

Medical Marijuana Potency Round Robin Fall 2016

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Chemist IV**



Medical Marijuana Potency Round Robin Fall 2016

- **10 Laboratories participated.**
- **Three separate samples, 2-3g each:
Platinum Blue, 072716-0102, 072716-0103.**
- **Each sample was given an alpha-numeric random number, a total of 30 separate numbers.**
- **Asked to identify and quantitate five cannabinoids if present, d9THC, THC-Acid, CBD, CBD-Acid and CBN as well as calculate Total THC for each sample.**
- **Laboratories use their own methods and standards.**

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- **Technology** – all laboratories reported using HPLC-PDA.
- **Laboratory Reporting Limits** varied from 0.001% to 0.2%. One laboratory reported different limits for two of the five cannabinoids, all others reported the same reporting limit for all five cannabinoids
- **Data** is presented in control charts (using mean and standard deviation of all points). 1, 2 and 3 standard deviations from the mean are identified for each cannabinoid.
- **Mean, Median, Standard Deviation and Relative Standard Deviation (RSD%)** are included with the charts for each Cannabinoid and each sample.
- **For data sets with less than eight detections, no Z-Score was calculated.**

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Sample Characterization Table 1.

	Table 1.	Sample Characterization				
		%	%	%	%	%
		<u>Δ-9 THC</u>	<u>THC-A</u>	<u>CBD</u>	<u>CBDA</u>	<u>CBN</u>
24-Aug-2016	P. Blue	0.55	18.71	ND	ND	ND
7-Sep-2016		0.62	18.47	ND	ND	
24-Aug-2016	072716-02	3.61	13.57	ND	0.30	ND
7-Sep-2016		4.01	13.39	ND	0.35	ND
24-Aug-2016	072716-03	0.57	4.91	0.34	5.83	ND
7-Sep-2016		0.64	4.85	0.33	6.03	ND

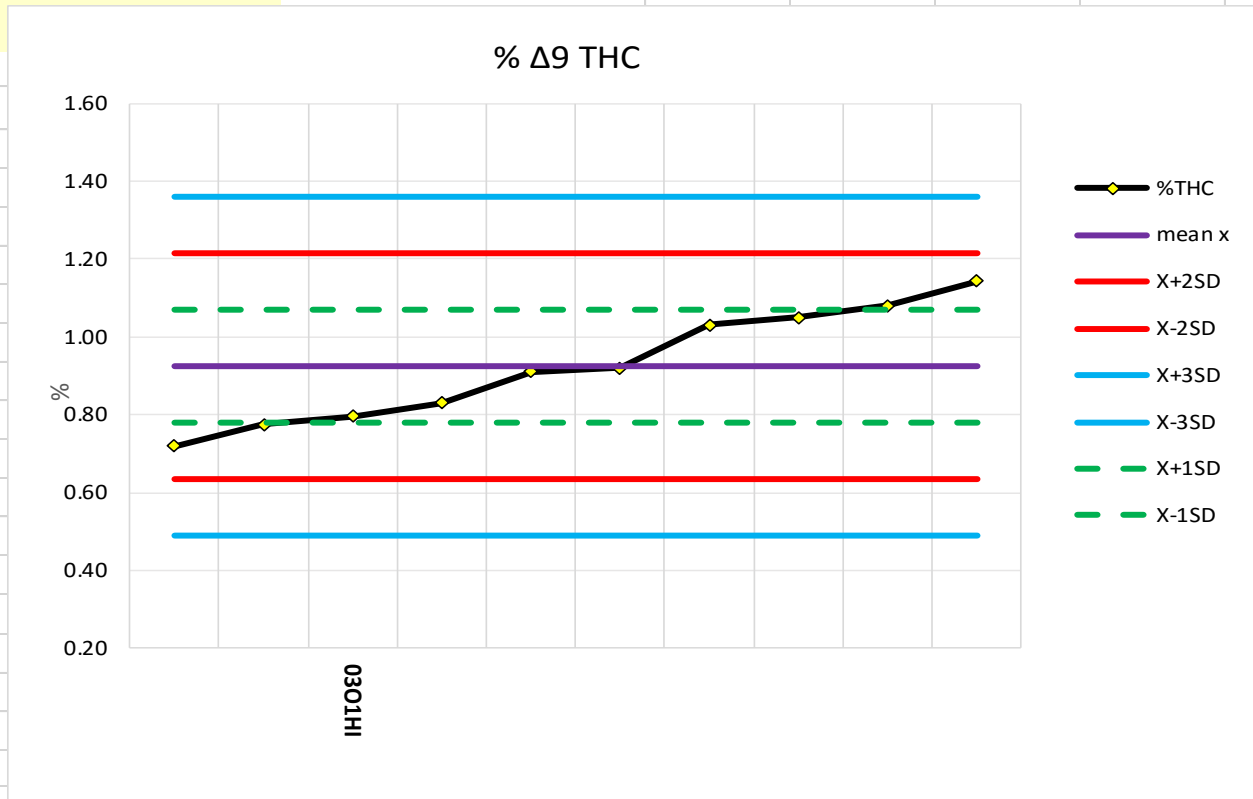
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PLATINUM BLUE DREAM

% Δ9 THC

Sample ID	Reported Value	Z-Score
	0.72	-1.42
	0.77	-1.05
03O1HI	0.80	-0.90
	0.83	-0.66
	0.91	-0.10
	0.92	-0.04
	1.03	0.72
	1.05	0.86
	1.08	1.06
	1.14	1.50

