

**Round Test 2022-2 on
Stickiness Characterization Methods**

- FINAL REPORT –

date: March 8, 2023

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

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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.

Gourlot Jean-Paul, Drieling Axel, Froese Karsten, Lassus Serge, Giner Michel. 2023. Round Test 2022-2 on stickiness characterization methods - Final report. Montpellier : CIRAD-ITMF, 132 p.

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 an 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, meaning that sticky points may be ‘grouped’ in some parts of the material while the rest of the material remains free of stickiness. 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 some ‘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 sets of cottons were constituted for each participating laboratory, whatever the method used. Envelopes were sent out to laboratories in end of October 2022.

After experimenting some problems in sample deliveries, all laboratories finally sent their results back by January 31, 2023. 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 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 is 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 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 every day practice: the observation is that the report was not always harmonized within methods.

Under necessity and for allowing a comparison, we may be 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 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. Since March 2020, Contest-S was recognized by ITMF-ICCTM, and therefore Contest-S becomes the name of this category. No transformation of the data.
- For H2SD: 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 Qualitative:
 - NIL: 0
 - Trace: 1
 - Light: 2
 - Moderate : 3.

- For quantitative: one measurement = one cell. No transformation of the data.
- For SCT: one measurement = one record = sum of reading of top foil + reading of bottom foil.

All individual results per Method and LabID for each cotton ¹

¹Footnote

* Results sorted by Method and then by LabID.

* NA or NaN : no results provided.

Table for Cotton A

Meth	LabID	R1	R2	R3	R4	R5	R6	Un
Carameliza	20	2.3	NA	NA	NA	NA	NA	Color degree
Carameliza	165	2.0	NA	NA	NA	NA	NA	Color degree
Contest-S	10	261.0	141.0	77.0	80.0	123.0	103.0	Contest Grad
Contest-S	15	167.0	110.0	139.0	115.0	77.0	69.0	Contest Grad
Contest-S	60	138.0	85.0	49.0	147.0	57.0	70.0	Contest Grad
Contest-S	75	109.0	174.0	66.0	79.0	169.0	94.0	Contest Grad
Contest-S	85	174.0	144.0	190.0	246.0	157.0	182.0	Contest Grad
Contest-S	90	139.0	125.0	150.0	129.0	93.0	219.0	Contest Grad
Contest-S	115	109.0	168.0	107.0	154.0	77.0	111.0	Contest Grad
Contest-S	135	57.0	93.0	99.0	72.0	94.0	101.0	Contest Grad
H2SD	25	7.0	16.0	17.0	5.0	15.0	9.0	Sticky point
H2SD	50	27.0	12.0	21.0	32.0	8.0	13.0	Sticky point
H2SD	70	23.0	21.0	15.0	7.0	14.0	13.0	Sticky point
H2SD	95	9.0	10.0	8.0	9.0	7.0	10.0	Sticky point
H2SD	110	3.0	3.0	2.0	1.0	2.0	3.0	Sticky point
H2SD	130	21.0	17.0	15.0	16.0	20.0	10.0	Sticky point
H2SD	140	10.0	4.0	9.0	14.0	9.0	17.0	Sticky point
H2SD	145	18.0	14.0	19.0	15.0	27.0	NA	Sticky point
H2SD	150	26.0	17.0	9.0	10.0	15.0	14.0	Sticky point
KOTITI	35	3.0	3.0	3.0	3.0	3.0	3.0	Kotiti grade
Minicard	105	0.2	0.8	0.5	NA	NA	NA	ITMF grades
MinicardC	160	1.5	2.5	2.0	NA	NA	NA	Cirad grades
Qualitativ	100	1.0	1.0	1.0	2.0	2.0	1.0	Grade
Quantitati	65	0.1	0.2	0.2	0.1	0.1	0.1	Percent
Quantitati	120	0.3	0.3	0.3	0.3	0.4	NA	Percent
SCT	5	23.0	17.0	25.0	NA	NA	NA	Sticky point
SCT	30	12.0	16.0	14.0	13.0	15.0	14.0	Sticky point
SCT	40	29.0	31.0	25.0	29.0	18.0	15.0	Sticky point
SCT	45	20.0	26.0	12.0	NA	NA	NA	Sticky point
SCT	55	15.0	16.0	15.0	NA	NA	NA	Sticky point
SCT	80	32.0	29.0	25.0	NA	NA	NA	Sticky point
SCT	125	16.0	16.0	16.0	NA	NA	NA	Sticky point
SCT	155	22.0	31.0	27.0	NA	NA	NA	Sticky point

Table for Cotton B

Meth	LabID	R1	R2	R3	R4	R5	R6	Un
Carameliza	20	2.2	NA	NA	NA	NA	NA	Color degree
Carameliza	165	3.1	NA	NA	NA	NA	NA	Color degree
Contest-S	10	402.0	584.0	469.0	468.0	499.0	425.0	Contest Grad
Contest-S	15	618.0	404.0	418.0	444.0	460.0	285.0	Contest Grad
Contest-S	60	374.0	423.0	345.0	541.0	456.0	528.0	Contest Grad
Contest-S	75	457.0	480.0	455.0	481.0	561.0	427.0	Contest Grad
Contest-S	85	495.0	553.0	509.0	522.0	575.0	522.0	Contest Grad
Contest-S	90	445.0	518.0	480.0	538.0	622.0	449.0	Contest Grad
Contest-S	115	590.0	269.0	424.0	420.0	447.0	NA	Contest Grad
Contest-S	135	716.0	473.0	520.0	549.0	362.0	491.0	Contest Grad
H2SD	25	43.0	52.0	42.0	38.0	37.0	41.0	Sticky point
H2SD	50	28.0	44.0	51.0	47.0	47.0	39.0	Sticky point
H2SD	70	32.0	52.0	26.0	19.0	22.0	25.0	Sticky point
H2SD	95	31.0	32.0	27.0	30.0	29.0	33.0	Sticky point
H2SD	110	22.0	15.0	15.0	16.0	17.0	15.0	Sticky point
H2SD	130	25.0	28.0	20.0	19.0	28.0	37.0	Sticky point
H2SD	140	47.0	57.0	26.0	14.0	46.0	17.0	Sticky point
H2SD	145	78.0	65.0	73.0	68.0	82.0	NA	Sticky point
H2SD	150	31.0	36.0	37.0	36.0	33.0	30.0	Sticky point
KOTITI	35	6.0	9.0	9.0	9.0	6.0	6.0	Kotiti grade
Minicard	105	0.5	1.5	1.2	NA	NA	NA	ITMF grades
MinicardC	160	2.0	4.0	3.5	NA	NA	NA	Cirad grades
Qualitativ	100	1.0	2.0	2.0	3.0	3.0	3.0	Grade
Quantitati	65	0.2	0.1	0.1	0.2	0.1	0.2	Percent
Quantitati	120	0.6	0.6	0.8	0.9	0.9	NA	Percent
SCT	5	75.0	135.0	130.0	NA	NA	NA	Sticky point
SCT	30	75.0	67.0	74.0	73.0	69.0	77.0	Sticky point
SCT	40	64.0	78.0	77.0	63.0	93.0	70.0	Sticky point
SCT	45	86.0	69.0	48.0	NA	NA	NA	Sticky point
SCT	55	52.0	78.0	88.0	NA	NA	NA	Sticky point
SCT	80	85.0	131.0	82.0	NA	NA	NA	Sticky point
SCT	125	75.0	109.0	65.0	NA	NA	NA	Sticky point
SCT	155	62.0	100.0	113.0	NA	NA	NA	Sticky point

Table for Cotton C

Meth	LabID	R1	R2	R3	R4	R5	R6	Un
Carameliza	20	2.7	NA	NA	NA	NA	NA	Color degree
Carameliza	165	3.4	NA	NA	NA	NA	NA	Color degree
Contest-S	10	543.0	426.0	495.0	379.0	488.0	320.0	Contest Grad
Contest-S	15	350.0	312.0	394.0	402.0	378.0	464.0	Contest Grad
Contest-S	60	541.0	502.0	478.0	346.0	389.0	525.0	Contest Grad
Contest-S	75	334.0	292.0	527.0	423.0	418.0	504.0	Contest Grad
Contest-S	85	521.0	583.0	496.0	553.0	352.0	502.0	Contest Grad
Contest-S	90	496.0	335.0	369.0	386.0	459.0	332.0	Contest Grad
Contest-S	115	507.0	437.0	363.0	478.0	363.0	403.0	Contest Grad
Contest-S	135	516.0	528.0	443.0	564.0	410.0	510.0	Contest Grad
H2SD	25	30.0	22.0	25.0	25.0	36.0	50.0	Sticky point
H2SD	50	43.0	22.0	37.0	27.0	48.0	30.0	Sticky point
H2SD	70	28.0	28.0	33.0	21.0	20.0	19.0	Sticky point
H2SD	95	15.0	21.0	23.0	26.0	21.0	27.0	Sticky point
H2SD	110	22.0	24.0	17.0	19.0	24.0	22.0	Sticky point
H2SD	130	24.0	21.0	27.0	34.0	26.0	26.0	Sticky point
H2SD	140	17.0	18.0	16.0	15.0	15.0	23.0	Sticky point
H2SD	145	70.0	59.0	51.0	53.0	59.0	NA	Sticky point
H2SD	150	32.0	20.0	35.0	12.0	22.0	28.0	Sticky point
KOTITI	35	6.0	6.0	6.0	6.0	9.0	9.0	Kotiti grade
Minicard	105	2.0	1.8	1.8	NA	NA	NA	ITMF grades
MinicardC	160	5.0	4.5	4.0	NA	NA	NA	Cirad grades
Qualitativ	100	0.0	0.0	0.0	1.0	0.0	0.0	Grade
Quantitati	65	0.1	0.1	0.1	0.1	0.2	0.1	Percent
Quantitati	120	0.3	0.3	0.4	0.5	0.5	NA	Percent
SCT	5	44.0	42.0	50.0	NA	NA	NA	Sticky point
SCT	30	53.0	51.0	57.0	49.0	47.0	52.0	Sticky point
SCT	40	24.0	26.0	30.0	23.0	33.0	35.0	Sticky point
SCT	45	44.0	44.0	36.0	NA	NA	NA	Sticky point
SCT	55	44.0	48.0	50.0	NA	NA	NA	Sticky point
SCT	80	50.0	50.0	50.0	NA	NA	NA	Sticky point
SCT	125	55.0	55.0	51.0	NA	NA	NA	Sticky point
SCT	155	33.0	35.0	33.0	NA	NA	NA	Sticky point

Table for Cotton D

Meth	LabID	R1	R2	R3	R4	R5	R6	Un
Carameliza	20	2.6	NA	NA	NA	NA	NA	Color degree
Carameliza	165	2.5	NA	NA	NA	NA	NA	Color degree
Contest-S	10	134.0	81.0	145.0	77.0	97.0	108.0	Contest Grad
Contest-S	15	95.0	233.0	150.0	108.0	149.0	68.0	Contest Grad
Contest-S	60	103.0	154.0	79.0	127.0	186.0	113.0	Contest Grad
Contest-S	75	82.0	206.0	176.0	123.0	90.0	71.0	Contest Grad
Contest-S	85	314.0	261.0	108.0	163.0	203.0	156.0	Contest Grad
Contest-S	90	93.0	162.0	106.0	74.0	207.0	197.0	Contest Grad
Contest-S	115	154.0	202.0	91.0	252.0	180.0	101.0	Contest Grad
Contest-S	135	165.0	234.0	300.0	314.0	131.0	351.0	Contest Grad
H2SD	25	18.0	10.0	19.0	10.0	10.0	16.0	Sticky point
H2SD	50	6.0	8.0	6.0	4.0	10.0	9.0	Sticky point
H2SD	70	20.0	20.0	18.0	18.0	16.0	14.0	Sticky point
H2SD	95	12.0	14.0	6.0	8.0	7.0	11.0	Sticky point
H2SD	110	6.0	4.0	5.0	4.0	3.0	4.0	Sticky point
H2SD	130	25.0	12.0	12.0	18.0	23.0	14.0	Sticky point
H2SD	140	12.0	15.0	9.0	8.0	8.0	9.0	Sticky point
H2SD	145	12.0	16.0	21.0	22.0	15.0	NA	Sticky point
H2SD	150	7.0	52.0	35.0	30.0	18.0	12.0	Sticky point
KOTITI	35	5.0	2.0	2.0	2.0	2.0	2.0	Kotiti grade
Minicard	105	0.5	1.0	0.5	NA	NA	NA	ITMF grades
MinicardC	160	2.0	3.0	2.0	NA	NA	NA	Cirad grades
Qualitativ	100	0.0	0.0	0.0	0.0	0.0	1.0	Grade
Quantitati	65	0.2	0.1	0.1	0.1	0.1	0.1	Percent
Quantitati	120	0.2	0.2	0.4	0.3	0.3	NA	Percent
SCT	5	15.0	16.0	16.0	NA	NA	NA	Sticky point
SCT	30	9.0	7.0	5.0	6.0	9.0	8.0	Sticky point
SCT	40	18.0	22.0	27.0	26.0	23.0	21.0	Sticky point
SCT	45	20.0	14.0	17.0	NA	NA	NA	Sticky point
SCT	55	18.0	19.0	32.0	NA	NA	NA	Sticky point
SCT	80	15.0	16.0	10.0	NA	NA	NA	Sticky point
SCT	125	18.0	31.0	31.0	NA	NA	NA	Sticky point
SCT	155	24.0	20.0	18.0	NA	NA	NA	Sticky point

Table for Cotton E

Meth	LabID	R1	R2	R3	R4	R5	R6	Un
Carameliza	20	3.0	NA	NA	NA	NA	NA	Color degree
Carameliza	165	3.1	NA	NA	NA	NA	NA	Color degree
Contest-S	10	624.0	568.0	569.0	449.0	602.0	549.0	Contest Grad
Contest-S	15	619.0	635.0	546.0	624.0	636.0	629.0	Contest Grad
Contest-S	60	549.0	540.0	632.0	573.0	650.0	617.0	Contest Grad
Contest-S	75	500.0	511.0	604.0	663.0	591.0	576.0	Contest Grad
Contest-S	85	644.0	586.0	582.0	590.0	447.0	575.0	Contest Grad
Contest-S	90	525.0	634.0	683.0	667.0	495.0	565.0	Contest Grad
Contest-S	115	661.0	639.0	644.0	628.0	599.0	575.0	Contest Grad
Contest-S	135	608.0	675.0	534.0	626.0	738.0	649.0	Contest Grad
H2SD	25	63.0	37.0	45.0	48.0	68.0	67.0	Sticky point
H2SD	50	32.0	60.0	55.0	49.0	51.0	44.0	Sticky point
H2SD	70	48.0	40.0	57.0	35.0	27.0	39.0	Sticky point
H2SD	95	48.0	47.0	59.0	52.0	62.0	58.0	Sticky point
H2SD	110	32.0	66.0	79.0	42.0	49.0	41.0	Sticky point
H2SD	130	34.0	27.0	71.0	37.0	43.0	40.0	Sticky point
H2SD	140	72.0	45.0	71.0	44.0	71.0	73.0	Sticky point
H2SD	145	84.0	80.0	79.0	65.0	78.0	NA	Sticky point
H2SD	150	57.0	49.0	33.0	44.0	60.0	59.0	Sticky point
KOTITI	35	8.0	8.0	8.0	8.0	8.0	8.0	Kotiti grade
Minicard	105	1.5	2.5	2.5	NA	NA	NA	ITMF grades
MinicardC	160	4.0	5.5	5.5	NA	NA	NA	Cirad grades
Qualitativ	100	3.0	3.0	3.0	3.0	3.0	4.0	Grade
Quantitati	65	0.8	0.5	0.5	0.5	0.8	0.5	Percent
Quantitati	120	1.0	1.0	0.7	1.2	1.2	NA	Percent
SCT	5	88.0	93.0	81.0	NA	NA	NA	Sticky point
SCT	30	122.0	141.0	123.0	131.0	135.0	127.0	Sticky point
SCT	40	98.0	59.0	59.0	75.0	80.0	59.0	Sticky point
SCT	45	107.0	115.0	111.0	NA	NA	NA	Sticky point
SCT	55	113.0	91.0	111.0	NA	NA	NA	Sticky point
SCT	80	139.0	109.0	138.0	NA	NA	NA	Sticky point
SCT	125	135.0	151.0	104.0	NA	NA	NA	Sticky point
SCT	155	142.0	133.0	124.0	NA	NA	NA	Sticky point

Statistics per Method, LabID for each cottons ²

²Footnote

- * 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

Meth	LabID	MeanIntraLab	Un	VarIntraLab	CVIntraLab	MeanInterLab	Delta
Carameliza	20	2.3	Color degree	NA	NA	2.1	0.1
Carameliza	165	2.0	Color degree	NA	NA	2.1	-0.1
Contest-S	10	130.8	Contest Grad	4673.0	52.2	122.7	8.1
Contest-S	15	112.8	Contest Grad	1367.4	32.8	122.7	-9.9
Contest-S	60	91.0	Contest Grad	1748.4	45.9	122.7	-31.7
Contest-S	75	115.2	Contest Grad	2114.2	39.9	122.7	-7.5
Contest-S	85	182.2	Contest Grad	1258.6	19.5	122.7	59.5
Contest-S	90	142.5	Contest Grad	1771.9	29.5	122.7	19.8
Contest-S	115	121.0	Contest Grad	1134.8	27.8	122.7	-1.7
Contest-S	135	86.0	Contest Grad	308.8	20.4	122.7	-36.7
H2SD	25	11.5	Sticky point	26.3	44.6	13.1	-1.6
H2SD	50	18.8	Sticky point	88.6	50.0	13.1	5.7
H2SD	70	15.5	Sticky point	33.5	37.3	13.1	2.4
H2SD	95	8.8	Sticky point	1.4	13.2	13.1	-4.3
H2SD	110	2.3	Sticky point	0.7	35.0	13.1	-10.8
H2SD	130	16.5	Sticky point	15.5	23.9	13.1	3.4
H2SD	140	10.5	Sticky point	20.3	42.9	13.1	-2.6
H2SD	145	18.6	Sticky point	26.3	27.6	13.1	5.5
H2SD	150	15.2	Sticky point	37.4	40.3	13.1	2.1
KOTITI	35	3.0	Kotiti grade	0.0	0.0	3.0	0.0
Minicard	105	0.5	ITMF grades	0.1	50.0	0.5	0.0
MinicardC	160	2.0	Cirad grades	0.2	25.0	2.0	0.0
Qualitativ	100	1.3	Grade	0.3	38.7	1.3	0.0
Quantitati	65	0.2	Percent	0.0	36.5	0.2	-0.1
Quantitati	120	0.3	Percent	0.0	18.3	0.2	0.1
SCT	5	21.7	Sticky point	17.3	19.2	20.8	0.9
SCT	30	14.0	Sticky point	2.0	10.1	20.8	-6.8
SCT	40	24.5	Sticky point	43.1	26.8	20.8	3.7
SCT	45	19.3	Sticky point	49.3	36.3	20.8	-1.4
SCT	55	15.3	Sticky point	0.3	3.8	20.8	-5.4
SCT	80	28.7	Sticky point	12.3	12.3	20.8	7.9
SCT	125	16.0	Sticky point	0.0	0.0	20.8	-4.8
SCT	155	26.7	Sticky point	20.3	16.9	20.8	5.9

Table for Cotton B

Meth	LabID	MeanIntraLab	Un	VarIntraLab	CVIntraLab	MeanInterLab	Delta
Carameliza	20	2.2	Color degree	NA	NA	2.7	-0.5
Carameliza	165	3.1	Color degree	NA	NA	2.7	0.4
Contest-S	10	474.5	Contest Grad	4073.9	13.5	477.6	-3.1
Contest-S	15	438.2	Contest Grad	11577.0	24.6	477.6	-39.4
Contest-S	60	444.5	Contest Grad	6349.9	17.9	477.6	-33.1
Contest-S	75	476.8	Contest Grad	2093.0	9.6	477.6	-0.7
Contest-S	85	529.3	Contest Grad	869.1	5.6	477.6	51.8
Contest-S	90	508.7	Contest Grad	4445.5	13.1	477.6	31.1
Contest-S	115	430.0	Contest Grad	12986.5	26.5	477.6	-47.6
Contest-S	135	518.5	Contest Grad	13451.5	22.4	477.6	40.9
H2SD	25	42.2	Sticky point	28.6	12.7	36.5	5.6
H2SD	50	42.7	Sticky point	67.5	19.3	36.5	6.1
H2SD	70	29.3	Sticky point	142.3	40.7	36.5	-7.2
H2SD	95	30.3	Sticky point	4.7	7.1	36.5	-6.2
H2SD	110	16.7	Sticky point	7.5	16.4	36.5	-19.9
H2SD	130	26.2	Sticky point	43.0	25.1	36.5	-10.4
H2SD	140	34.5	Sticky point	318.7	51.7	36.5	-2.0
H2SD	145	73.2	Sticky point	48.7	9.5	36.5	36.7
H2SD	150	33.8	Sticky point	8.6	8.7	36.5	-2.7
KOTITI	35	7.5	Kotiti grade	2.7	21.9	7.5	0.0
Minicard	105	1.1	ITMF grades	0.3	48.0	1.1	0.0
MinicardC	160	3.2	Cirad grades	1.1	32.9	3.2	0.0
Qualitativ	100	2.3	Grade	0.7	35.0	2.3	0.0
Quantitati	65	0.2	Percent	0.0	34.6	0.5	-0.3
Quantitati	120	0.8	Percent	0.0	17.6	0.5	0.3
SCT	5	113.3	Sticky point	1108.3	29.4	84.3	29.0
SCT	30	72.5	Sticky point	14.3	5.2	84.3	-11.8
SCT	40	74.2	Sticky point	124.6	15.0	84.3	-10.1
SCT	45	67.7	Sticky point	362.3	28.1	84.3	-16.6
SCT	55	72.7	Sticky point	345.3	25.6	84.3	-11.6
SCT	80	99.3	Sticky point	754.3	27.6	84.3	15.0
SCT	125	83.0	Sticky point	532.0	27.8	84.3	-1.3
SCT	155	91.7	Sticky point	702.3	28.9	84.3	7.4

Table for Cotton C

Meth	LabID	MeanIntraLab	Un	VarIntraLab	CVIntraLab	MeanInterLab	Delta
Carameliza	20	2.7	Color degree	NA	NA	3.0	-0.3
Carameliza	165	3.4	Color degree	NA	NA	3.0	0.4
Contest-S	10	441.8	Contest Grad	6847.0	18.7	440.3	1.5
Contest-S	15	383.3	Contest Grad	2639.5	13.4	440.3	-57.0
Contest-S	60	463.5	Contest Grad	6167.5	16.9	440.3	23.2
Contest-S	75	416.3	Contest Grad	8443.5	22.1	440.3	-24.0
Contest-S	85	501.2	Contest Grad	6411.0	16.0	440.3	60.8
Contest-S	90	396.2	Contest Grad	4523.0	17.0	440.3	-44.2
Contest-S	115	425.2	Contest Grad	3569.8	14.1	440.3	-15.2
Contest-S	135	495.2	Contest Grad	3289.0	11.6	440.3	54.8
H2SD	25	31.3	Sticky point	107.9	33.1	29.0	2.3
H2SD	50	34.5	Sticky point	98.7	28.8	29.0	5.5
H2SD	70	24.8	Sticky point	31.8	22.7	29.0	-4.2
H2SD	95	22.2	Sticky point	18.6	19.4	29.0	-6.8
H2SD	110	21.3	Sticky point	7.9	13.1	29.0	-7.7
H2SD	130	26.3	Sticky point	18.7	16.4	29.0	-2.7
H2SD	140	17.3	Sticky point	9.1	17.4	29.0	-11.7
H2SD	145	58.4	Sticky point	54.8	12.7	29.0	29.4
H2SD	150	24.8	Sticky point	72.2	34.2	29.0	-4.2
KOTITI	35	7.0	Kotiti grade	2.4	22.1	7.0	0.0
Minicard	105	1.8	ITMF grades	0.0	7.9	1.8	0.0
MinicardC	160	4.5	Cirad grades	0.2	11.1	4.5	0.0
Qualitativ	100	0.2	Grade	0.2	244.9	0.2	0.0
Quantitati	65	0.1	Percent	0.0	32.7	0.3	-0.1
Quantitati	120	0.4	Percent	0.0	26.8	0.3	0.1
SCT	5	45.3	Sticky point	17.3	9.2	43.9	1.4
SCT	30	51.5	Sticky point	11.9	6.7	43.9	7.6
SCT	40	28.5	Sticky point	24.3	17.3	43.9	-15.4
SCT	45	41.3	Sticky point	21.3	11.2	43.9	-2.6
SCT	55	47.3	Sticky point	9.3	6.5	43.9	3.4
SCT	80	50.0	Sticky point	0.0	0.0	43.9	6.1
SCT	125	53.7	Sticky point	5.3	4.3	43.9	9.8
SCT	155	33.7	Sticky point	1.3	3.4	43.9	-10.2

Table for Cotton D

Meth	LabID	MeanIntraLab	Un	VarIntraLab	CVIntraLab	MeanInterLab	Delta
Carameliza	20	2.6	Color degree	NA	NA	2.5	0.1
Carameliza	165	2.5	Color degree	NA	NA	2.5	0.0
Contest-S	10	107.0	Contest Grad	770.0	25.9	155.7	-48.7
Contest-S	15	133.8	Contest Grad	3367.0	43.4	155.7	-21.9
Contest-S	60	127.0	Contest Grad	1457.2	30.1	155.7	-28.7
Contest-S	75	124.7	Contest Grad	3031.1	44.2	155.7	-31.0
Contest-S	85	200.8	Contest Grad	5698.2	37.6	155.7	45.1
Contest-S	90	139.8	Contest Grad	3188.6	40.4	155.7	-15.9
Contest-S	115	163.3	Contest Grad	3767.9	37.6	155.7	7.6
Contest-S	135	249.2	Contest Grad	7687.0	35.2	155.7	93.5
H2SD	25	13.8	Sticky point	18.6	31.1	13.7	0.2
H2SD	50	7.2	Sticky point	5.0	31.1	13.7	-6.5
H2SD	70	17.7	Sticky point	5.5	13.2	13.7	4.0
H2SD	95	9.7	Sticky point	9.9	32.5	13.7	-4.0
H2SD	110	4.3	Sticky point	1.1	23.8	13.7	-9.3
H2SD	130	17.3	Sticky point	31.9	32.6	13.7	3.7
H2SD	140	10.2	Sticky point	7.8	27.4	13.7	-3.5
H2SD	145	17.2	Sticky point	17.7	24.5	13.7	3.5
H2SD	150	25.7	Sticky point	278.7	65.0	13.7	12.0
KOTITI	35	2.5	Kotiti grade	1.5	49.0	2.5	0.0
Minicard	105	0.7	ITMF grades	0.1	43.3	0.7	0.0
MinicardC	160	2.3	Cirad grades	0.3	24.7	2.3	0.0
Qualitativ	100	0.2	Grade	0.2	244.9	0.2	0.0
Quantitati	65	0.1	Percent	0.0	32.7	0.2	-0.1
Quantitati	120	0.3	Percent	0.0	26.1	0.2	0.1
SCT	5	15.7	Sticky point	0.3	3.7	18.4	-2.7
SCT	30	7.3	Sticky point	2.7	22.3	18.4	-11.0
SCT	40	22.8	Sticky point	11.0	14.5	18.4	4.5
SCT	45	17.0	Sticky point	9.0	17.6	18.4	-1.4
SCT	55	23.0	Sticky point	61.0	34.0	18.4	4.6
SCT	80	13.7	Sticky point	10.3	23.5	18.4	-4.7
SCT	125	26.7	Sticky point	56.3	28.1	18.4	8.3
SCT	155	20.7	Sticky point	9.3	14.8	18.4	2.3

Table for Cotton E

Meth	LabID	MeanIntraLab	Un	VarIntraLab	CVIntraLab	MeanInterLab	Delta
Carameliza	20	3.0	Color degree	NA	NA	3.0	0.0
Carameliza	165	3.1	Color degree	NA	NA	3.0	0.1
Contest-S	10	560.2	Contest Grad	3689.4	10.8	596.4	-36.2
Contest-S	15	614.8	Contest Grad	1179.0	5.6	596.4	18.5
Contest-S	60	593.5	Contest Grad	2097.9	7.7	596.4	-2.9
Contest-S	75	574.2	Contest Grad	3711.8	10.6	596.4	-22.2
Contest-S	85	570.7	Contest Grad	4285.5	11.5	596.4	-25.7
Contest-S	90	594.8	Contest Grad	6049.8	13.1	596.4	-1.5
Contest-S	115	624.3	Contest Grad	1007.1	5.1	596.4	28.0
Contest-S	135	638.3	Contest Grad	4669.9	10.7	596.4	42.0
H2SD	25	54.7	Sticky point	169.9	23.8	53.6	1.1
H2SD	50	48.5	Sticky point	94.7	20.1	53.6	-5.1
H2SD	70	41.0	Sticky point	108.4	25.4	53.6	-12.6
H2SD	95	54.3	Sticky point	38.7	11.4	53.6	0.8
H2SD	110	51.5	Sticky point	310.7	34.2	53.6	-2.1
H2SD	130	42.0	Sticky point	232.0	36.3	53.6	-11.6
H2SD	140	62.7	Sticky point	198.7	22.5	53.6	9.1
H2SD	145	77.2	Sticky point	51.7	9.3	53.6	23.6
H2SD	150	50.3	Sticky point	111.1	20.9	53.6	-3.2
KOTITI	35	8.0	Kotiti grade	0.0	0.0	8.0	0.0
Minicard	105	2.2	ITMF grades	0.3	26.6	2.2	0.0
MinicardC	160	5.0	Cirad grades	0.8	17.3	5.0	0.0
Qualitativ	100	3.2	Grade	0.2	12.9	3.2	0.0
Quantitati	65	0.6	Percent	0.0	22.1	0.8	-0.2
Quantitati	120	1.0	Percent	0.0	19.3	0.8	0.2
SCT	5	87.3	Sticky point	36.3	6.9	112.1	-24.7
SCT	30	129.8	Sticky point	53.8	5.6	112.1	17.8
SCT	40	71.7	Sticky point	251.1	22.1	112.1	-40.4
SCT	45	111.0	Sticky point	16.0	3.6	112.1	-1.1
SCT	55	105.0	Sticky point	148.0	11.6	112.1	-7.1
SCT	80	128.7	Sticky point	290.3	13.2	112.1	16.6
SCT	125	130.0	Sticky point	571.0	18.4	112.1	17.9
SCT	155	133.0	Sticky point	81.0	6.8	112.1	20.9

Data presented by boxplots per Method, LabID for each cotton ³

This section was appearing for the last time in 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 from RT2019-2 on.

³Footnote

* NA excluded.

* In each box, the bolded line represents the median of all individual results for the considered LabID.

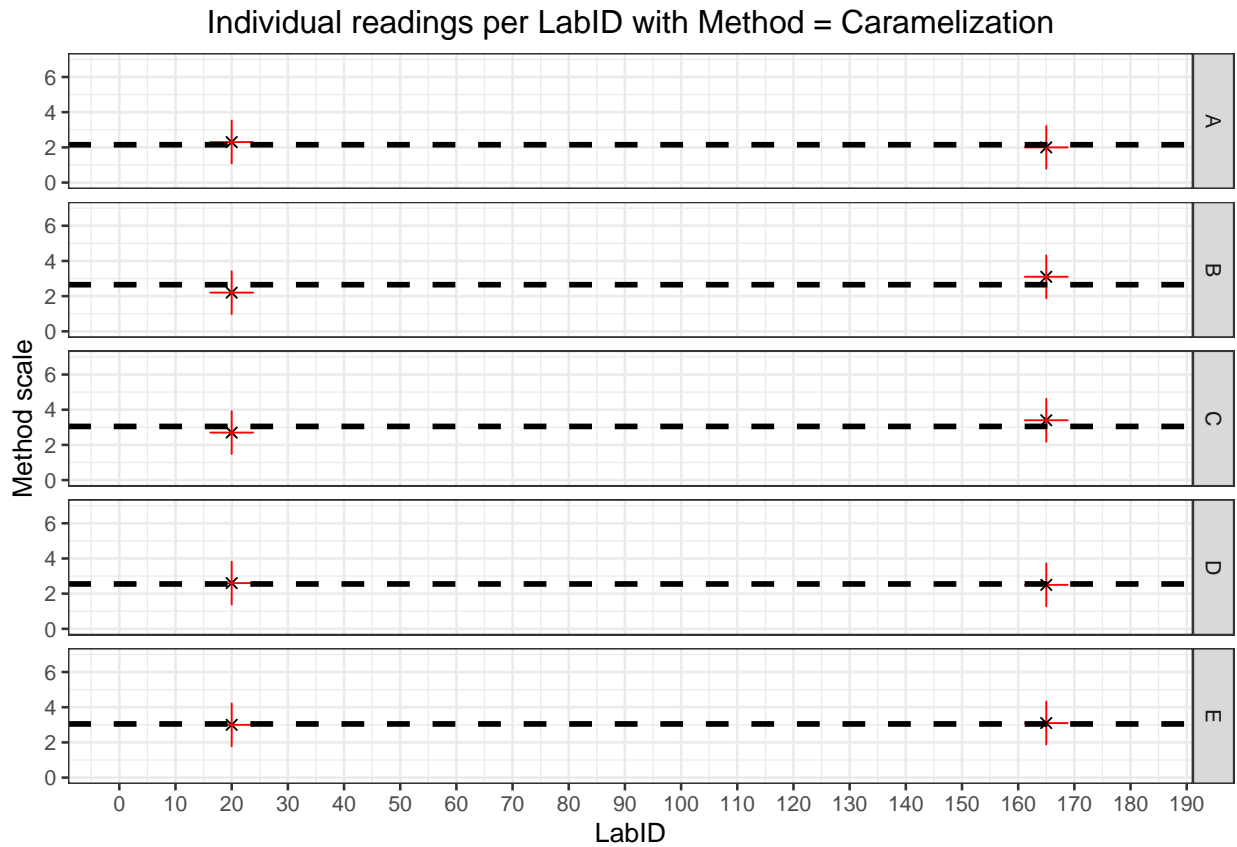
* The square represents the upper 75% (Q75) and lower 25% (Q25) percentiles of the individual results.

* The whiskers represent the quantiles that included in $\pm 1.5 * (Q75 - Q25)$.

* Extreme points may additionally be displayed by a point further out from the whiskers.

Charts of individual readings per Method and LabID for each cotton

4

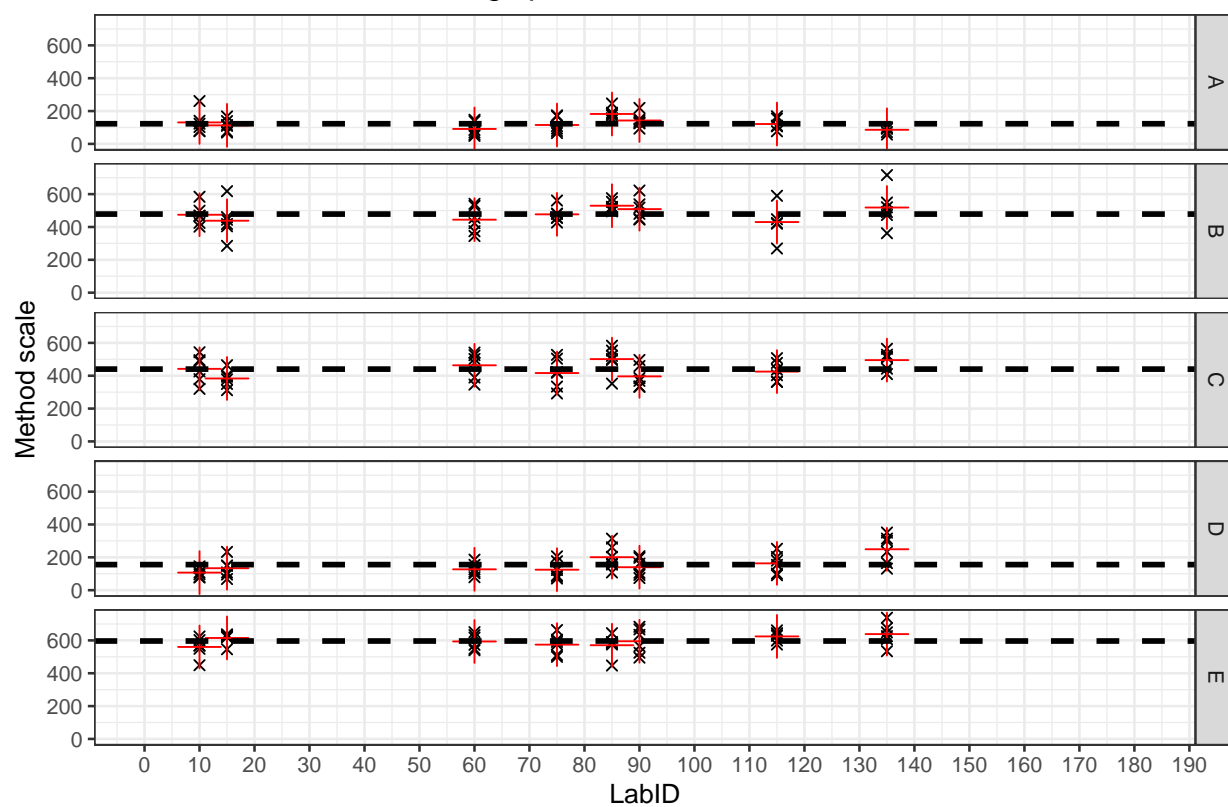


pdf 2

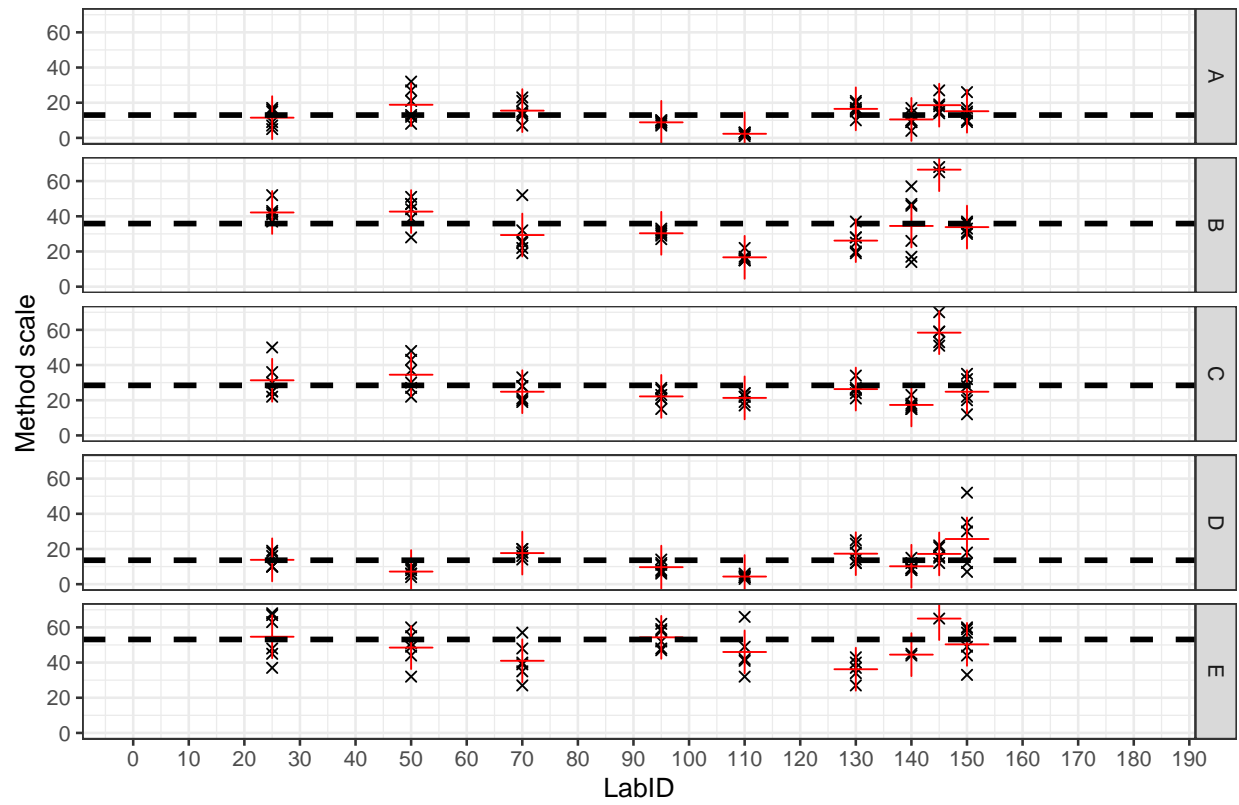
⁴Footnote

- * 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.

