



ABBREVIATED METHOD FOR TNCO ANALYSIS - MODIFIED ISO SMOKING

Rana Tayyarah
ITG Brands, LLC
rana.tayyarah@itgbrands.com

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Objective and Success Criteria

Objective

Develop a method for a 2 day reporting of TNCO

Success criteria

- 2 day reporting
- %RSD no more than 2 x ISO
- Applicable to a range of conventional cigarette designs
- Applicable to ISO smoking parameters
- Applicable to a high volume sample set
- Applicable to a comparative analysis study

Variables Considered

- Conditioning time
- Number of Cigarettes
- Loose versus packed cigarettes
- Standard butt length versus fixed number of puffs

Sample Types

- Typical American blend cigarette designs
- Menthol and Non-Menthol

	Range
ISO 'Tar' (mg/cig)	3 – 17
Length (mm)	80 – 100
Filter Ventilation (%)	0 – 60

Method Establishment - Design

- Launch a separate Logistics Project
- Evaluate major variables with a small set of samples
- Robustness for 'No Conditioning'
- Method Verification - Baseline Data collection over time

Logistics Project

- Collection and logging simultaneous
 - for a preview of the samples
- Automated Batch-building
- Custom Data Review Report
- Automated Reported

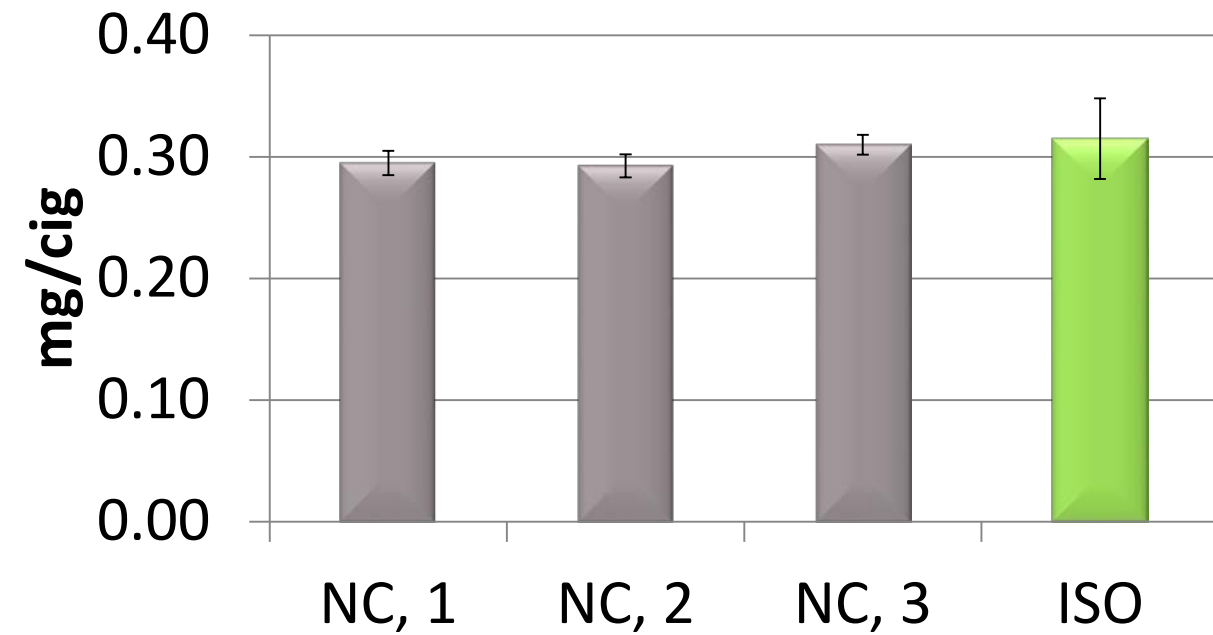
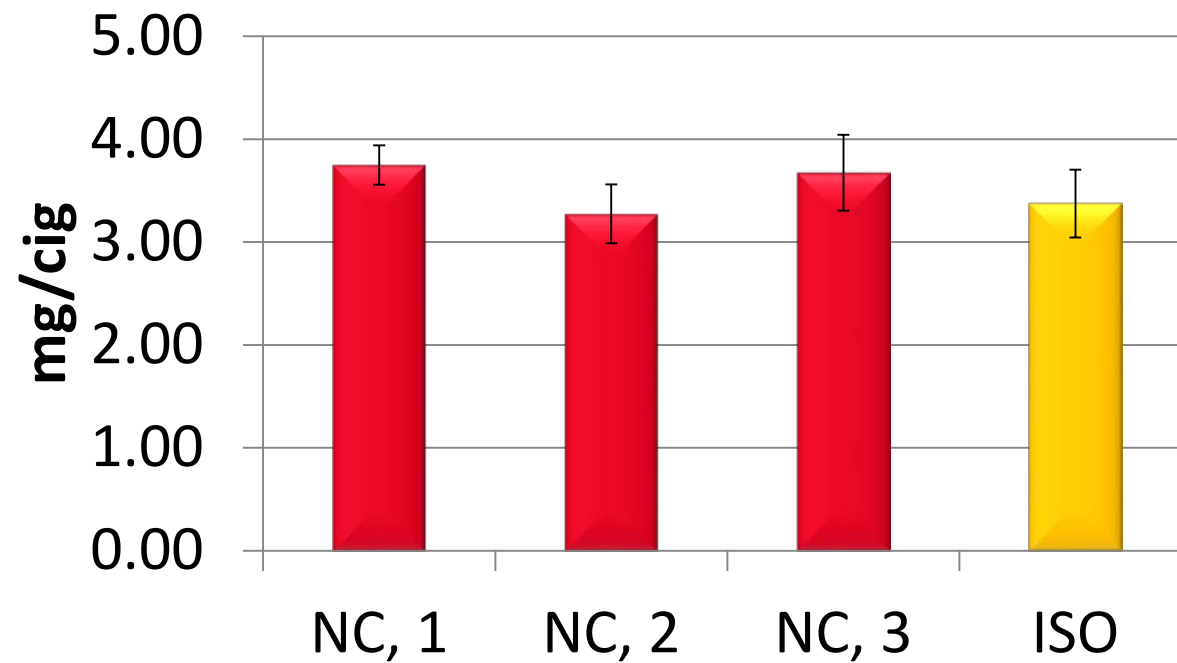
- Isolated workflows in the lab

