



Sub-Group Cigar Smoking Methods (CSM) Annual Report

CORESTA SSPT2021 Virtual Conference

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Sub-Group Cigar Smoking Methods

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Objectives:

1. To develop and update CORESTA Recommended Methods as requested by the Scientific Commission by investigating the technical problems associated with the mechanical smoking of cigars
2. To conduct periodical collaborative studies in order to improve repeatability and reproducibility in different cigar sizes and types
3. To establish confidence intervals for the smoke yields of all different cigar sizes



Sub-Group Cigar Smoking Methods

❖ AGENDA

- ❖ Status of cigar related CRMs
- ❖ 15th collaborative study
- ❖ 16th collaborative study
- ❖ Revision of CRMs
 - 47 (sampling)
 - 65/66/67/68
- ❖ Summary of CORESTA strategy
 - Strategy House (Jutta Pani)
 - CSM contribution to 2 and 5-year strategic goals
- ❖ Actions – Next meeting
- ❖ Summary
- ❖ Acknowledgements



Sub-Group Cigar Smoking Methods

❖ A wrap up of cigar related CRMs:

CRM	Title	Published
N° 46	Atmosphere for Conditioning and Testing Cigars of all Sizes and Shapes	June 2018
N° 47	Cigars – Sampling	Jan. 2000
N° 64	Routine Analytical Cigar-Smoking Machine - Specifications, Definitions and Standard Conditions	May 2018
N° 65	Determination of Total and Nicotine-Free Dry Particulate Matter using a Routine Analytical Cigar-Smoking Machine – Determination of Total Particulate Matter and Preparation for Water and Nicotine Measurements (fourth edition)	Aug. 2019
N° 66	Determination of Nicotine in the Mainstream Smoke of Cigars by Gas Chromatographic Analysis	March 2020
N° 67	Determination of Water in the Mainstream Smoke of Cigars by Gas Chromatographic Analysis	March 2020
N° 68	Determination of Carbon Monoxide in the Mainstream Smoke of Cigars by Non-Dispersive Infrared Analysis	March 2020



Sub-Group Cigar Smoking Methods

❖ 15th Collaborative Study 2020

- Following the latest version of CRM,
i.e. 1 single result is one filter pad with 1 or 2 cigars.
- 5 single results per cigar
- 5 different cigars
 - 1 CORESTA monitor (CM9)
 - 4 reference products from UKY



Sub-Group Cigar Smoking Methods

❖ 15th Collaborative Study 2020

	Description
O	CM9, Coresta Monitor cigarette (Borgwaldt, Cerulean)
K	1C1 (UK) Large cigar, HTL wrapper, Dia (mm): 15,9 Length: 136,5 Mass (g): 6,4
L	1C2 (UK) Little cigar, filter, Dia (mm): 7,8 Length: 99,0 Mass (g): 1,4
M	1C3 (UK) Small cigarillo, Dia (mm): 11,0 Length: 109,5 Mass (g): 2,7
N	1C4 (UK) Large cigar, all natural, Dia (mm): 12,8 Length: 103 Mass (g): 3,2

Sub-Group Cigar Smoking Methods

❖ 15th Collaborative Study 2020





Sub-Group Cigar Smoking Methods

❖ 15th Collaborative Study 2020

- Timing: Nov 2020 – March 2021
- Participants:
Altria Client Service LLC, Enthalpy Analytical, Global Laboratory Services, ITGB, MST, University of Kentucky, STG BV
- Data collection and analysis
- Weight, TPM, Water, Nicotine, NFDPM, CO, Puff no.
- Due to the limited number of participants Cochran and Grubbs test to identify and eliminate outliers have not been performed. Alternatively, the robust method outlined in ISO 5725 part 5 to estimate r and R have been applied. This approach has the advantage of not being influenced by outliers.
- Z-Scores were calculated to give an indication to laboratories whether their results agree with those of the other participating laboratories.