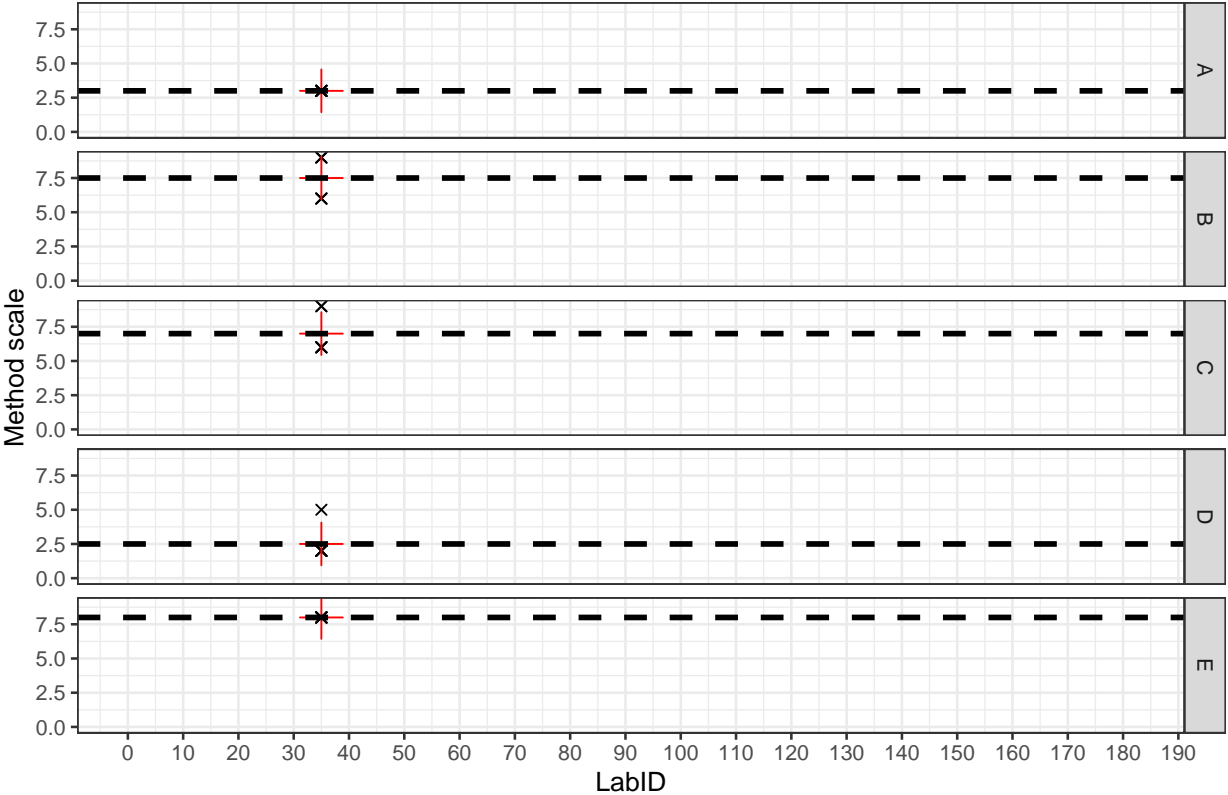
Individual readings per LabID with Method = Contest-S



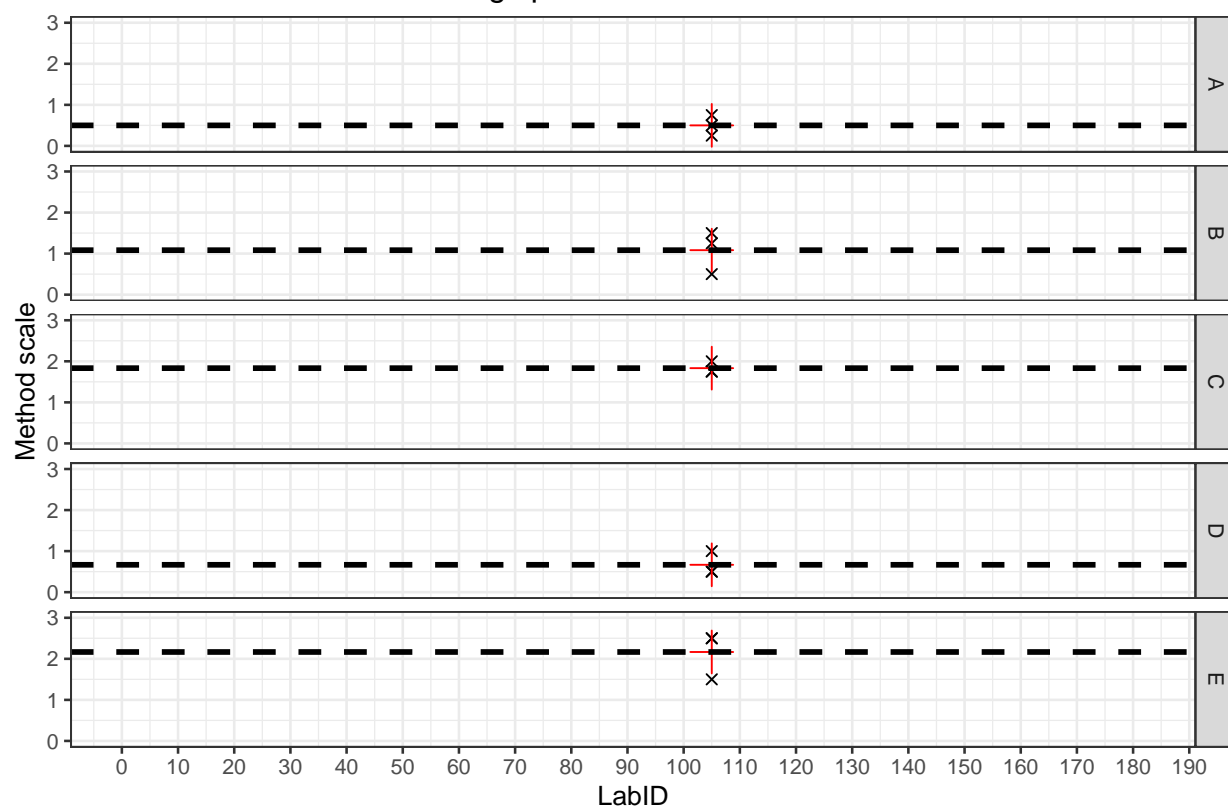
Individual readings per LabID with Method = H2SD



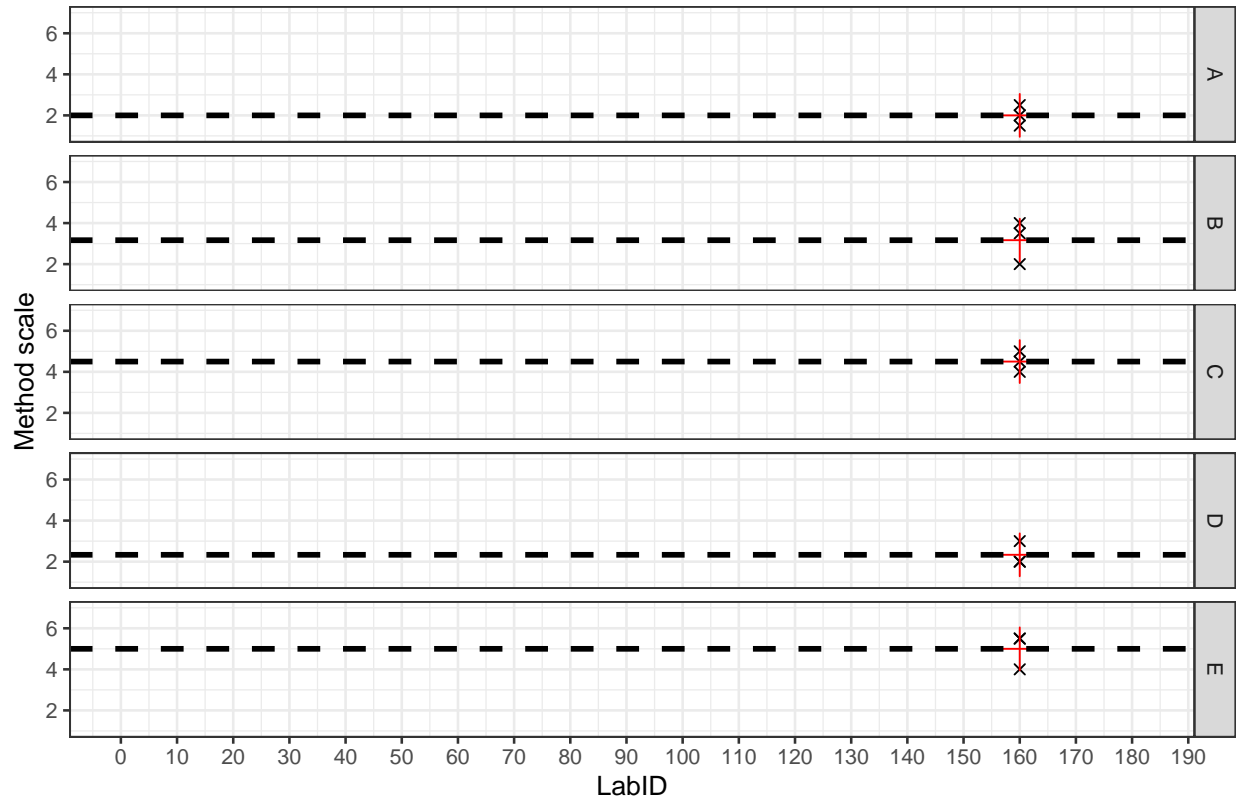
Individual readings per LabID with Method = KOTITI



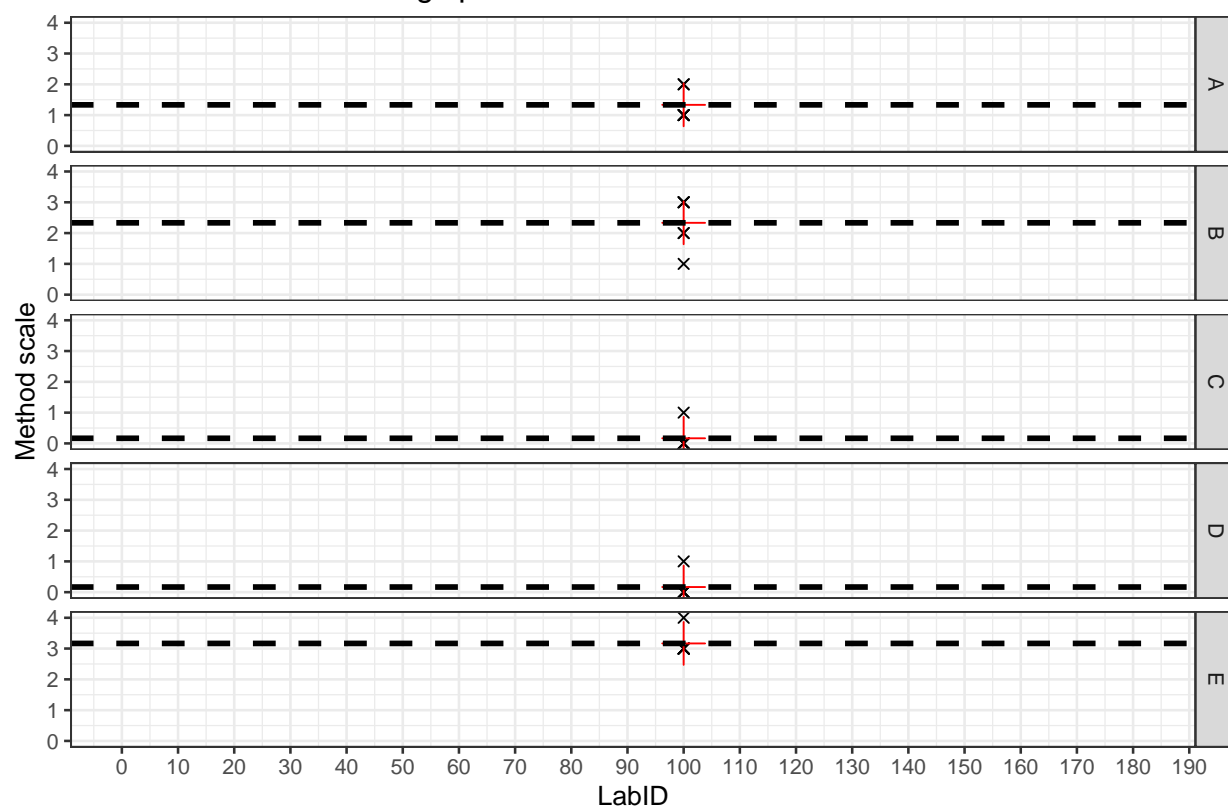
Individual readings per LabID with Method = Minicard



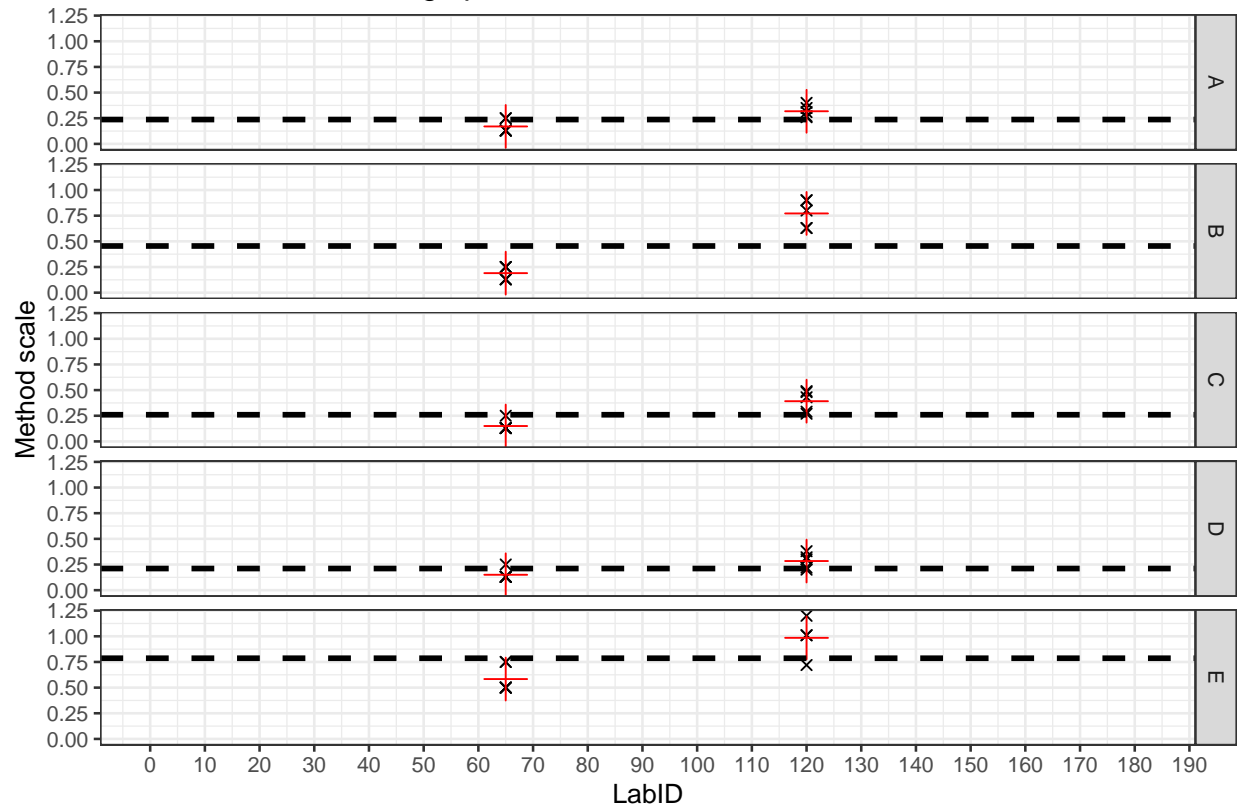
Individual readings per LabID with Method = MinicardC



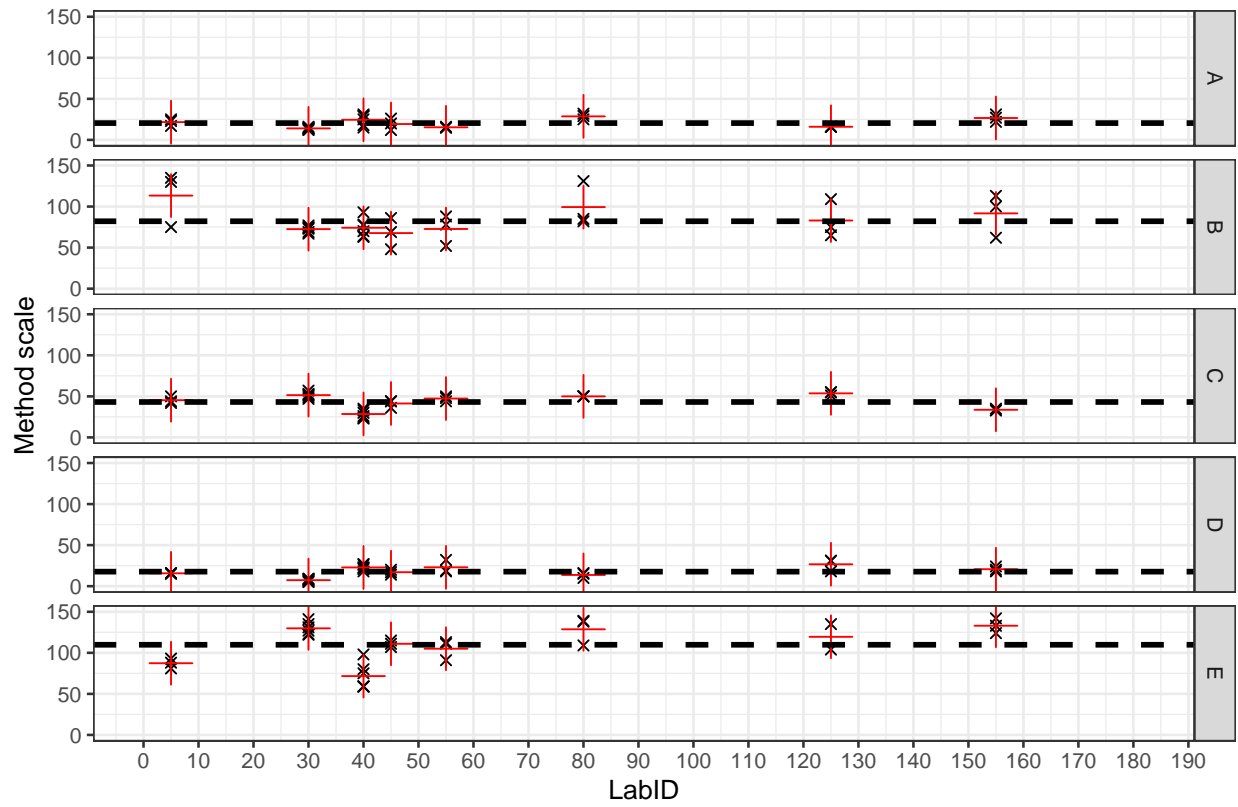
Individual readings per LabID with Method = Qualitative method



Individual readings per LabID with Method = Quantitative method

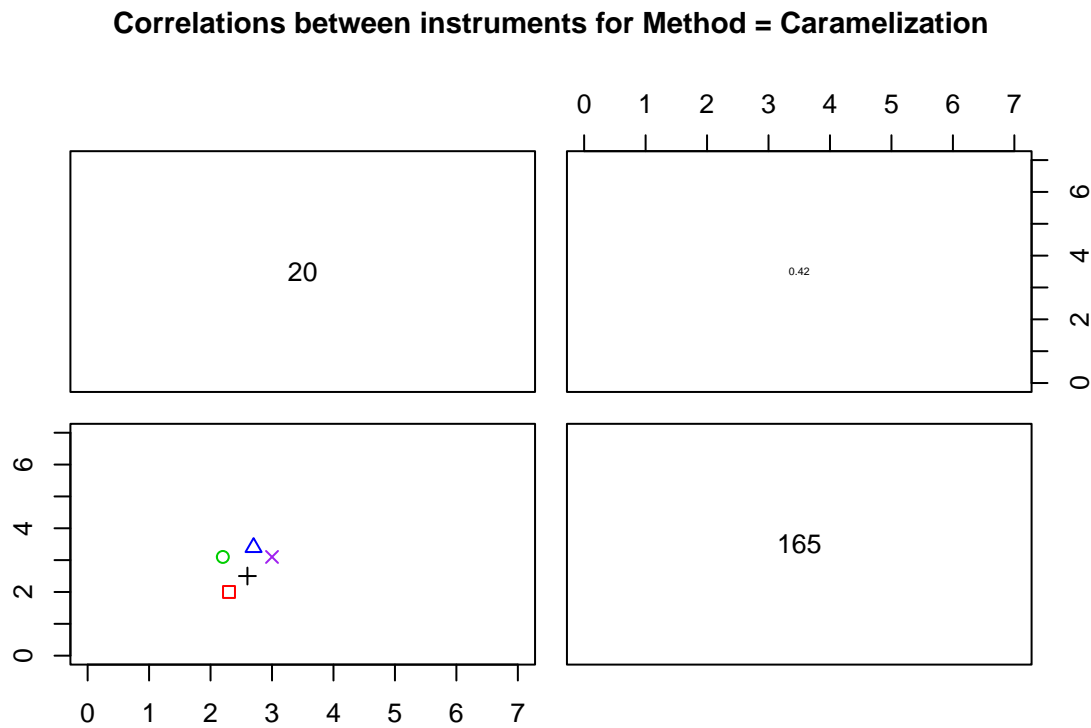


Individual readings per LabID with Method = SCT



Correlation charts and correlation values between LabID using a same Method for all cottons ⁵

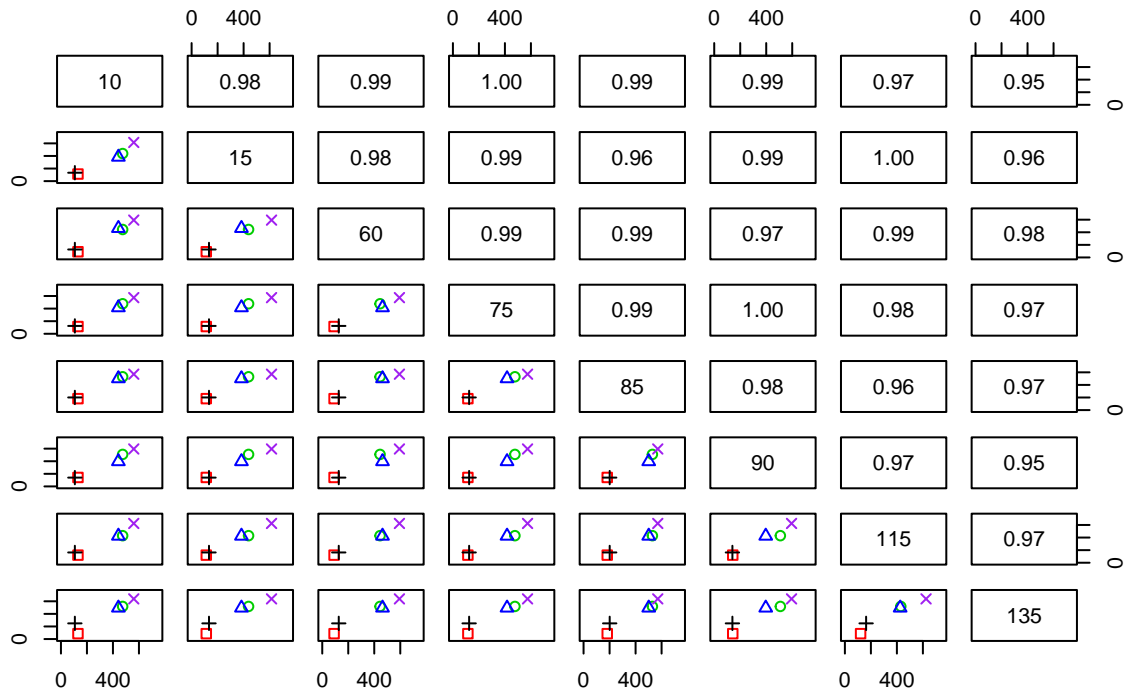
A correlation matrix of charts is provided only when two or more instruments were used for a given method.



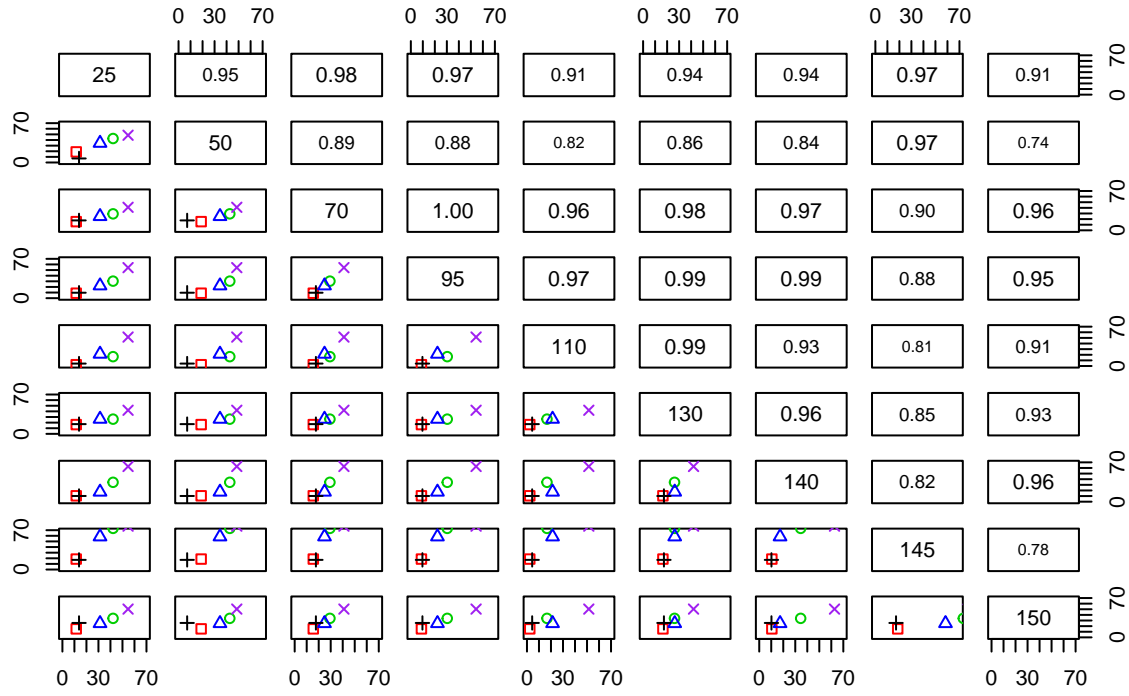
⁵Footnote

- * 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.

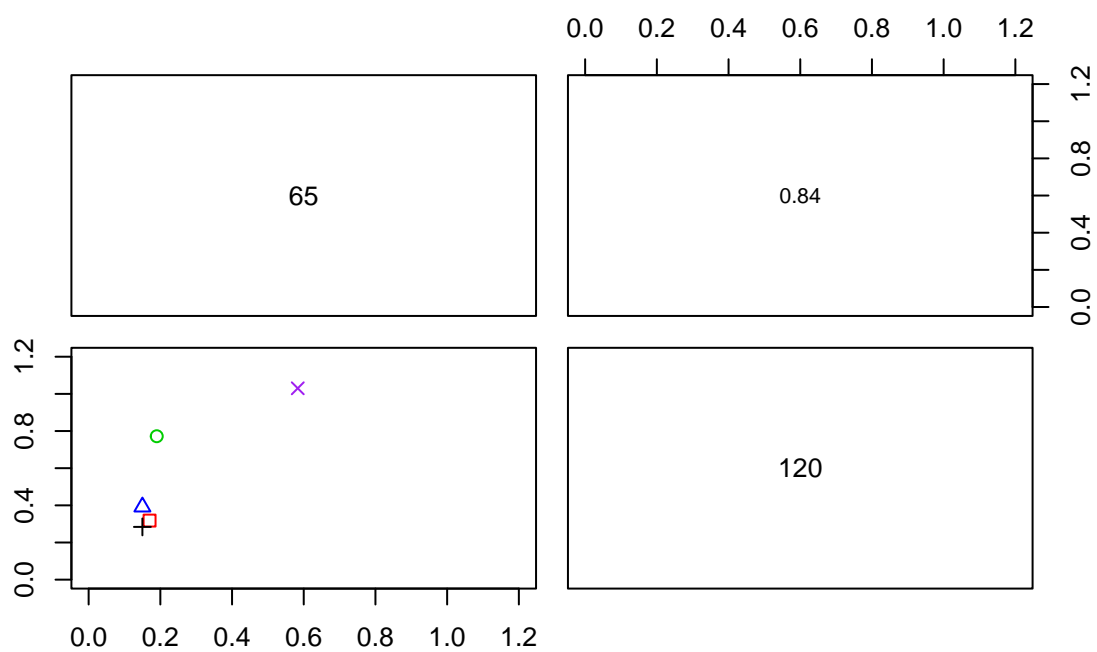
Correlations between instruments for Method = Contest-S



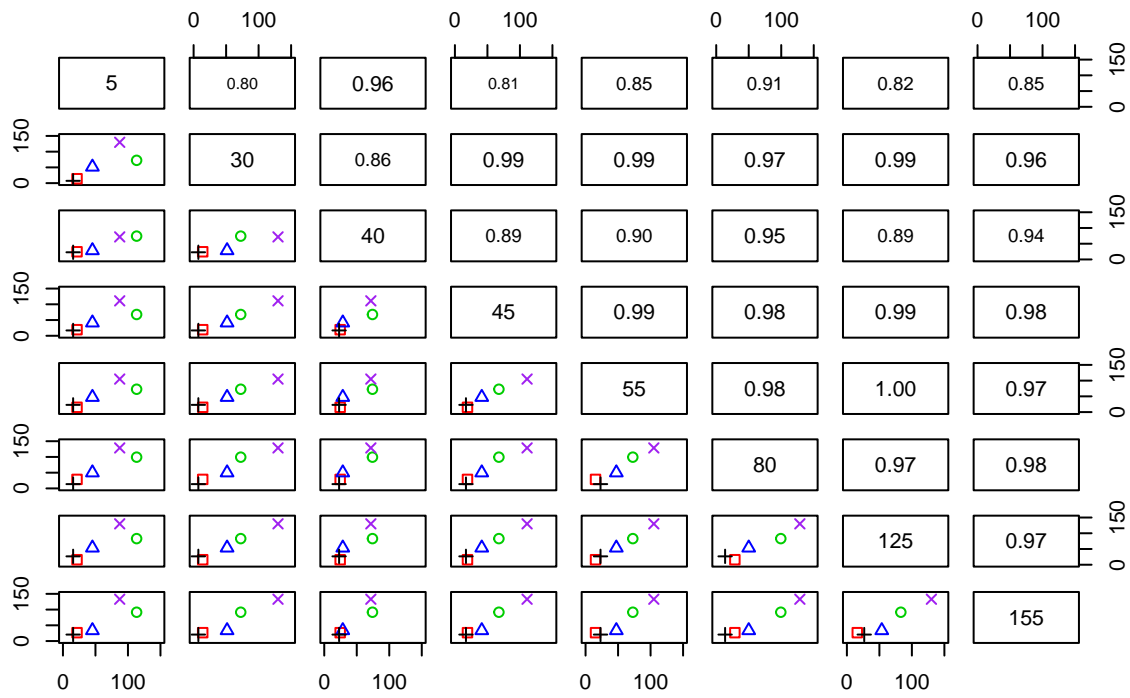
Correlations between instruments for Method = H2SD



Correlations between instruments for Method = Quantitative method



Correlations between instruments for Method = SCT

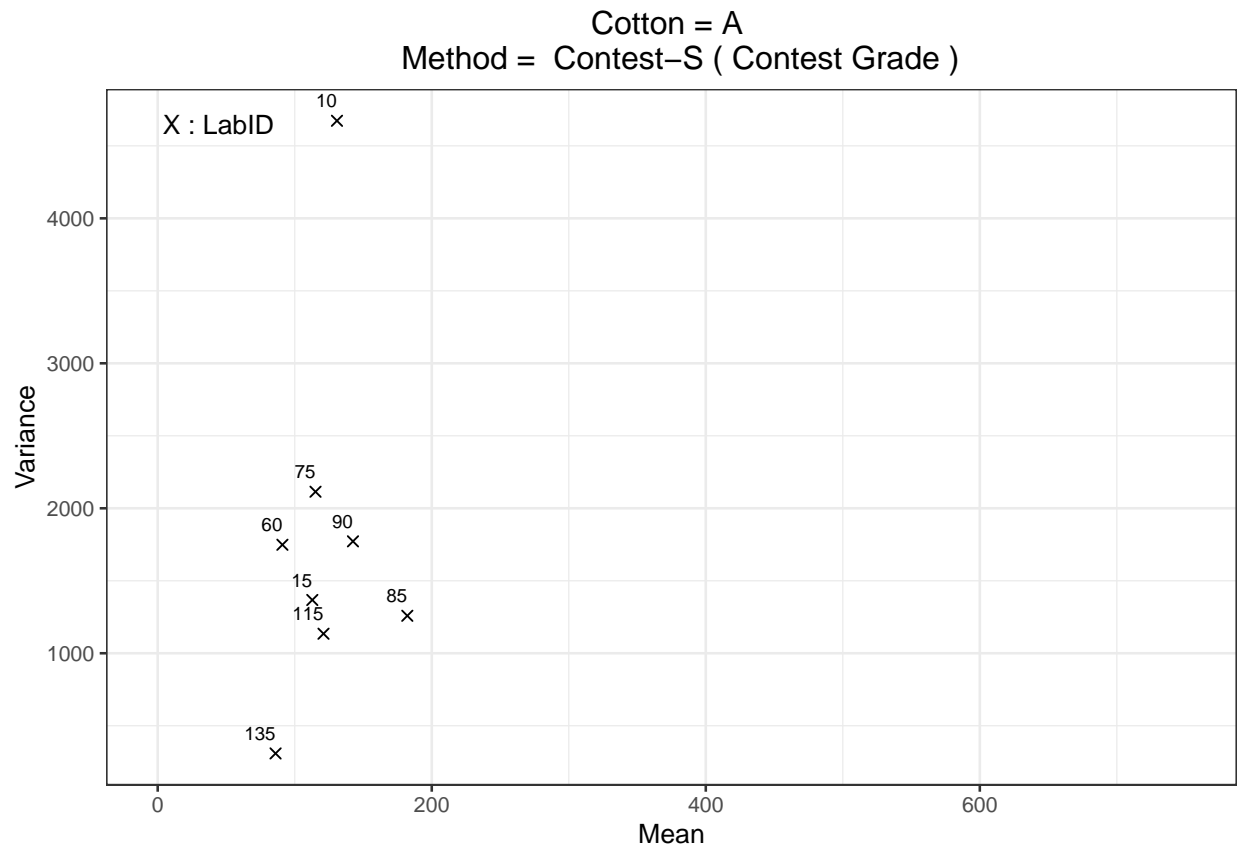


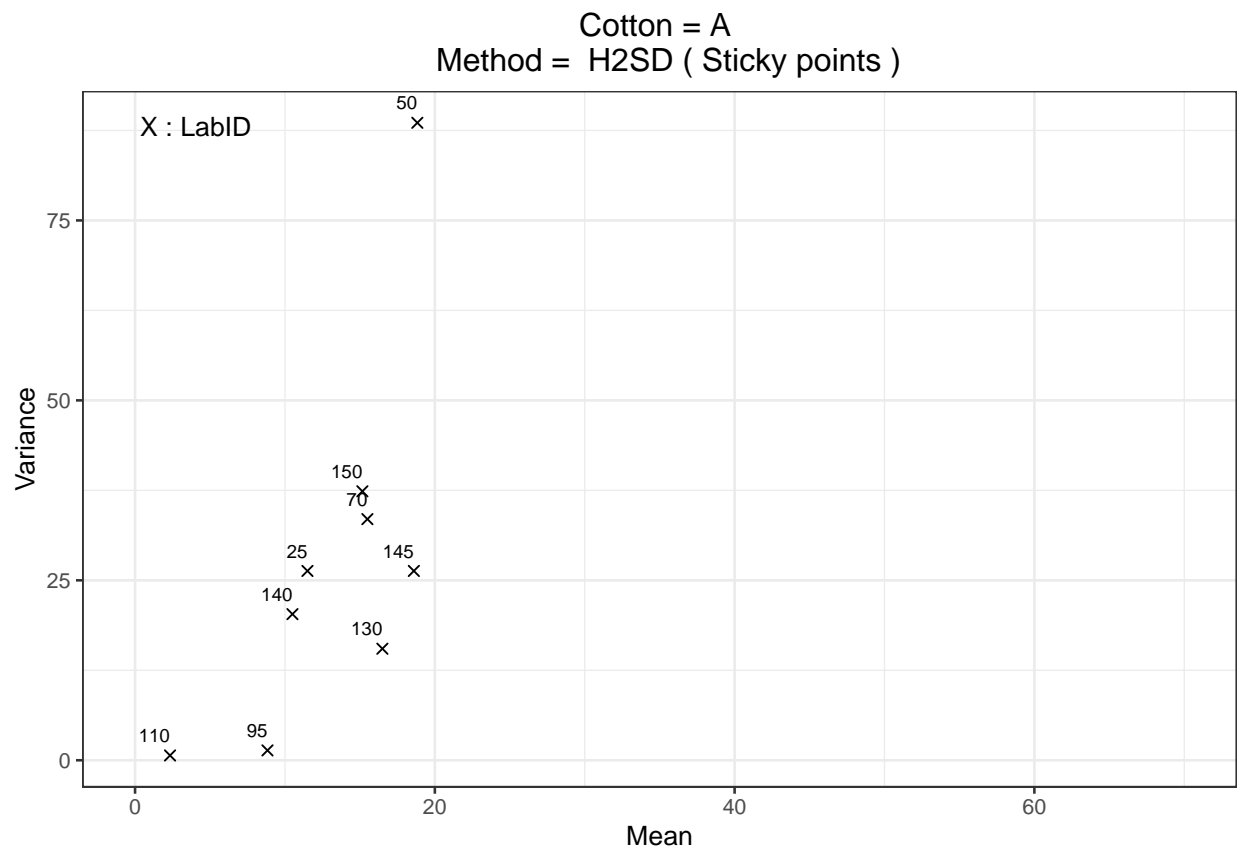
Charts Variance = f(Mean) for each Cotton and Method, taking care of LabIDs

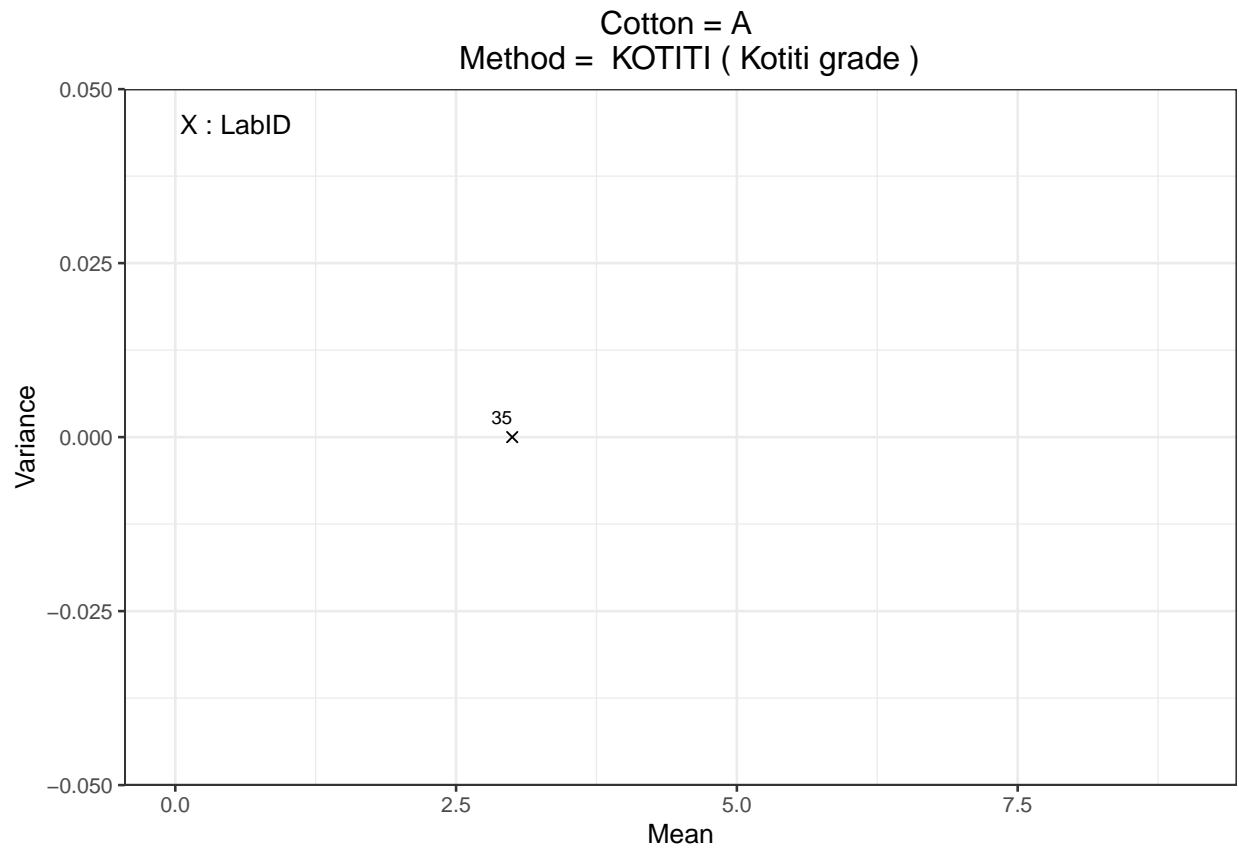
This type of chart is devoted to displaying the ability of laboratories to reproduce themselves for each cotton, based on the n readings (up to six) they provided for each cotton sample. Stickiness has the reputation to be heterogeneously distributed within samples (whatever the efforts we made for homogenizing 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

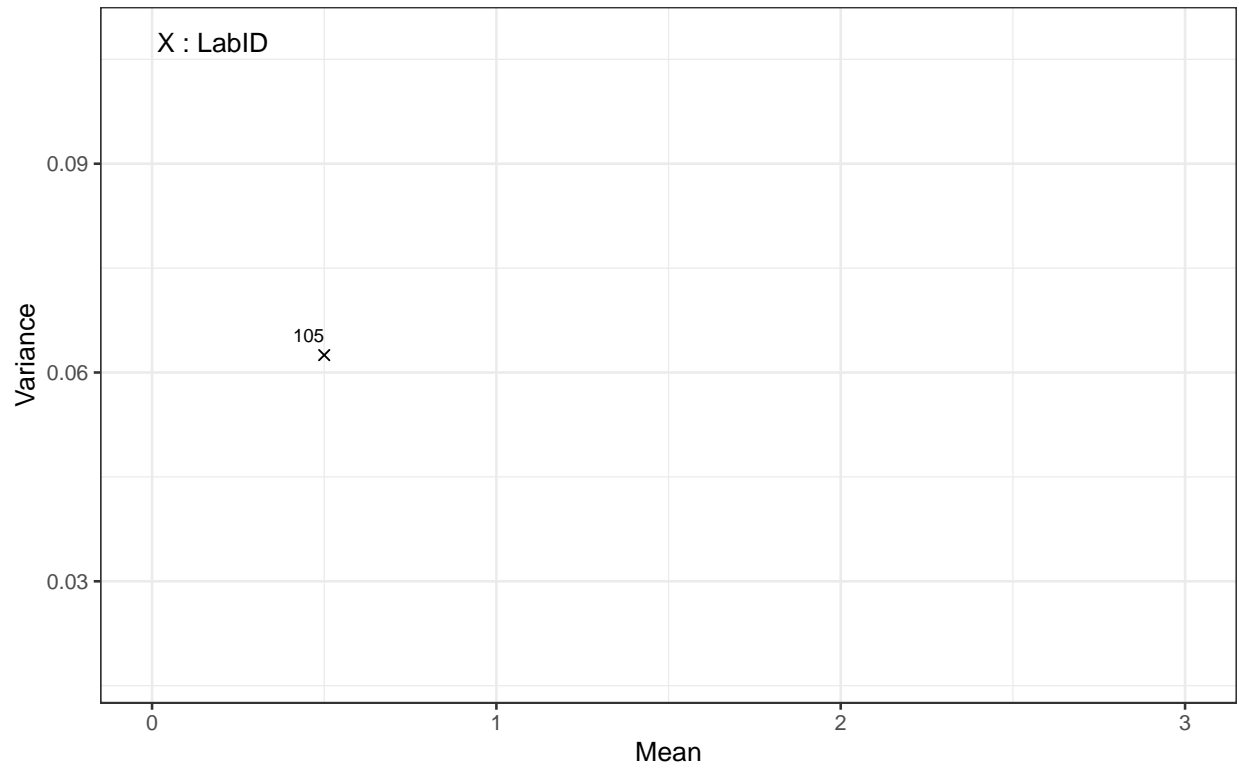
[1] “For Cotton = A and for method = Caramelization , 2 LabID (LabID being 20, 165) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”