- No Repeat analysis window, but loop back cycle established

Method Establishment

- Conditioning time (0, 24 hours)
- Number of Cigarettes (1-5)
- Loose versus packed cigarettes
- Fixed butt length versus fixed number of puffs

No Conditioning vs ISO



NC – No conditioning, no equilibrium weight, smoked day of making, 3 cigs/pad, ISO butt length

Packed vs Loose – No Conditioning

	n	'Tar' (mg/cig)	Nicotine (mg/cig)	CO (mg/cig)
Packed	91	13.95 ± 0.68	1.00 ± 0.05	15.98 ± 0.88
Loose	96	13.79 ± 0.65	1.00 ± 0.05	15.68 ± 0.91
All Data*	385	13.90 ± 0.68	1.02 ± 0.05	15.92 ± 0.88
ISO Smoking	248	13.92 ± 0.93	1.04 ± 0.06	16.12 ± 1.04
% Difference		0.1%	2.3%	1.3%

*4 cigs/pad, loose or packed cigarettes, Smoked the same day as making with no equilibrium weights using ISO parameters, ISO butt length

6-Puff Variability Comparisons – MS Nicotine

Sample (ISO 'Tar')	ISO	6 Puff Modified ISO
A – 3 mg	9%	18%, 9%, 5%
B – 7 mg	8%	7%
C – 14 mg	7%	6%
D – 17 mg	7%	6%
CM6	4%	4%