Sub-Group Cigar Smoking Methods

❖ Z-Scores

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

$|Z| < 2$: The laboratory result is considered acceptable

$2 < |Z| < 3$: Warning

$|Z| > 3$: Signal to investigate

➤ 4 Z-Scores between 2 and 3. No Z-Scores above 3



Sub-Group Cigar Smoking Methods

Weight mg/test item

Product	Mean	N Labs	r	r (%)	R	R (%)
K (1C1)	6493	7	982	15,1%	1038	16,0%
L (1C2)	1339	7	58	4,3%	61	4,6%
M (1C3)	2738	7	214	7,8%	240	8,8%
N (1C4)	3170	7	221	7,0%	260	8,2%
O (CM9)	942	7	17,3	1,8%	29,1	3,1%

Nicotine (mg/test item)

Product	Mean	N Labs	r	r (%)	R	R (%)
K (1C1)	2,36	7	0,877	37,2%	1,846	78,4%
L (1C2)	1,10	7	0,256	23,2%	0,481	43,6%
M (1C3)	1,91	7	0,349	18,2%	0,555	29,0%
N (1C4)	3,04	7	1,000	32,9%	2,164	71,2%
O (CM9)	1,38	7	0,167	12,1%	0,475	34,4%



Sub-Group Cigar Smoking Methods

TPM mg/test item

Product	Mean	N Labs	r	r (%)	R	R (%)
K (1C1)	92,04	7	22,89	24,9%	57,28	62,2%
L (1C2)	23,17	7	4,05	17,5%	7,08	30,6%
M (1C3)	62,24	7	10,34	16,6%	17,32	27,8%
N (1C4)	62,05	7	15,07	24,3%	29,84	48,1%
O (CM9)	15,52	7	2,62	16,9%	5,19	33,5%

Water (mg/test item)

Product	Mean	N Labs	r	r (%)	R	R (%)
K (1C1)	12,47	7	8,34	66,9%	11,57	92,8%
L (1C2)	1,33	7	0,66	49,9%	0,97	72,7%
M (1C3)	4,39	7	1,90	43,3%	2,75	62,7%
N (1C4)	4,78	7	3,28	68,6%	7,17	150,0%
O (CM9)	1,06	7	0,45	42,5%	1,11	104,4%



Sub-Group Cigar Smoking Methods

NFDPM (Tar, mg/test item)

Product	Mean	N Labs	r	r (%)	R	R (%)
K (1C1)	221,14	7	75,04	33,9%	103,28	46,7%
L (1C2)	33,05	7	8,29	25,1%	13,69	41,4%
M (1C3)	101,11	7	13,18	13,0%	26,17	25,9%
N (1C4)	95,80	7	22,74	23,7%	58,15	60,7%
O (CM9)	10,36	7	2,43	23,4%	4,88	47,1%

Carbon Monoxide (CO, mg/test item)

Product	Mean	N Labs	r	r (%)	R	R (%)
K (1C1)	76,82	7	20,26	26,4%	53,84	70,1%
L (1C2)	20,74	7	3,79	18,3%	6,64	32,0%
M (1C3)	55,94	7	8,95	16,0%	15,85	28,3%
N (1C4)	54,11	7	12,24	22,6%	21,62	40,0%
O (CM9)	13,03	7	2,36	18,1%	4,51	34,6%



Sub-Group Cigar Smoking Methods

Puff Count (puffs/test item)

Product	Mean	N Labs	r	r (%)	R	R (%)
K (1C1)	86,60	7	20,76	24,0%	69,27	80,0%
L (1C2)	21,24	7	2,25	10,6%	4,52	21,3%
M (1C3)	37,21	7	3,28	8,8%	6,20	16,7%
N (1C4)	44,22	7	8,25	18,6%	13,32	30,1%
O (CM9)	12,23	7	0,74	6,0%	2,82	23,1%



Sub-Group Cigar Smoking Methods

Comparison r% and R% 2020 vs. 2019

Weight Test Item	2020		2019	
	r (%)	R (%)	r (%)	R (%)
K	15,10%	16,00%	15,50%	23,00%
L	4,30%	4,60%	4,10%	4,50%
M	7,80%	8,80%	8,40%	8,90%
N	7,00%	8,20%	7,80%	10,10%

Nicotine Test Item	2020		2019	
	r (%)	R (%)	r (%)	R (%)
K	37,20%	78,40%	44,40%	91,80%
L	23,20%	43,60%	20,90%	64,90%
M	18,20%	29,00%	13,40%	60,00%
N	32,90%	71,20%	41,30%	75,40%

TPM Test Item	2020		2019	
	r (%)	R (%)	r (%)	R (%)
K	24,90%	62,20%	33,50%	59,10%
L	17,50%	30,60%	23,90%	39,60%
M	16,60%	27,80%	15,30%	29,70%
N	24,30%	48,10%	32,50%	44,70%