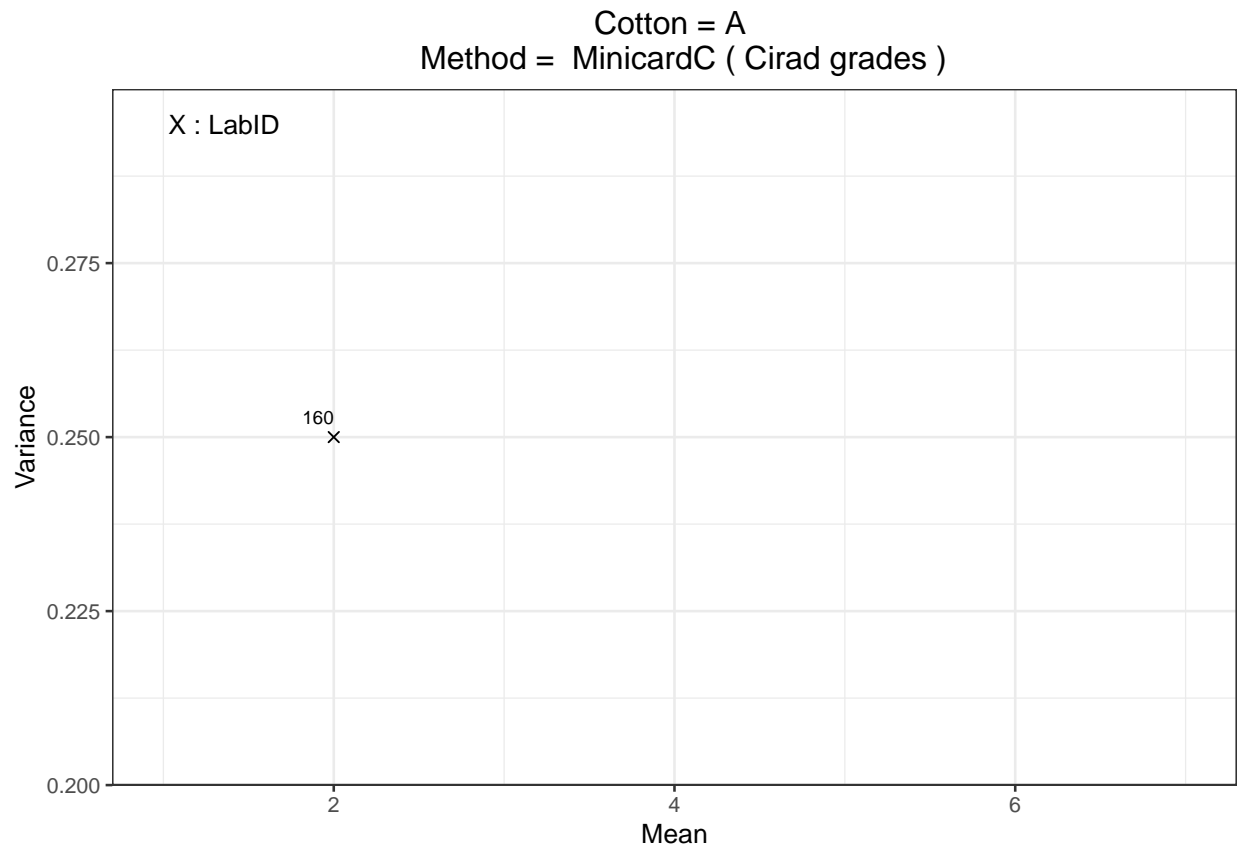


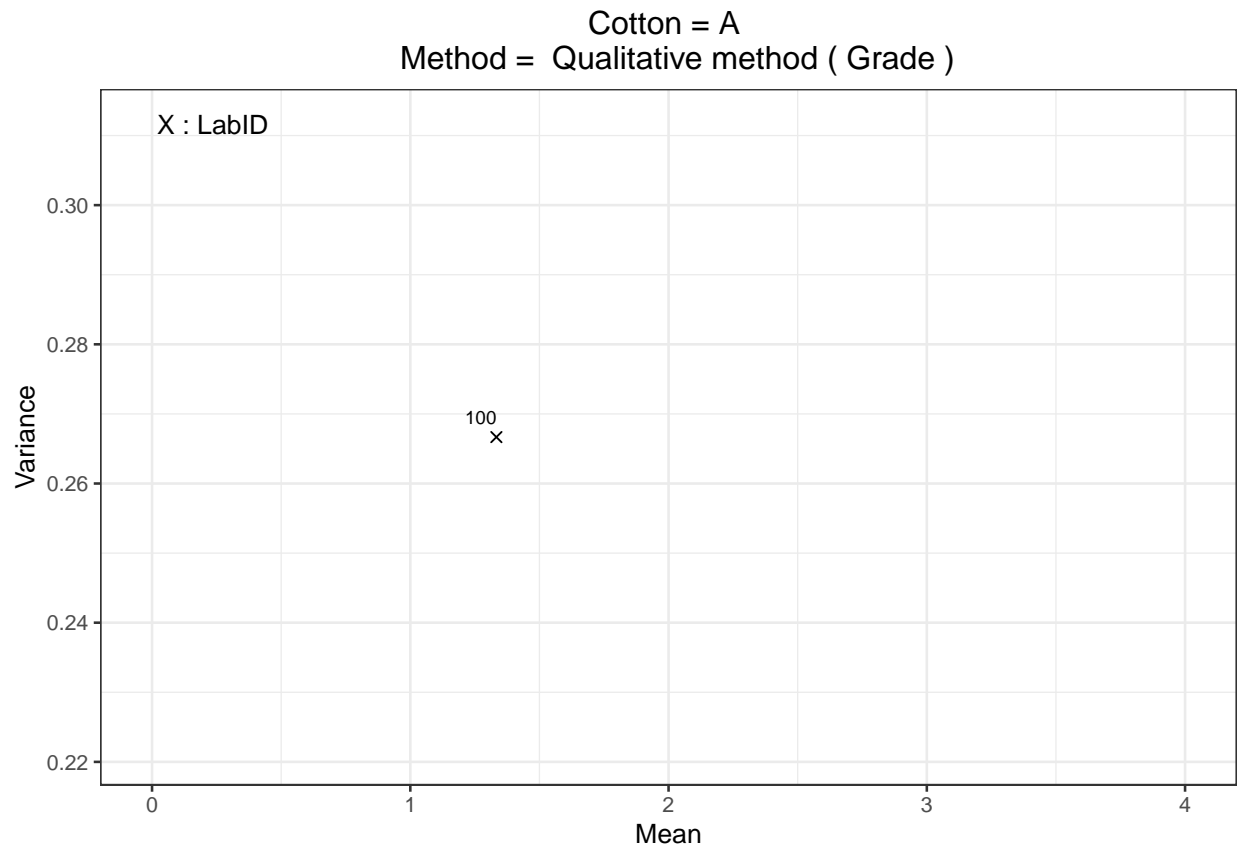


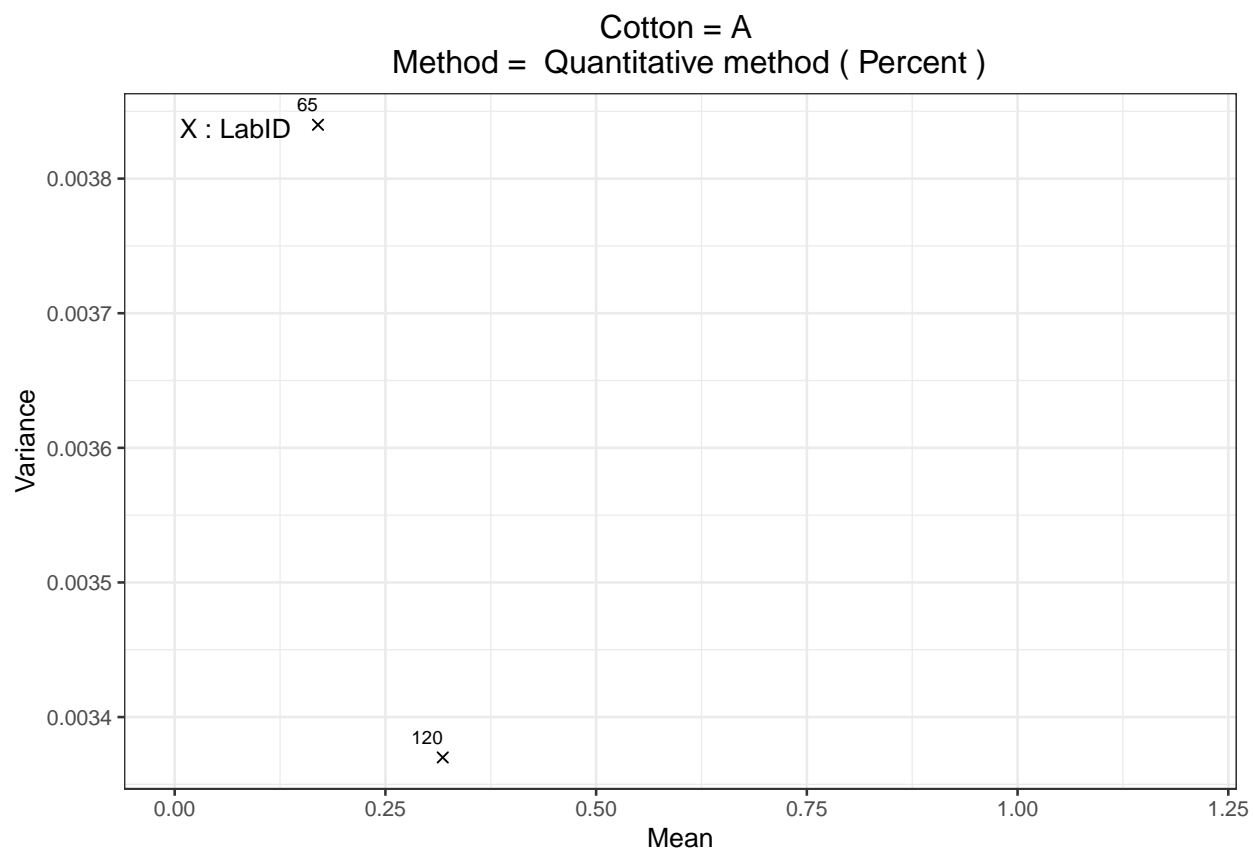


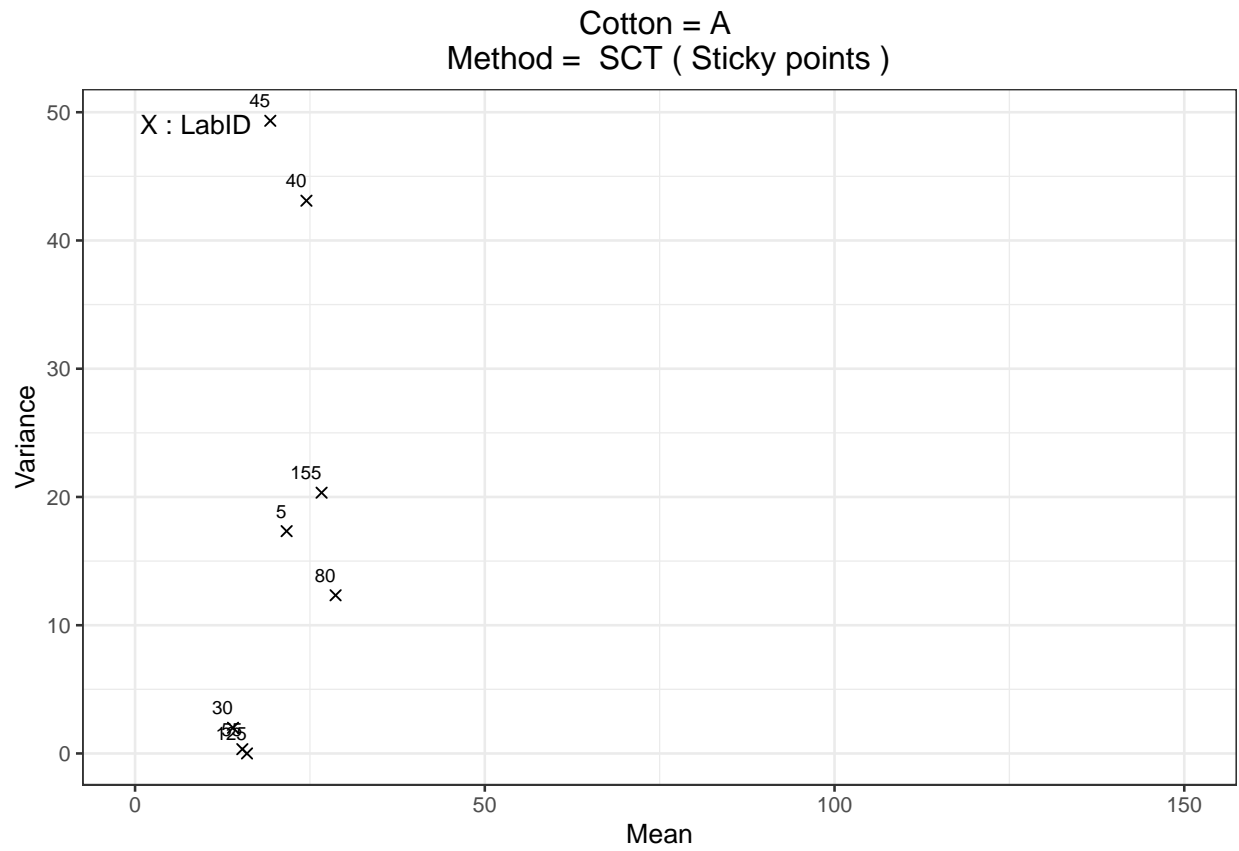
Cotton = A
Method = Minicard (ITMF grades)





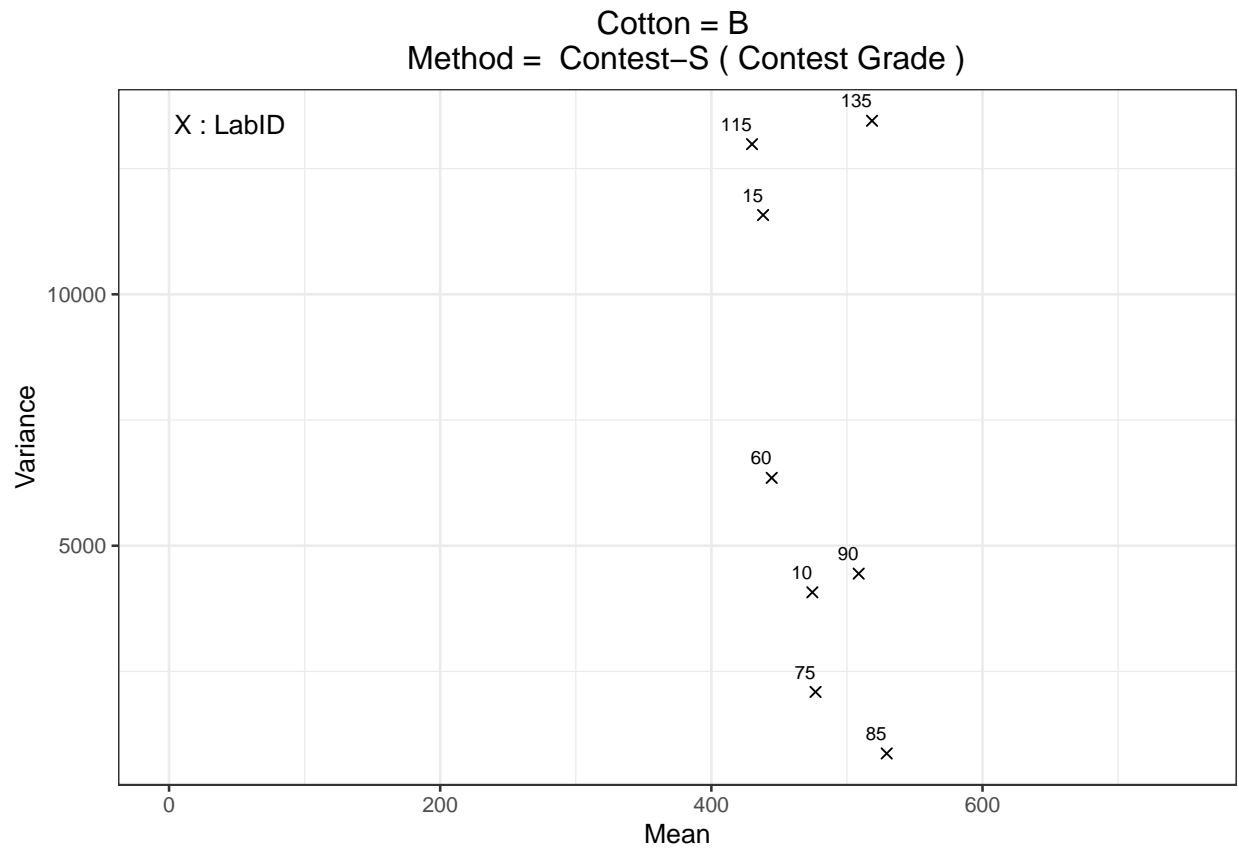


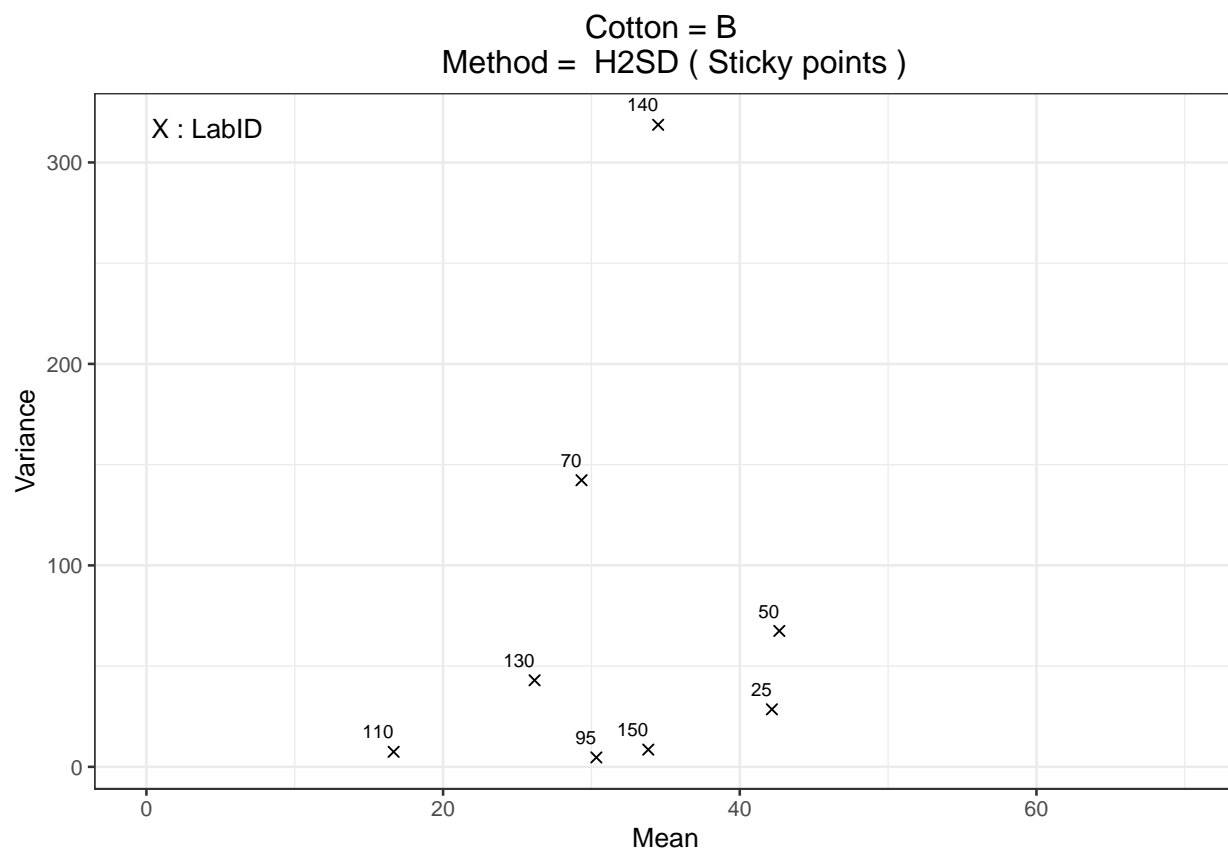


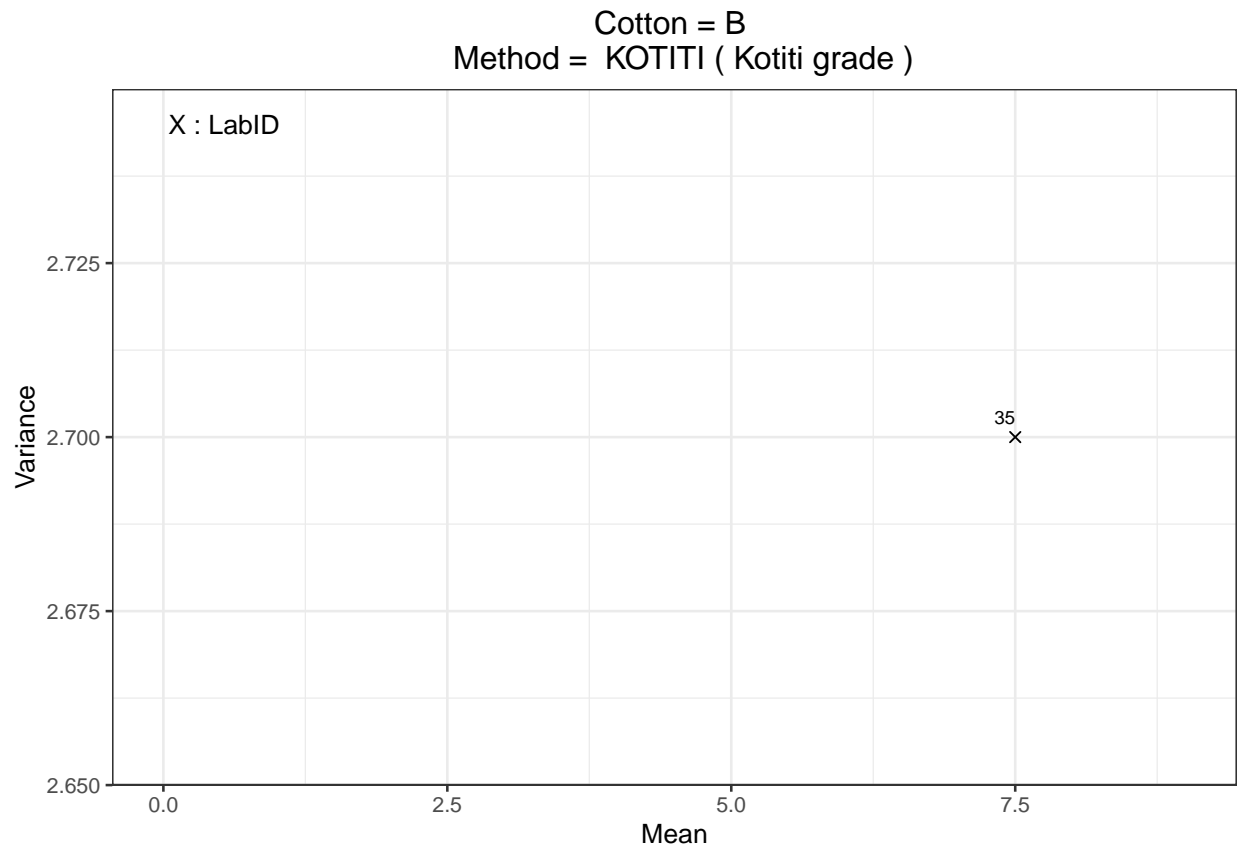


Cotton B : Variance between individual measurements = f(Mean) for all concerned labs

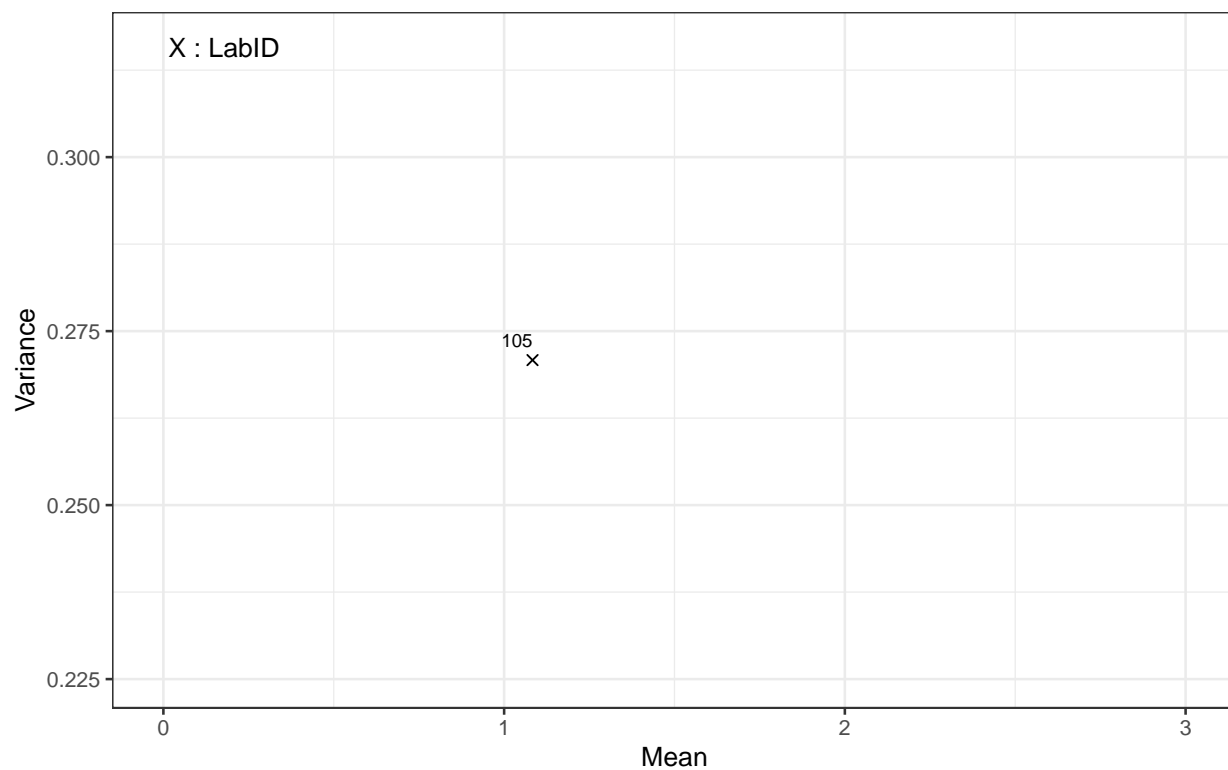
[1] “For Cotton = B and for method = Caramelization , 2 LabID (LabID being 20, 165) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”

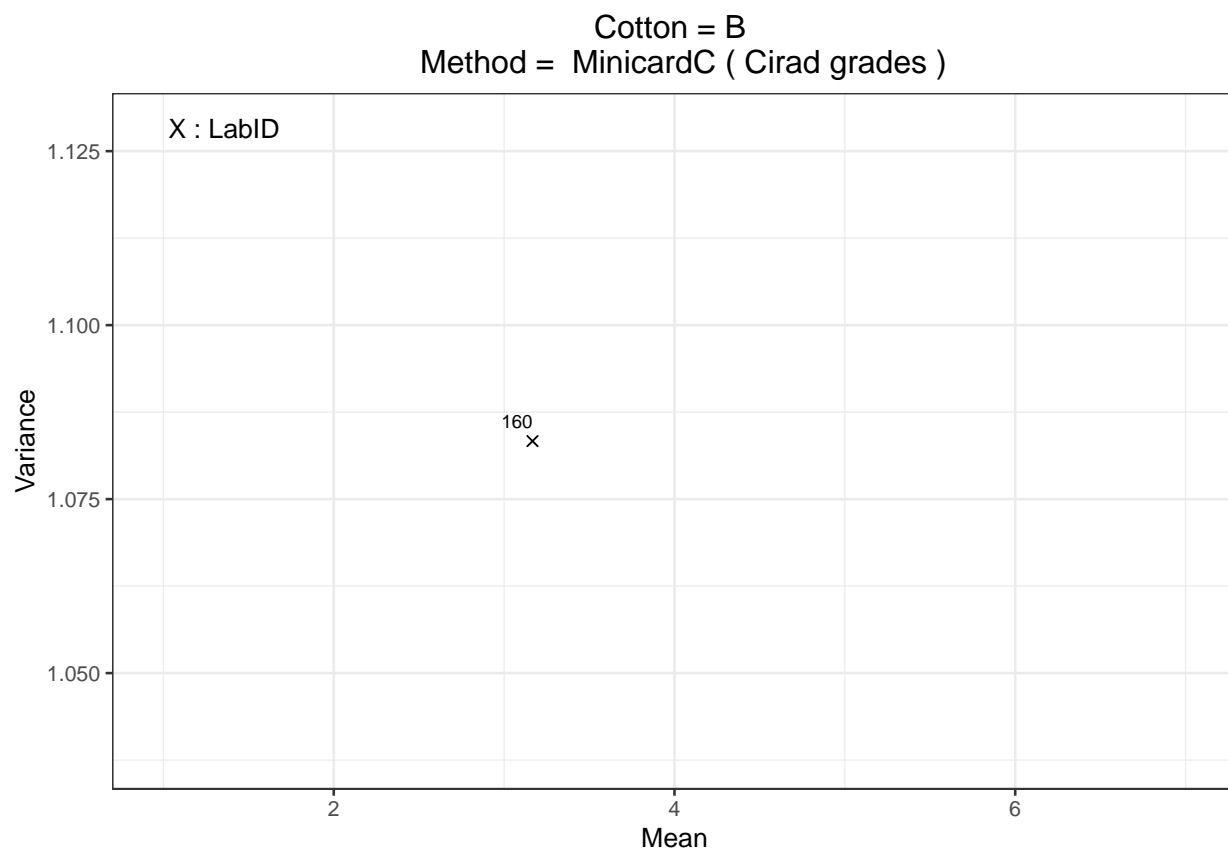


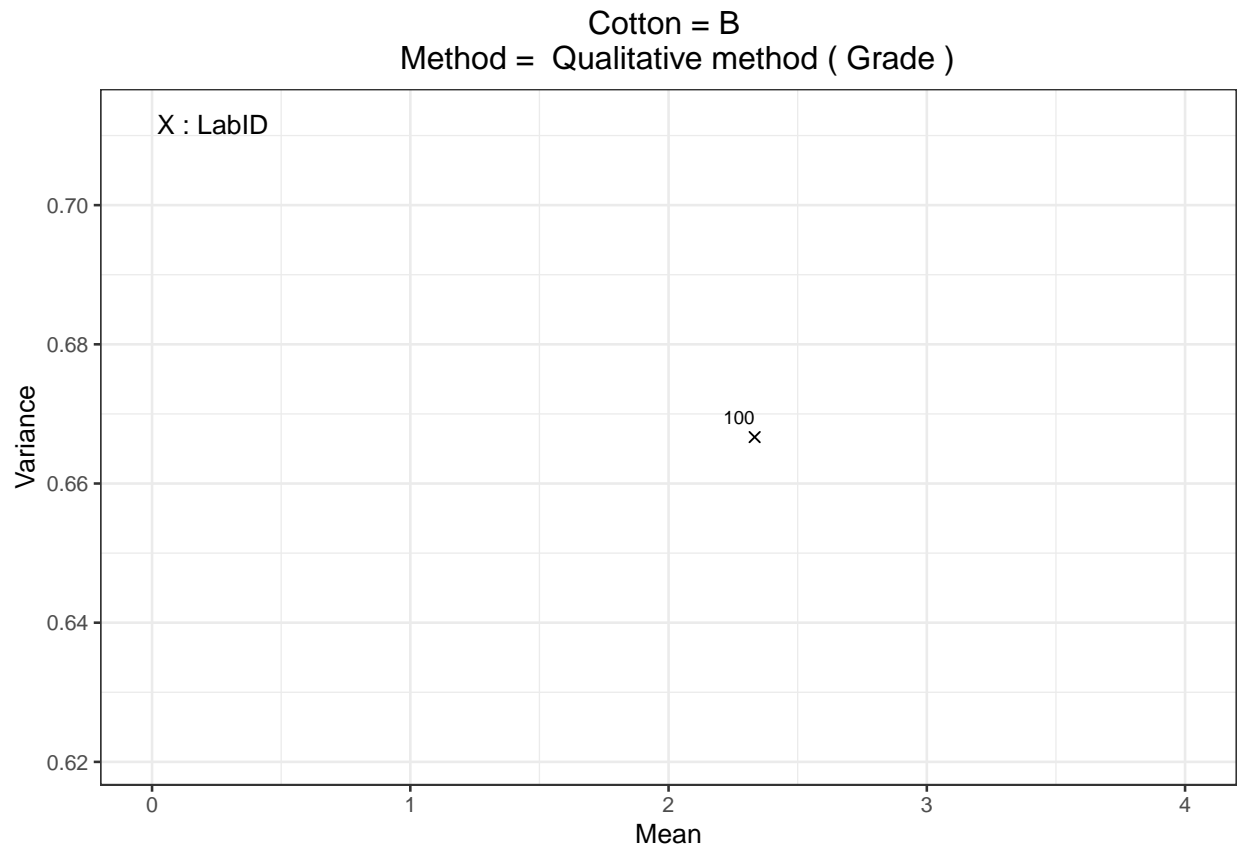


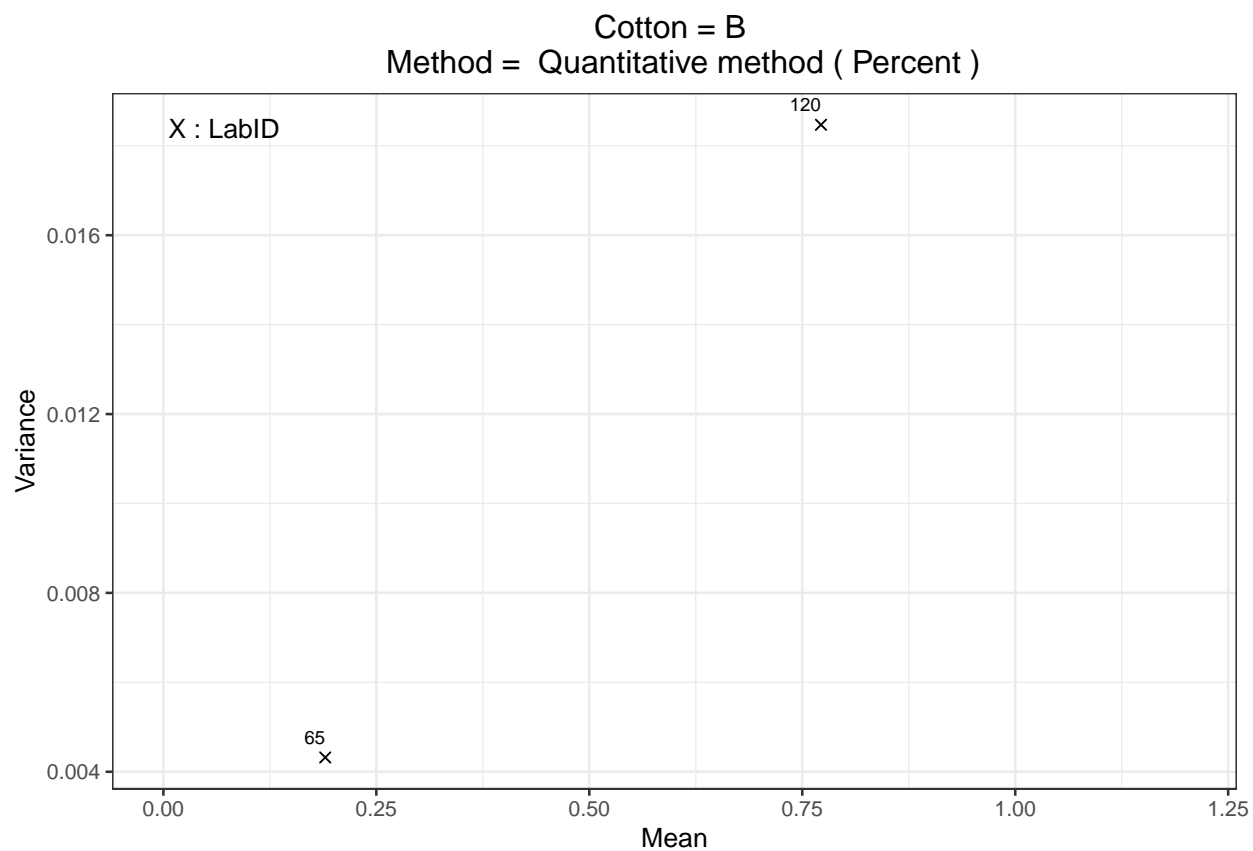


Cotton = B
Method = Minicard (ITMF grades)

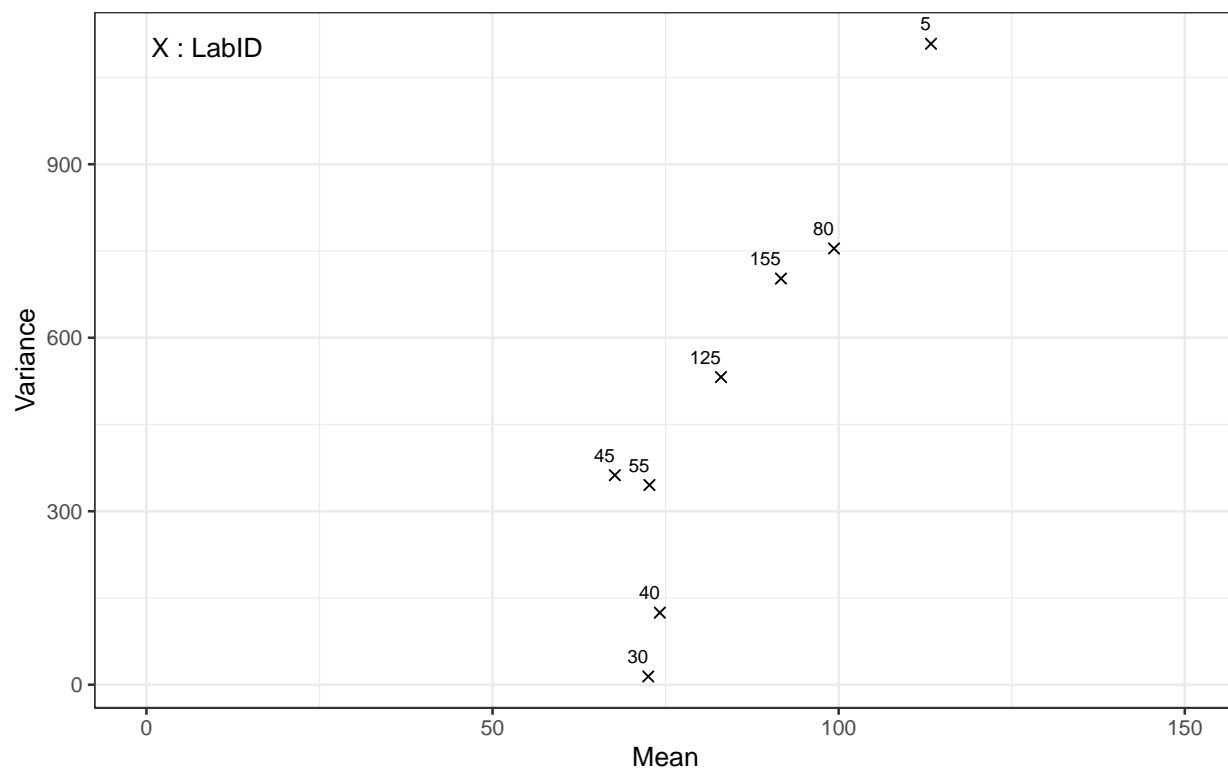






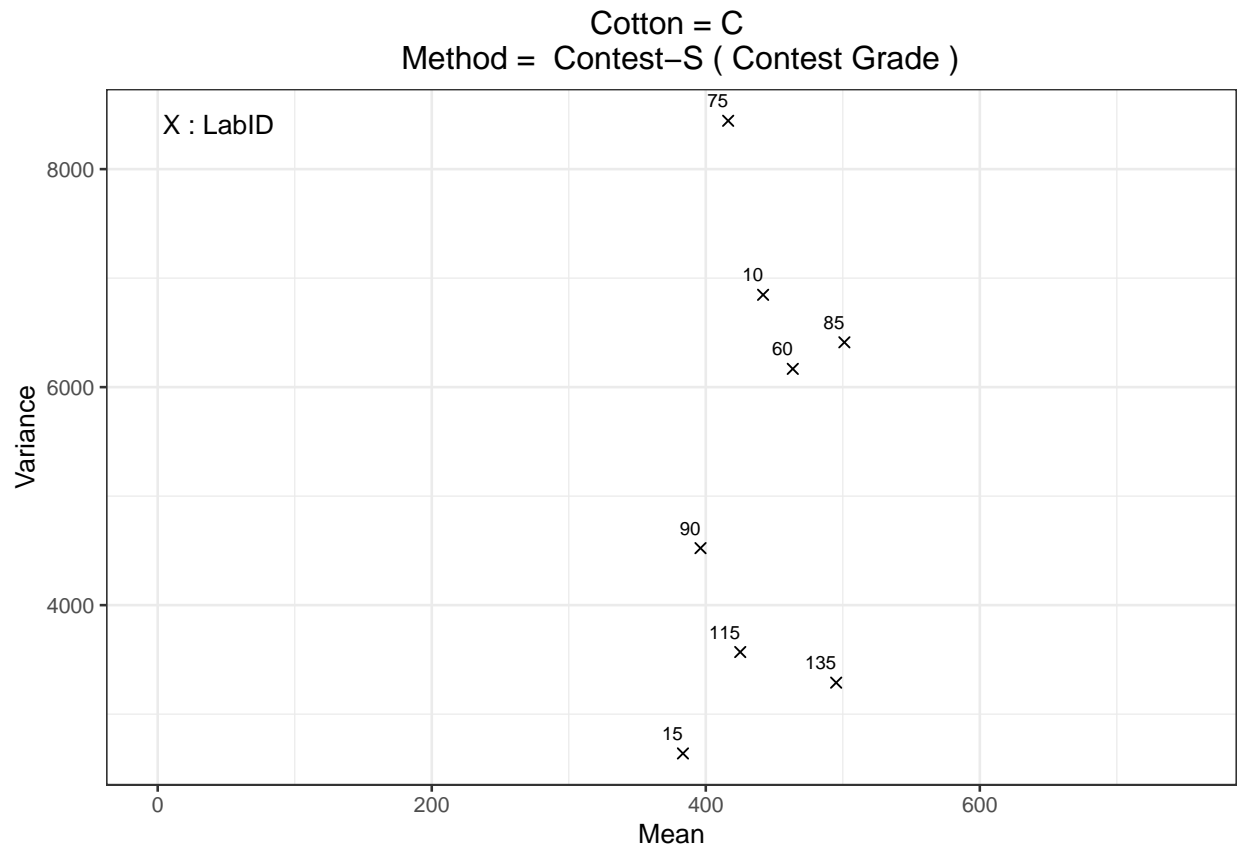


Cotton = B
Method = SCT (Sticky points)