Mean	0.926
std. dev.	0.145
Median	0.916
% RSD	15.67%
Range	0.424



mean	X + 2 S	X - 2 SD	X + 3SD	X - 3SD	X + 1SD	X - 1 SD
0.93	1.22	0.64	1.36	0.49	1.07	0.78

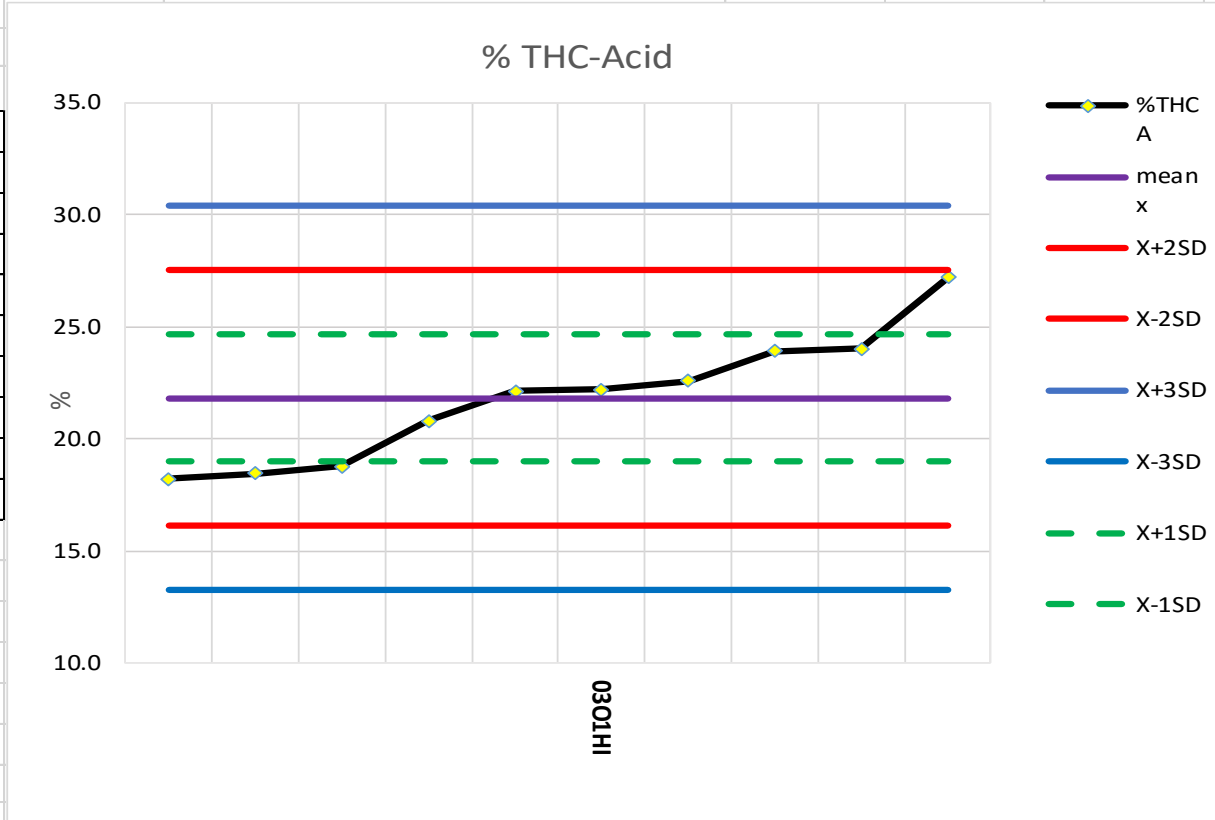
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PLATINUM BLUE DREAM

% THC-ACID

Sample ID	Reported Value	Z-Score
	18.2	-1.27
	18.5	-1.18
	18.8	-1.07
	20.8	-0.36
	22.1	0.10
0301HI	22.2	0.13
	22.6	0.27
	23.9	0.72
	24.0	0.76
	27.2	1.88

Mean	21.83
std. dev.	2.865
Median	22.17
% RSD	13.12%
RANGE	9.02

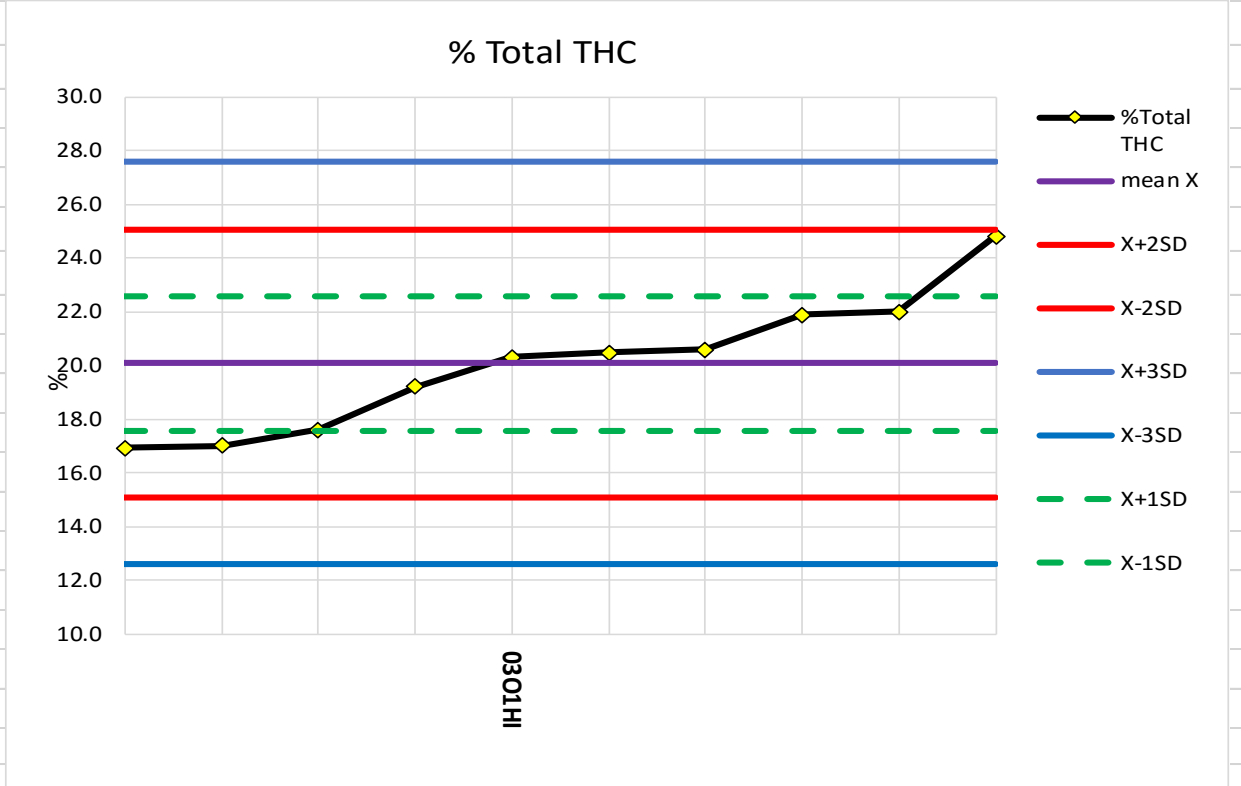


mean	X + 2 SD	X - 2 SD	X + 3 SD	X - 3 SD	X + 1 SD	X - 1 SD
21.83	27.56	16.10	30.42	13.24	24.69	18.97

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Total THC - PLATINUM BLUE DREAM