NPDP Test Item	2020		2019	
	r (%)	R (%)	r (%)	R (%)
K	26,40%	70,10%	34,60%	51,80%
L	18,30%	32,00%	23,60%	42,00%
M	16,00%	28,30%	15,10%	30,70%
N	22,60%	40,00%	29,80%	42,30%



Sub-Group Cigar Smoking Methods

Comparison r% and R% 2020 vs. 2019

CO Test Item	2020		2019	
	r (%)	R (%)	r (%)	R (%)
K	33,90%	46,70%	40,90%	72,20%
L	25,10%	41,40%	29,80%	39,40%
M	13,00%	25,90%	17,60%	32,00%
N	23,70%	60,70%	30,80%	41,90%

Water Test Item	2020		2019	
	r (%)	R (%)	r (%)	R (%)
K	66,90%	92,80%	55,80%	108,60%
L	49,90%	72,70%	61,50%	80,80%
M	43,30%	62,70%	30,10%	52,60%
N	68,60%	150,00%	74,20%	145,00%

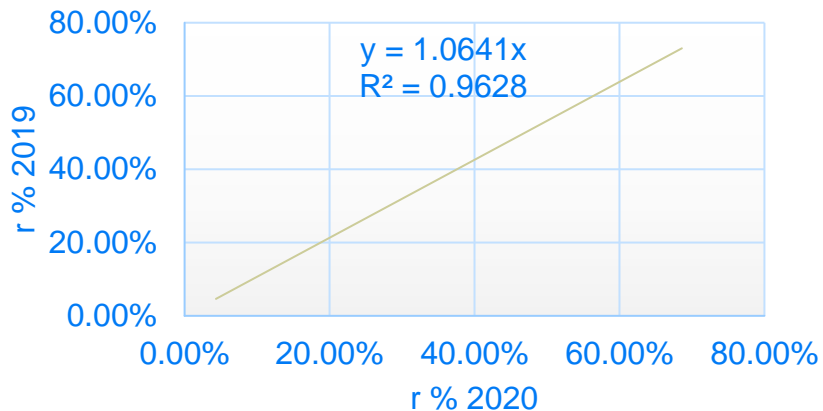
Puff Test Item	2020		2019	
	r (%)	R (%)	r (%)	R (%)
K	24,00%	80,00%	17,00%	86,10%
L	10,60%	21,30%	12,30%	21,60%
M	8,80%	16,70%	9,30%	17,70%
N	18,60%	30,10%	23,80%	28,10%



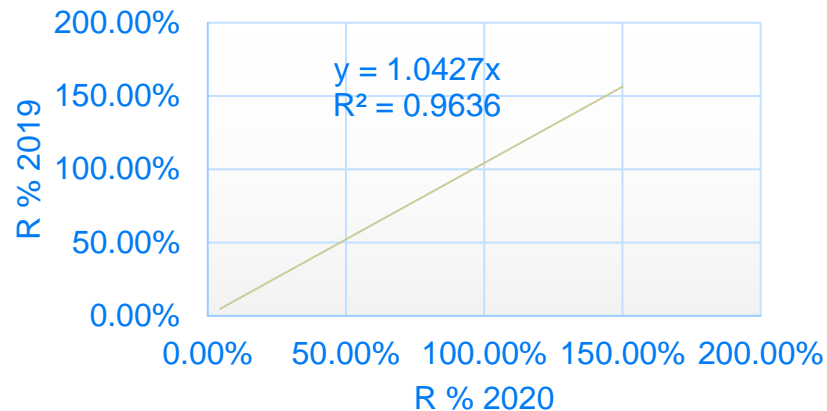
Sub-Group Cigar Smoking Methods

Comparison r% and R% 2020 vs. 2021

r % 2019 vs 2020



R % 2019 vs 2020





Sub-Group Cigar Smoking Methods

Mean values 2020 vs 2019:

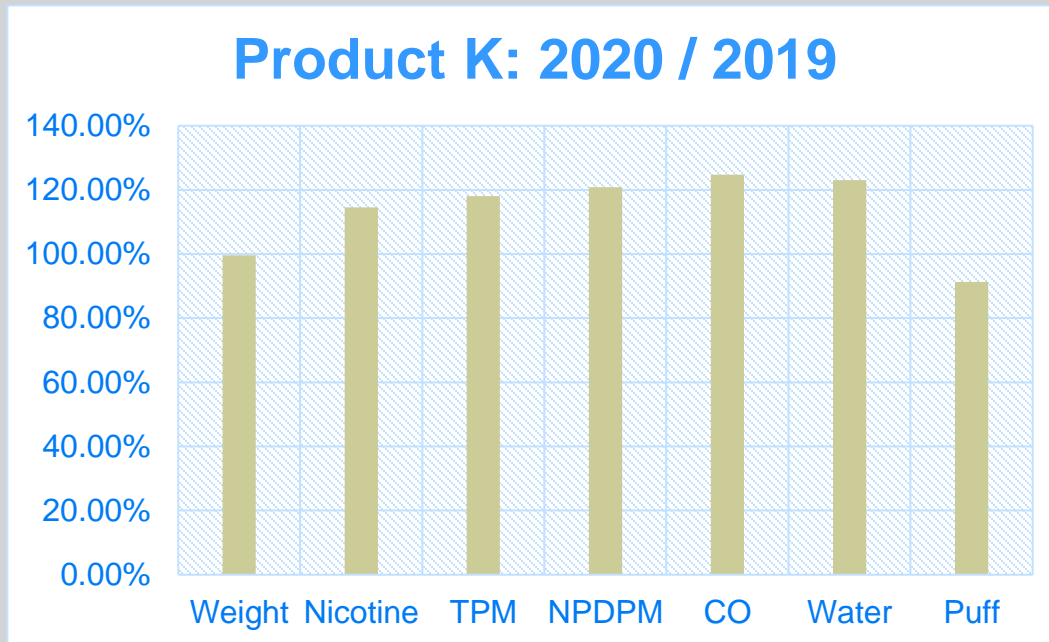
Product K

Smoke yields ~ 20 % up compared to 2019.

Only CO being statistically significant

Note: Puff no. down

Possible change in diameter and puff volume?





Sub-Group Cigar Smoking Methods

❖ 15th Collaborative Study 2020: Summary and Conclusions

- Low number of laboratories – No outlier detection applied. Robust methodology from ISO 5725 – Part 5 applied
- Most mean values in good agreement with 2019 result. Product K tended to be 20 % higher in smoke yields. Further investigation will be conducted.
- r & R results indicate large variability in line with previous studies
- Z-Scores indicate reasonable agreement between laboratories



Sub-Group Cigar Smoking Methods

❖ 16th Collaborative Study 2021

- Proposed timing: Dec 2021 – March 2022
- Proposed test items and protocol :
 - Sames as 14th and 15th CS



Sub-Group Cigar Smoking Methods

❖ Revision of CRM 47 (Sampling)

- The recent changes in other CRMs do not require changes in CRM 47
- References to various ISO standards need updating:
 - **3. REFERENCES**
 - ISO 3534: 1993* Statistics - Vocabulary and symbols.
 - ISO 5725: 1994* Accuracy (trueness and precision) of measurement methods and results.
- Proposal: Circulation of revised copy for comments



Sub-Group Cigar Smoking Methods

❖ Revision of CRM 65/66/67/68

- Should we update the CRMs with the latest r & R values?
 - Currently the CRMs include r & R values from a 2018 collaborative study
 - The r % & R % values does not seem to be systematically different between the 2018 and 2020 studies
 - Proposal: An overview comparing the current r & R values with the 2020 values will be circulated for comments.



Sub-Group Cigar Smoking Methods

❖ CORESTA Strategy House

- Input for 2 Year and 5 Year plans needed by end of November
 - 2 Year plan:
 - ◆ “Cigar CRMs for HPHC constituents (TSNA, BaP Volatiles, Carbonyls)”
 - 5 Year plan:
 - ◆ “Existing CRMs remain robust and credible”
 - ◆ “Characterize the variability amongst cigars”