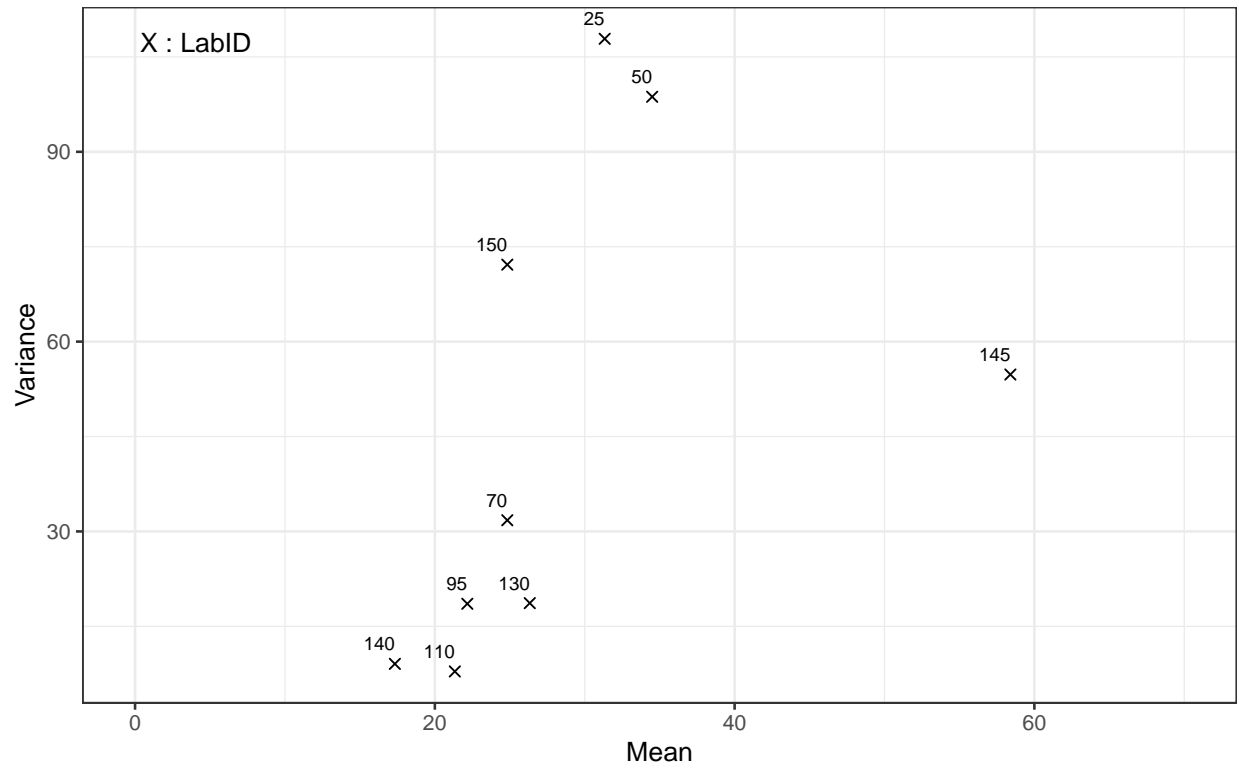


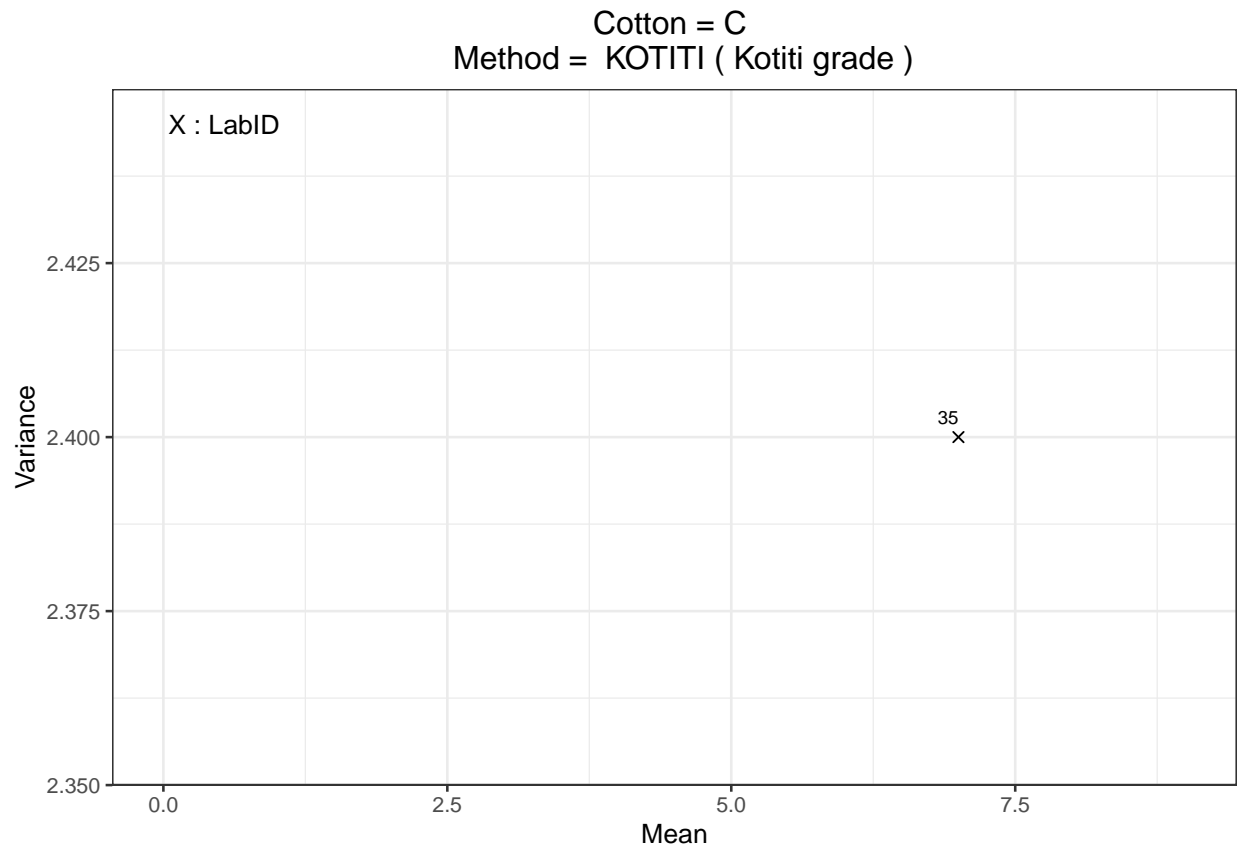
Cotton C : Variance between individual measurements = f(Mean) for all concerned labs

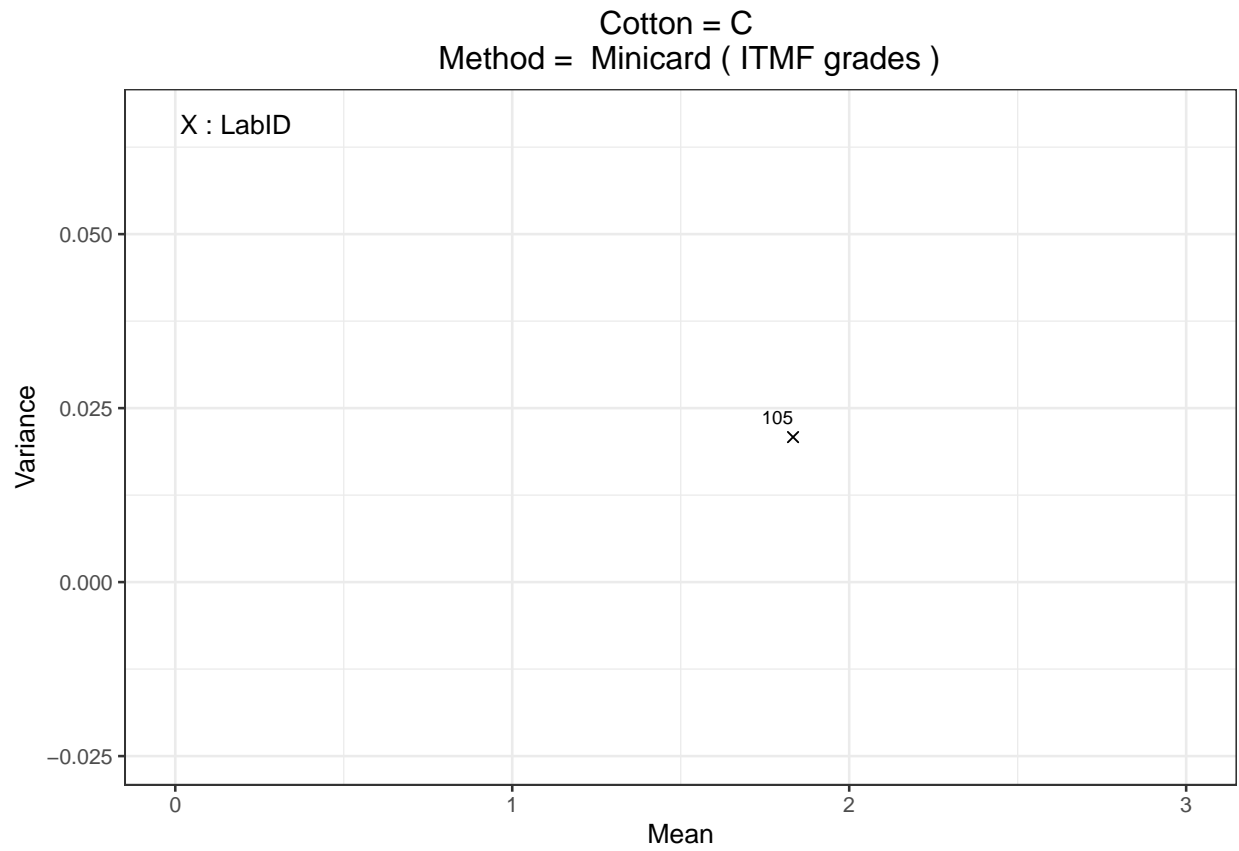
[1] “For Cotton = C and for method = Caramelization , 2 LabID (LabID being 20, 165) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”

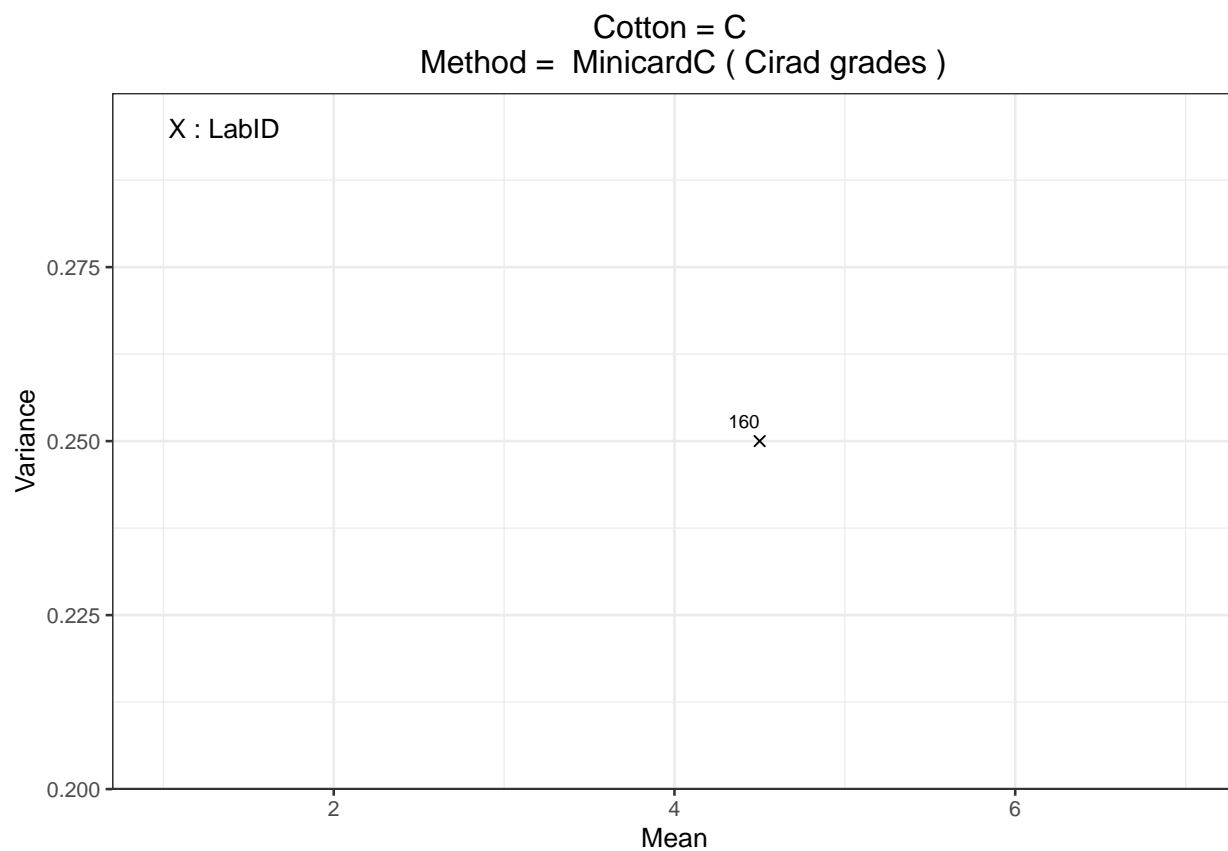


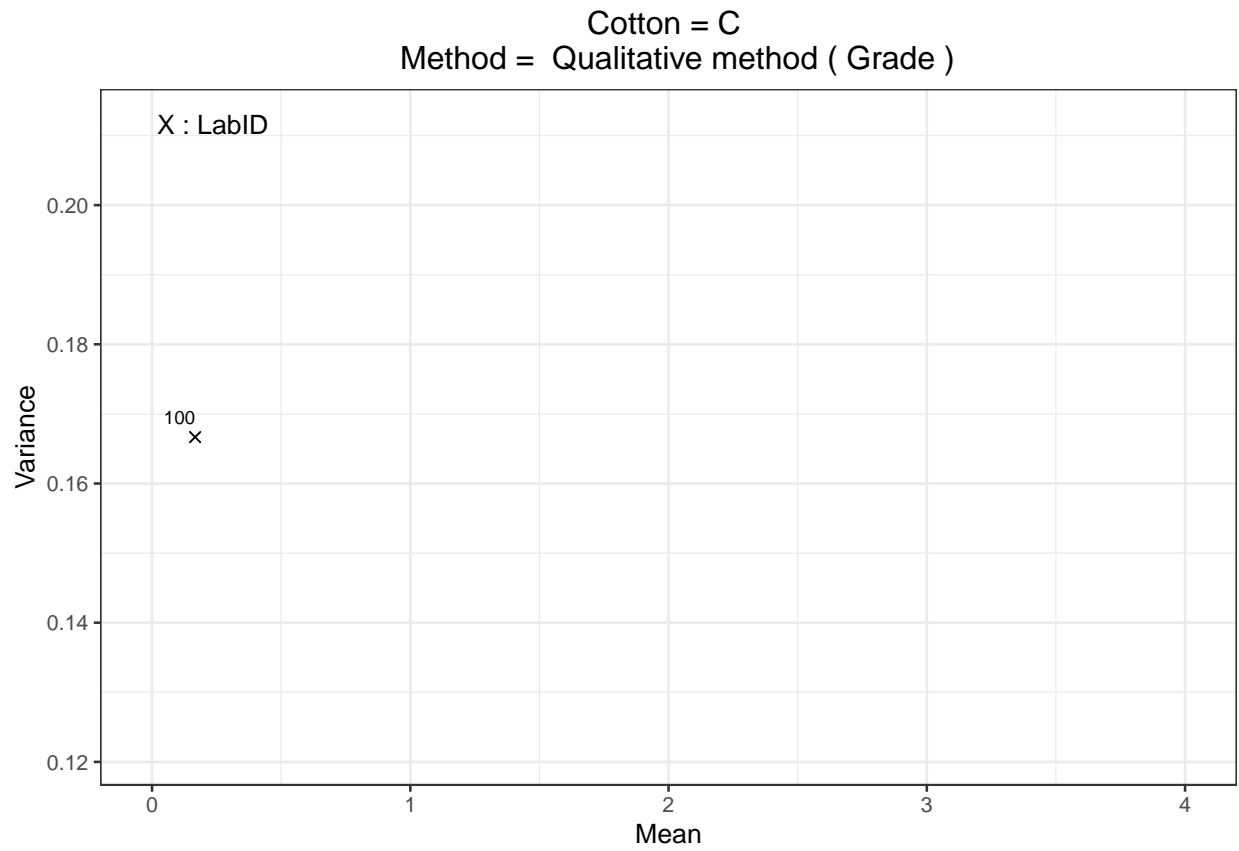
Cotton = C
Method = H2SD (Sticky points)

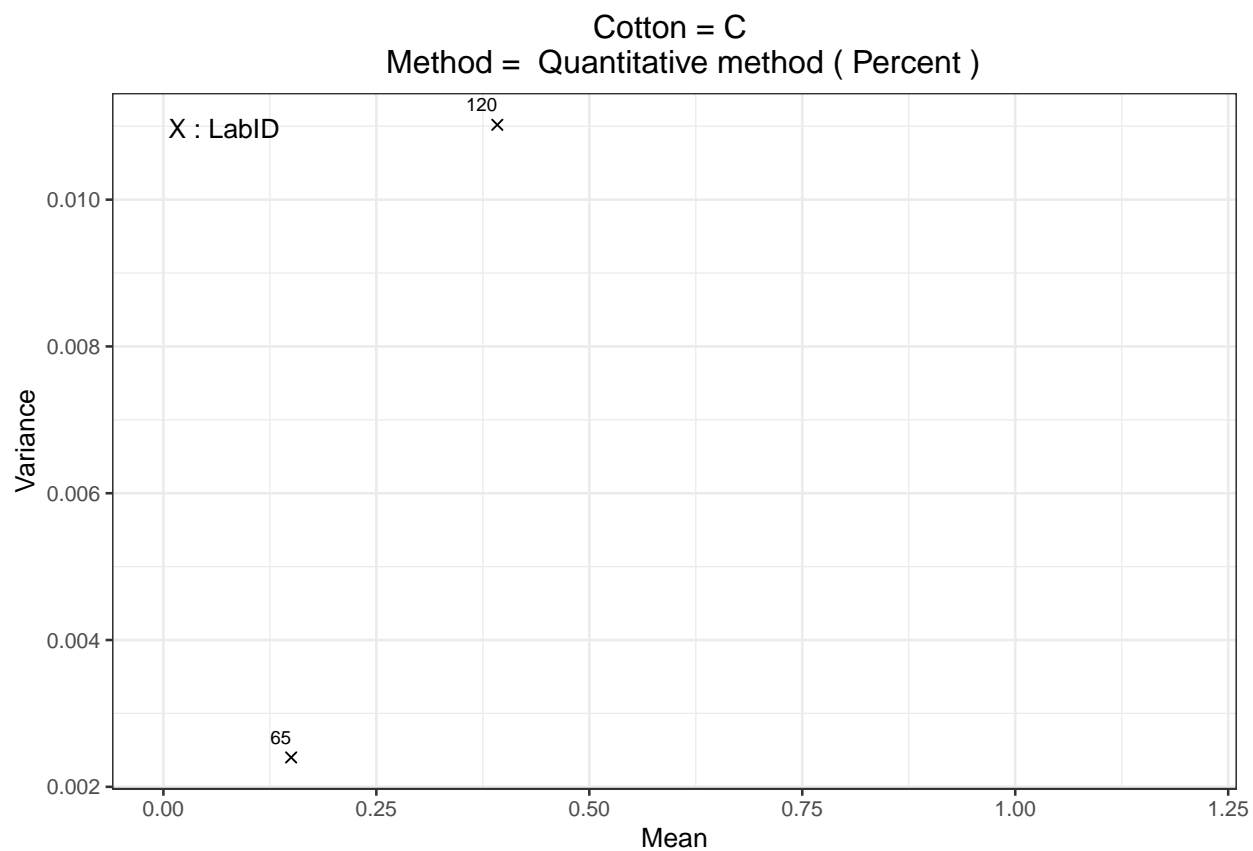


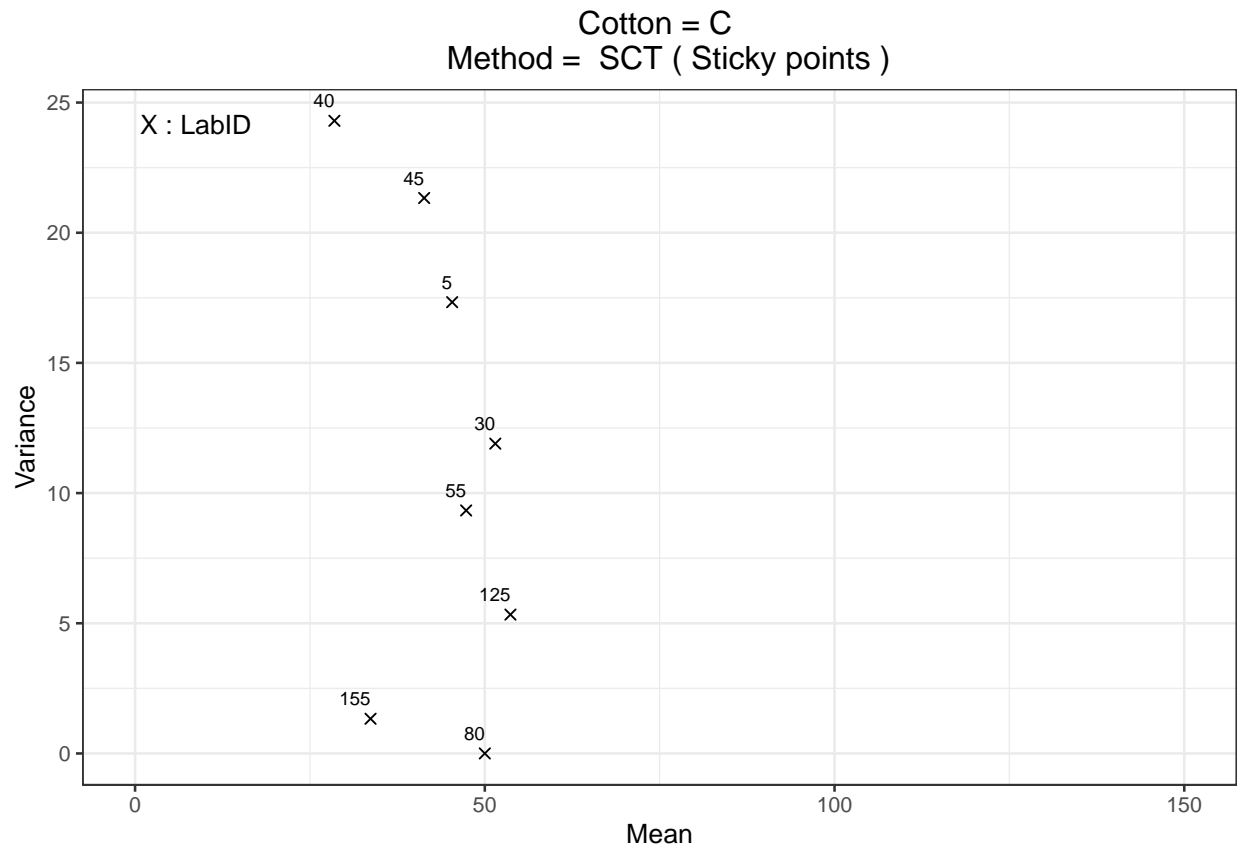






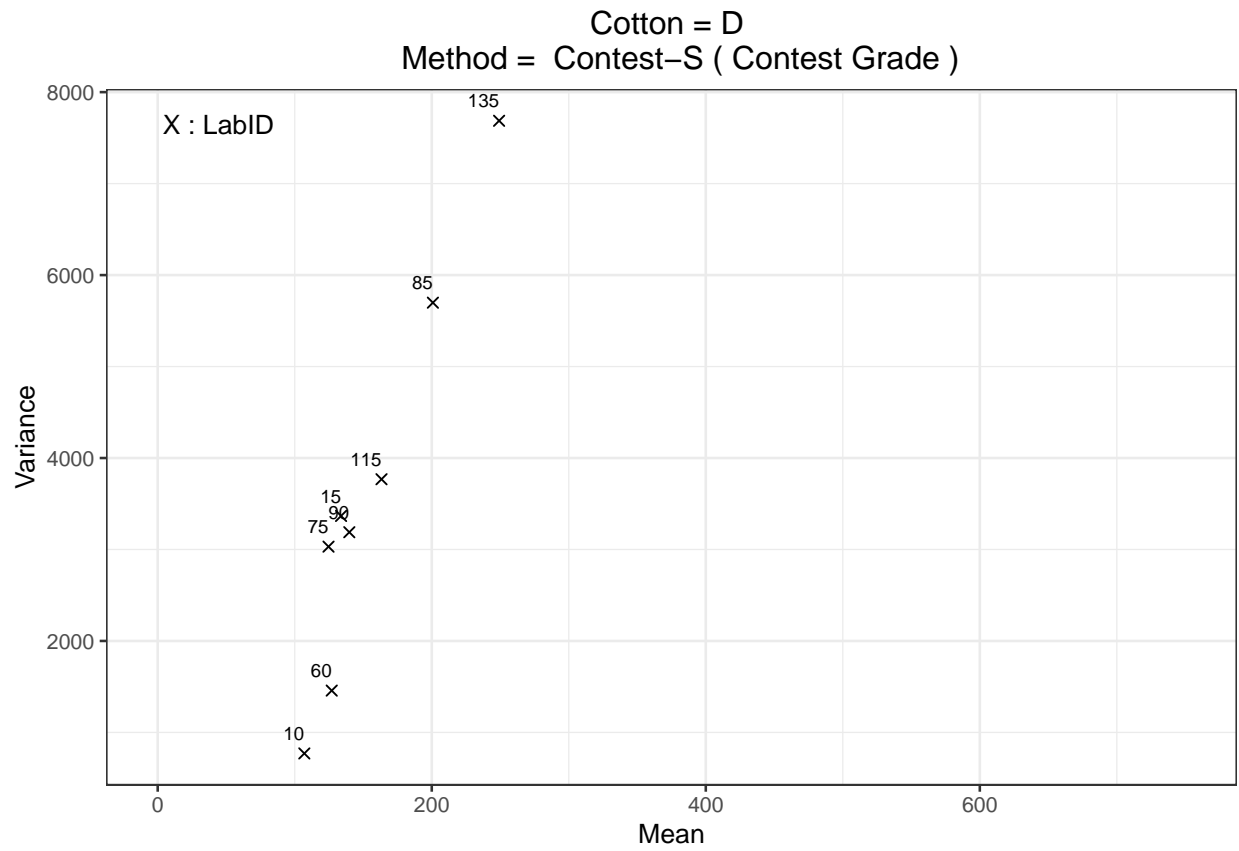


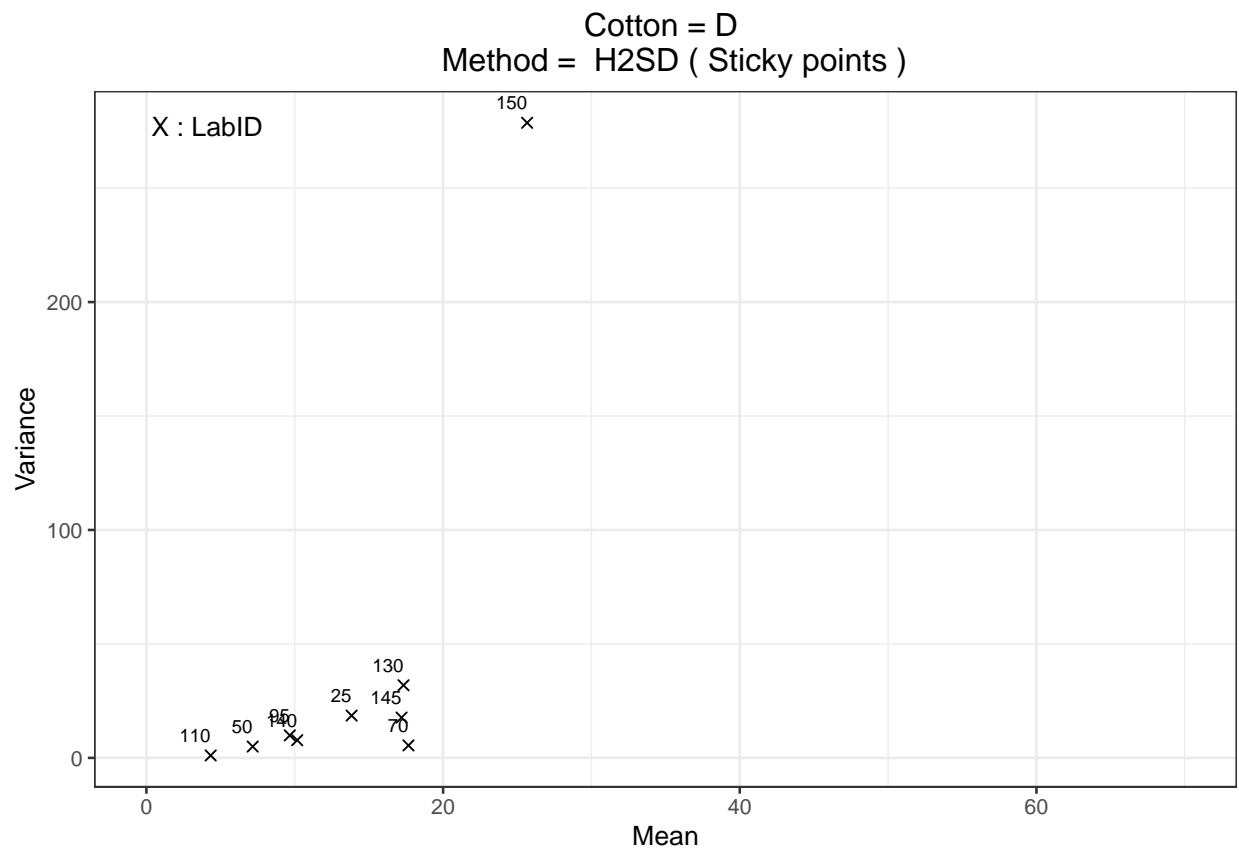


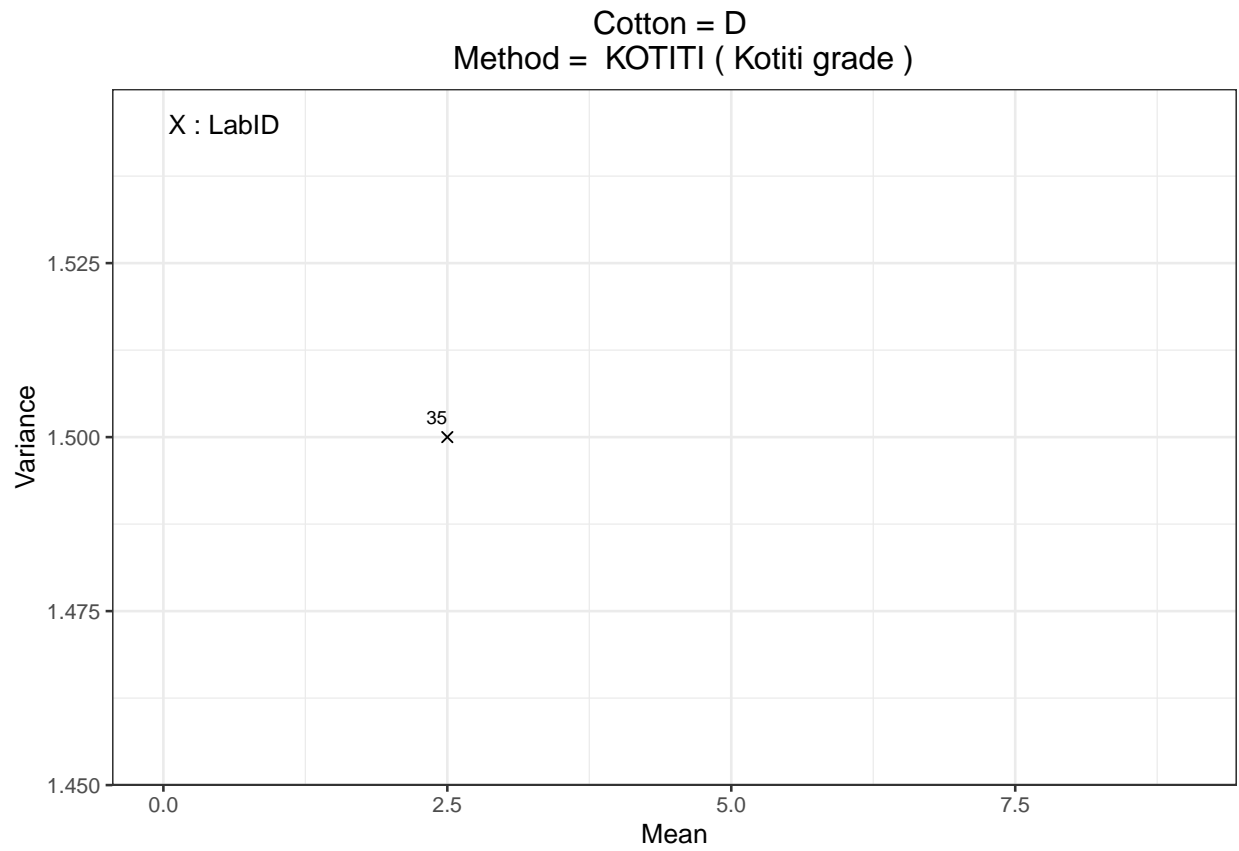


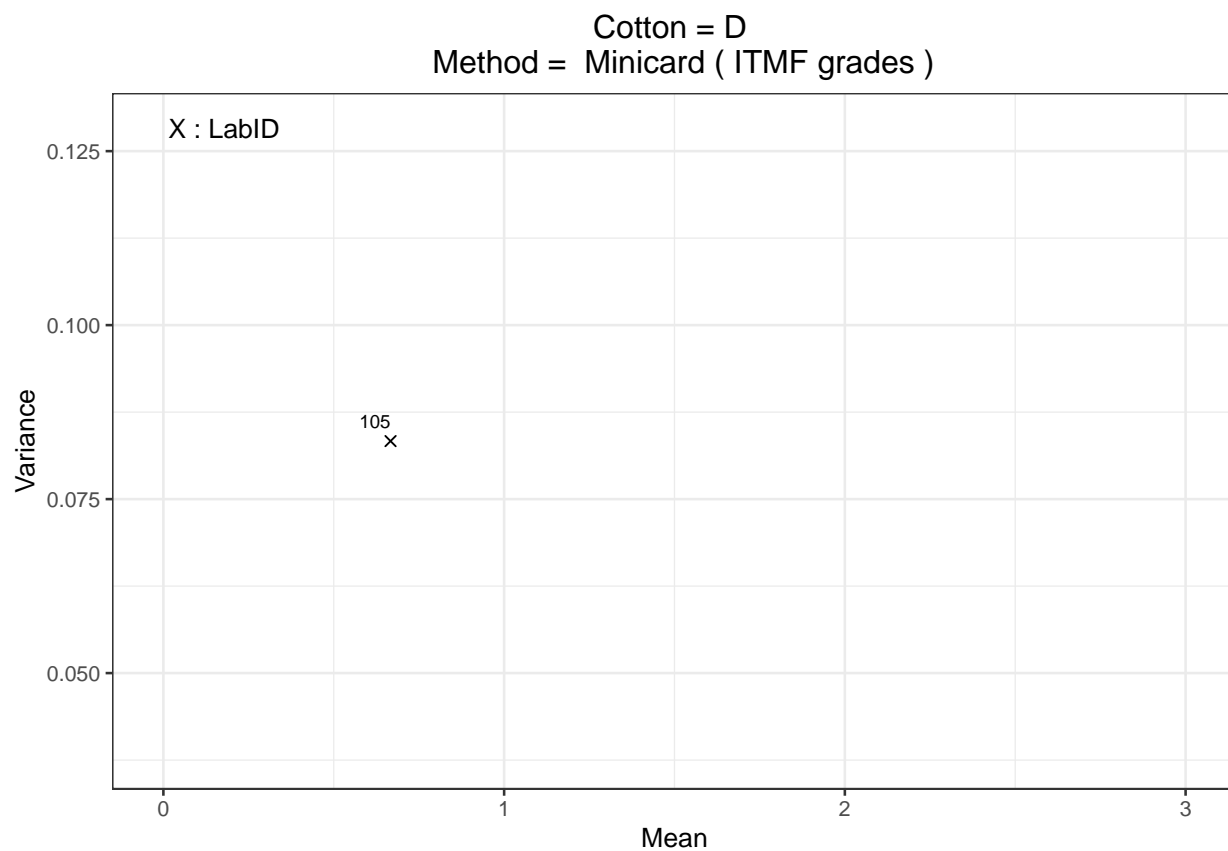
Cotton D : Variance between individual measurements = f(Mean) for all concerned labs

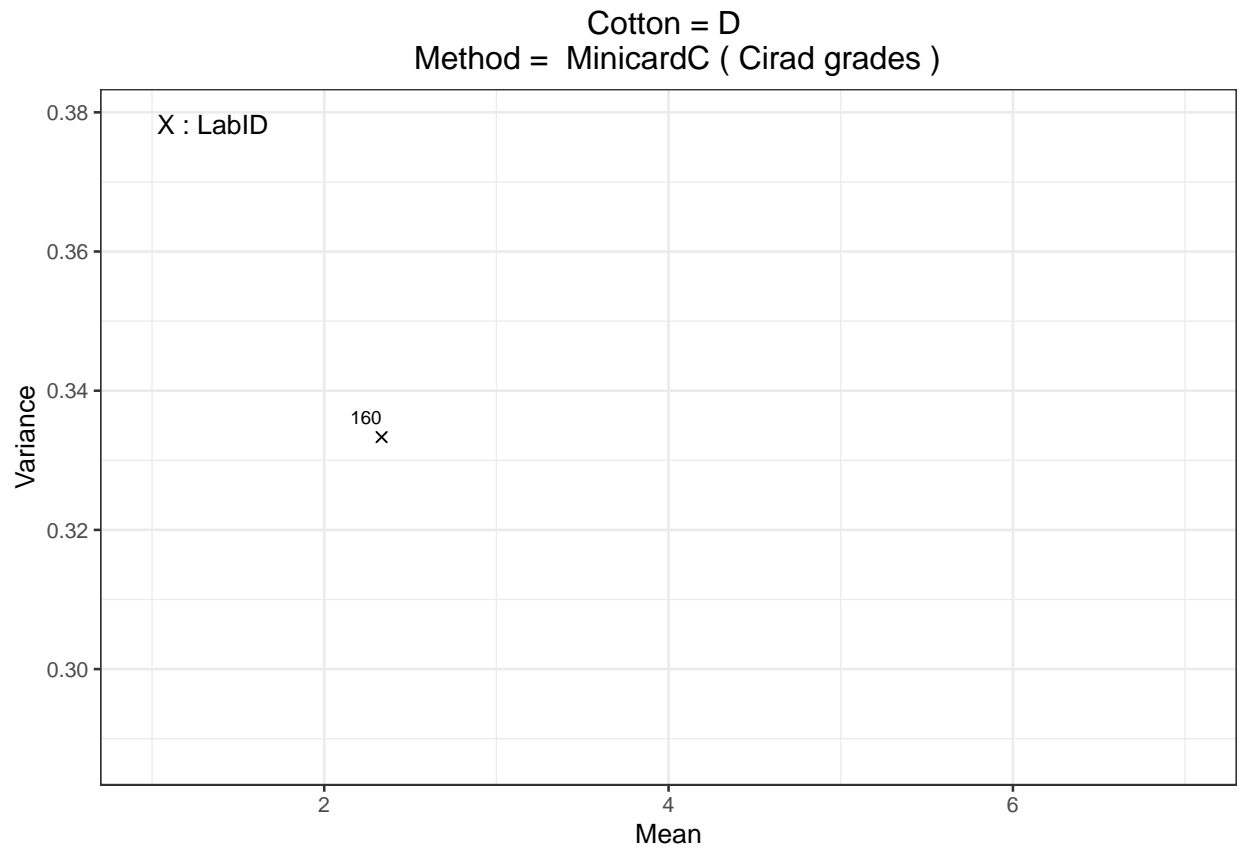
[1] “For Cotton = D and for method = Caramelization , 2 LabID (LabID being 20, 165) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”