Sample ID	Reported Value	Z-Score
	16.9	-1.27
	17.0	-1.23
	17.6	-0.99
	19.2	-0.35
03O1HI	20.3	0.09
	20.5	0.16
	20.6	0.21
	21.9	0.72
	22.0	0.78
	24.8	1.90
Mean	20.074	
std. dev.	2.495	
Median	20.380	
% RSD	12.43%	
MIN - MAX	16.9 - 24.8	



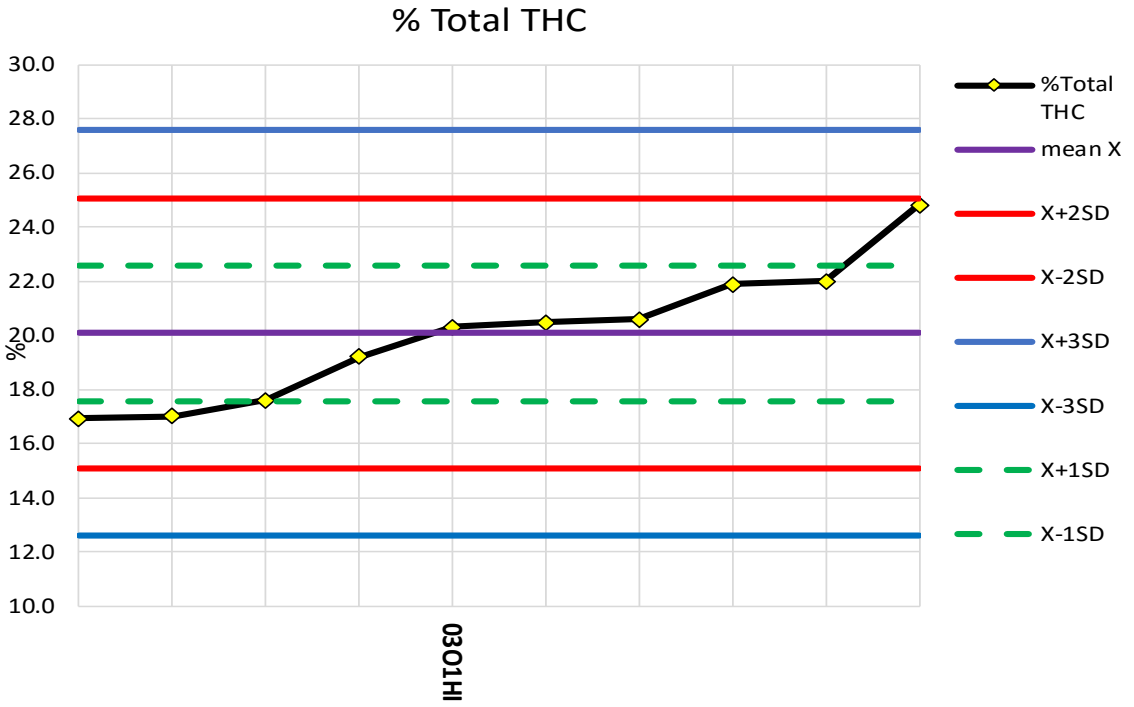
mean	X + 2 SD	X - 2 SD	X + 3SD	X - 3SD	X + 1SD	X - 1SD
20.07	25.06	15.08	27.56	12.59	22.57	17.58

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Total THC - PLATINUM BLUE DREAM

<u>Sample ID</u>	<u>Reported Value</u>	<u>Z-Score</u>
	16.9	-1.27
	17.0	-1.23
	17.6	-0.99
	19.2	-0.35
03O1HI	20.3	0.09
	20.5	0.16
	20.6	0.21
	21.9	0.72
	22.0	0.78
	24.8	1.90

Mean	20.07
std. dev.	2.49
Median	20.38
% RSD	12.43%
Range	7.90



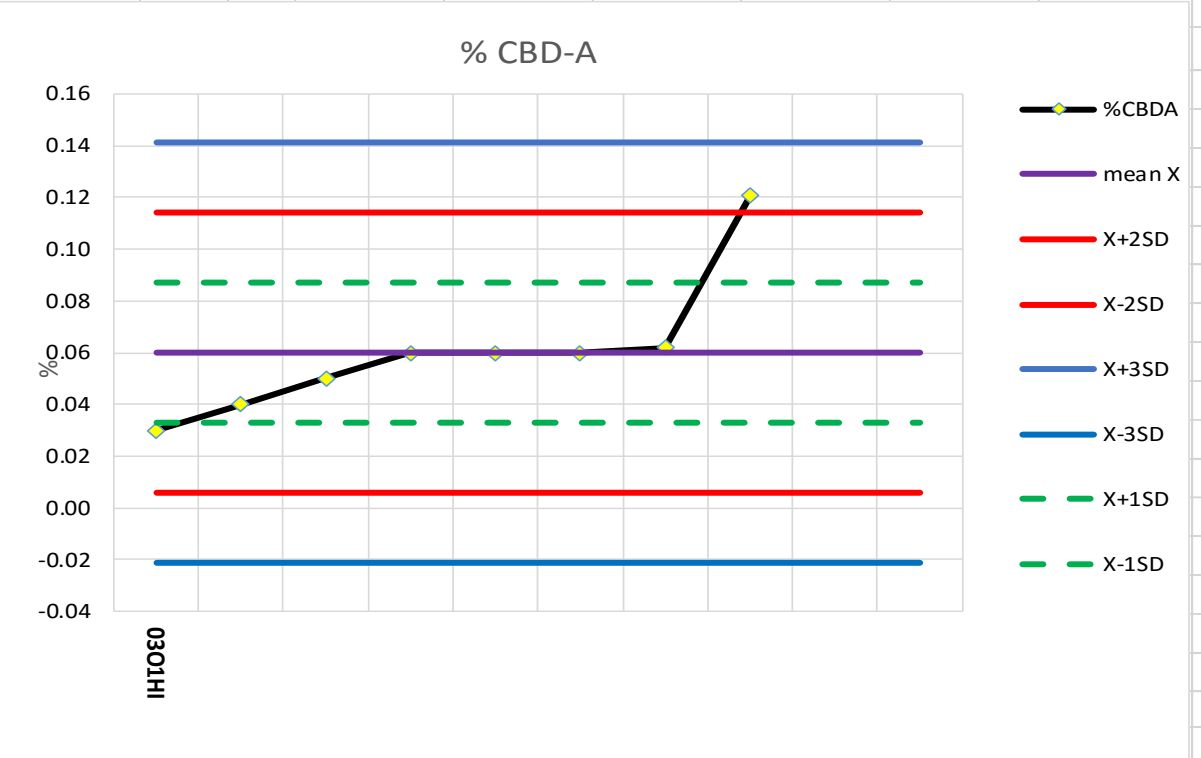
<u>mean</u>	<u>X + 2 SD</u>	<u>X - 2 SD</u>	<u>X + 3SD</u>	<u>X - 3SD</u>	<u>X + 1SD</u>	<u>X - 1SD</u>
20.07	25.06	15.08	27.56	12.59	22.57	17.58