Success criteria - %RSD no more than 2x ISO value

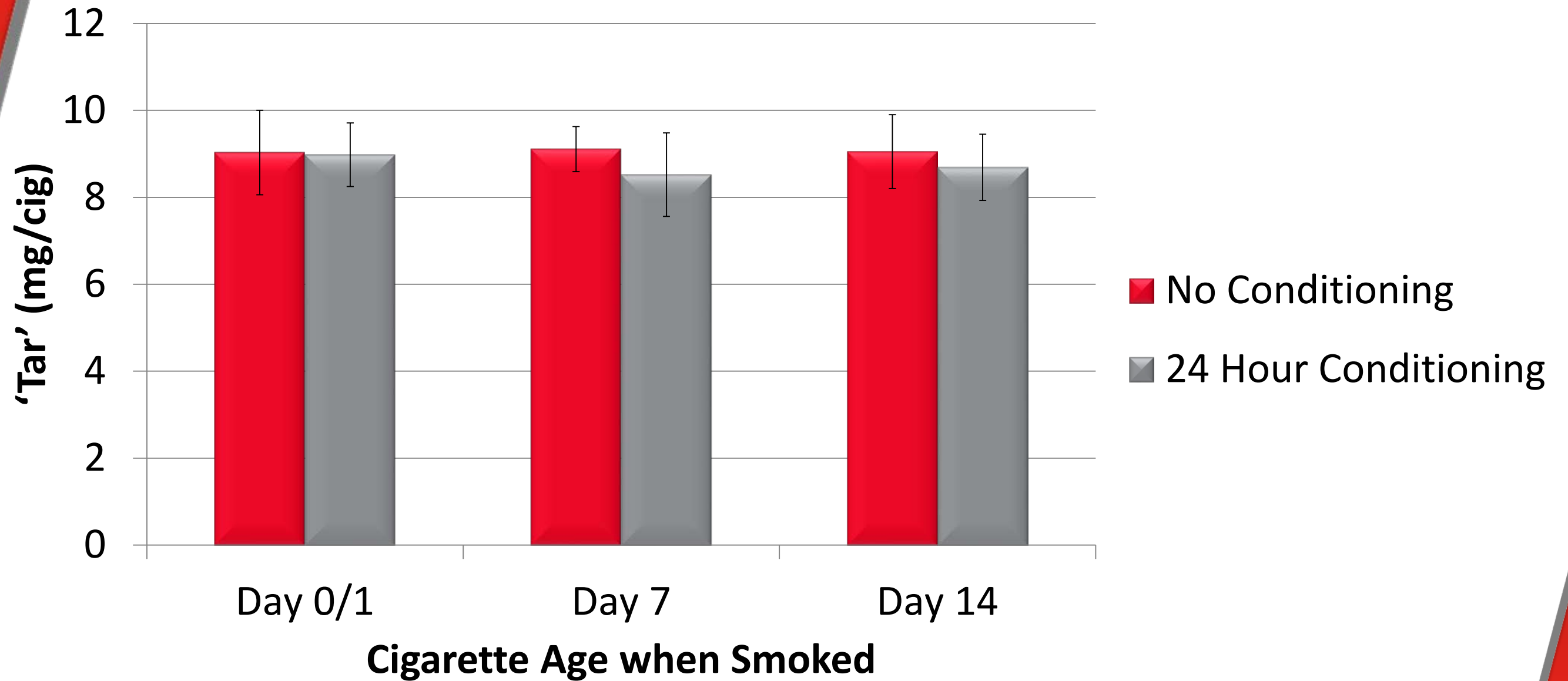
Method Establishment - Results

- Conditioning time (0, 24 hours)
 - Results were similar, 0 was chosen for baseline study
- Number of Cigarettes (1-5)
 - Result were similar, 3 cigarettes were chosen for baseline
- Loose versus packed cigarettes
 - Result were similar, packed was chosen for baseline study
- Fixed butt length versus fixed number of puffs
 - Both met criteria, fixed butt length was chosen for baseline study