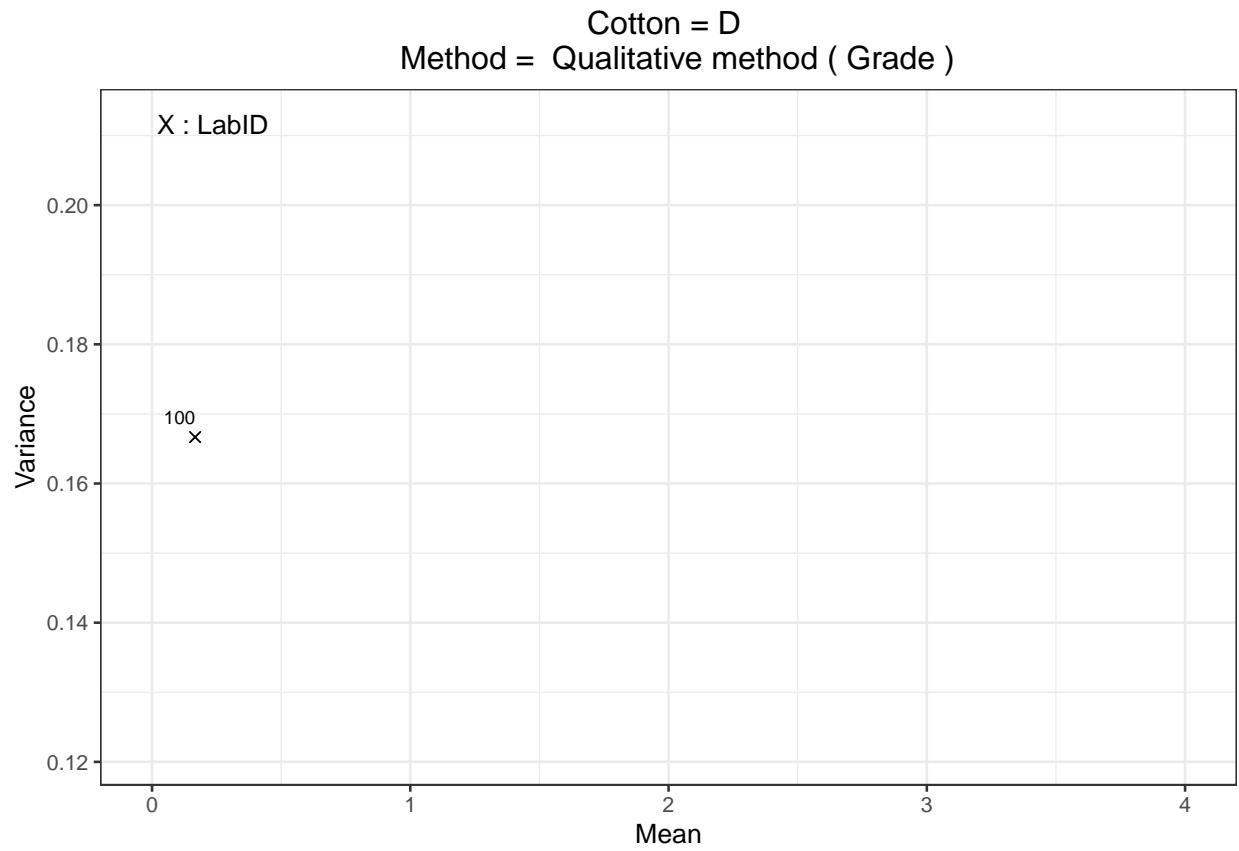


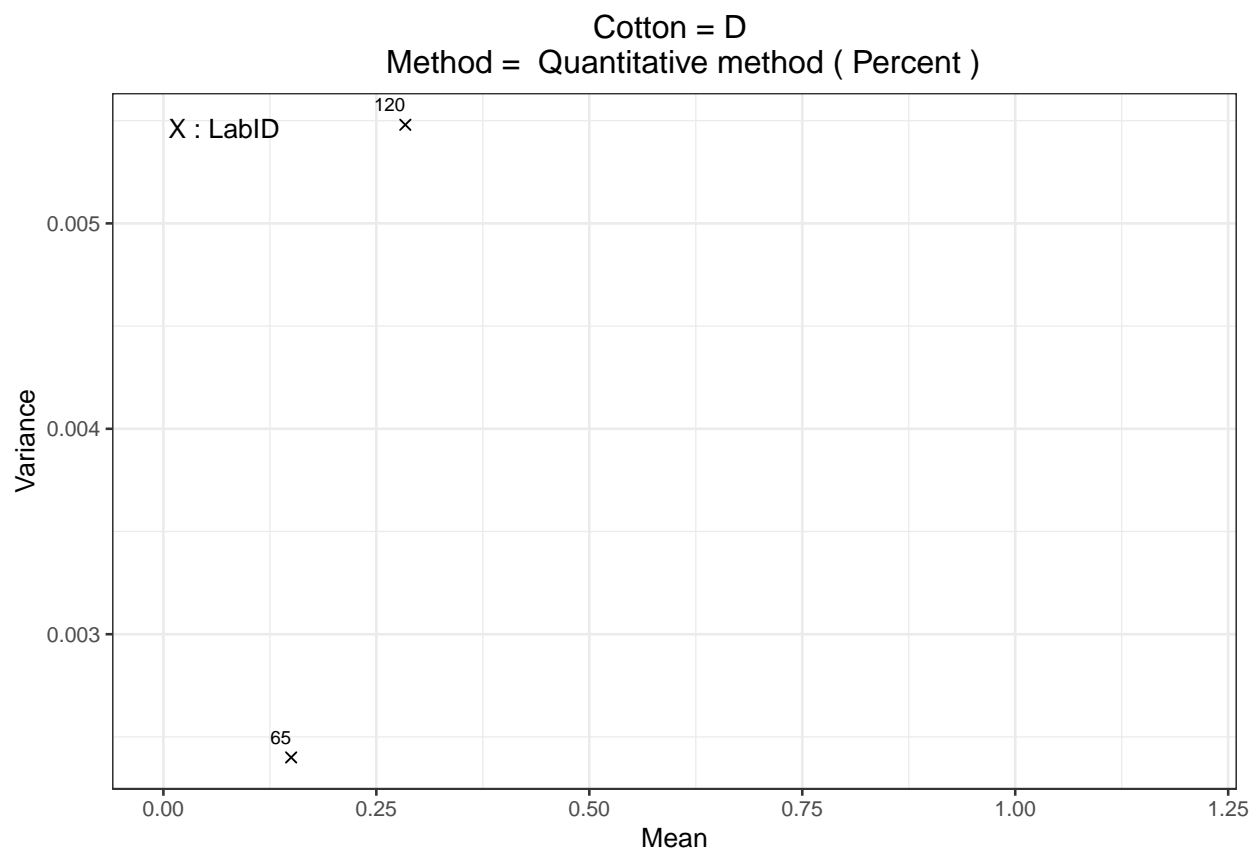


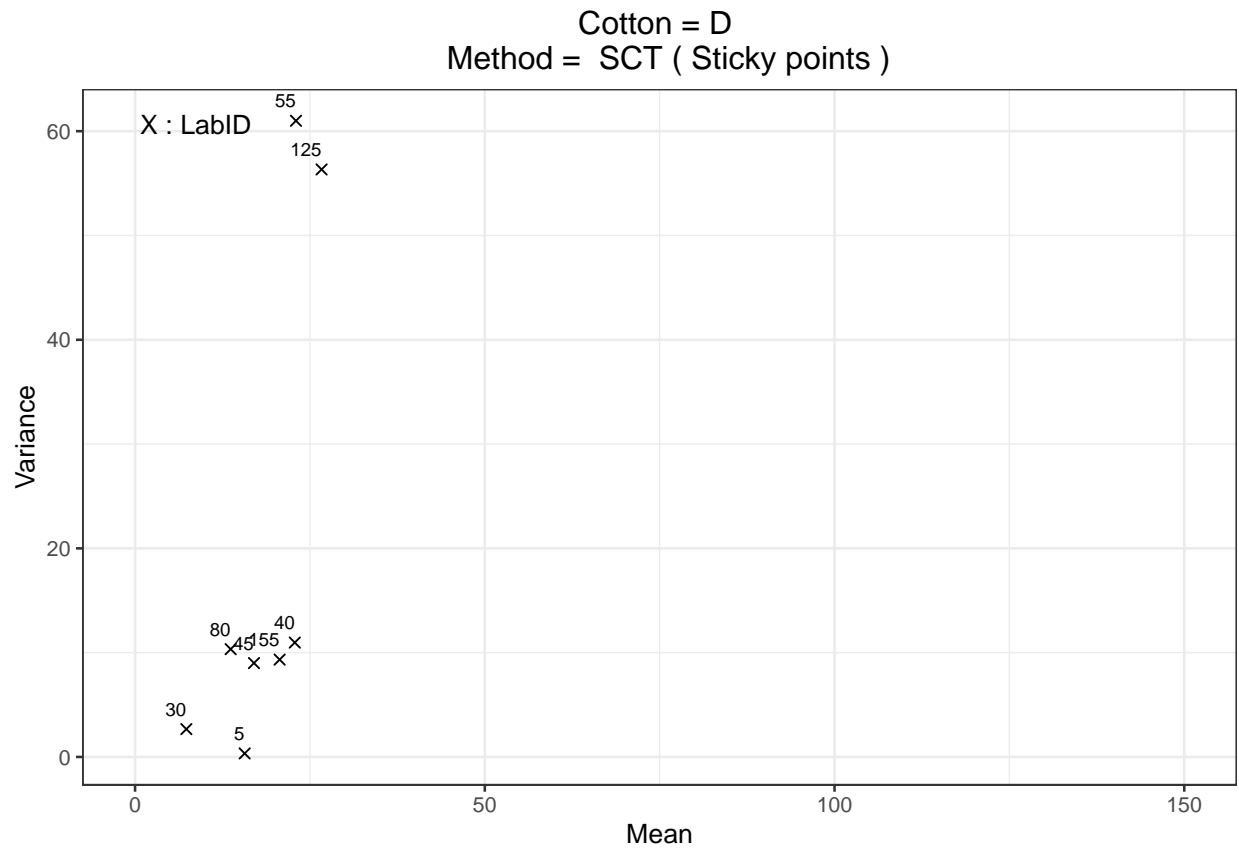






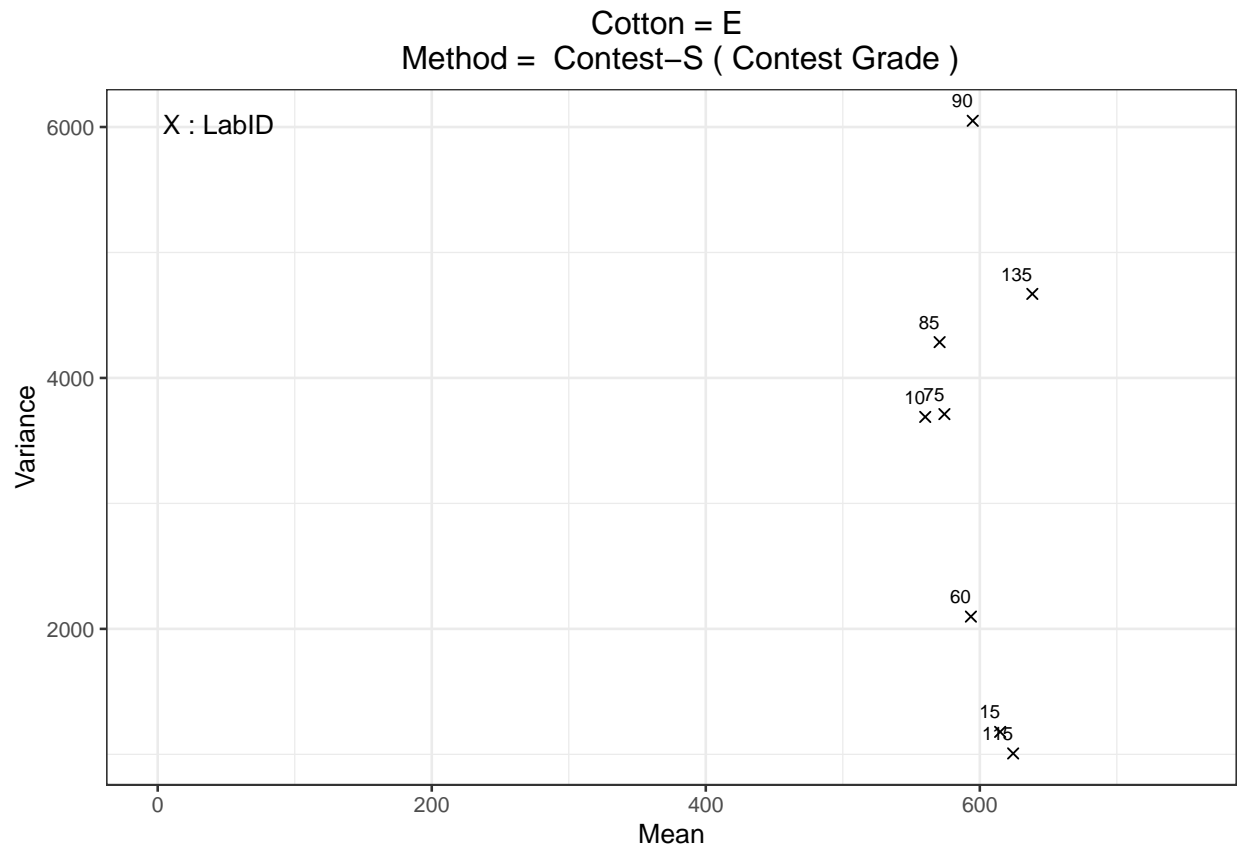




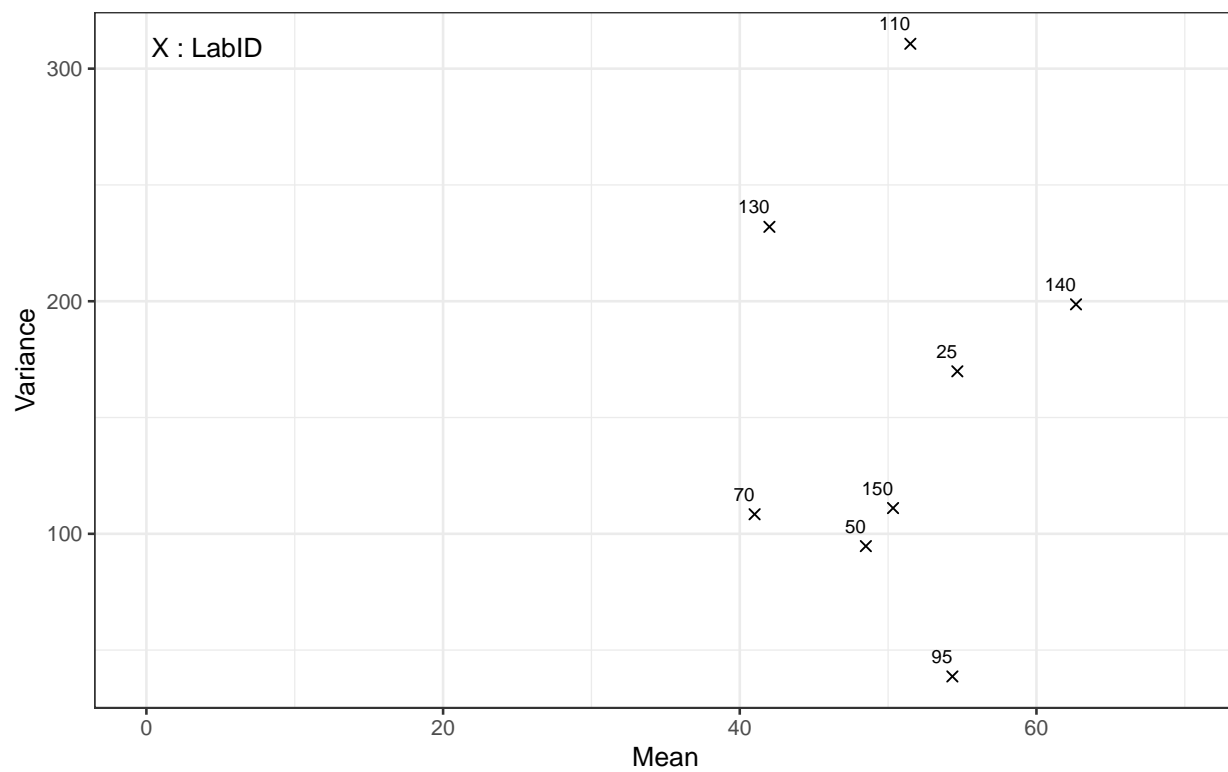


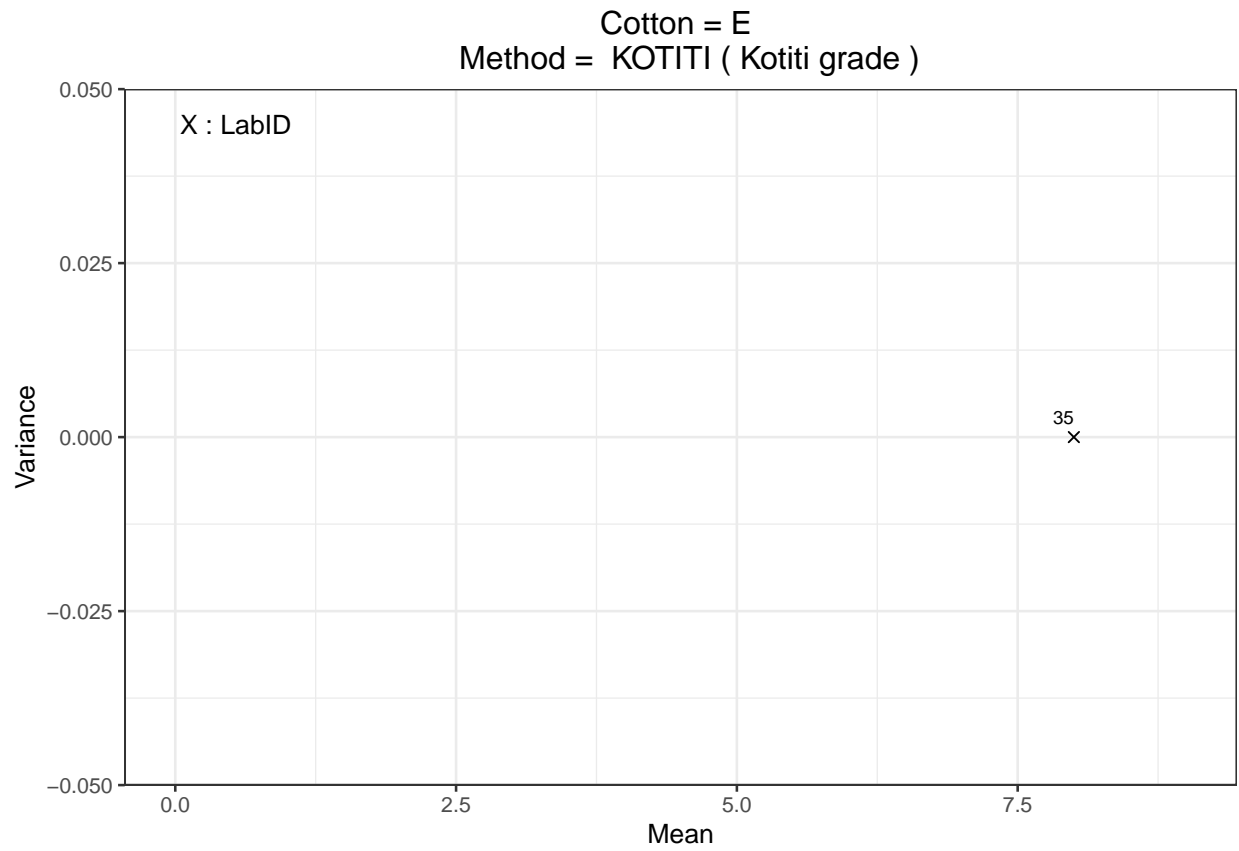
Cotton E : Variance between individual measurements = f(Mean) for all concerned labs

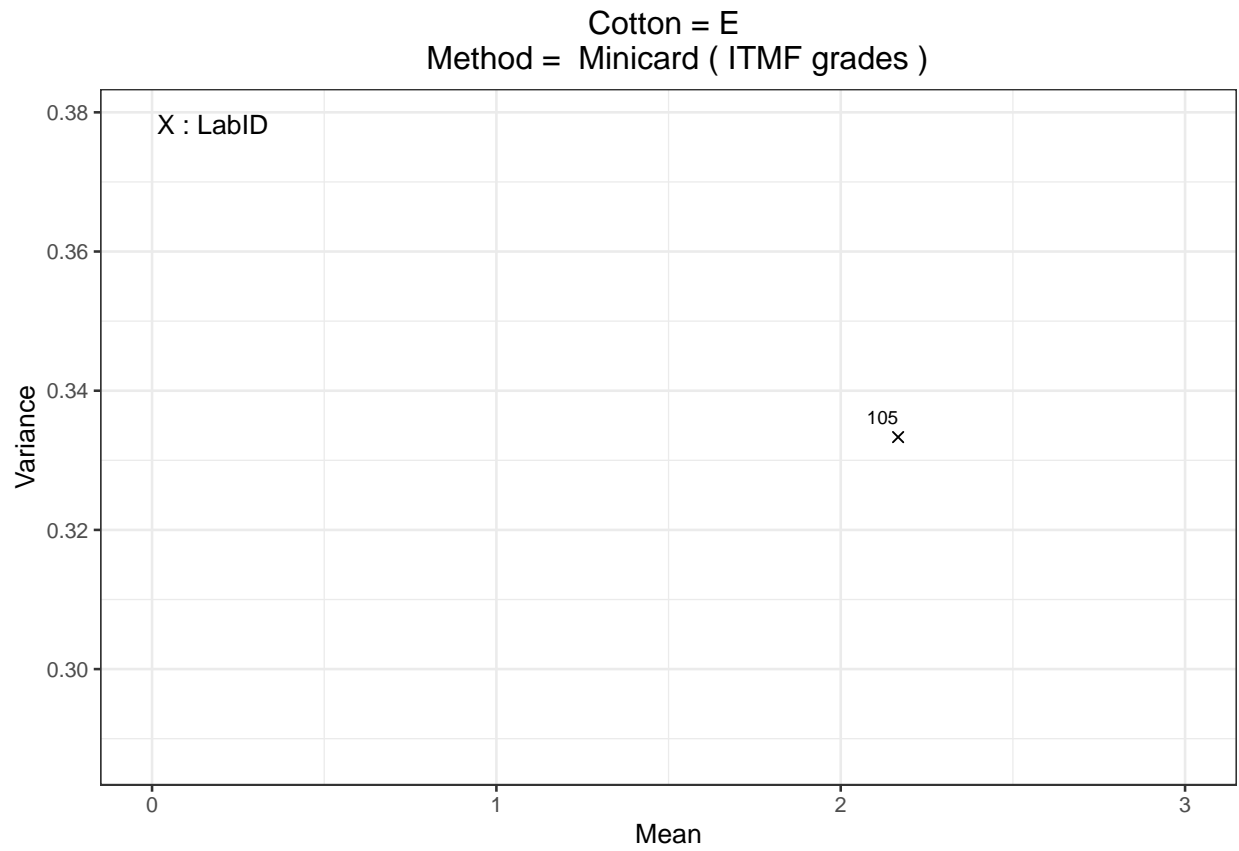
[1] “For Cotton = E and for method = Caramelization , 2 LabID (LabID being 20, 165) cannot be shown on this chart as only one measurement was performed and, therefore, a variance cannot be calculated in this case.”

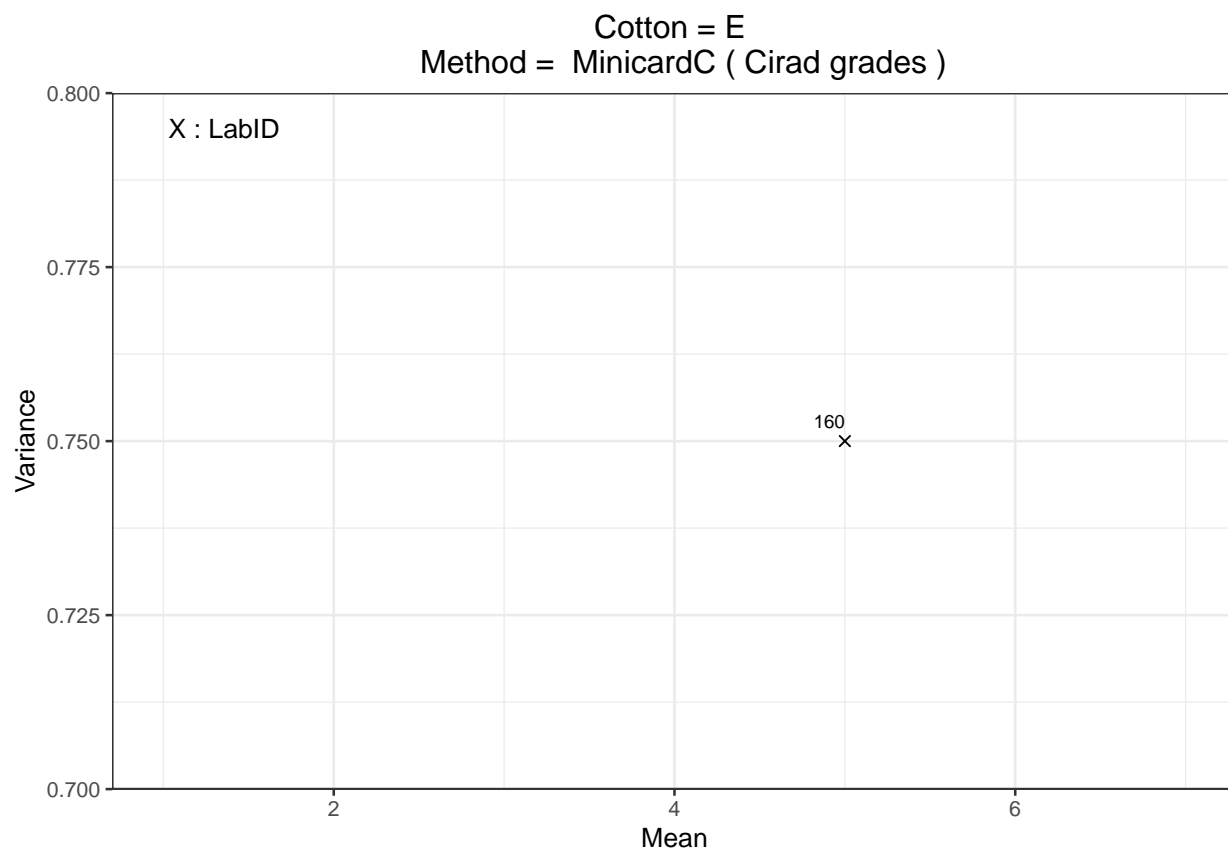


Cotton = E
Method = H2SD (Sticky points)

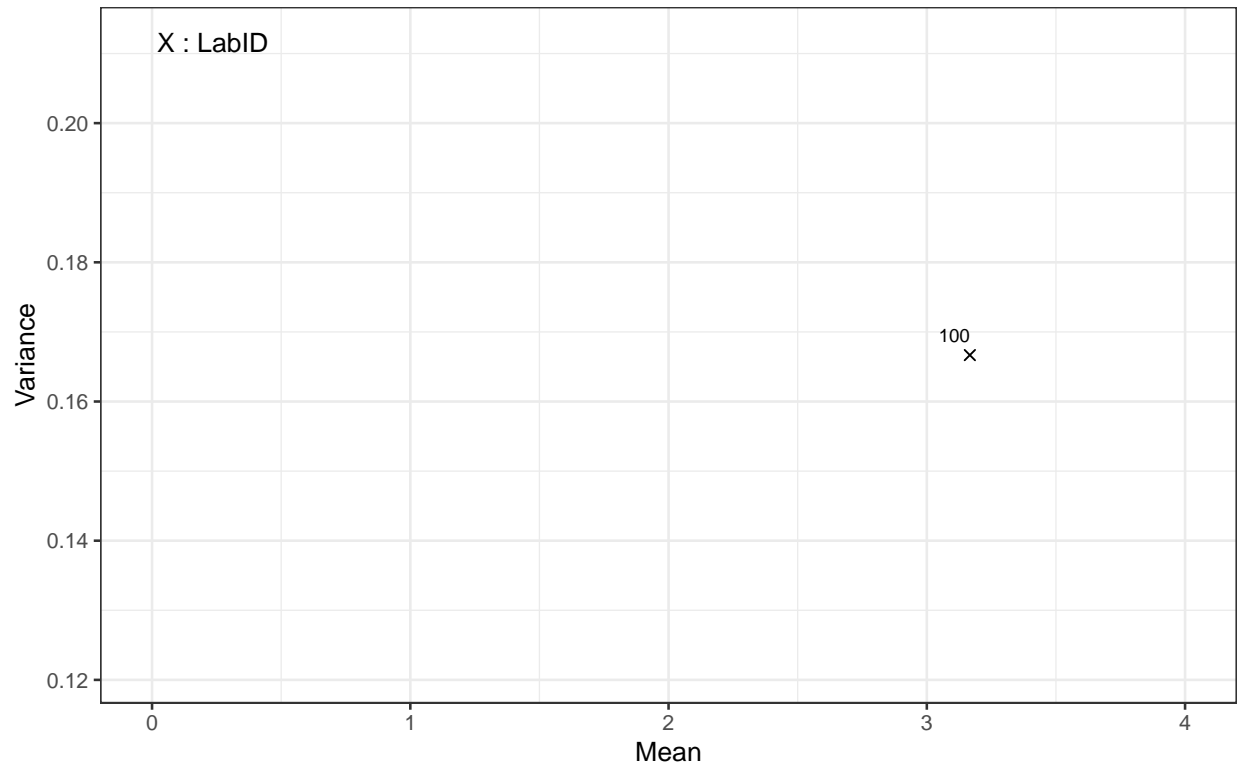


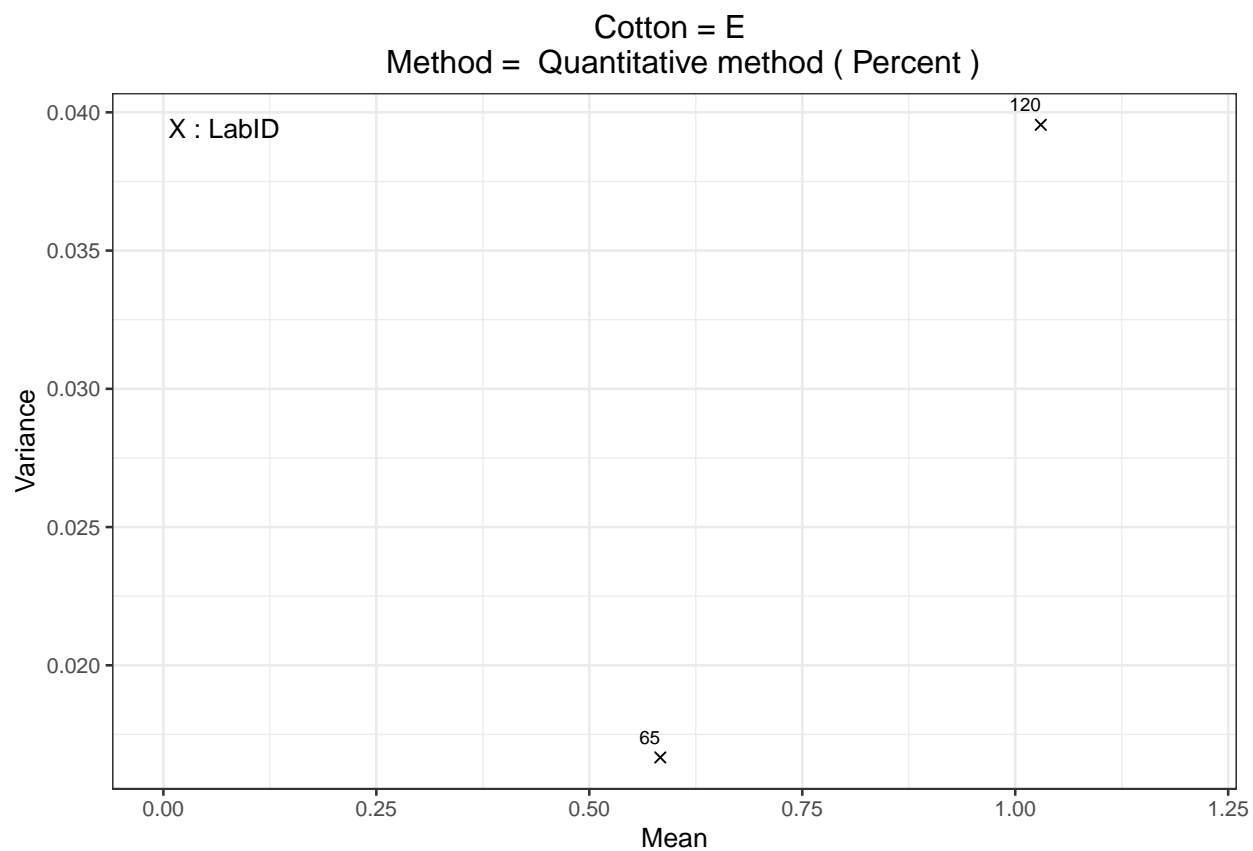




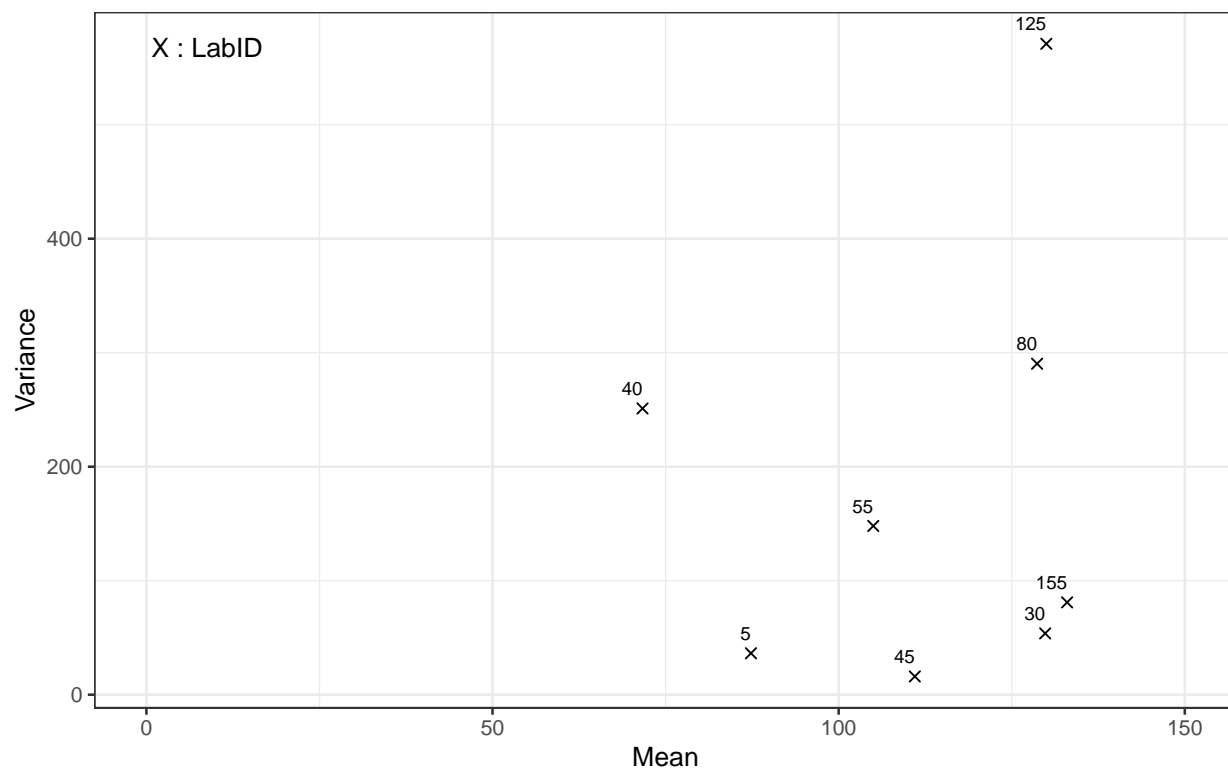


Cotton = E
Method = Qualitative method (Grade)





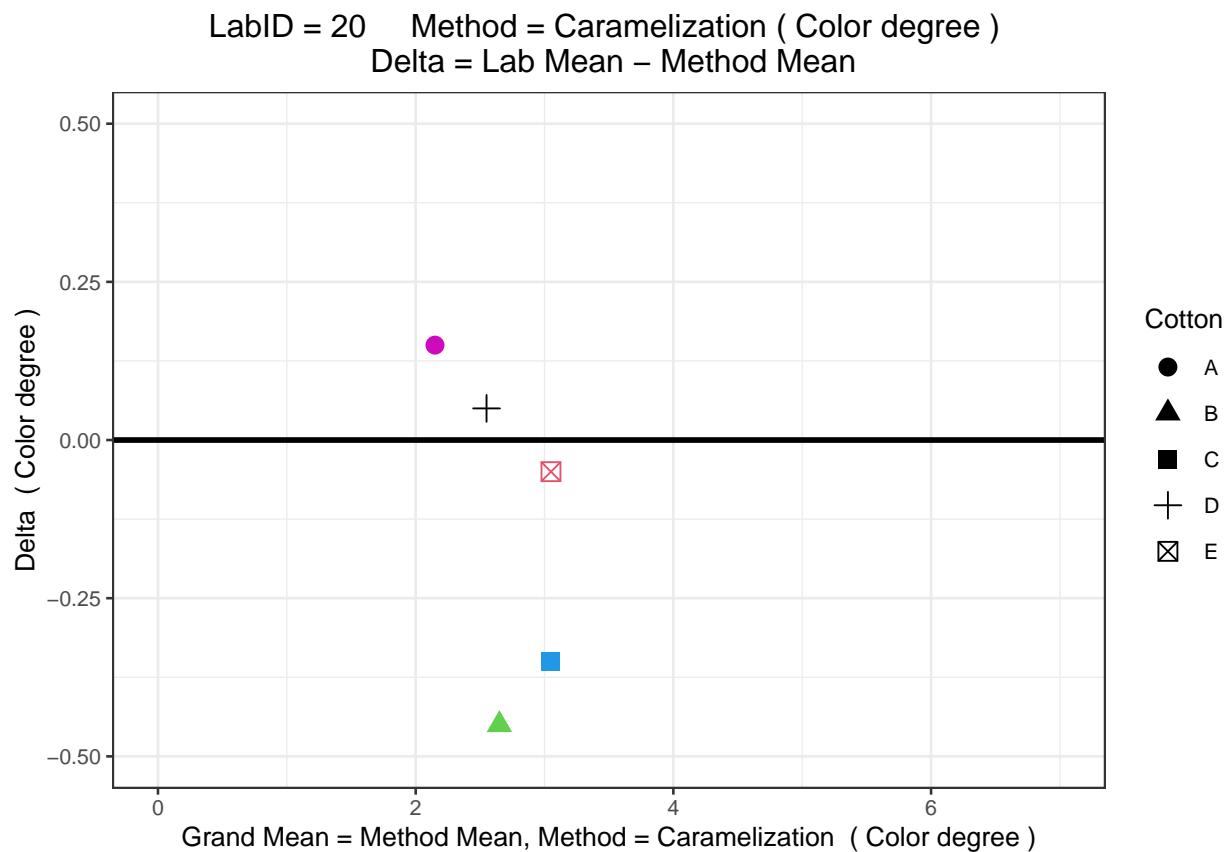
Cotton = E
Method = SCT (Sticky points)



CSITC type charts: distance Delta of Lab readings to the Grand Mean by Method and by LabID ⁶