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PLATINUM BLUE DREAM % CBD-A

Sample ID	Reported Value	Z-Score
03O1HI	0.03	-1.11
	0.04	-0.74
	0.05	-0.37
	0.06	0.00
	0.06	0.00
	0.06	0.00
	0.06	0.07
	0.12	2.26
	ND	NA
	ND	NA

		Drop 0.12
Mean	0.060	0.052
std. dev.	0.027	0.012
Median	0.060	0.060
% RSD	44.81%	23.99%
Range	0.06	0.03



<u>mean</u>	<u>X + 2 SD</u>	<u>X - 2 SD</u>	<u>X + 3SD</u>	<u>X - 3SD</u>	<u>X +1 SD</u>	<u>X - 1 SD</u>
0.06	0.11	0.01	0.14	-0.02	0.09	0.03

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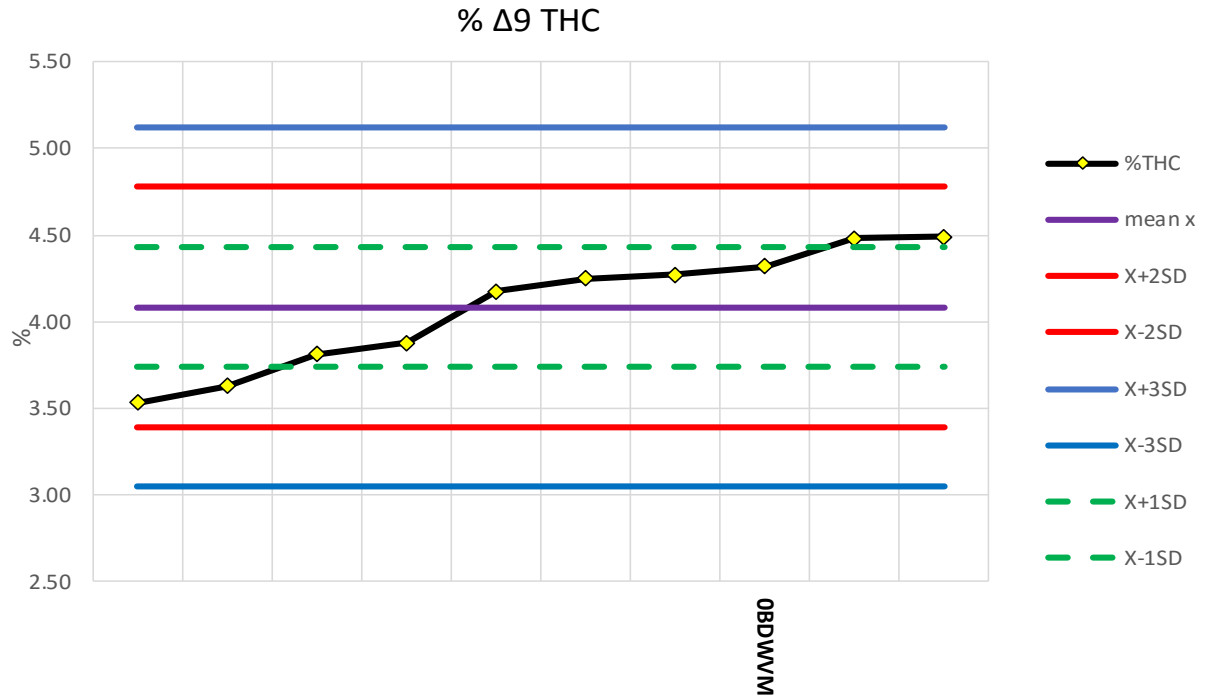
Plantinum Blue Dream				
% CBD			% CBN	
Sample ID	Reported Value		Sample ID	Reported Value
	ND			ND
	ND			0.01
	ND			ND
	ND			0.35
	ND			0.04
	ND			ND
	ND			ND
	0.001			0.02
	0.10			0.03
03O1HI	ND		03O1HI	ND
Mean	0.051		Mean	0.089
std. dev.	0.070		std. dev.	0.148
Median	0.051		Median	0.030
% RSD	138.62%		% RSD	165.24%

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072716-0102

% Δ9 THC

Sample ID	Reported Value	Z-Score
	3.53	-1.60
	3.63	-1.31
	3.81	-0.79
	3.88	-0.60
	4.18	0.27
	4.25	0.48
	4.27	0.54
OBDWVM	4.32	0.68
	4.48	1.14
	4.49	1.18