No Conditioning Questions

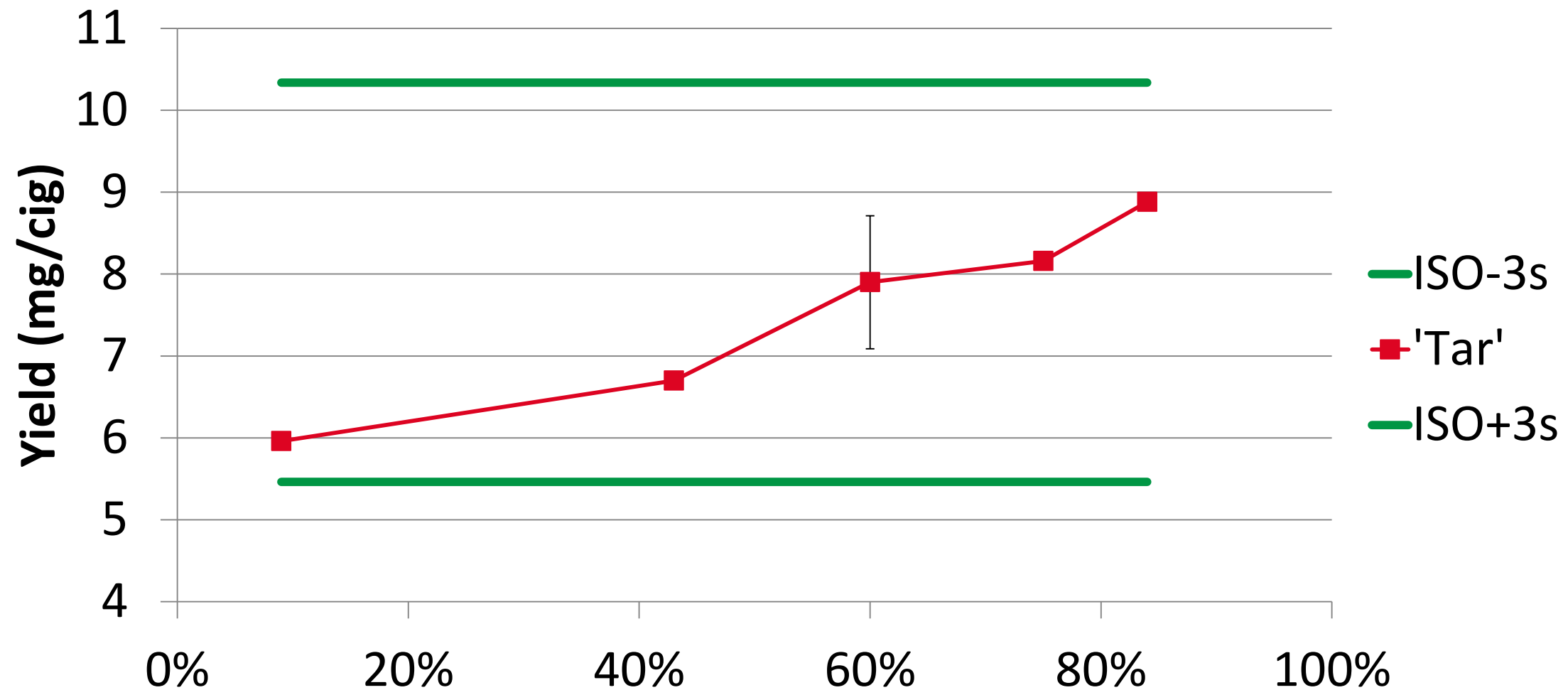
- Cigarette Equilibration (Age)
- Seasonal Impact
- Dry/Moist Cigarettes

Cigarette Equilibration (Short-term Aging)



n=12

Impact of Varied Conditioning %RH



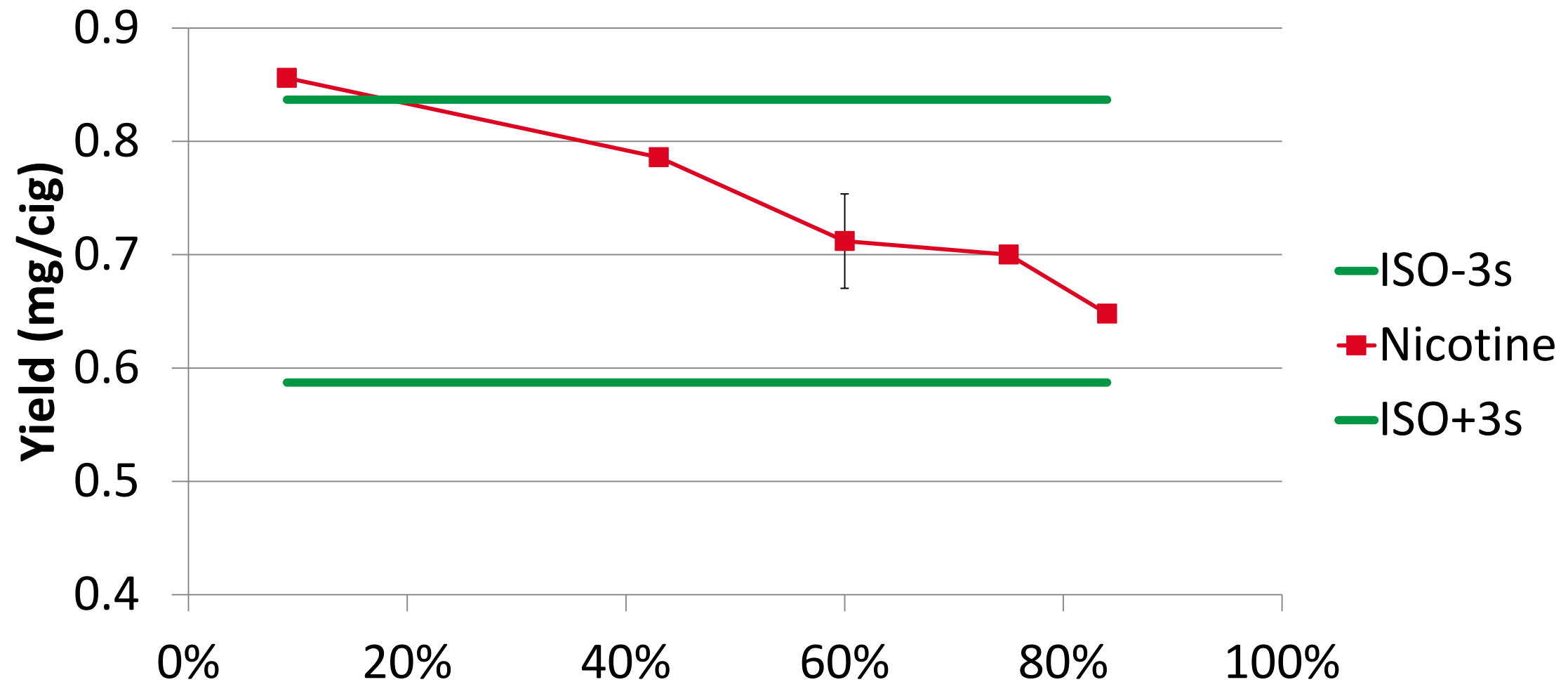
3R4F cigarettes conditioned for 2 weeks at target %RH