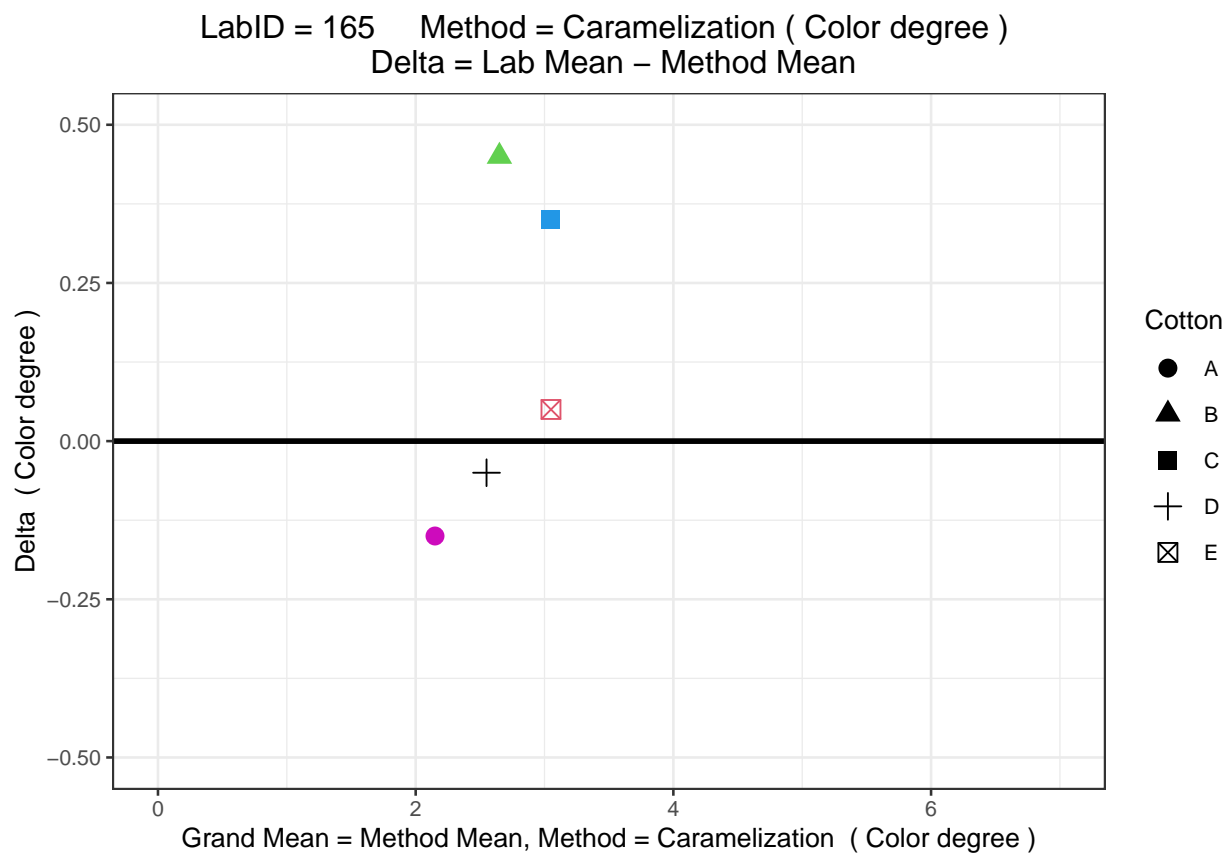
This type of chart is devoted to displaying the ability of any Method and any LabID to not deviate from the observed GrandMean of any given characteristic whatever the measured levels of the participating cottons, and then covering the range of stickiness of the participating cottons in this case. If only one LabID is using a given Method, then all Delta points (one point per participating cotton) will be positionned 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 positionned in symetry 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

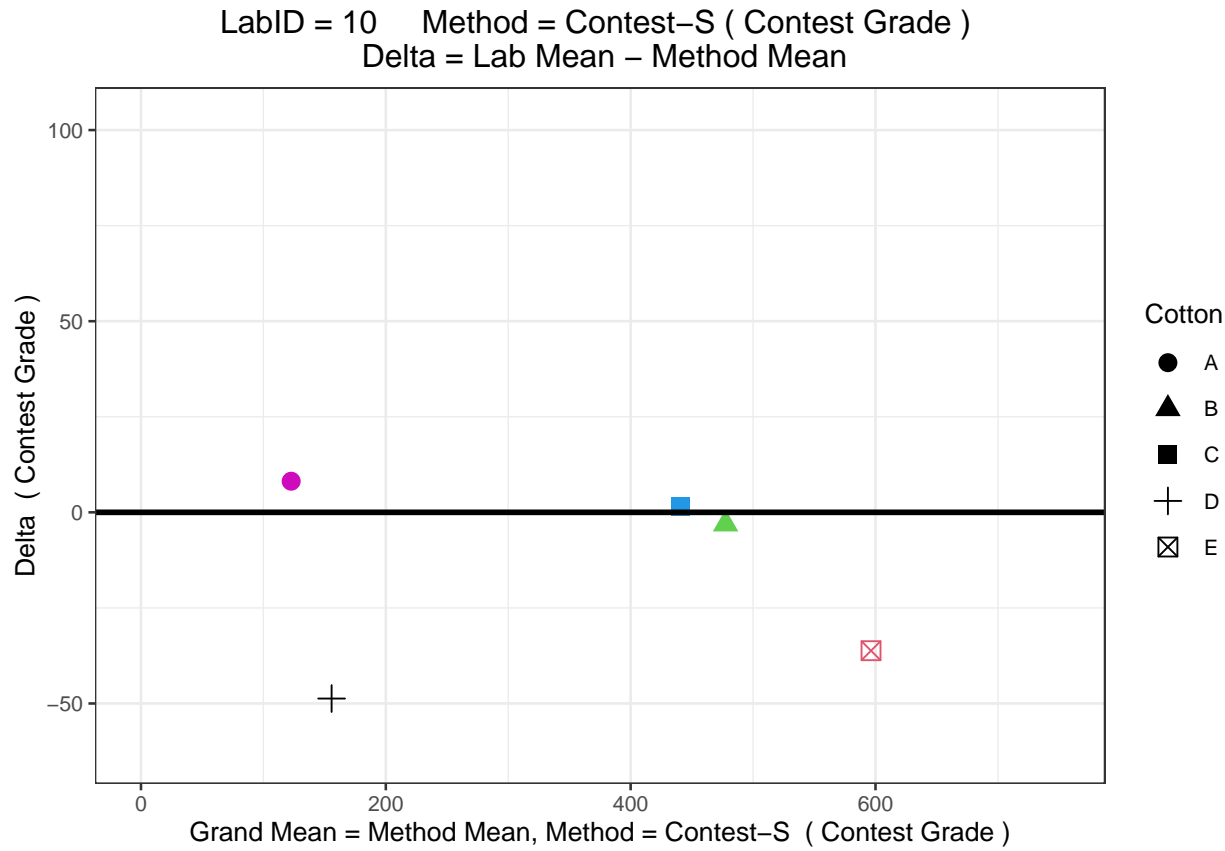


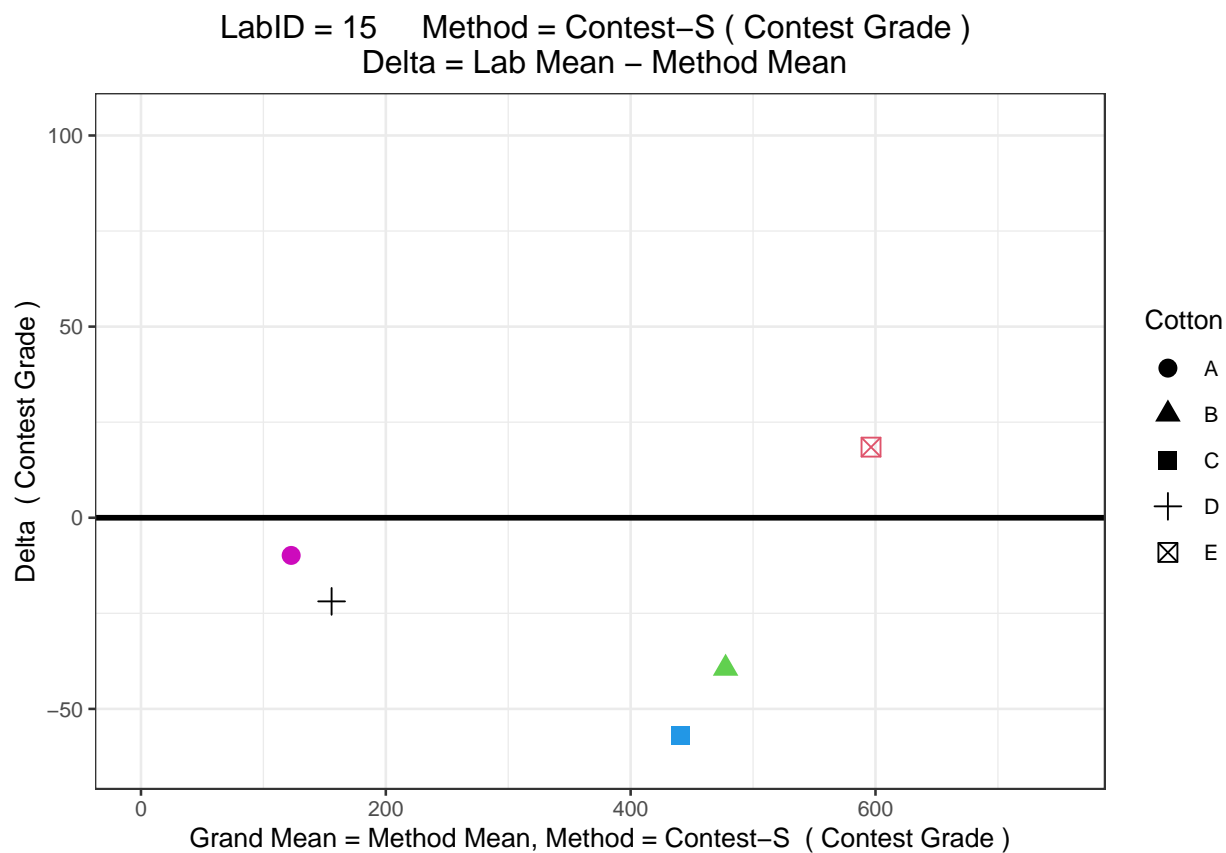
⁶Footnote

* GMean = Grand Mean of all laboratory means, calculated by Method.
* Chart abscissa axis is given in the original individual readings scale.

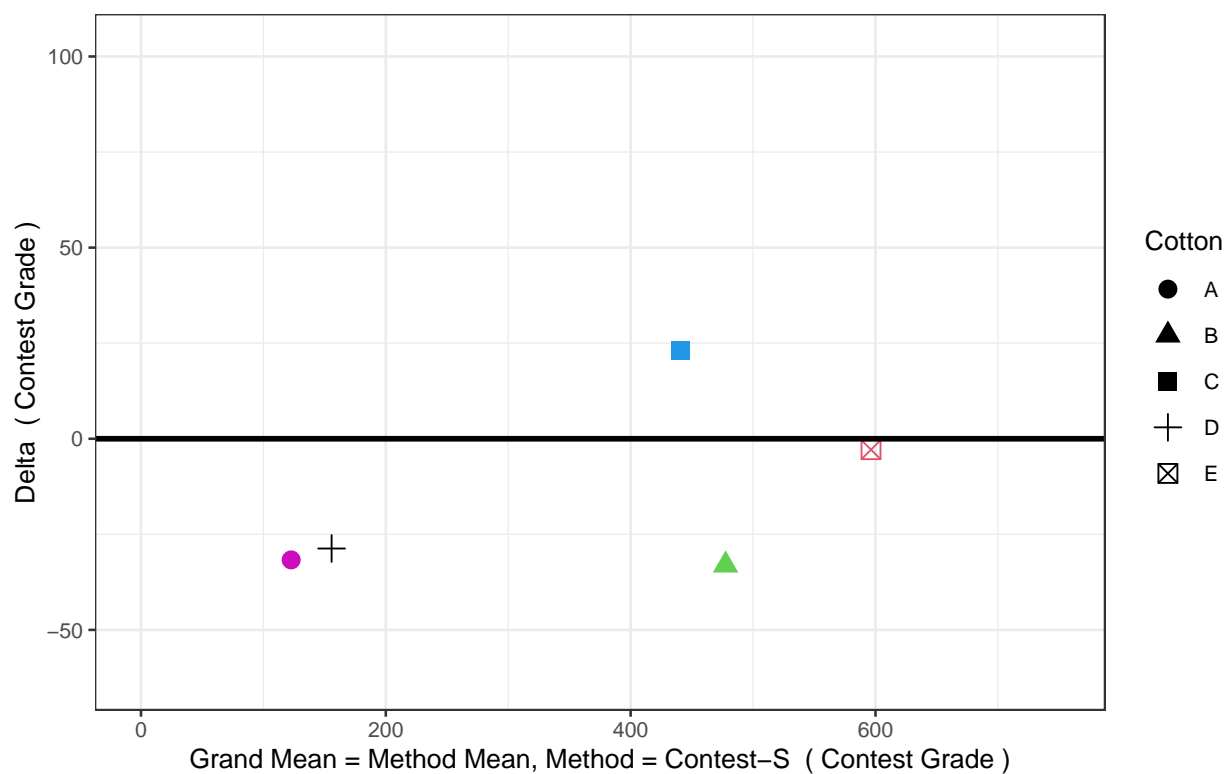


CSITC type chart for Method Contest-S

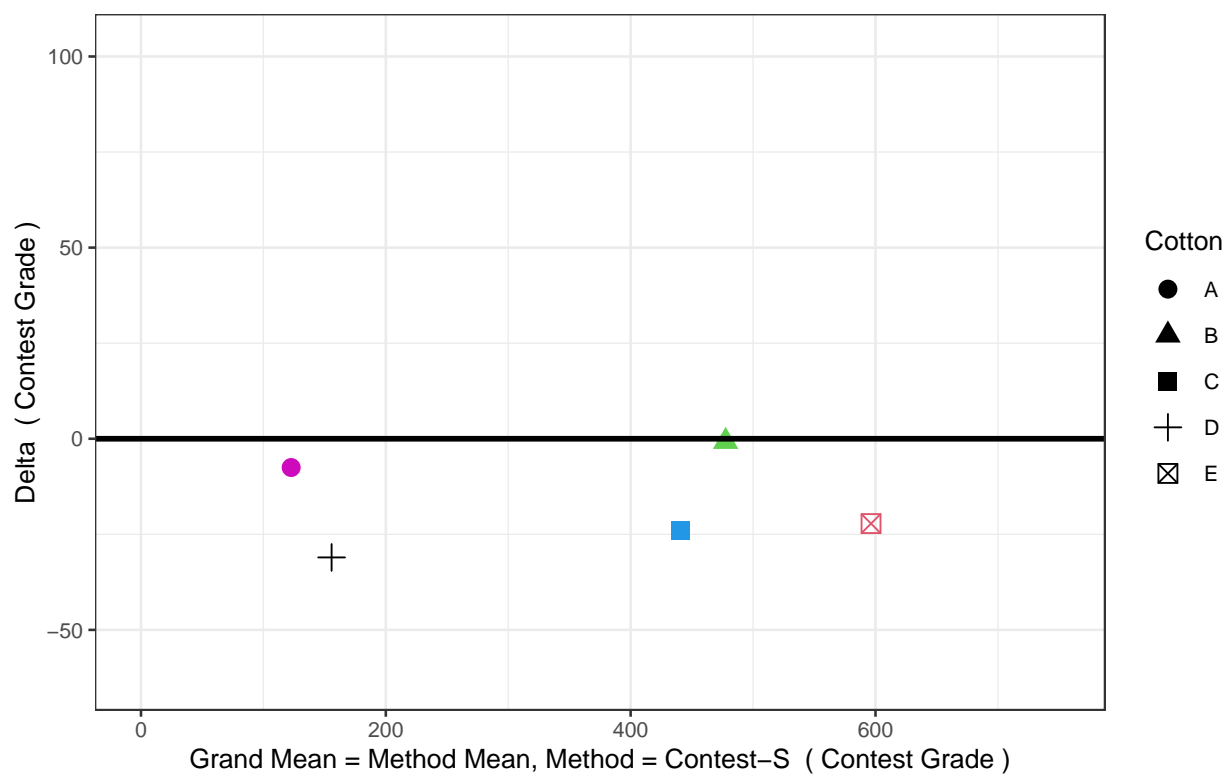


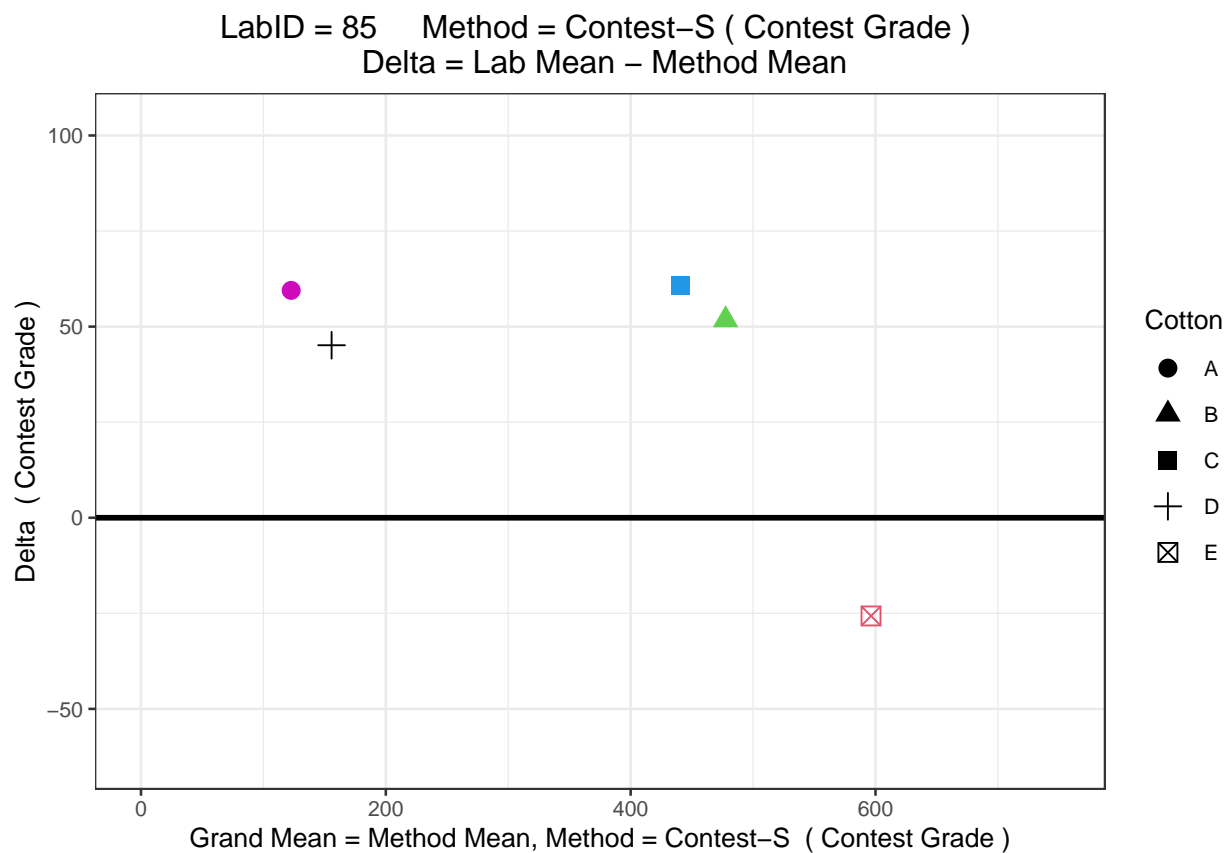


LabID = 60 Method = Contest-S (Contest Grade)
Delta = Lab Mean - Method Mean

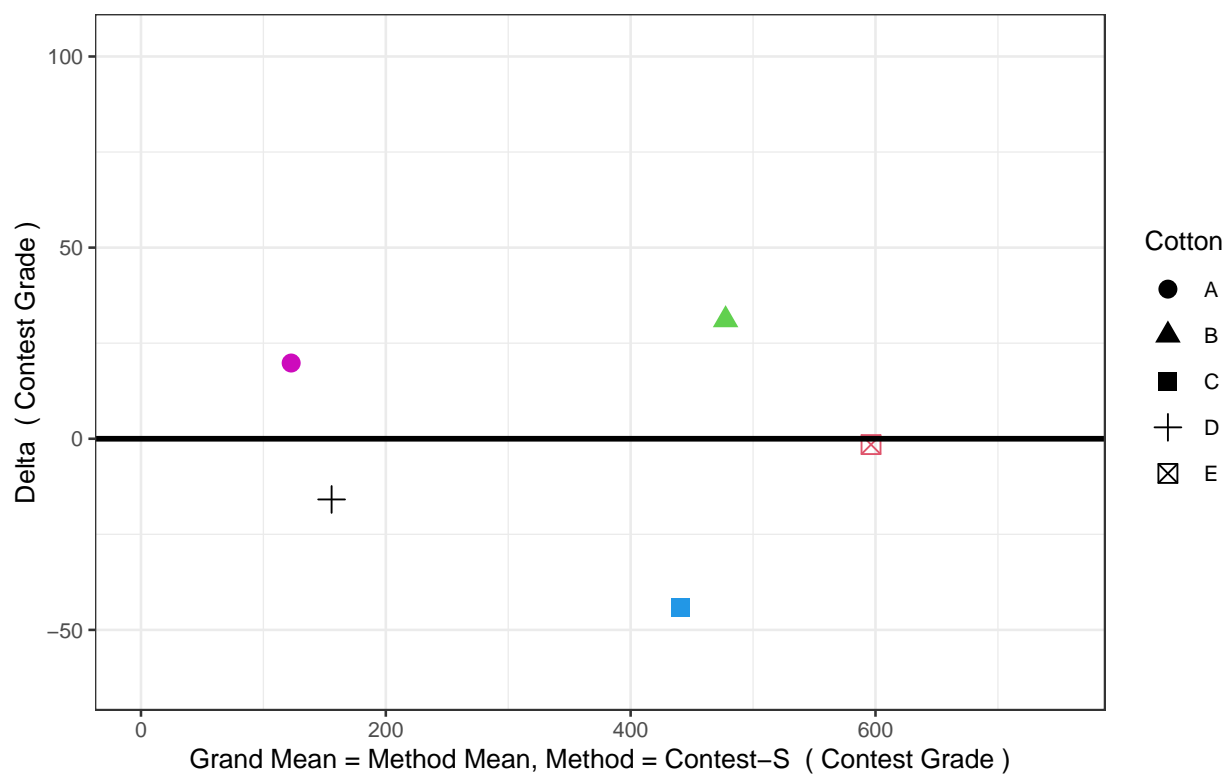


LabID = 75 Method = Contest-S (Contest Grade)
Delta = Lab Mean - Method Mean

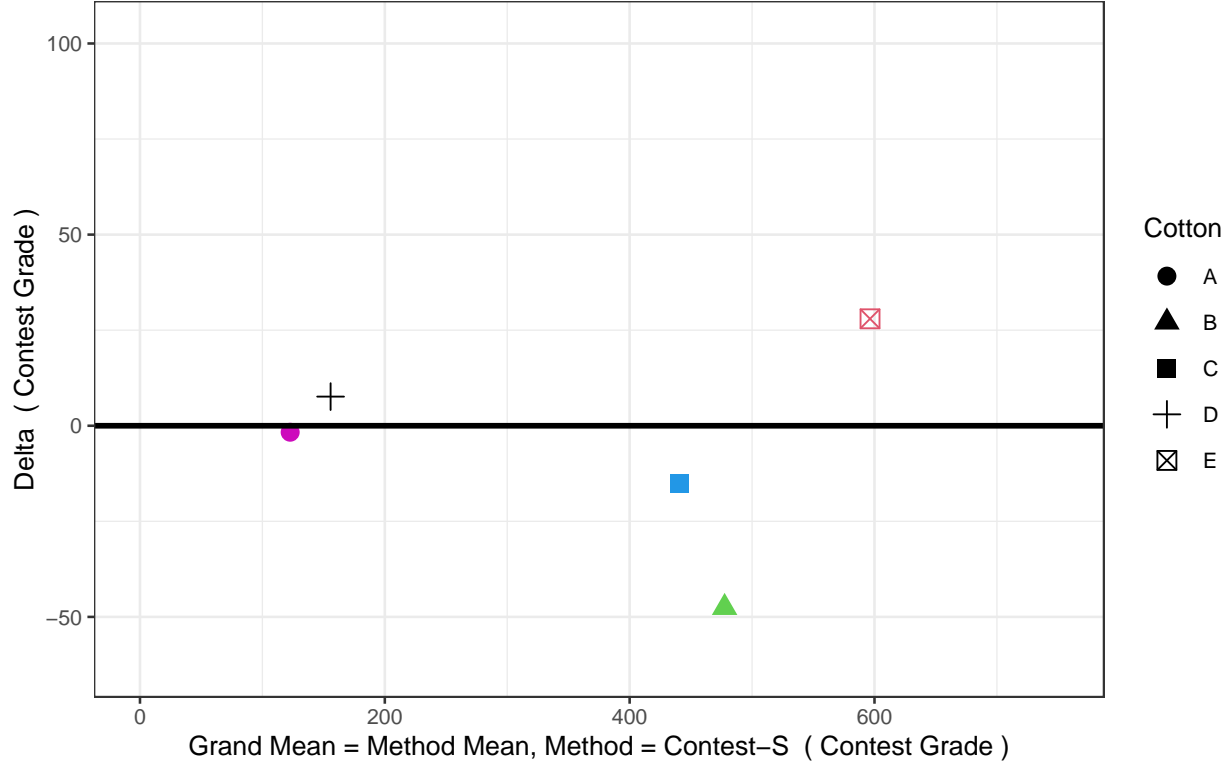




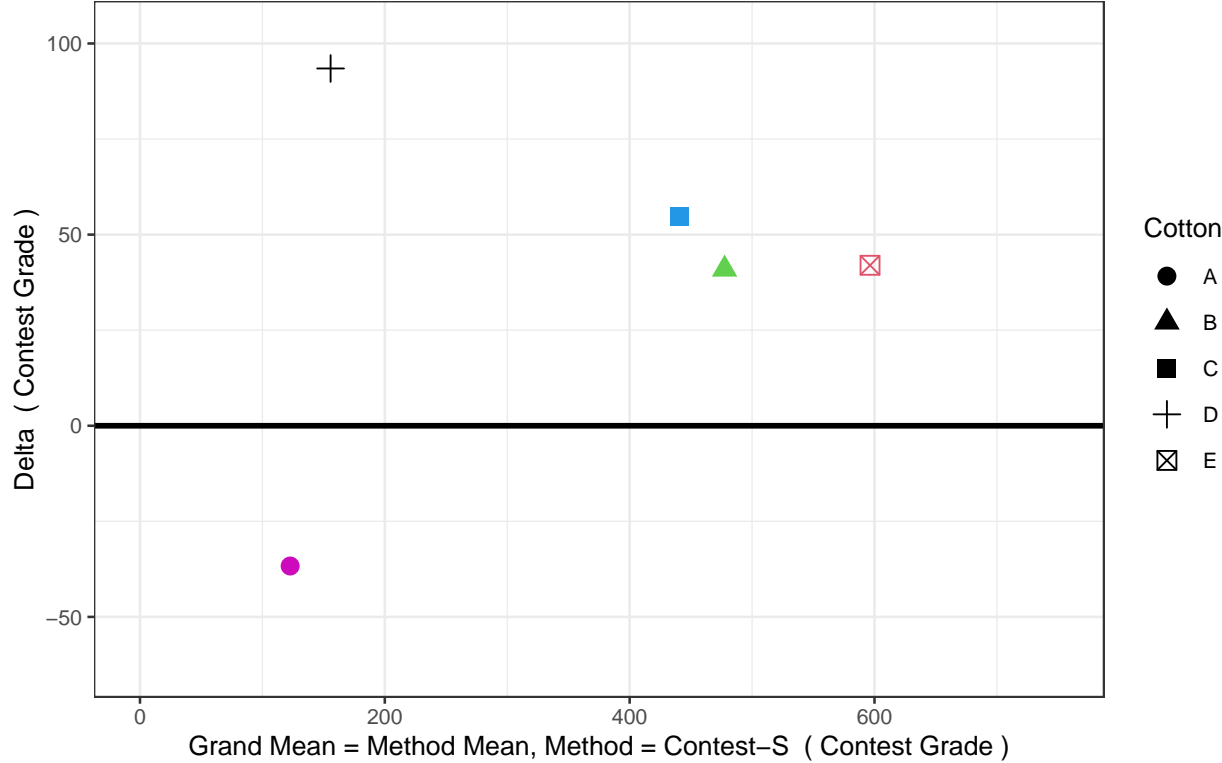
LabID = 90 Method = Contest-S (Contest Grade)
Delta = Lab Mean - Method Mean



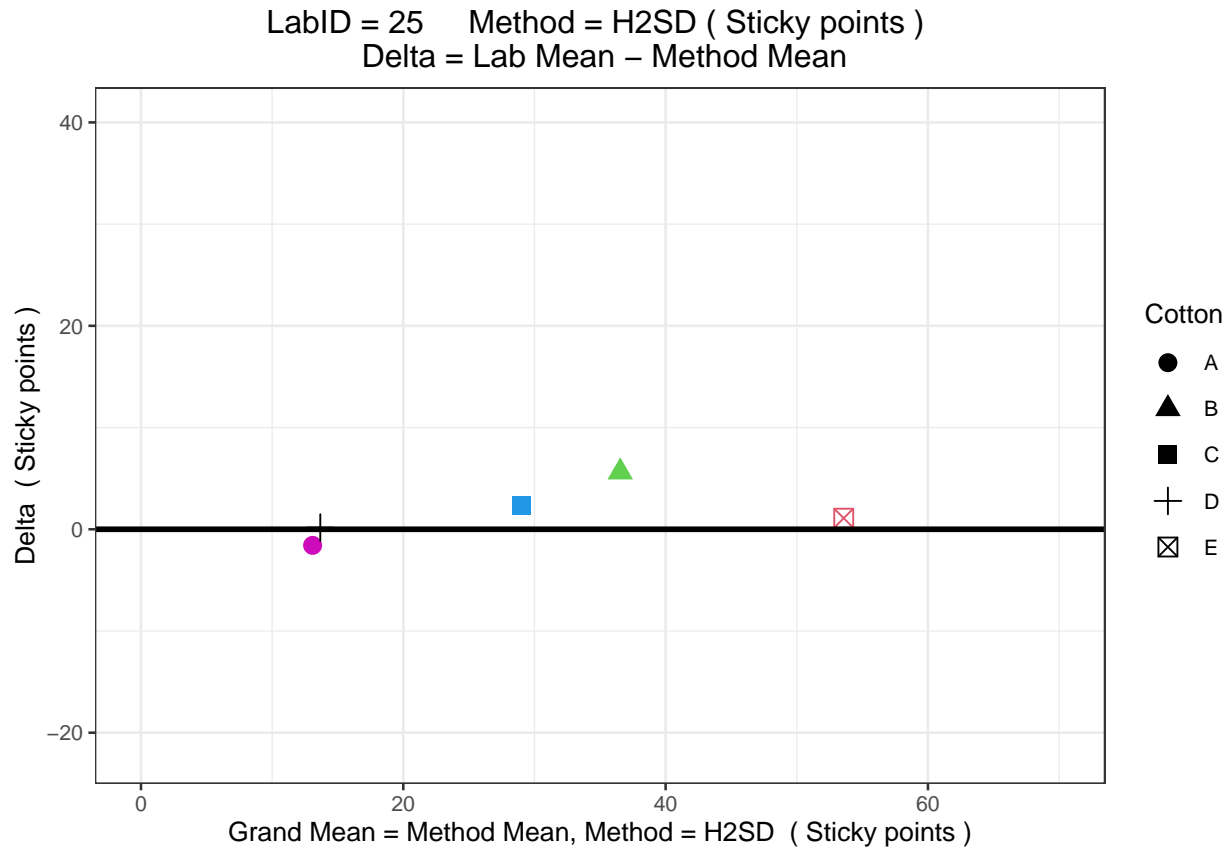
LabID = 115 Method = Contest-S (Contest Grade)
Delta = Lab Mean – Method Mean



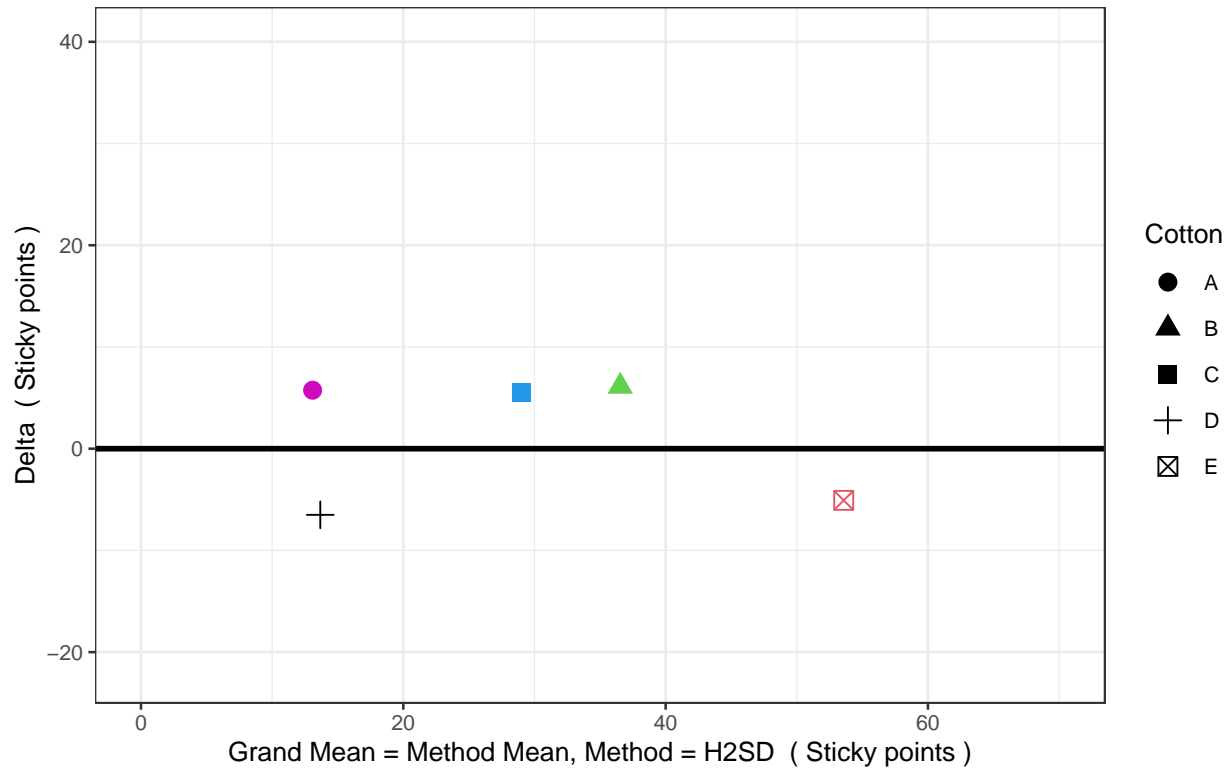
LabID = 135 Method = Contest-S (Contest Grade)
Delta = Lab Mean – Method Mean



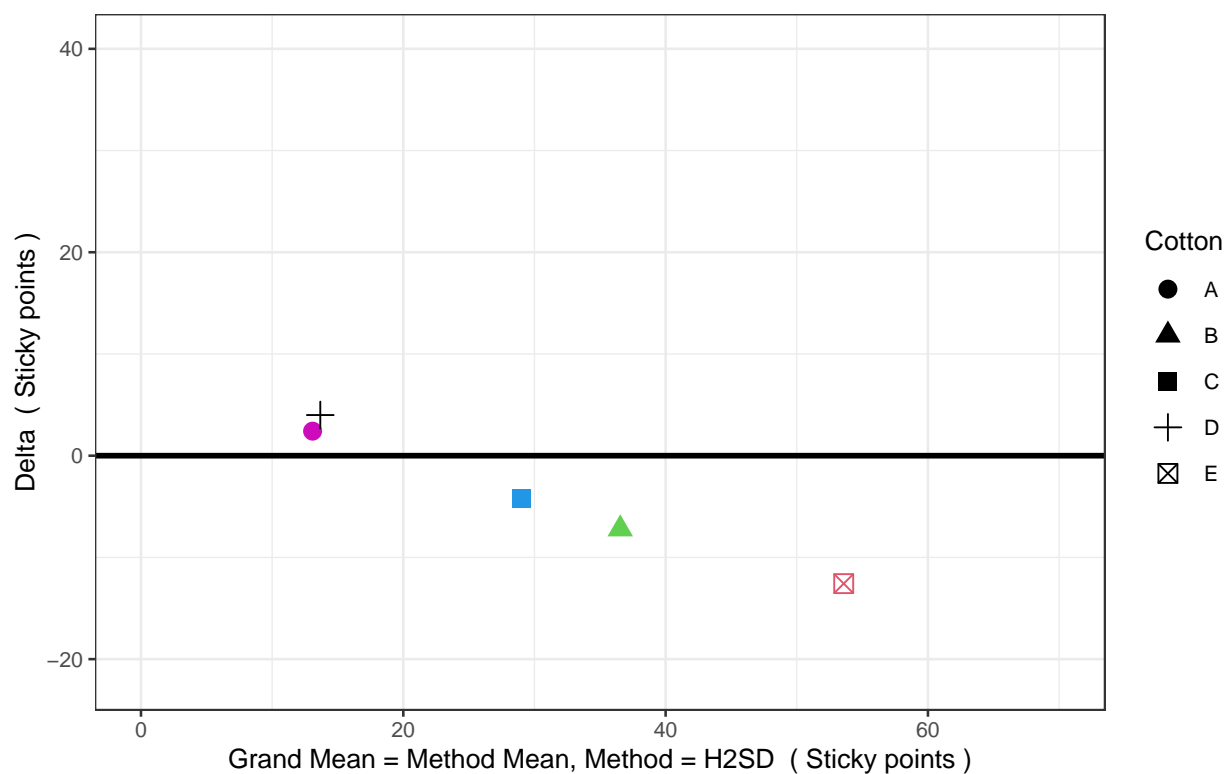
CSITC type chart for Method H2SD



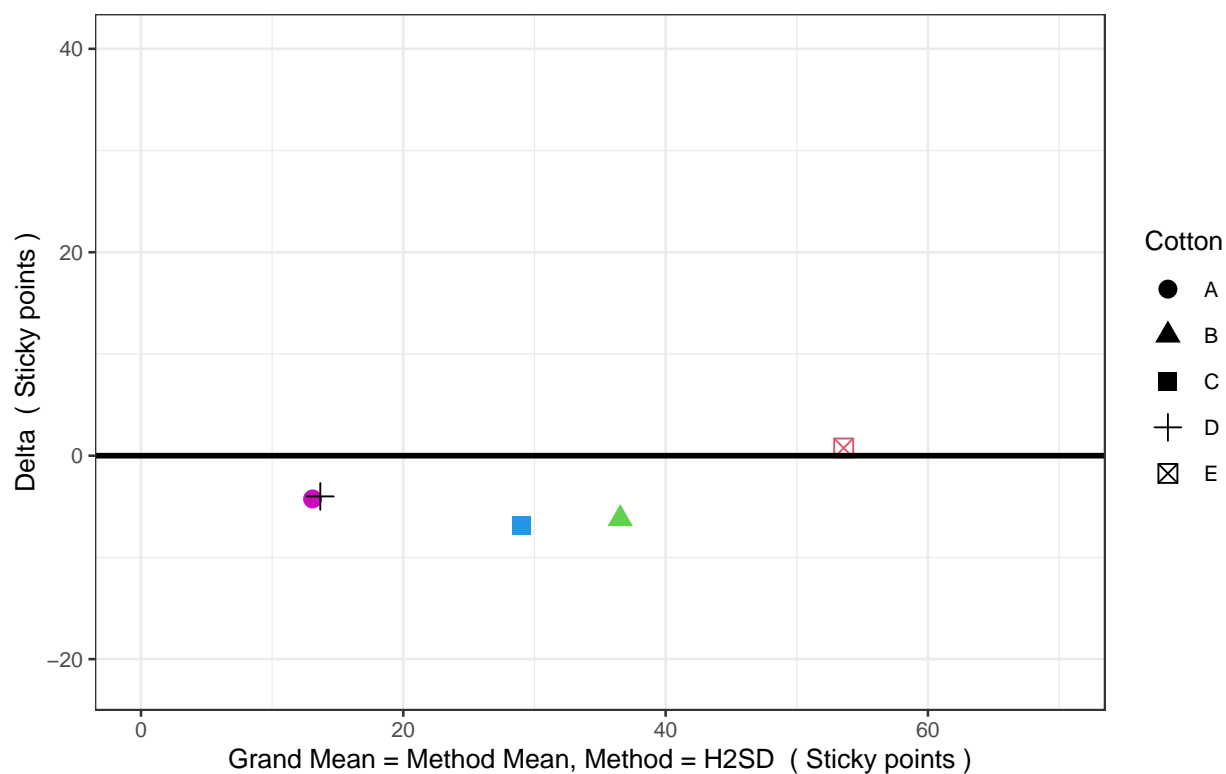
LabID = 50 Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean



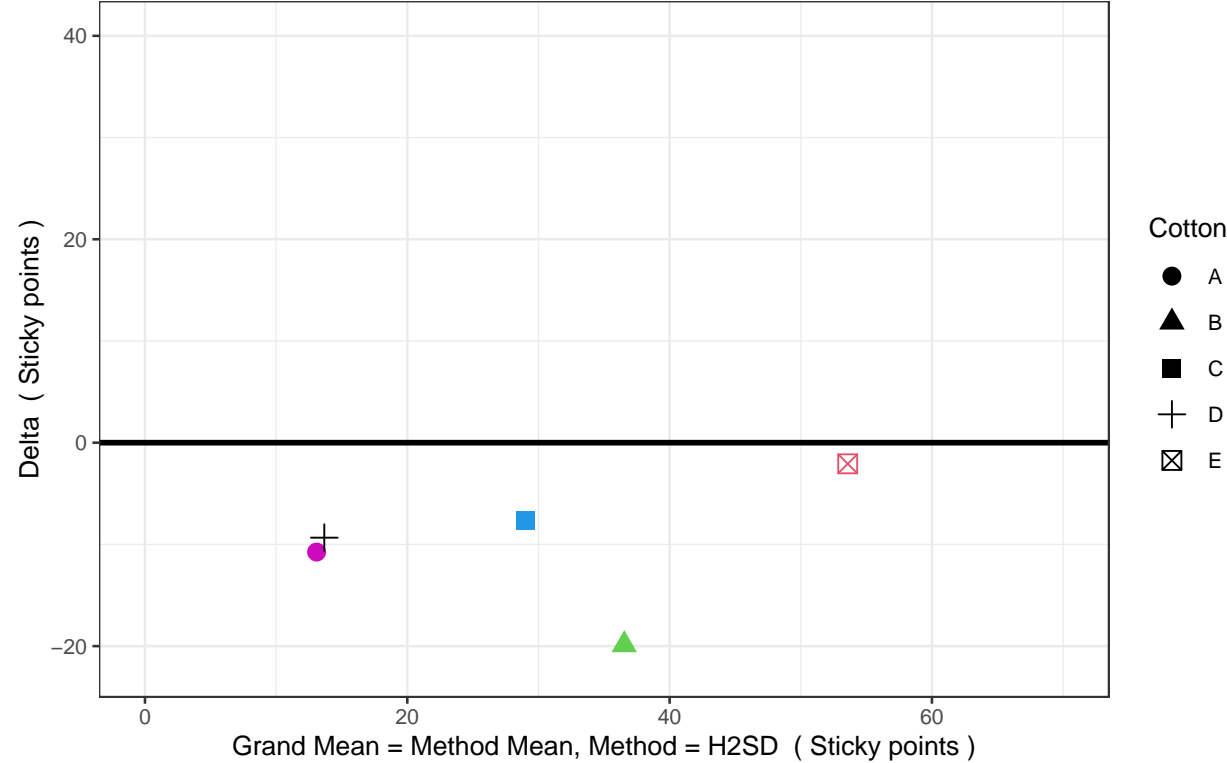
LabID = 70 Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean



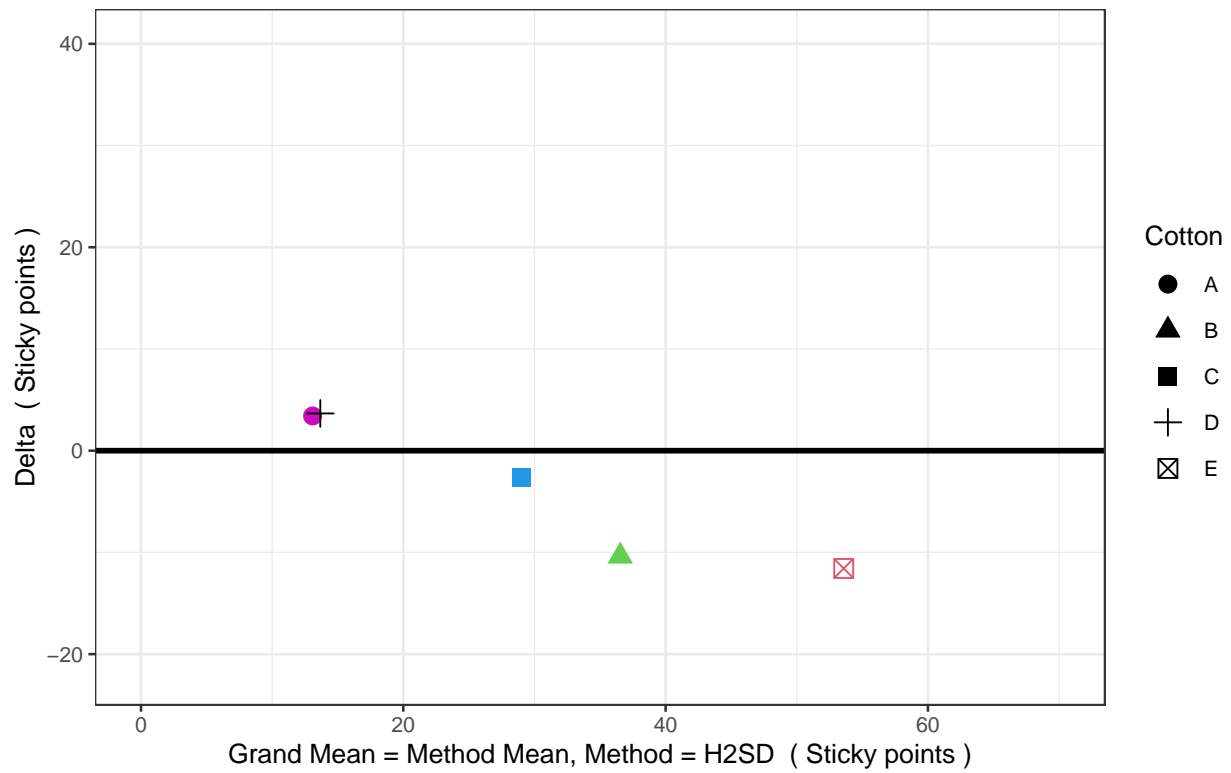
LabID = 95 Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean



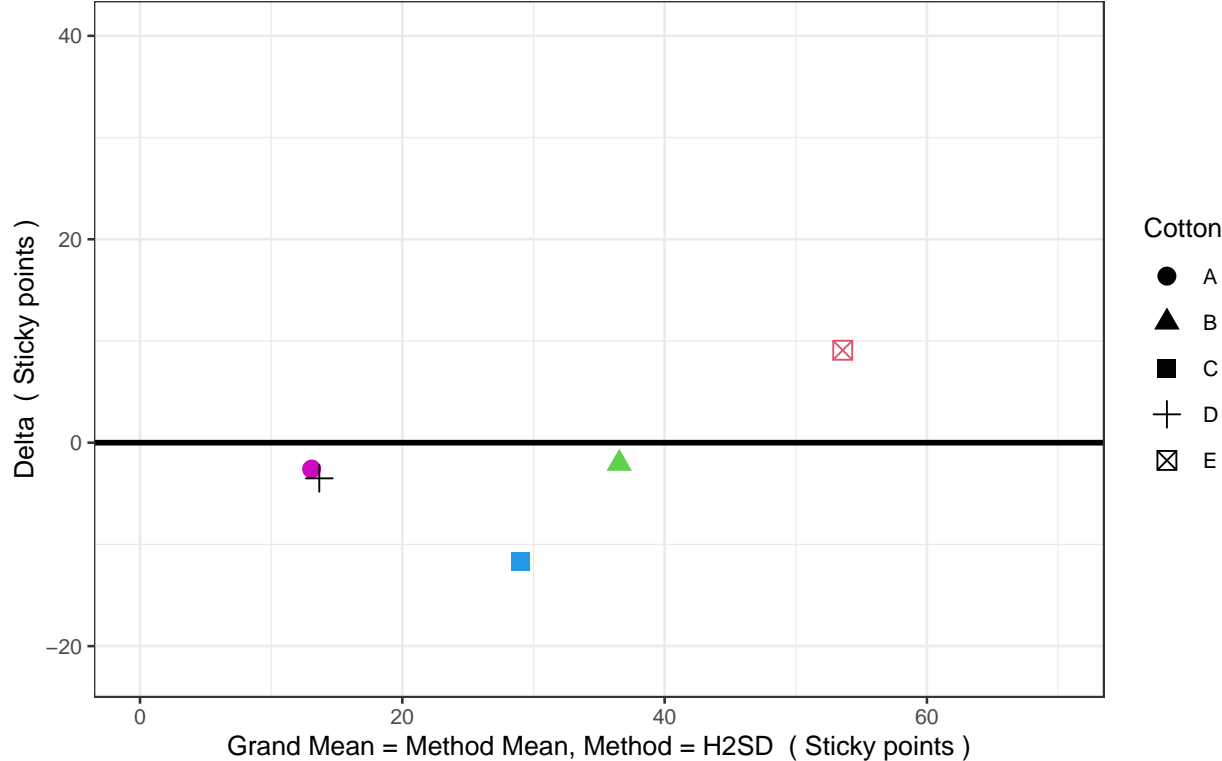
LabID = 110 Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean



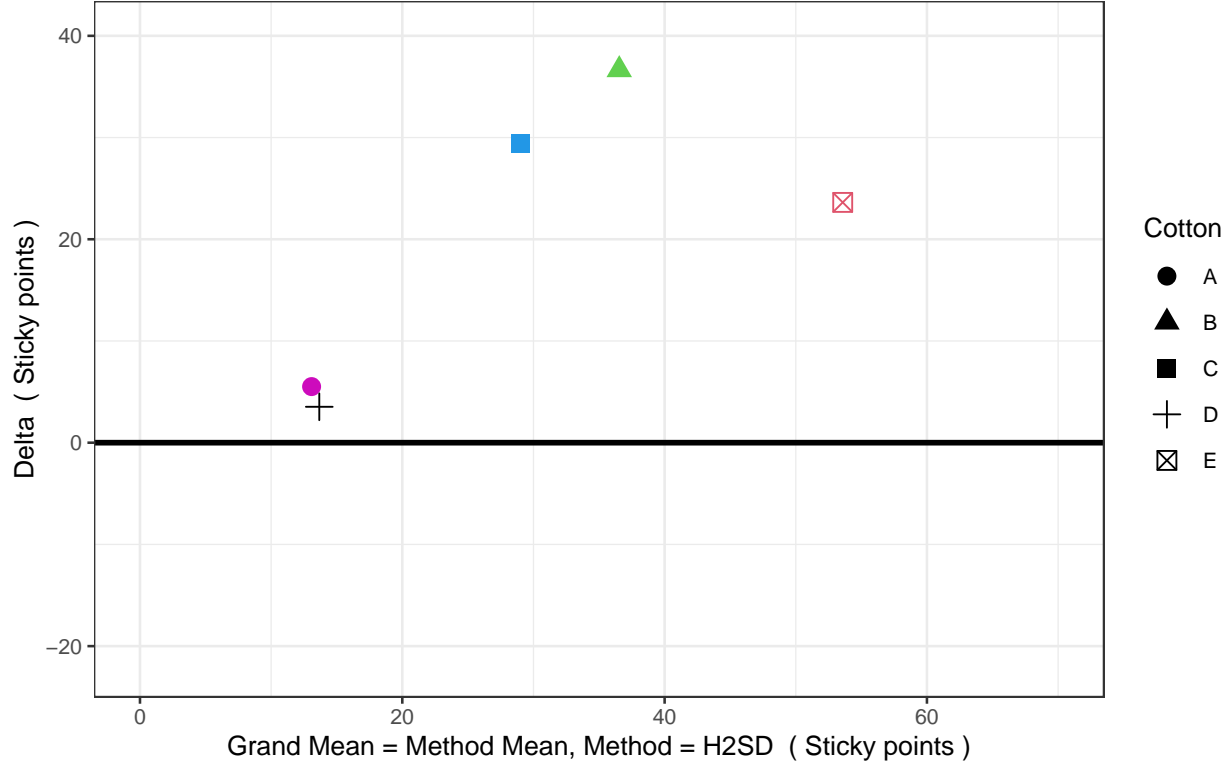
LabID = 130 Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean



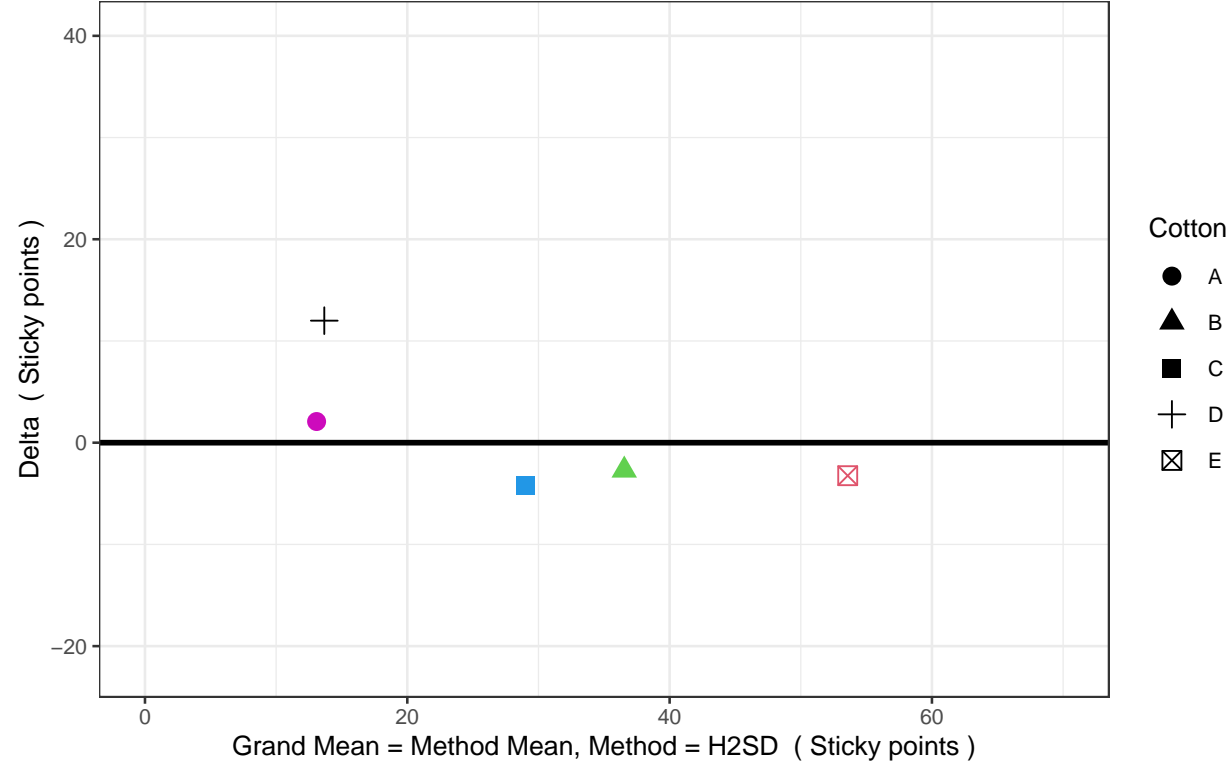
LabID = 140 Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean



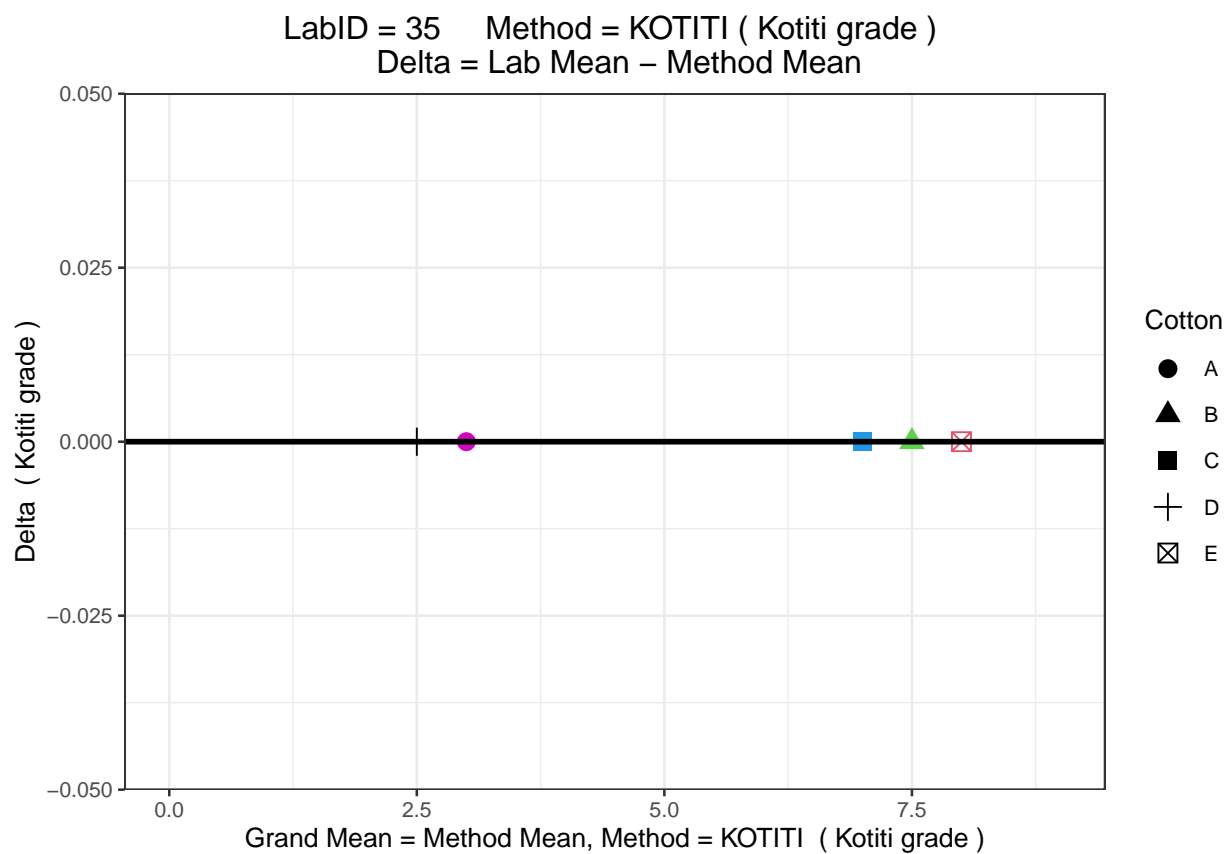
LabID = 145 Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean



LabID = 150 Method = H2SD (Sticky points)
Delta = Lab Mean – Method Mean



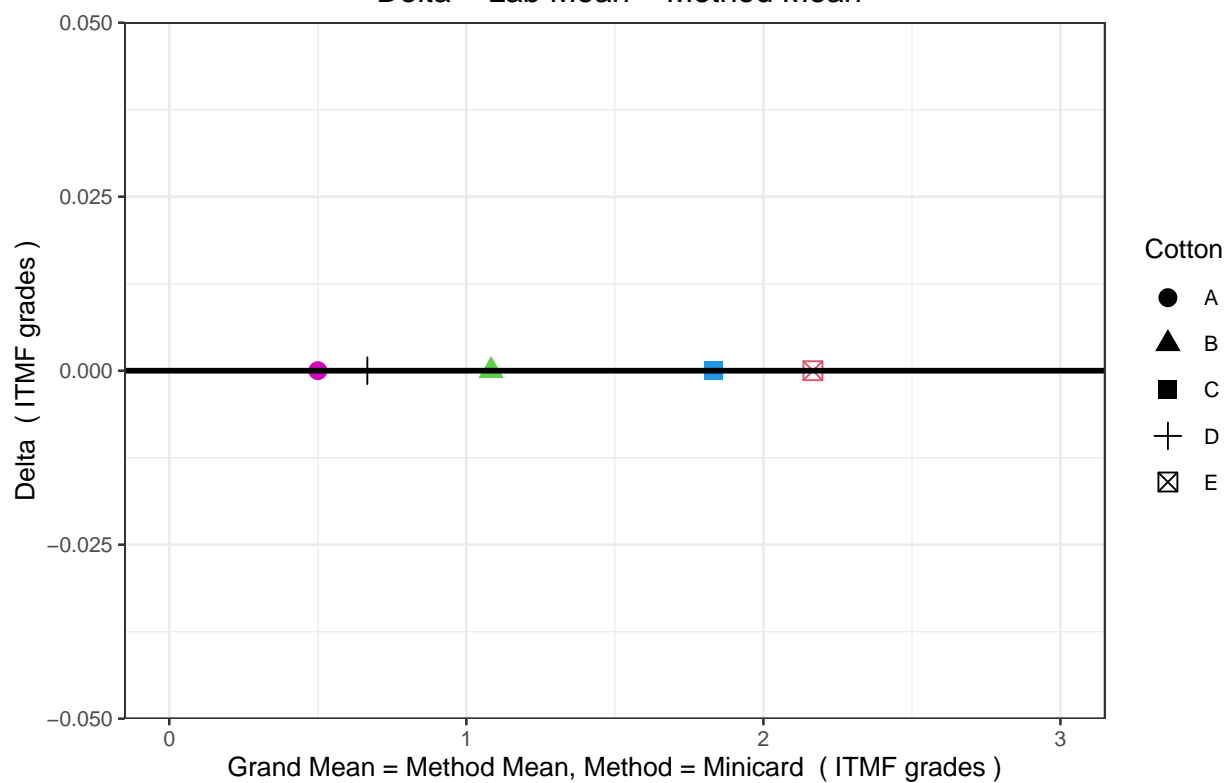
CSITC type chart for Method KOTITI



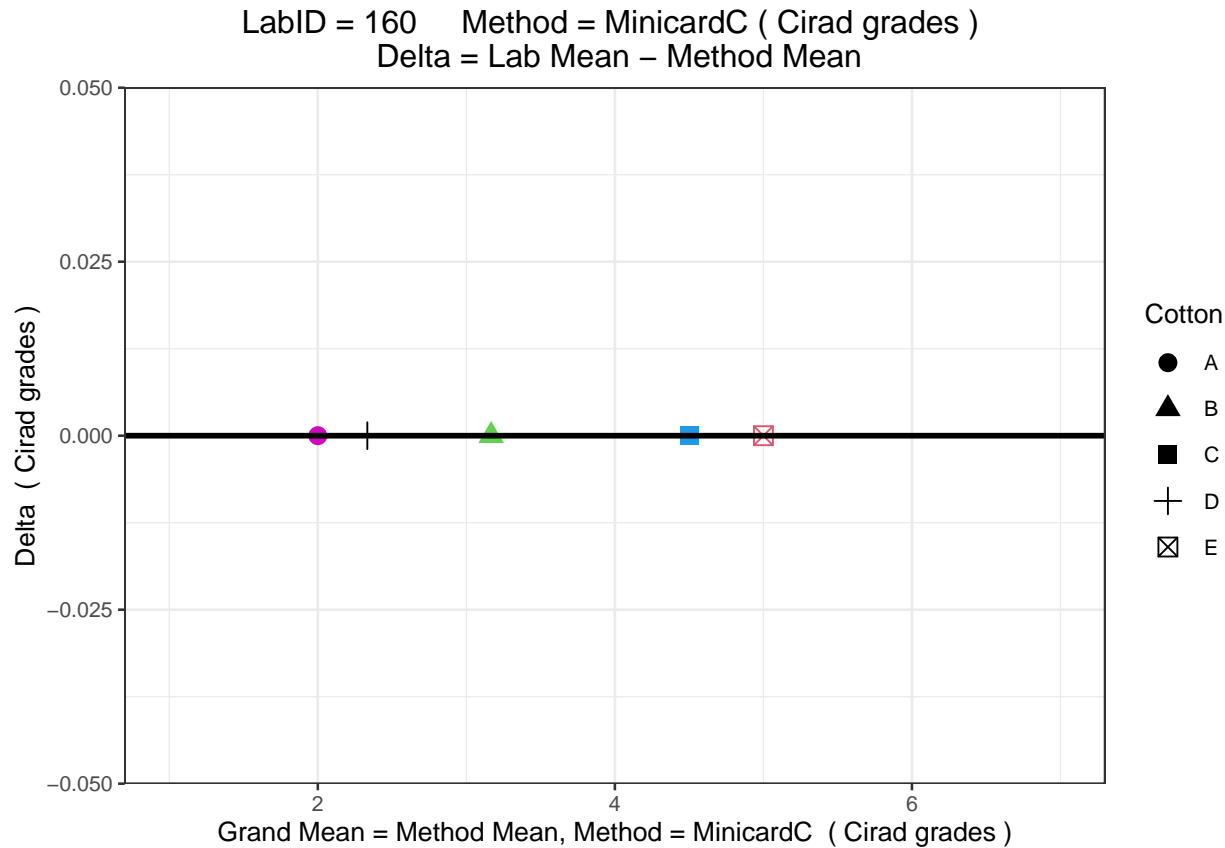
CSITC type chart for Method Minicard

LabID = 105 Method = Minicard (ITMF grades)

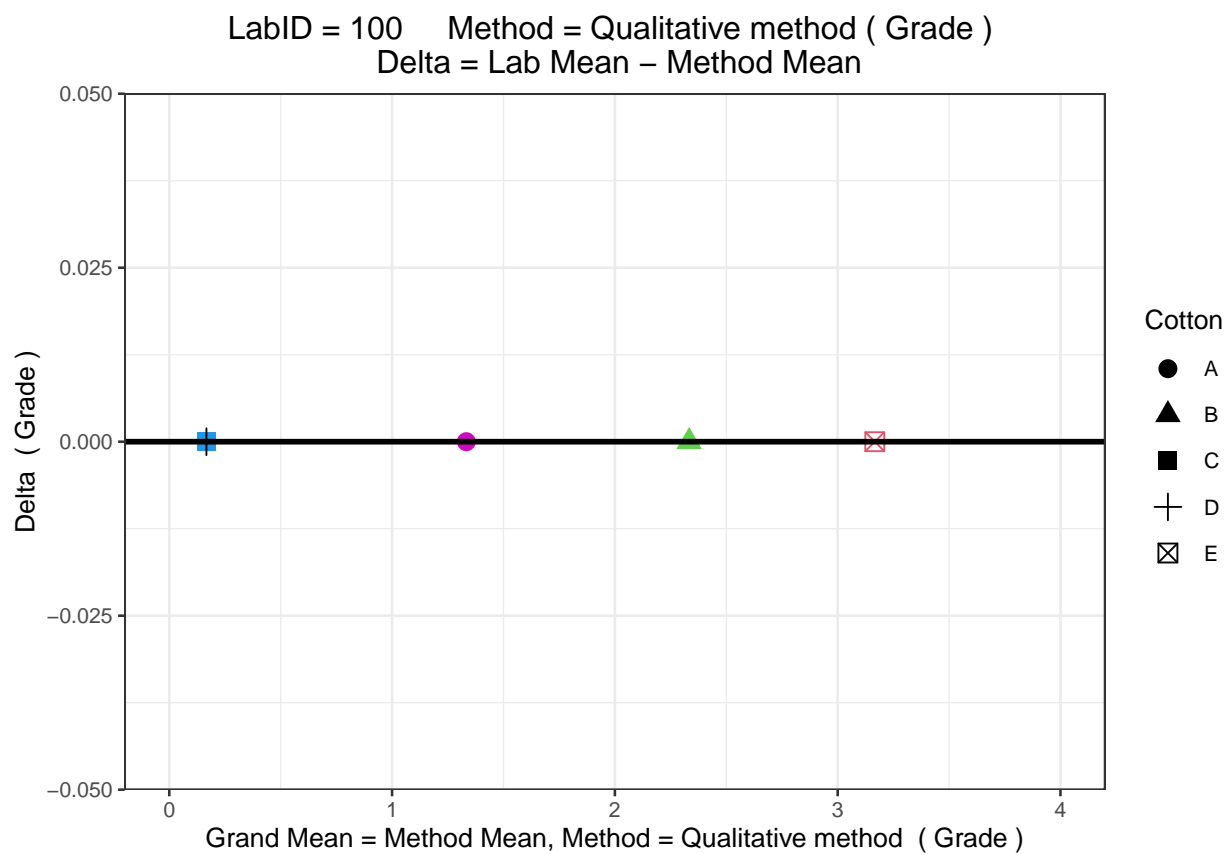
Delta = Lab Mean – Method Mean



CSITC type chart for Method MinicardC

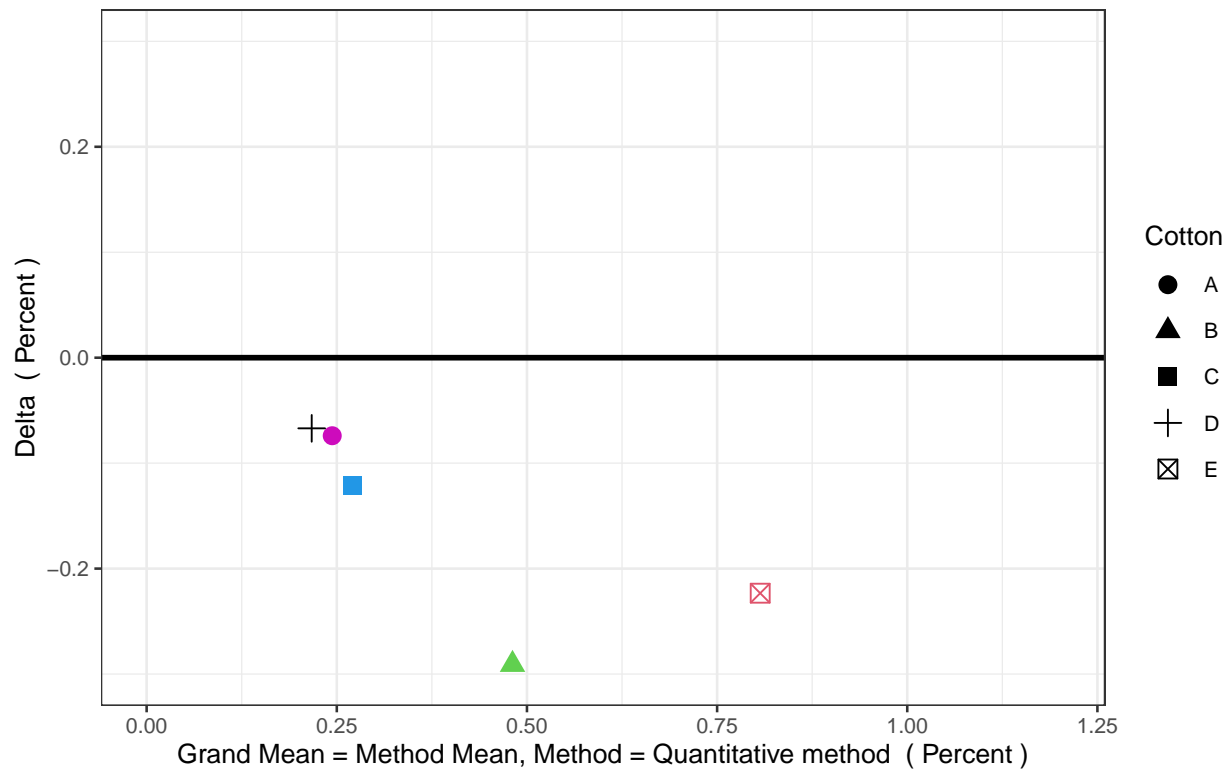


CSITC type chart for Method Qualitative method

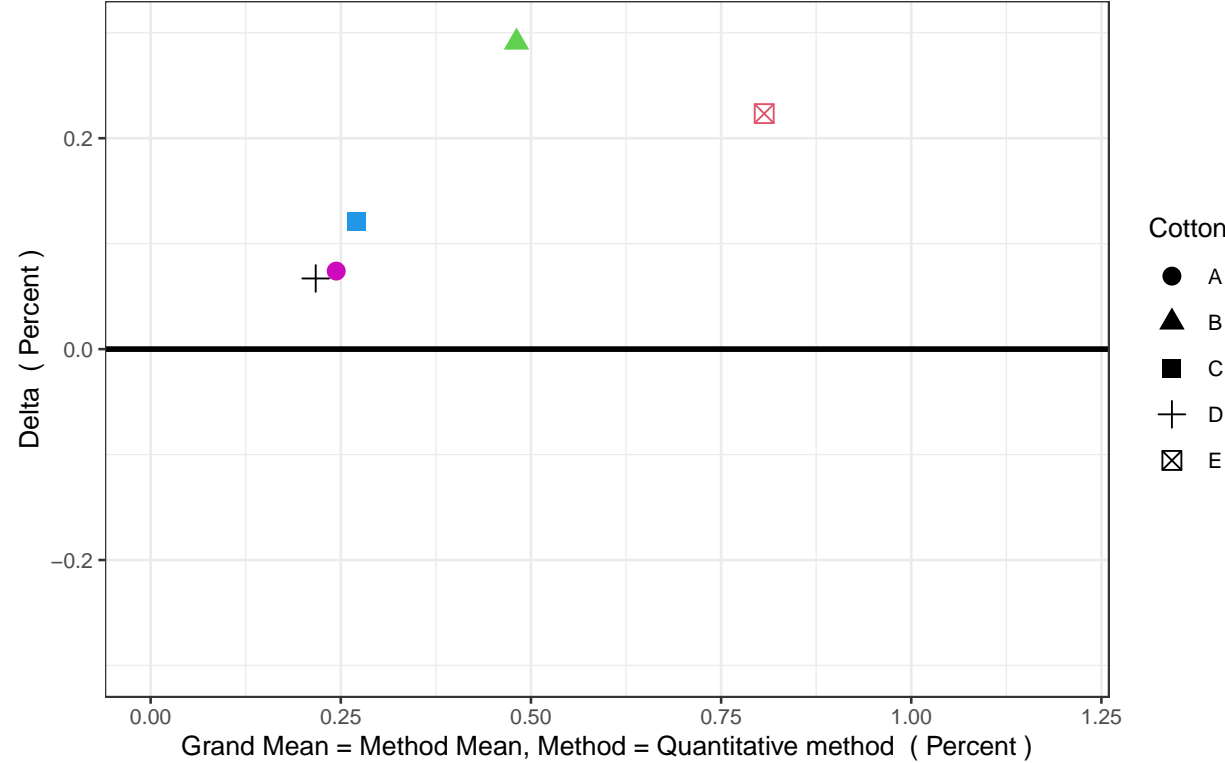


CSITC type chart for Method Quantitative method

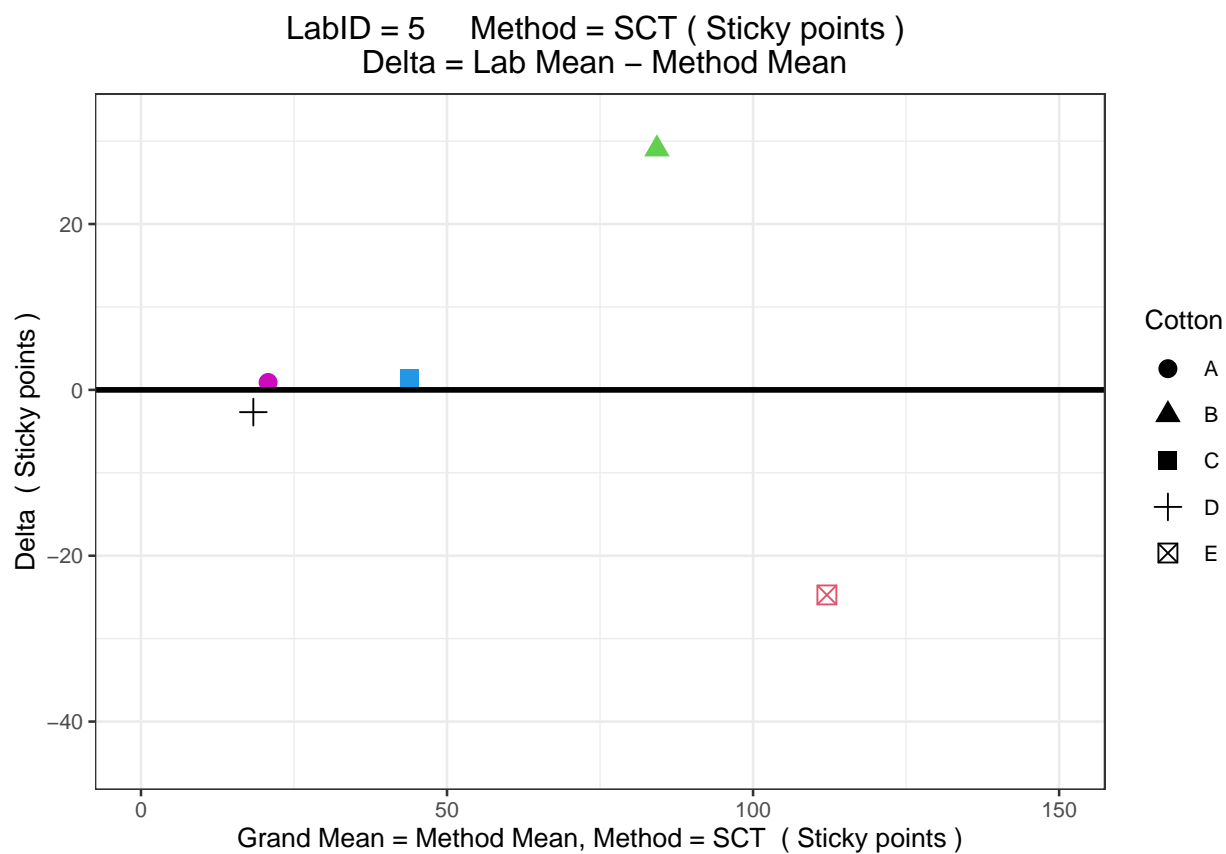
LabID = 65 Method = Quantitative method (Percent)
Delta = Lab Mean – Method Mean



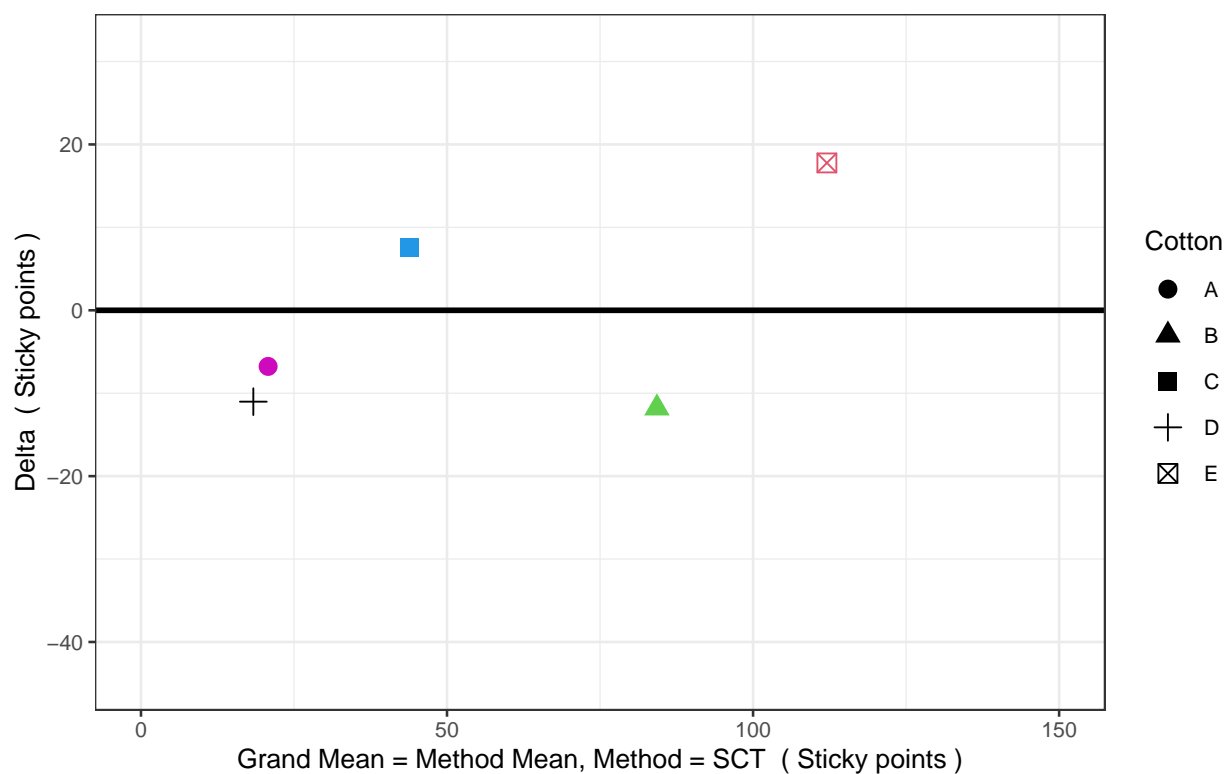
LabID = 120 Method = Quantitative method (Percent)
Delta = Lab Mean – Method Mean



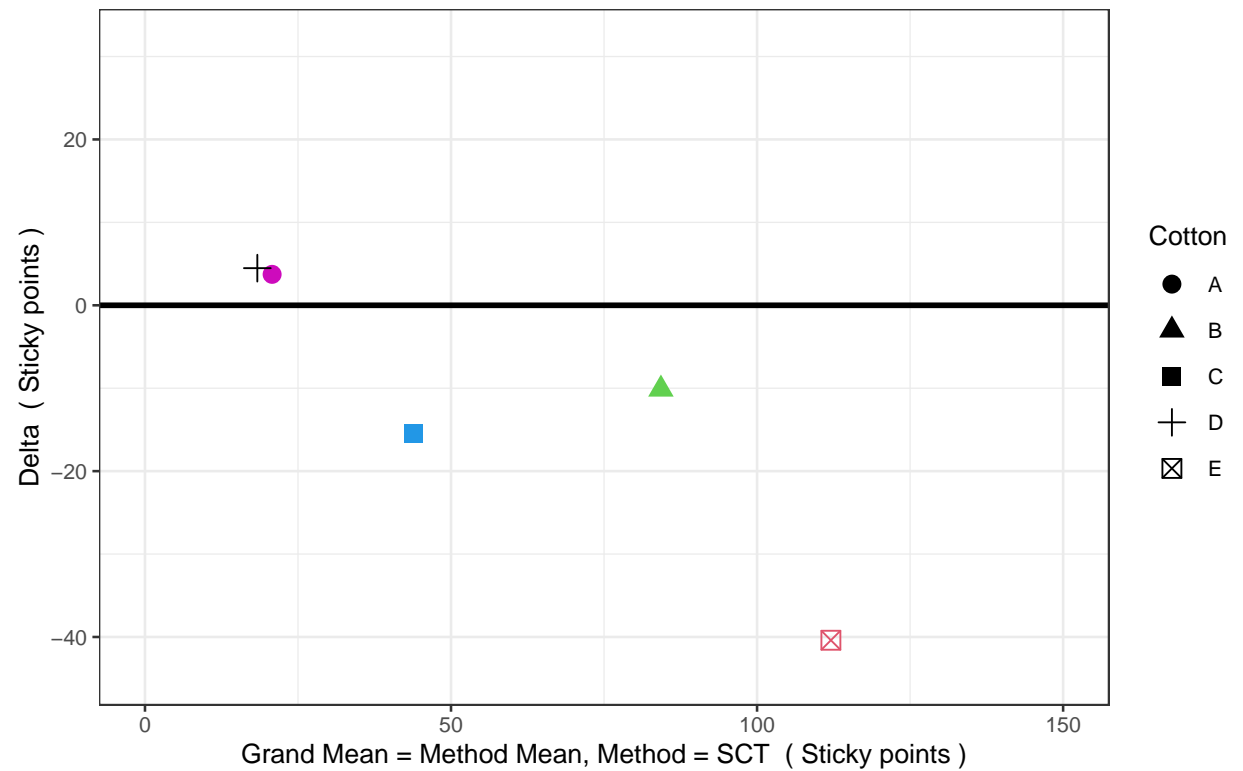
CSITC type chart for Method SCT



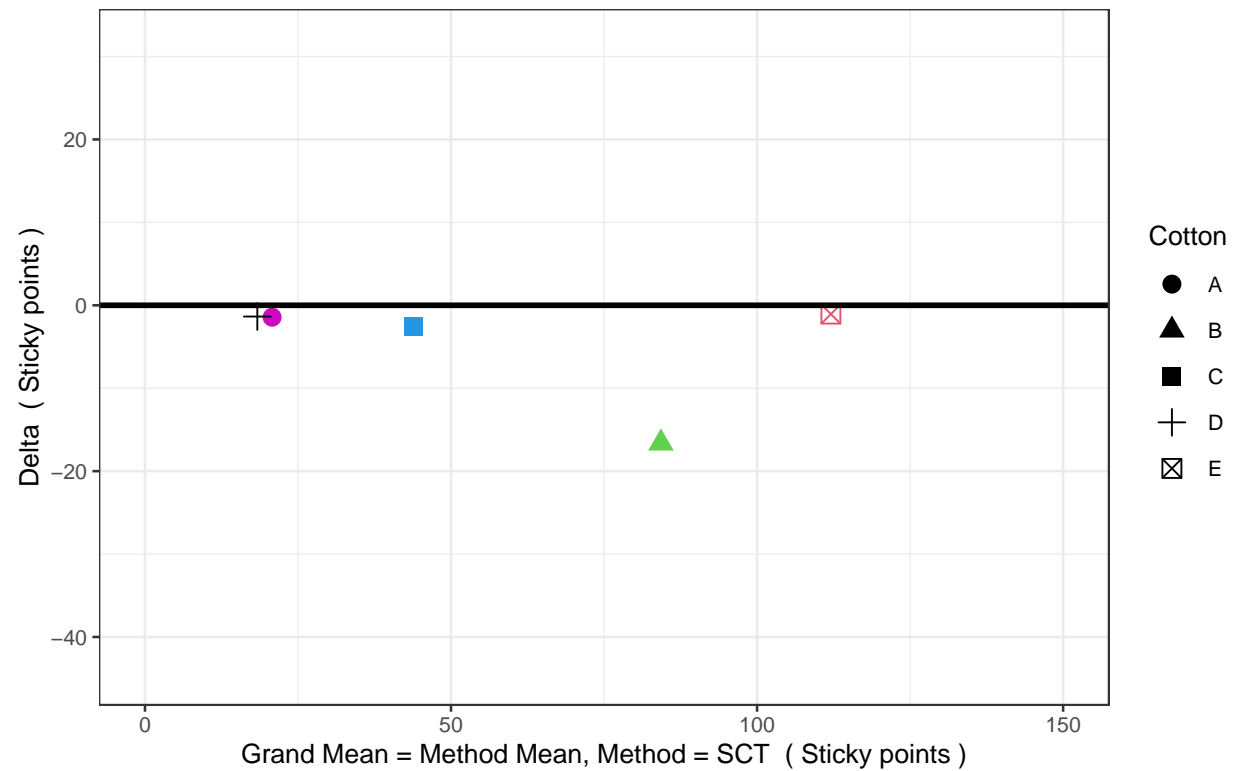
LabID = 30 Method = SCT (Sticky points)
Delta = Lab Mean – Method Mean