Mean 4.08
std. dev. 0.35
Median 4.21
% RSD 8.49%
Range 0.96

mean	X + 2 SD	X - 2 SD	X + 3SD	X - 3SD	X + 1 SD	X - 1 SD
4.08	4.78	3.39	5.12	3.04	4.43	3.74

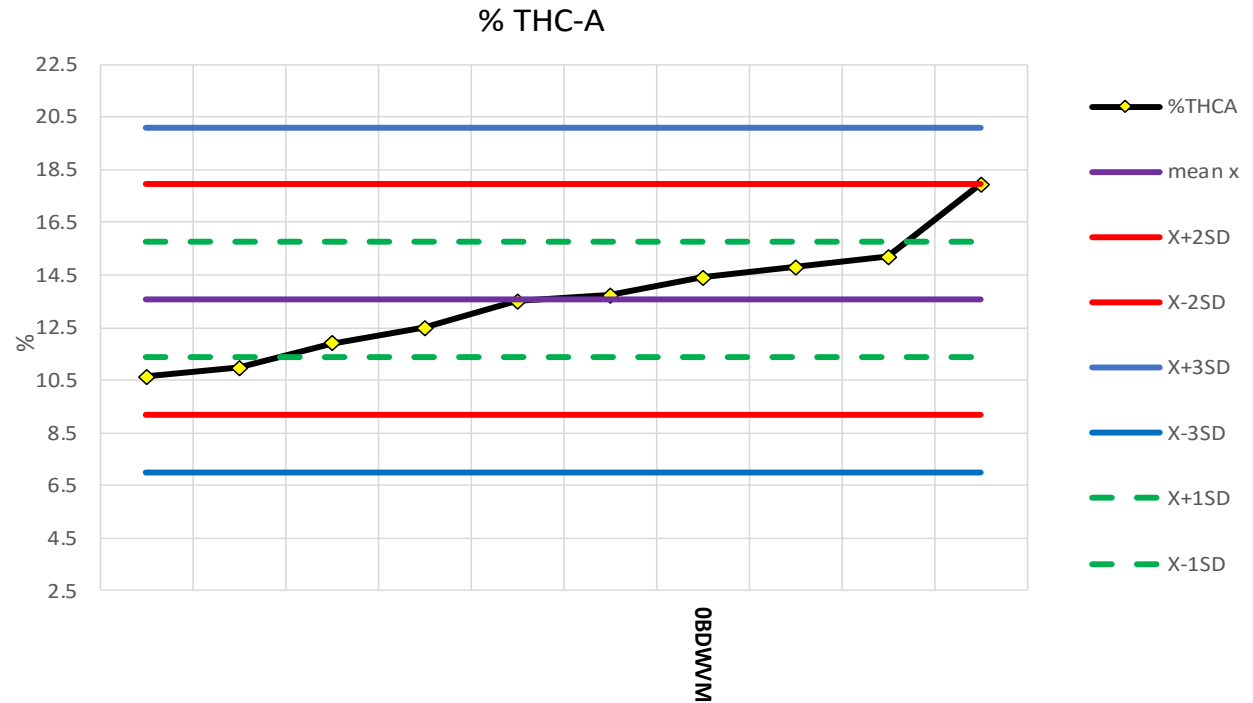
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072716-0102

% THC-A

Sample ID	Reported Value	Z-Score
	10.6	-1.33
	11.0	-1.18
	11.9	-0.75
	12.5	-0.48
	13.5	-0.02
	13.7	0.07
OBDWVM	14.4	0.39
	14.8	0.57
	15.2	0.74
	17.9	2.00

Mean	13.55
std. dev.	2.19
Median	13.61
% RSD	16.16%
Range	7.30



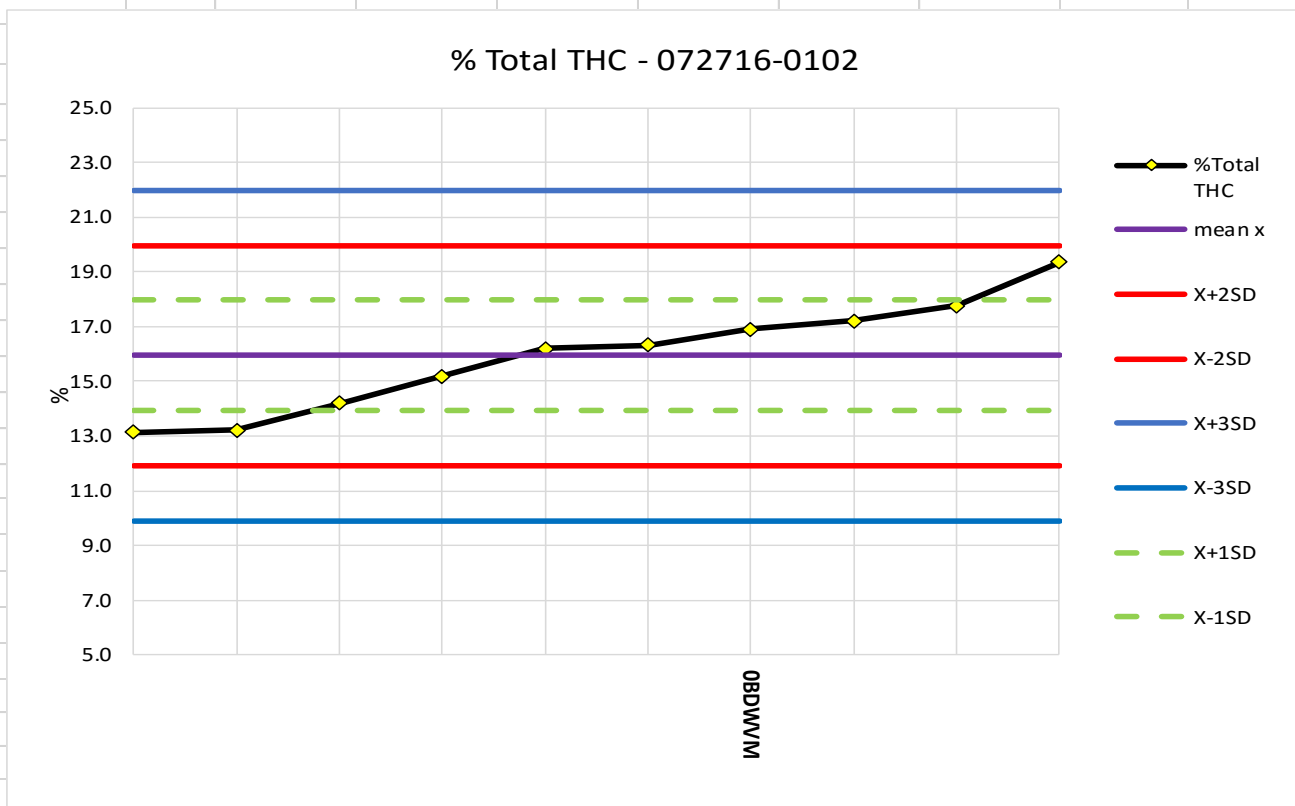
<u>mean</u>	<u>X + 2 SD</u>	<u>X - 2 SD</u>	<u>X + 3SD</u>	<u>X - 3SD</u>	<u>X + 1SD</u>	<u>X - 1SD</u>
13.55	17.93	9.17	20.12	6.98	15.74	11.36

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Total THC - 072714-0102

<u>Sample ID</u>	<u>Reported Value</u>	<u>Z-Score</u>
	13.1	-1.40
	13.2	-1.37
	14.2	-0.88
	15.2	-0.38
	16.2	0.12
	16.3	0.17
OBDWVM	16.9	0.46
	17.2	0.61
	17.8	0.89
	19.4	1.67

Mean	15.95
std. dev.	2.02
Median	16.26
% RSD	12.64%
Range	6.2



<u>mean</u>	<u>X + 2 SD</u>	<u>X - 2 SD</u>	<u>X + 3SD</u>	<u>X - 3SD</u>	<u>X + 1 SD</u>	<u>X - 1 SD</u>
15.95	19.98	11.92	22.00	9.90	17.96	13.93

