all R components for processing the data