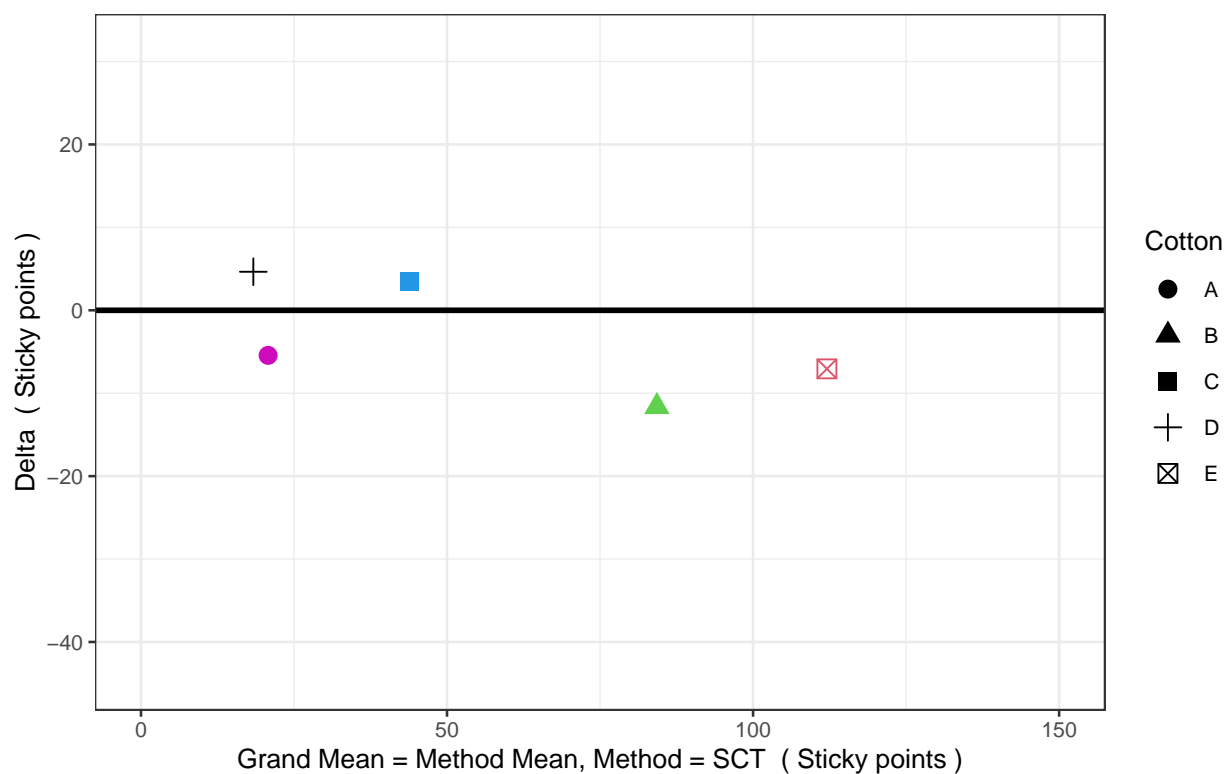
LabID = 40 Method = SCT (Sticky points)
Delta = Lab Mean - Method Mean



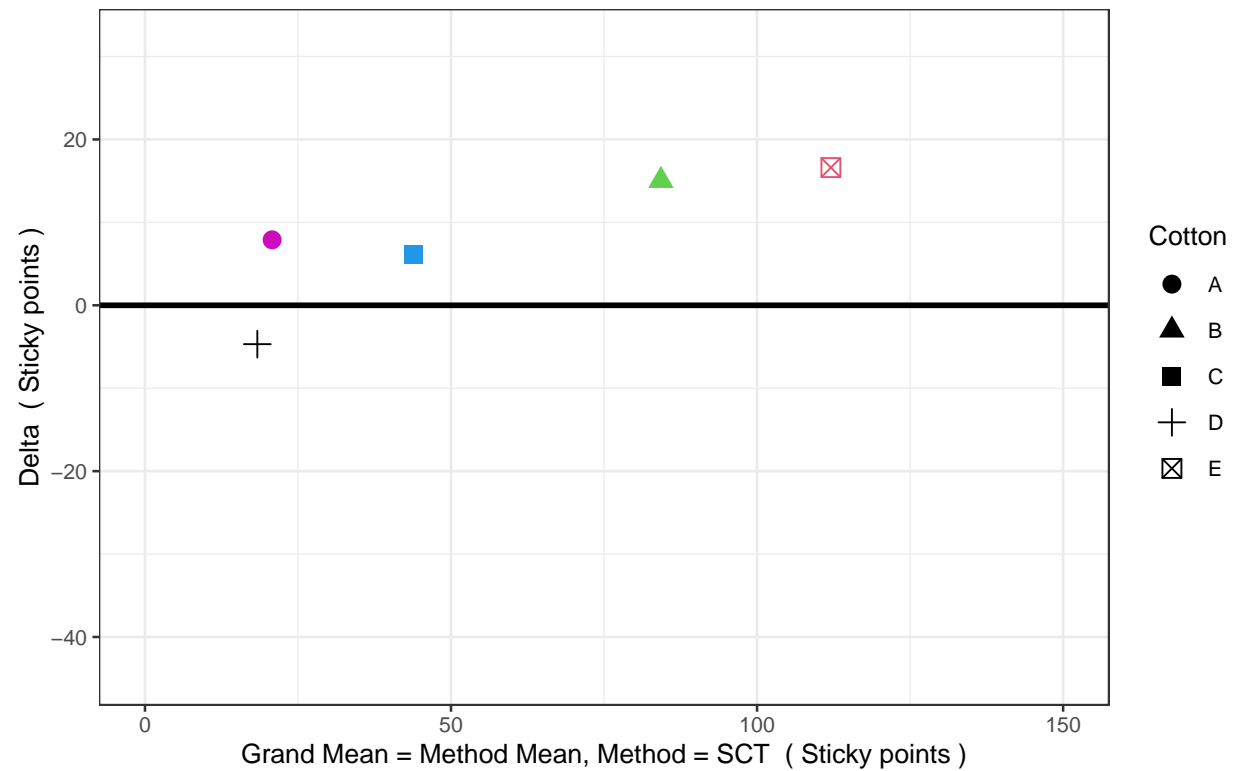
LabID = 45 Method = SCT (Sticky points)
Delta = Lab Mean – Method Mean



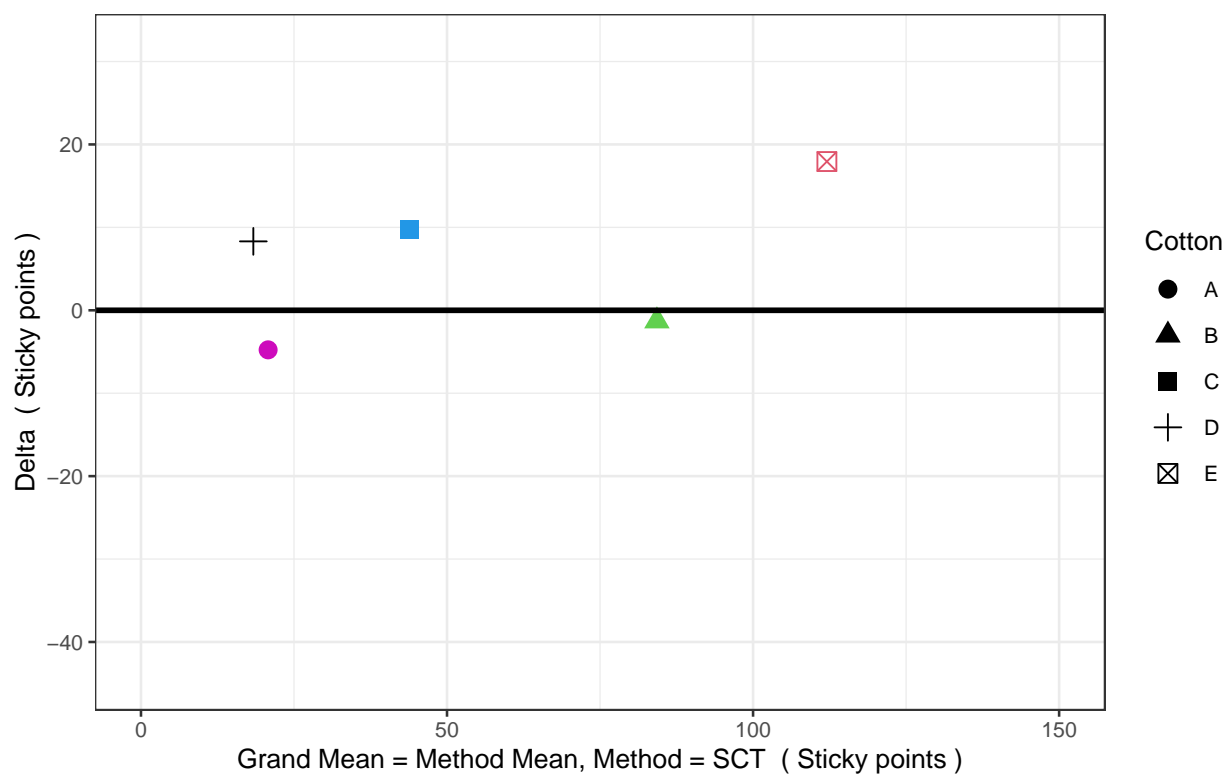
LabID = 55 Method = SCT (Sticky points)
Delta = Lab Mean – Method Mean



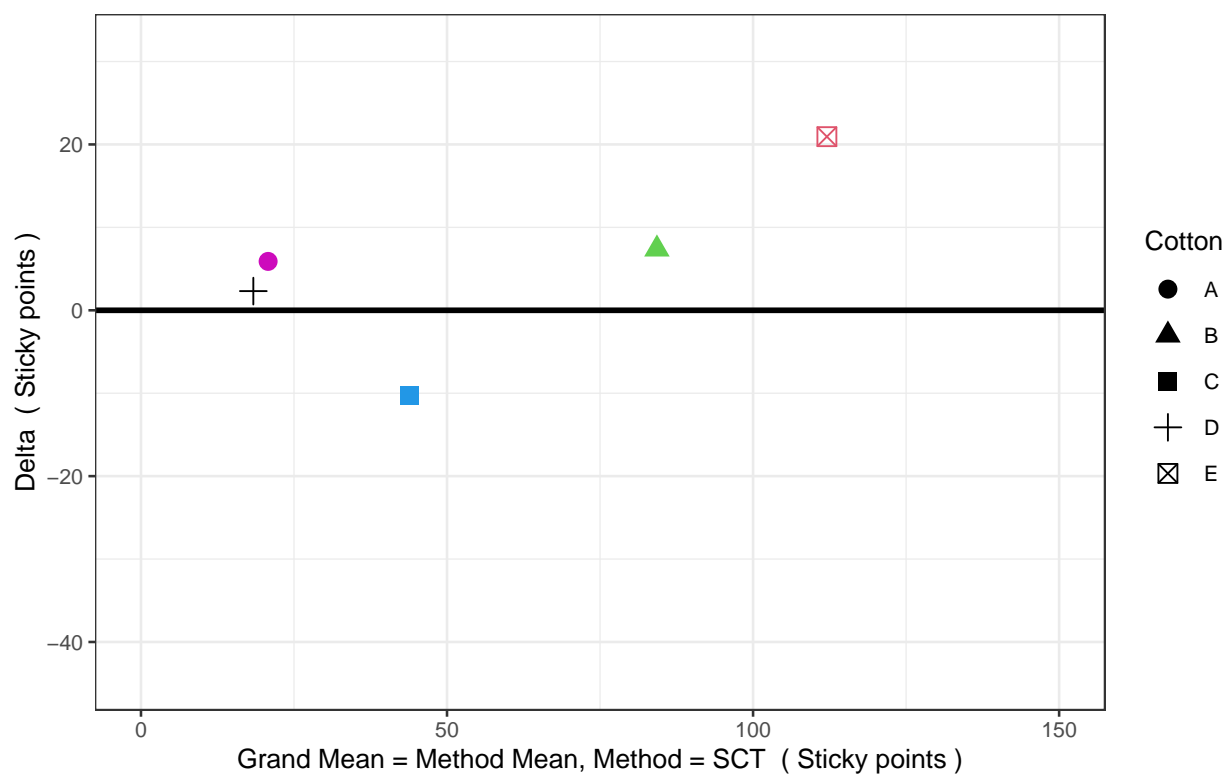
LabID = 80 Method = SCT (Sticky points)
Delta = Lab Mean – Method Mean



LabID = 125 Method = SCT (Sticky points)
Delta = Lab Mean – Method Mean



LabID = 155 Method = SCT (Sticky points)
Delta = Lab Mean – Method Mean



CommonScale ⁷

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: $CommonScale = \frac{LabID \text{ reading} * 100}{MaxEver \text{ for this method}}$, 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.

Method	MaxEver	Unit
Caramelization	7.0	Color degree
Contest-S	750.0	Contest Grade
H2SD	70.0	Sticky points
KOTITI	9.0	Kotiti grade
Minicard	3.0	ITMF grades
MinicardC	7.0	Cirad grades
Qualitative method	4.0	Grade
Quantitative method	1.2	Percent
SCT	150.0	Sticky points

For instance,

- a reading of 2 at the minicard, with a MaxEver set at 3, will convert into a CommonScale reading of:
$$67 = \frac{2 * 100}{3}.$$
- a reading of 63 at the SCT, with a MaxEver set at 150, will convert into a CommonScale reading of:
$$42 = \frac{63 * 100}{150}.$$
- *etc.*

⁷Footnote

* 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

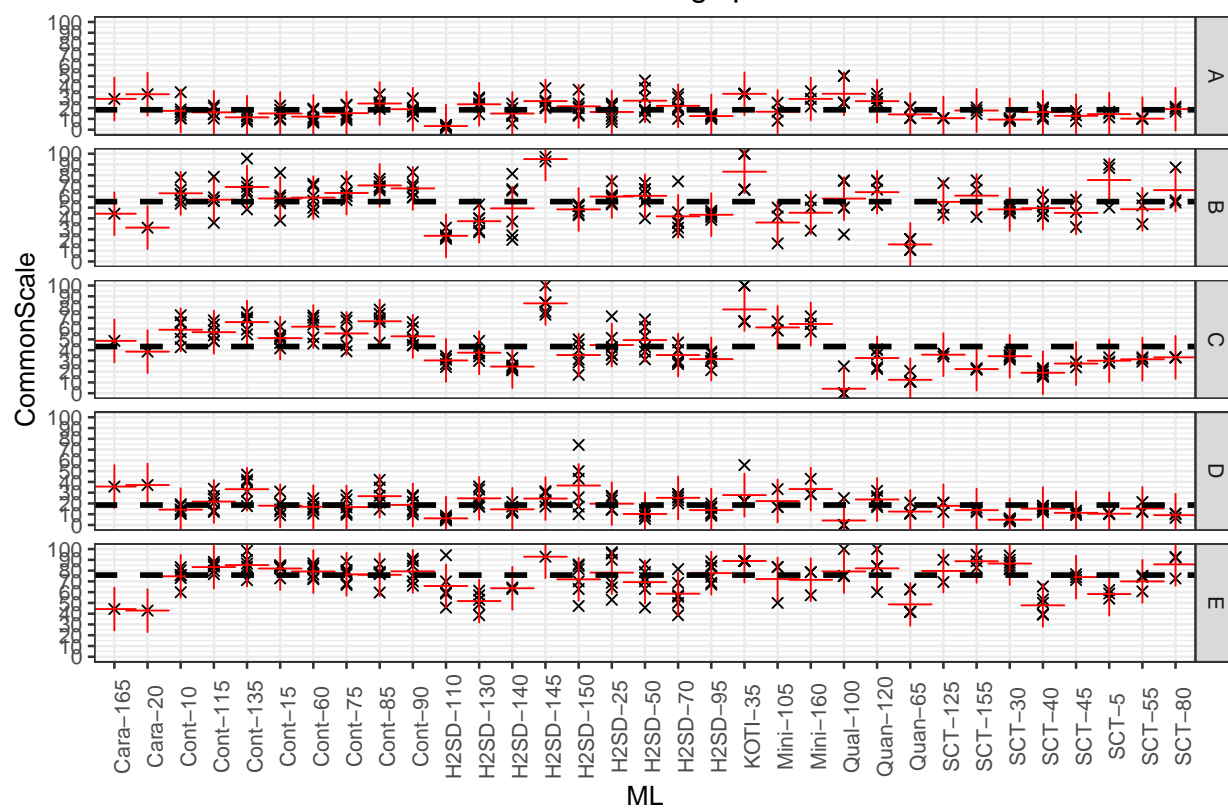
This approach has potential limitations:

- 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 phenomena 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.

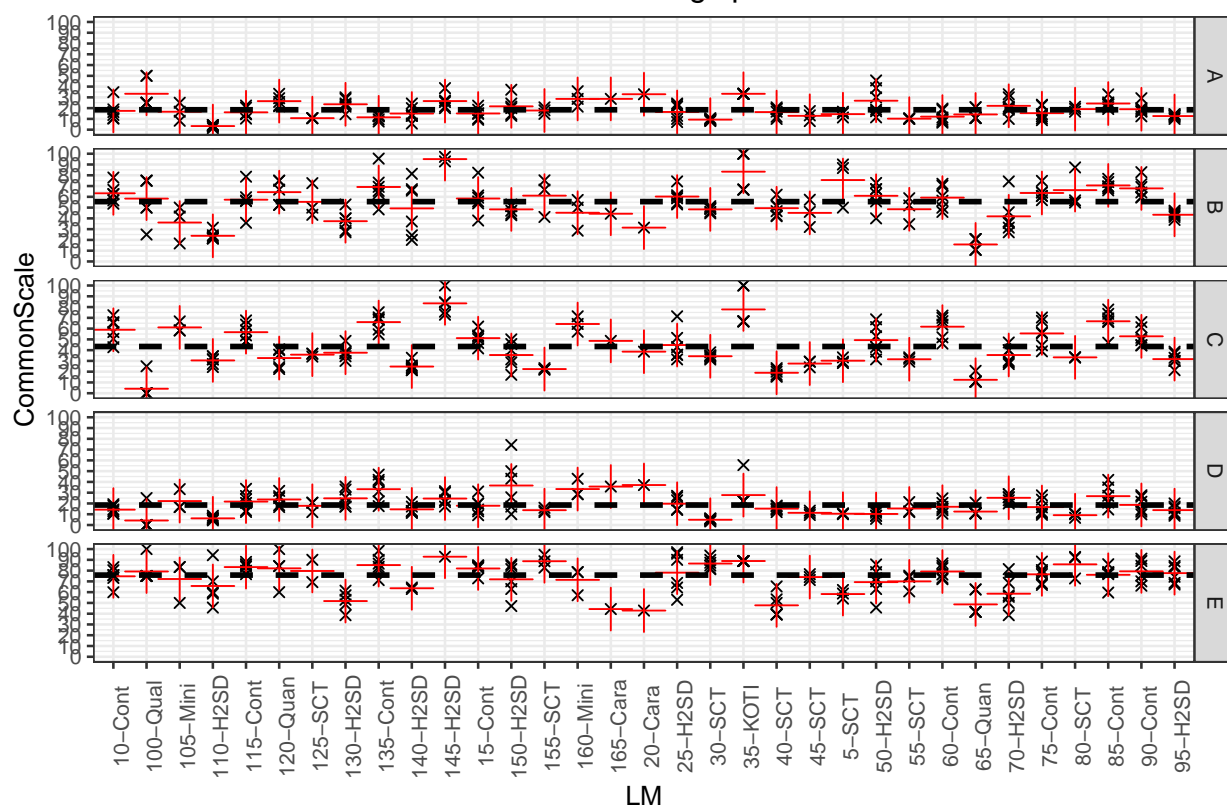
As a conclusion, as said earlier, CommonScale will be experimented at least for some round-tests in order to see if it could help Manufacturers and Users ***to get closer and closer results for each method for the same cottons over time.*** On the long run, the ability of each method to characterize 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

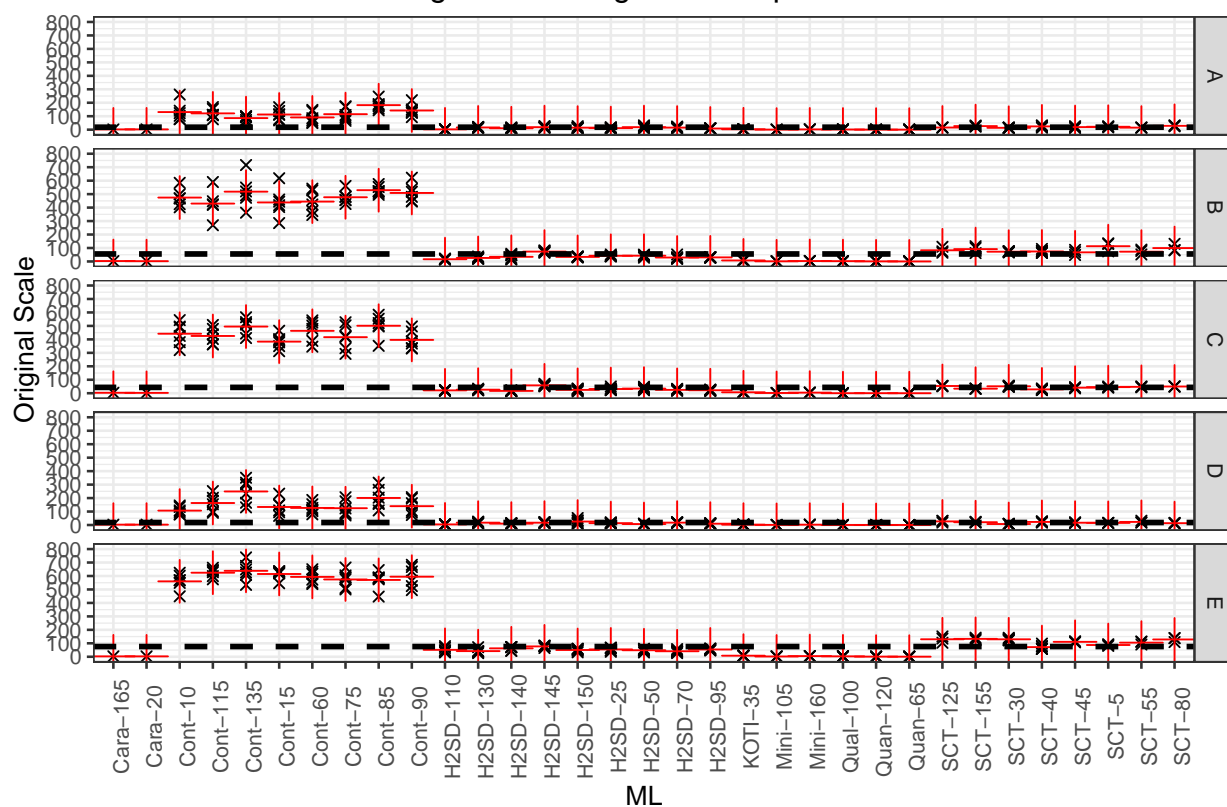
Individual CommonScale readings per Method and LabID



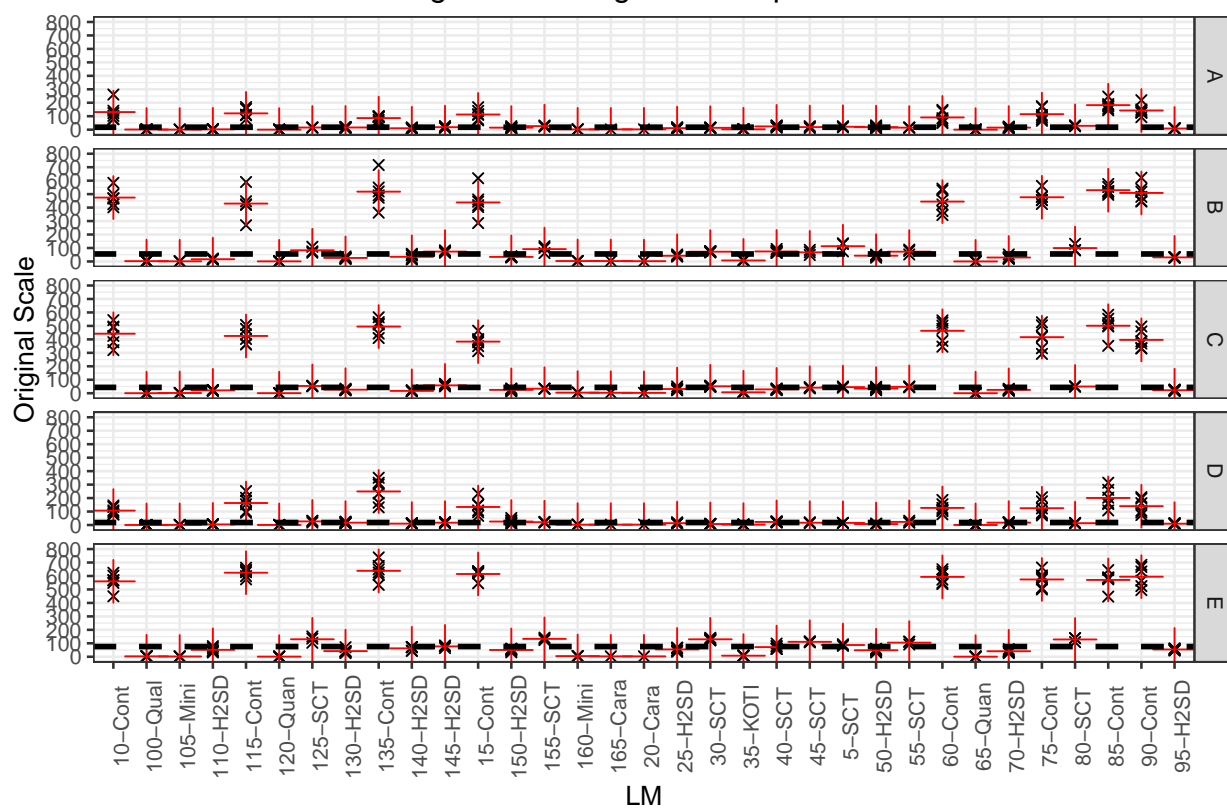
Individual CommonScale readings per LabID and Method



Individual readings in their original scale per Method and LabID



Individual readings in their original scale per LabID and Method



Overall statistics per Cotton and Method ⁸

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 helpfull 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 seing 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.

⁸Footnote

* NA or NaN excluded from the orginal raw data * NA appears in the following tables when less that two laboratories provided data for the given cotton and method

* Mean and Standard Deviation expressed in Unit, CV expressed in %

Mean, standard deviation and CV between instruments by method, Cotton A

Method	MeanInterLab	SdInterLab	CVInterLab	Unit
Caramelization	2.1	0.2	9.9	Color degree
Contest-S	122.7	30.5	24.8	Contest Grade
H2SD	13.1	5.3	40.8	Sticky points
KOTITI	3.0	NA	NA	Kotiti grade
Minicard	0.5	NA	NA	ITMF grades
MinicardC	2.0	NA	NA	Cirad grades
Qualitative method	1.3	NA	NA	Grade
Quantitative method	0.2	0.1	42.9	Percent
SCT	20.8	5.5	26.5	Sticky points

Mean, standard deviation and CV between instruments by method, Cotton B

Method	MeanInterLab	SdInterLab	CVInterLab	Unit
Caramelization	2.7	0.6	24.0	Color degree
Contest-S	477.6	38.2	8.0	Contest Grade
H2SD	36.5	15.9	43.5	Sticky points
KOTITI	7.5	NA	NA	Kotiti grade
Minicard	1.1	NA	NA	ITMF grades
MinicardC	3.2	NA	NA	Cirad grades
Qualitative method	2.3	NA	NA	Grade
Quantitative method	0.5	0.4	85.6	Percent
SCT	84.3	15.9	18.9	Sticky points

Mean, standard deviation and CV between instruments by method, Cotton C

Method	MeanInterLab	SdInterLab	CVInterLab	Unit
Caramelization	3.0	0.5	16.2	Color degree
Contest-S	440.3	43.5	9.9	Contest Grade
H2SD	29.0	12.2	41.9	Sticky points
KOTITI	7.0	NA	NA	Kotiti grade
Minicard	1.8	NA	NA	ITMF grades
MinicardC	4.5	NA	NA	Cirad grades
Qualitative method	0.2	NA	NA	Grade
Quantitative method	0.3	0.2	63.1	Percent
SCT	43.9	8.9	20.2	Sticky points

Mean, standard deviation and CV between instruments by method, Cotton D

Method	MeanInterLab	SdInterLab	CVInterLab	Unit
Caramelization	2.5	0.1	2.8	Color degree
Contest-S	155.7	47.4	30.4	Contest Grade
H2SD	13.7	6.6	47.9	Sticky points
KOTITI	2.5	NA	NA	Kotiti grade
Minicard	0.7	NA	NA	ITMF grades
MinicardC	2.3	NA	NA	Cirad grades
Qualitative method	0.2	NA	NA	Grade
Quantitative method	0.2	0.1	43.7	Percent
SCT	18.4	6.2	33.7	Sticky points

Mean, standard deviation and CV between instruments by method, Cotton E

Method	MeanInterLab	SdInterLab	CVInterLab	Unit
Caramelization	3.0	0.1	2.3	Color degree
Contest-S	596.4	27.7	4.6	Contest Grade
H2SD	53.6	11.0	20.6	Sticky points
KOTITI	8.0	NA	NA	Kotiti grade
Minicard	2.2	NA	NA	ITMF grades
MinicardC	5.0	NA	NA	Cirad grades
Qualitative method	3.2	NA	NA	Grade
Quantitative method	0.8	0.3	39.2	Percent
SCT	112.1	22.8	20.4	Sticky points

Frequently asked questions (Q) and answers (A) ⁹

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?

A: GB/T13785-1992 stands for a Chinese standards called 'Test method for degree of sugar contains in cotton fibers – Colorimetry'.

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 Sticky 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.

⁹Footnote

* Based on all round-tests carried out already.

NEW ! Calculation of Z-Scores for measuring the deviation of any results to the reference value per cotton

In order to alert participating laboratories when their results are deviating too much from the reference results for each cotton, it has been proposed to use the Z-Score system which is well-known and standardized value from laboratories in quality management systems, whatever material is tested or whatever characterization is measured. A Z-Score value usually belongs to the interval -3 to +3, as it is linked to a Normal-Gaussian distribution:

- When the value is belonging to the interval $[-1, +1]$, the measured value given by the participating laboratory is close enough to the reference value for that material, and no alert is necessary to improve the performance of the laboratory;
- When the value is belonging to the intervals $[-2, -1[\cup]+1, +2]$, the measured value given by the participating laboratory starts to deviate from the reference value for that material, and a particular attention is demanded to the laboratory personnel to start taking care or to improve the performance of the laboratory;
- When the value is belonging to the intervals $[-3, -2[\cup]+2, +3]$, the measured value given by the participating laboratory deviates too much from the reference value for that material, and a strong attention and corrections are demanded to the laboratory personnel to strongly improve the performance of the laboratory;
- When the value is belonging to the intervals $]less than -3[\cup]more than +3[$, the measured value given by the participating laboratory deviates far too much from the reference value for that material, and strong attentions and corrections are mandatory for the proper practice and better performance of the laboratory.

Z-Scores are calculated based on individual CommonScale results as described in some chapters above. Then, a mean CommonScale value is calculated for each LabID and each Material. Then a distribution is drawn based on these mean CommonScale values, from which Z-Score values are calculated based on Normal Standard Deviations. The reference values are based on the distribution from results of the chosen Methods in 2021 for starting the harmonization efforts, namely: Contest-S, H2SD, SCT as explained in Bremen in October 2022.

This leads to the inclusion of a new table in this Long Report. In practice, for each LabID, and for each tested material, a Z-Score value is reported in the table. Interpretation of this data is to be made with the above way of thinking (see bullet points just above).

At the end of the day, Z-Score values could be the real information for laboratories in order to harmonize results at a worldwide scale.

RT2022-2 : Zscores values, based on CommonScale data and with reference to thermo-mecanic Methods (Contest-S, H2SD and SCT)

LabID	A	B	C	D	E
5	-0.35	1.20	-0.79	-0.92	-1.48
10	0.19	0.40	0.97	-0.43	-0.18
15	-0.24	0.08	0.49	0.04	0.40
20	2.91	-1.68	-0.27	2.52	-2.70
25	0.01	0.20	0.10	0.28	0.09
30	-1.24	-0.57	-0.53	-1.64	0.77
35	2.98	1.71	2.13	1.31	0.95
40	-0.01	-0.50	-1.47	-0.31	-2.32
45	-0.62	-0.78	-0.95	-0.81	-0.23
50	1.85	0.25	0.38	-0.95	-0.60
55	-1.09	-0.57	-0.71	-0.29	-0.55
60	-0.75	0.14	1.15	-0.09	0.18
65	-0.40	-2.69	-1.87	-0.66	-2.25
70	1.01	-0.99	-0.47	0.99	-1.46
75	-0.19	0.42	0.76	-0.12	-0.03
80	0.48	0.59	-0.60	-1.09	0.71
85	1.39	0.87	1.45	1.19	-0.06
90	0.46	0.69	0.60	0.14	0.19
95	-0.66	-0.90	-0.70	-0.49	0.06
100	2.98	0.08	-2.38	-1.73	0.18
105	0.05	-1.37	1.10	0.60	-0.37
110	-2.30	-2.17	-0.77	-1.47	-0.26
115	-0.05	0.01	0.83	0.54	0.50
120	1.78	0.47	-0.64	0.79	0.71
125	-1.00	-0.12	-0.45	0.03	0.77
130	1.27	-1.29	-0.33	0.92	-1.34
135	-0.87	0.78	1.41	2.02	0.65
140	-0.24	-0.51	-1.12	-0.40	1.00
145	1.79	3.09	2.47	0.90	2.65
150	0.93	-0.57	-0.47	2.46	-0.40
155	0.25	0.26	-1.26	-0.49	0.94
160	2.14	-0.78	1.30	2.03	-0.44
165	2.15	-0.84	0.34	2.33	-2.59

Highlighted values in orange indicates a quite large deviation to the expected stickiness value for that cotton. Corrective actions may be necessary.

Software components to realize this report ¹⁰

Software code version: March 8, 2023 by Jean-Paul Gourlot

R version 4.2.1 (2022-06-23 ucrt) Platform: x86_64-w64-mingw32/x64 (64-bit) Running under: Windows 10 x64 (build 19045)

Matrix products: default

locale: [1] LC_COLLATE=French_France.utf8 LC_CTYPE=French_France.utf8 LC_MONETARY=French_France.utf8 LC_NUMERIC=C

[5] LC_TIME=French_France.utf8

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

other attached packages: [1] rmarkdown_2.14 markdown_1.1 ggplot2_3.3.6 reshape2_1.4.4 xlsx_0.6.5
xlsxjars_0.6.1 rJava_1.0-6 knitr_1.39

[9] readxl_1.4.0

loaded via a namespace (and not attached): [1] Rcpp_1.0.9 highr_0.9 cellranger_1.1.0 compiler_4.2.1
pillar_1.8.0 plyr_1.8.7 tools_4.2.1

[8] digest_0.6.29 evaluate_0.15 lifecycle_1.0.1 tibble_3.1.8 gtable_0.3.0 pkgconfig_2.0.3 rlang_1.0.4

[15] cli_3.3.0 yaml_2.3.5 xfun_0.31 fastmap_1.1.0 withr_2.5.0 stringr_1.4.0 dplyr_1.0.9

[22] generics_0.1.3 vctrs_0.4.1 tidyselect_1.1.2 glue_1.6.2 R6_2.5.1 rematch_1.0.1 fansi_1.0.3

[29] farver_2.1.1 purrr_0.3.4 magrittr_2.0.3 scales_1.2.0 htmltools_0.5.3 colorspace_2.0-3 labeling_0.4.2

[36] tinytex_0.40 utf8_1.2.2 stringi_1.7.8 munsell_0.5.0 crayon_1.5.1

¹⁰Footnote

* List of all R components for processing the data

[1] “ICCTM-ITMF-RTStick 2022-2_Long_2023-03-07_Raw”

General conclusions about the results of this round-test

At this point, some general conclusions can be drawn from the results of this round-test:

- Nine methods (one with two scales; in past RTS, up to eleven methods were participating) for measuring stickiness were used. Please see our conclusions in Bremen Conferences (see link below), for trying to make according decision for labs's future testing instrumentation and procedures.
- Thirty three instruments participated to this test. On our side, we were not able to easily deliver samples to some laboratories due to restrictions by carriers, and the final date to submit data was postponed to January 31, 2023. With all data available we prepared this report that is the only official one for ever.
- Maybe following the March 2021 meeting in Bremen, three methods are now counting a good participation (Contest-S (8), H2SD (9) and SCT (8)), while some methods now tend to reduce or disappear from some RTs already. Maybe also it is because participants had a look on past reports and Bremen ITMF-ICCTM presentations and saw our effort in the harmonization process focusing on thermo-mechanical methods mainly (see link below).
- Levels of reading as well as units to express stickiness remain quite different, confirming that maybe all methods are not exactly measuring the same property that all methods however name 'stickiness' by all methods. This could be a problem for the comparability of the measurements and the application of the results in processing.
- Variations in results are still quite high within and between laboratories using the same method, inducing somewhat low levels of reproducibility in the measurements. **It should be noticed that stickiness, due to its manifestation, has always been variable in 'real-life' samples; it also the case when 'prepared samples' as in this RT, but to a lesser degree.**
- It seems that this variation slightly reduced recently, but we need to find a criteria to measure it properly; please see last comment below;
- If one would compare methods, it would require calculating a representative result for each of the used methods; however taking care of the observed large variability levels in the results - both within laboratory and between laboratories - **a mean result or a median result per method would not be meaningful at this stage.** When these levels of variability will decrease, such a comparison will be published for each round-test occurrence.
- As discussed in Bremen (March 2018), since RT 2018-1, a new chapter appeared in the full report about the CommonScale approach as a first attempt of harmonization within and between methods (the later, at the condition that all methods do measure stickiness which will have to be proven according to a procedure to be developed).
- As discussed in Bremen (March 2021), harmonization steps will concentrate on thermo-mechanic methods and keeping the minicard as ITMF-ICCTM reference. More information will be disseminated on the harmonization steps in the future.
- As we assume that by showing their relative position of each laboratory on comparison with others will induce corrective actions to favor more harmonized results along time, we will run other occurrences of

this stickiness round-test in the coming times.

- To see the presentation that was made about this round-test in Bremen in March 2021, based on all acquired results since 2017, please visit: https://baumwollboerse.de/wp-content/uploads/2021/06/CCB_2021-T5-Gourlot-Drieling.pdf and/or <https://www.itmf.org/images/dl/reports/icctm-reports/ICCTM-Report-2021.pdf> .
- Lately, in Bremen (October 2022, see <https://www.itmf.org/images/dl/reports/icctm-reports/ICCTM-Report-2022.pdf>), it was proposed to use Z-Scores to express the distance of every individual measurement result (transformed in CommonScale) to a reference value for this cotton sample, knowing that the reference result is based on taking care on thermo-mechanic methods results only (based on 2021 decisions).

We recommend laboratories to observe their position and deduce the potential corrective actions that will lead to more grouped results in the coming round-test occurrences.

We stay available to all laboratories participating to this RT for providing any piece of information of their interest. Please note that preparing and dispatching samples has a cost and therefore we urge laboratories receiving samples to submit their results in due time.

In the same time, if you would have several kilograms of homogeneous material having a typical sticky behavior, and that you would like this cotton to participate in one or several future round-test occurrence(s), please contact Jean-Paul GOURLOT. Every thing will remain confidential at any time.

Finally, next round-test samples may be sent in a close future. Messages will be sent to the mailbox of participating laboratories contacts. **If you know other laboratories who wish to participate, please ask them to contact us...** Thanks for the cotton community.

We stay at disposal for any additional discussion; we do hope to see you again during the coming next RT later within the coming months.

Thank you again for your participation and support.