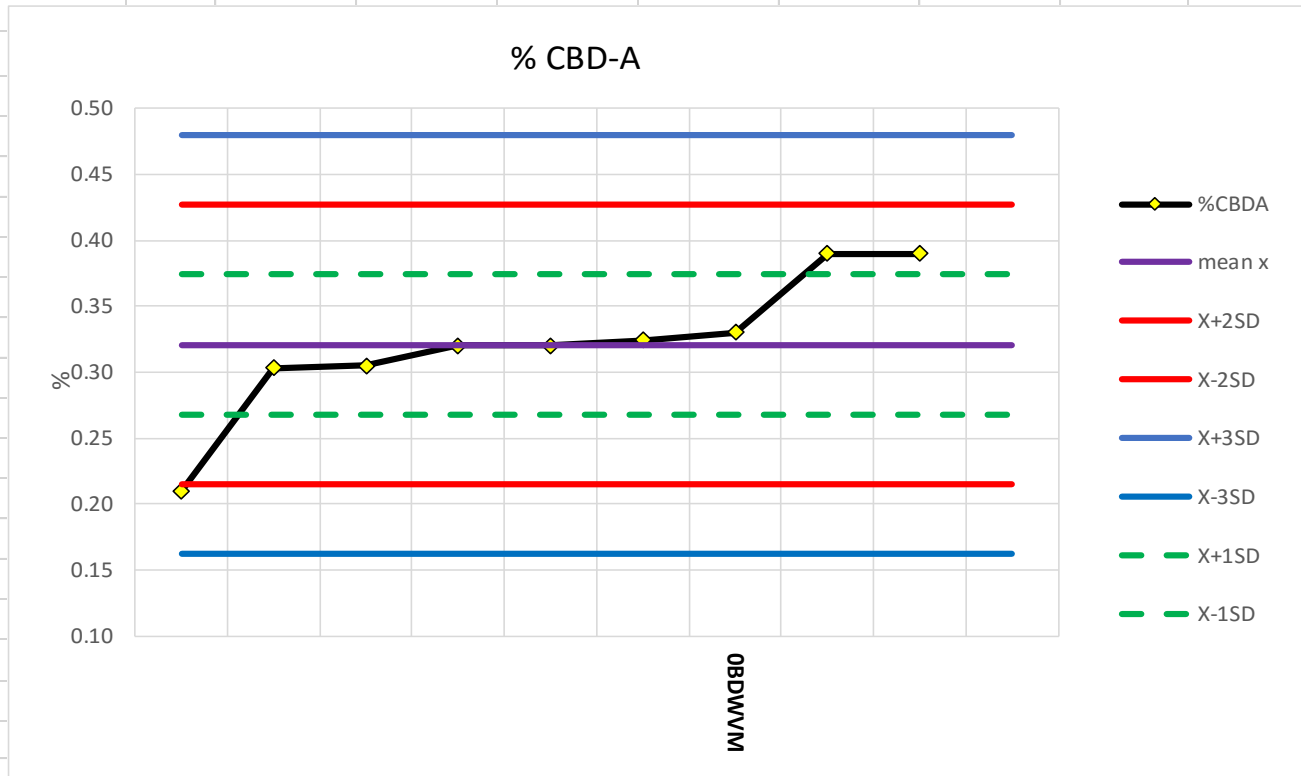
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072716-0102

% CBD-A

Sample ID	Reported Value	Z-Score
	0.21	-2.09
	0.30	-0.34
	0.31	-0.30
	0.32	-0.02
	0.32	-0.02
	0.32	0.06
OBDWVM	0.33	0.17
	0.39	1.30
	0.39	1.30
	ND	NA

Mean	0.321
std. dev.	0.053
Median	0.320
% RSD	16.51%
Range	0.18%



mean	X + 2 SD	X - 2 SD	X + 3SD	X - 3SD	X + 1 SD	X - 1 SD
0.321	0.43	0.21	0.48	0.16	0.37	0.27

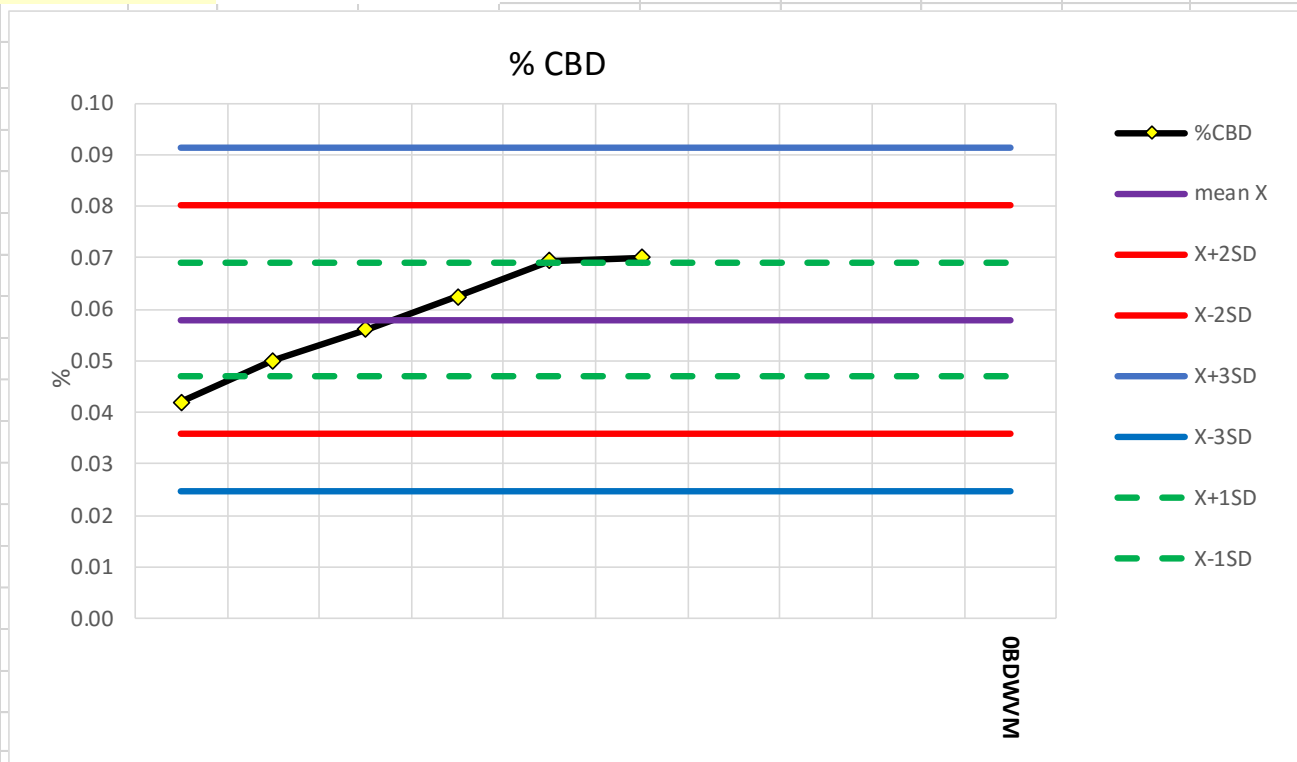
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072716-0102