Conditioning temperature = 22°C

Smoking Conditions = 60% RH, 22°C

n=5

Impact of Varied Conditioning %RH



3R4F cigarettes conditioned for 2 weeks at target %RH

Conditioning temperature = 22°C

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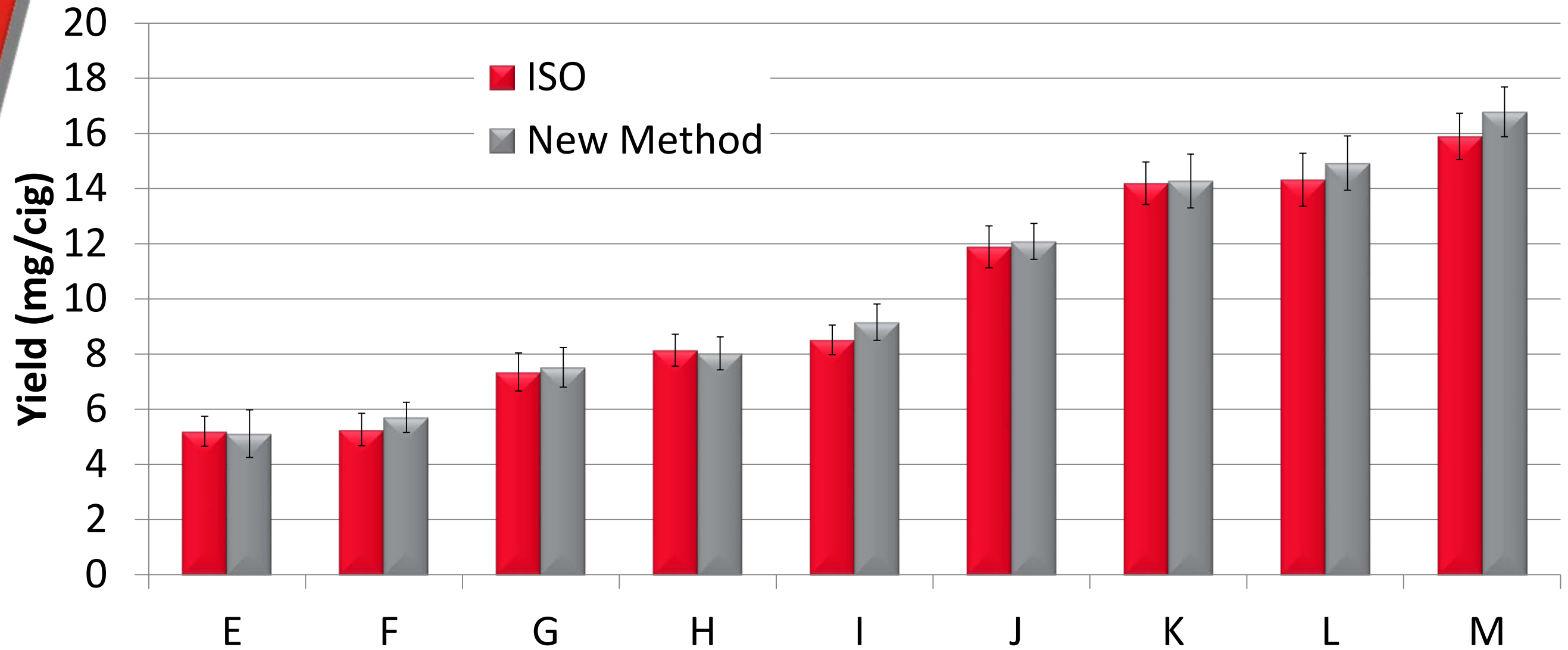
n=5