Sub-Group Cigar Smoking Methods

❖ CORESTA Strategy House

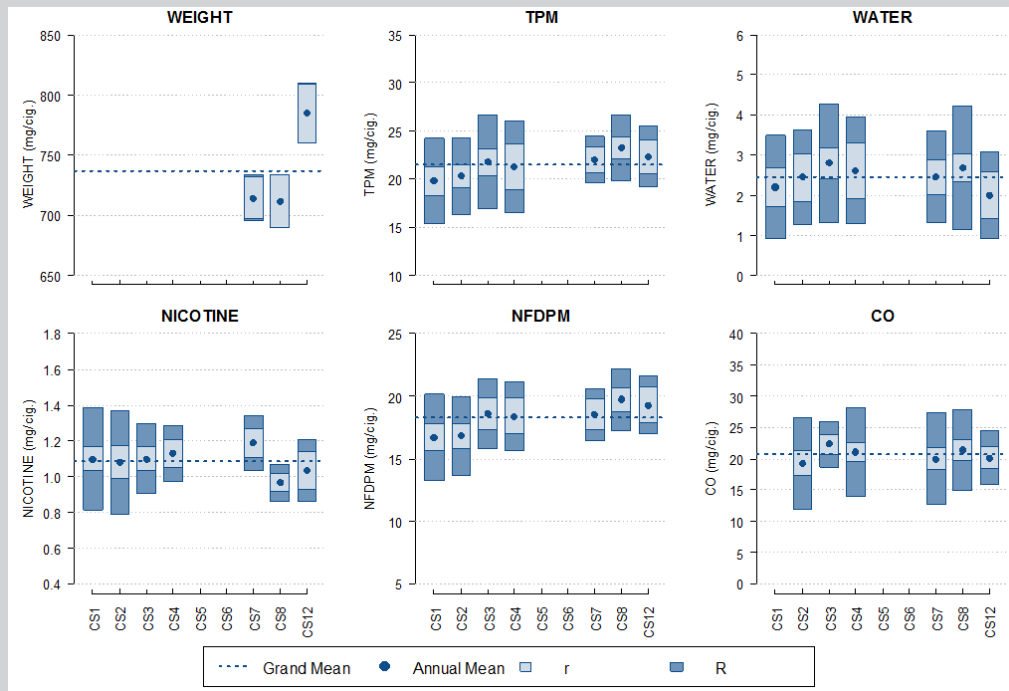
- “Cigar CRMs for HPHC constituents (TSNA, BaP Volatiles, Carbonyls”
 - Out of scope for CSM group, but strong encouragement to participate in **SA SG cigar smoke workstream – cigar methods for HPHCs**
- “Existing CRMs remain robust and credible”
 - Continued CS
- “Characterize the variability amongst cigars”
 - Further analysis of existing data from previous CS
 - New studies investigating the variation of products over multiple years

Sub-Group Cigar Smoking Methods

❖ “Characterize the variability amongst cigars”

➤ Further analysis of existing data from previous CS

- Products B, C and E have data for multiple years
- We would need to find raw data





Sub-Group Cigar Smoking Methods

❖ “Characterize the variability amongst cigars”

- New studies investigating the variation of products over multiple years
- It is proposed to conduct a study over multiple years, testing commercially available cigars for physical parameters and smoke yields
- It is proposed to test fresh product biannually for 3 years
- The outcome would be a data set demonstrating the variability in smoke yields including the effects of difference crop years, blend maintenance, production batches and different analytical runs in multiple laboratories



Sub-Group Cigar Smoking Methods

❖ Actions - Next meeting

- To be done via circulation of mail
 - Planning of CS 16
 - Input for strategic plans to SC

- Depending on feed back from SC
 - Meeting Q1 2022 (expected virtual) to develop NWIP aligned with strategy
 - Meeting Q3 or Q4 2022 follow up on CS 16



Sub-Group Cigar Smoking Methods

❖ Summary

- 15th CS successfully concluded
 - Some follow-up analysis of data from product K
- 16th CS proposed
- CRM47 needs revision
 - Proposal will be circulated to the CSM group
- Updating of CRMs 65/66/67/68 with new r&R discussed
- CORESTA strategy: Characterize variability amongst cigars
 - Proposed plans to support 5-year strategy
 - ◆ Analyse existing data from previous CS
 - ◆ Long term testing of smoke yields of commercially available cigars



Sub-Group Cigar Smoking Methods

❖ Acknowledgements

➤ Statistical analysis: Michael J. Morton

➤ Participating laboratories:

Altria Client Service LLC, Enthalpy Analytical, Global Laboratory Services, ITGB, MST, University of Kentucky, STG BV