% CBD

Sample ID	Reported Value	Z-Score
	0.04	NA
	0.05	NA
	0.06	NA
	0.06	NA
	0.07	NA
	0.07	NA
	ND	NA
	ND	NA
	ND	NA
OBDWVM	ND	NA

Mean	0.058
std. dev.	0.011
Median	0.059
% RSD	19.05%
Range	0.038



<u>mean</u>	<u>X + 2 SD</u>	<u>X - 2 SD</u>	<u>X + 3SD</u>	<u>X - 3SD</u>	<u>X + 1 SD</u>	<u>X - 1 SD</u>
0.058	0.08	0.04	0.09	0.02	0.07	0.05

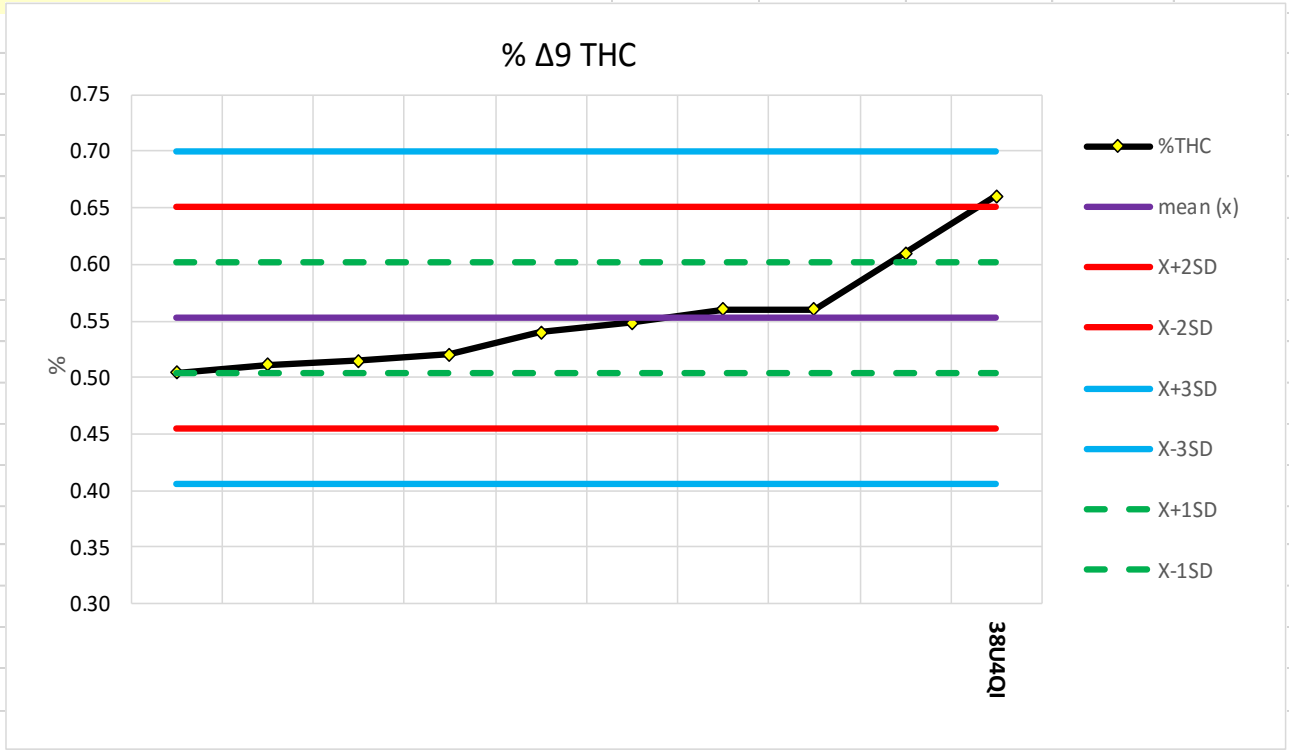
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072716-0103

% Δ9 THC

<u>Sample ID</u>	<u>Reported Value (%)</u>	<u>Z-Score</u>
	0.50	-1.00
	0.51	-0.86
	0.52	-0.78
	0.52	-0.67
	0.54	-0.27
	0.55	-0.10
	0.56	0.14
	0.56	0.14
	0.61	1.16
38U4QI	0.66	2.18

Mean	0.55
std. dev.	0.05
Median	0.54
% RSD	8.88%
Range	0.156



<u>mean</u>	<u>X + 2 SD</u>	<u>X - 2 SD</u>	<u>X + 3SD</u>	<u>X - 3SD</u>	<u>X + 1 SD</u>	<u>X - 1 SD</u>
0.55	0.65	0.45	0.70	0.41	0.60	0.50