Method Verification

- Full 'tar' range for samples
- Dry season and humid season*
- At least 100 data points per sample over time

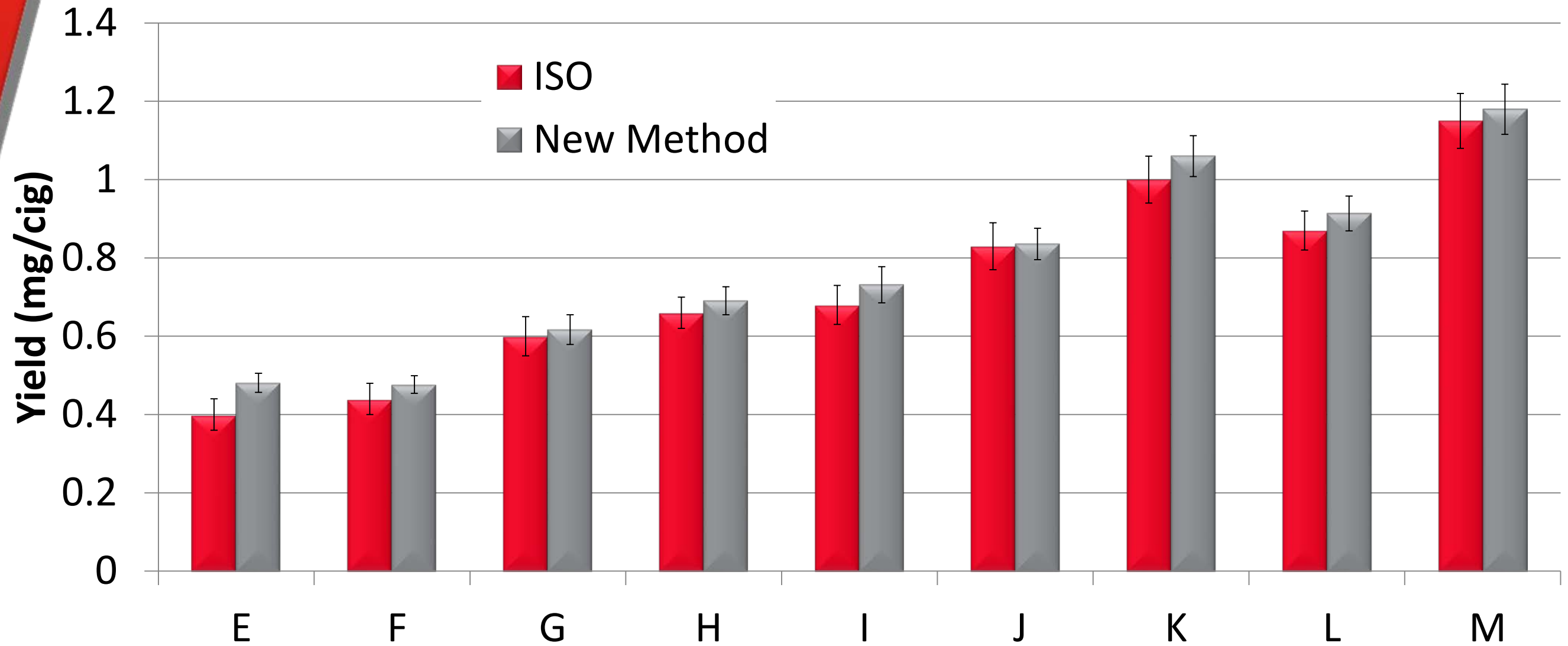
(*for North Carolina)

Verification – Exemplary ‘Tar’ Data



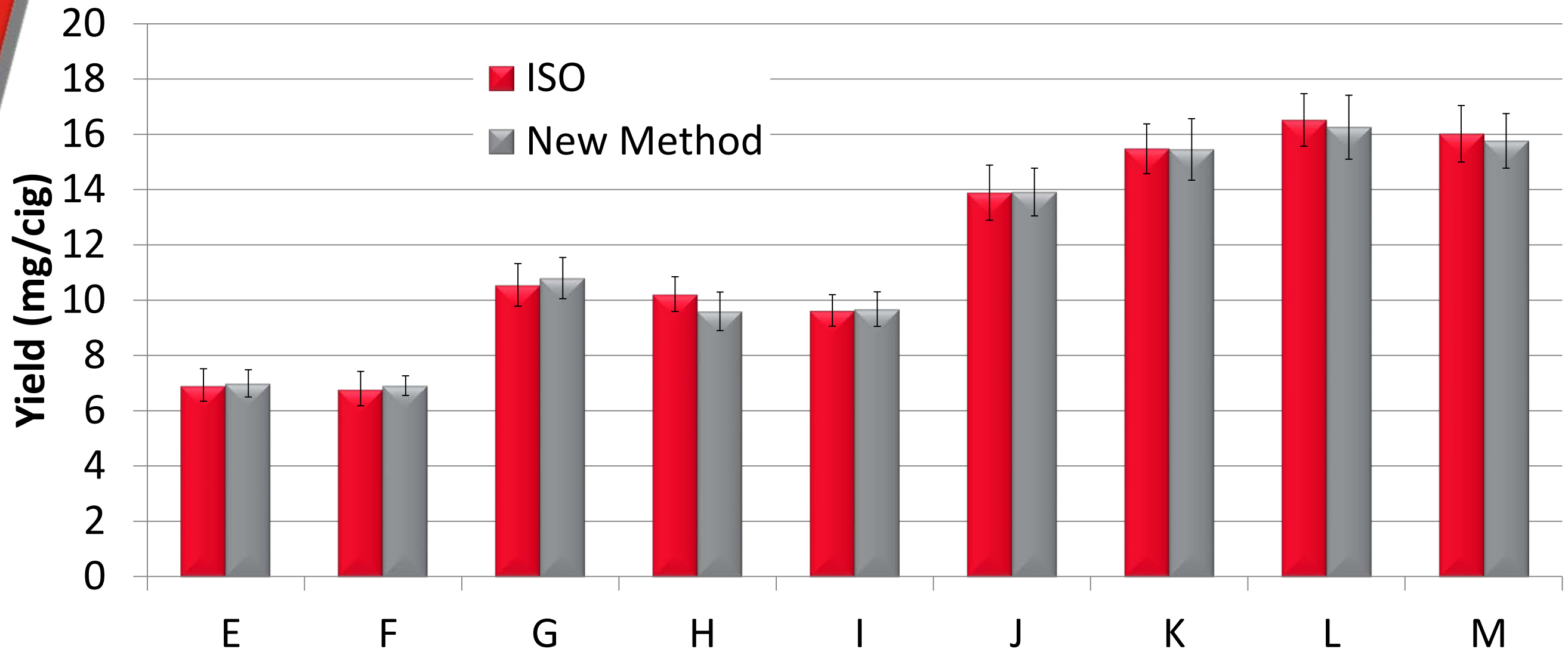
n=40-120

Verification – Exemplary Nicotine Data



n=40-120

Verification – Exemplary Carbon Monoxide Data



n=40-120

Conclusions

- A 2 day TNCO method was established with no cigarette conditioning, no equilibrium test, 3cigs/pad, loose or packed cigarettes, fixed butt length or fixed puff number
- The Modified Method meets the technical success criteria
 - Two day reportable, <2x ISO-variability, compatible with high volume submission
- Streamlined Laboratory workflows are key to meeting reporting objectives
- Yield results similar to ISO for standard butt length version
- Fixed puff testing would require control chart establishment for monitors
- Scope not extended to lab to lab comparisons, long-term consistency, or alternate regimes

Acknowledgements

- Sample Control, Routine Testing Services
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