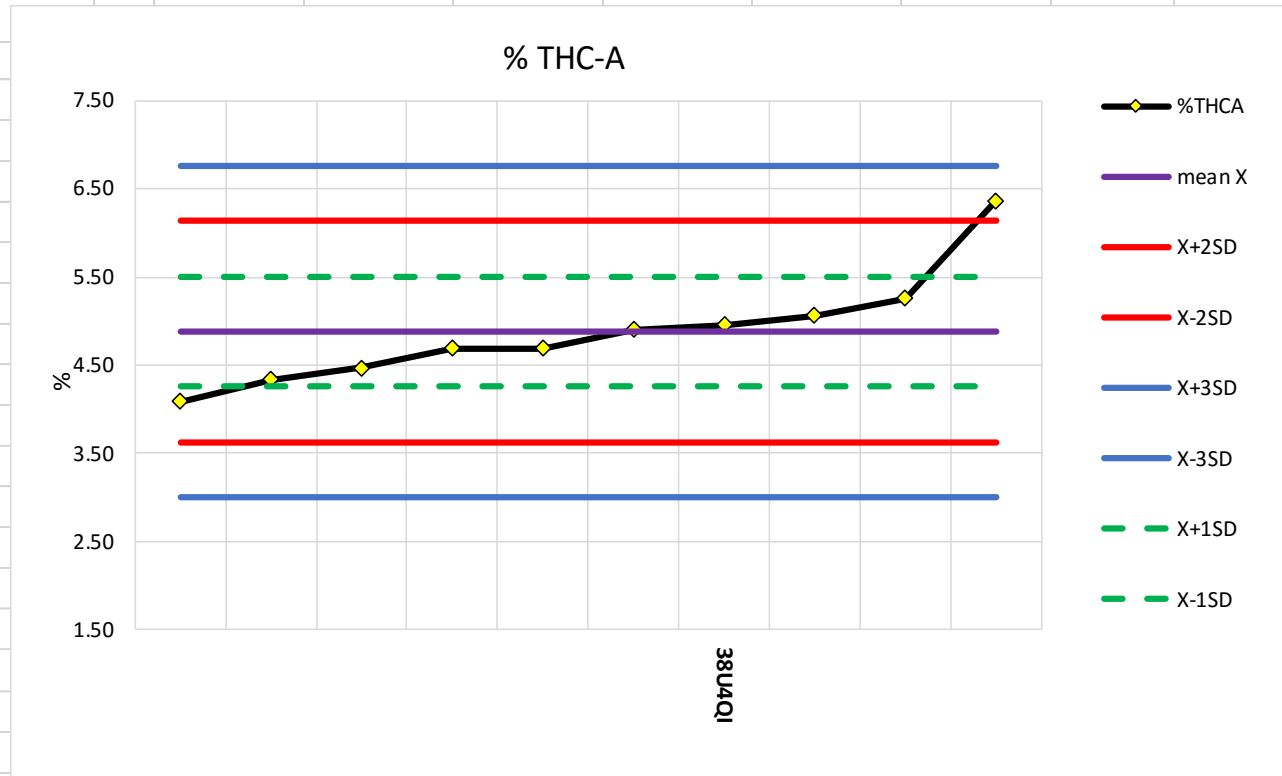
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072716-0103

% THC-A

Sample ID	Reported Value	Z-Score
	4.09	-1.27
	4.34	-0.87
	4.47	-0.66
	4.69	-0.31
	4.69	-0.31
	4.90	0.03
38U4QI	4.96	0.12
	5.06	0.28
	5.26	0.60
	6.36	2.36

Mean	4.88
std. dev.	0.63
Median	4.80
% RSD	12.83%
Range	2.27



mean	X + 2 SD	X - 2 SD	X + 3SD	X - 3SD	X + 1 SD	X - 1 SD
4.88	6.13	3.63	6.76	3.00	5.51	4.26

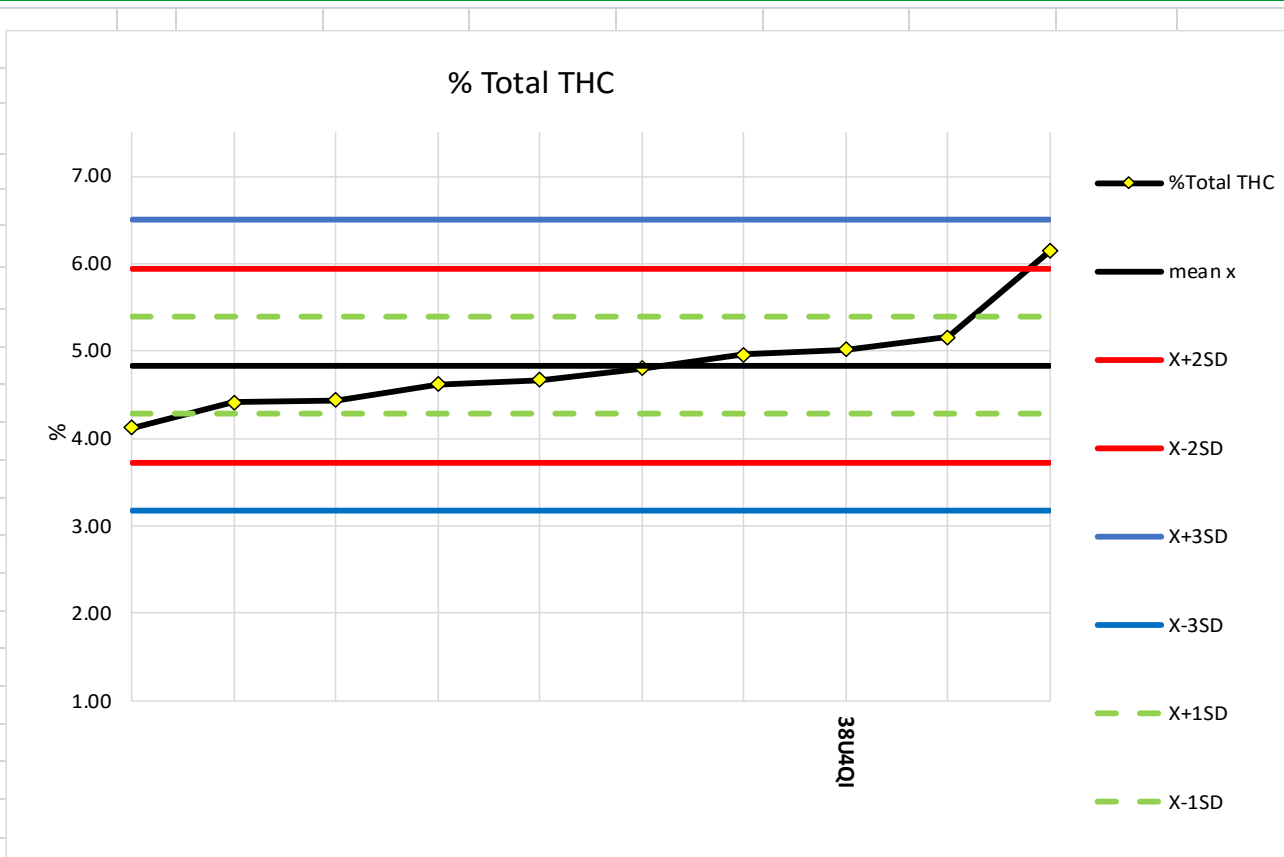
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072716-0103

Total THC - 072716-0103

<u>Sample ID</u>	<u>Reported Value (%)</u>	<u>Z-Score</u>
	4.12	-1.29
	4.42	-0.75
	4.44	-0.71
	4.62	-0.39
	4.67	-0.30
	4.80	-0.06
	4.96	0.23
38U4QI	5.02	0.33
	5.16	0.59
	6.14	2.35

Mean	4.83
std. dev.	0.56
Median	4.74
% RSD	11.49%
Range	2.02



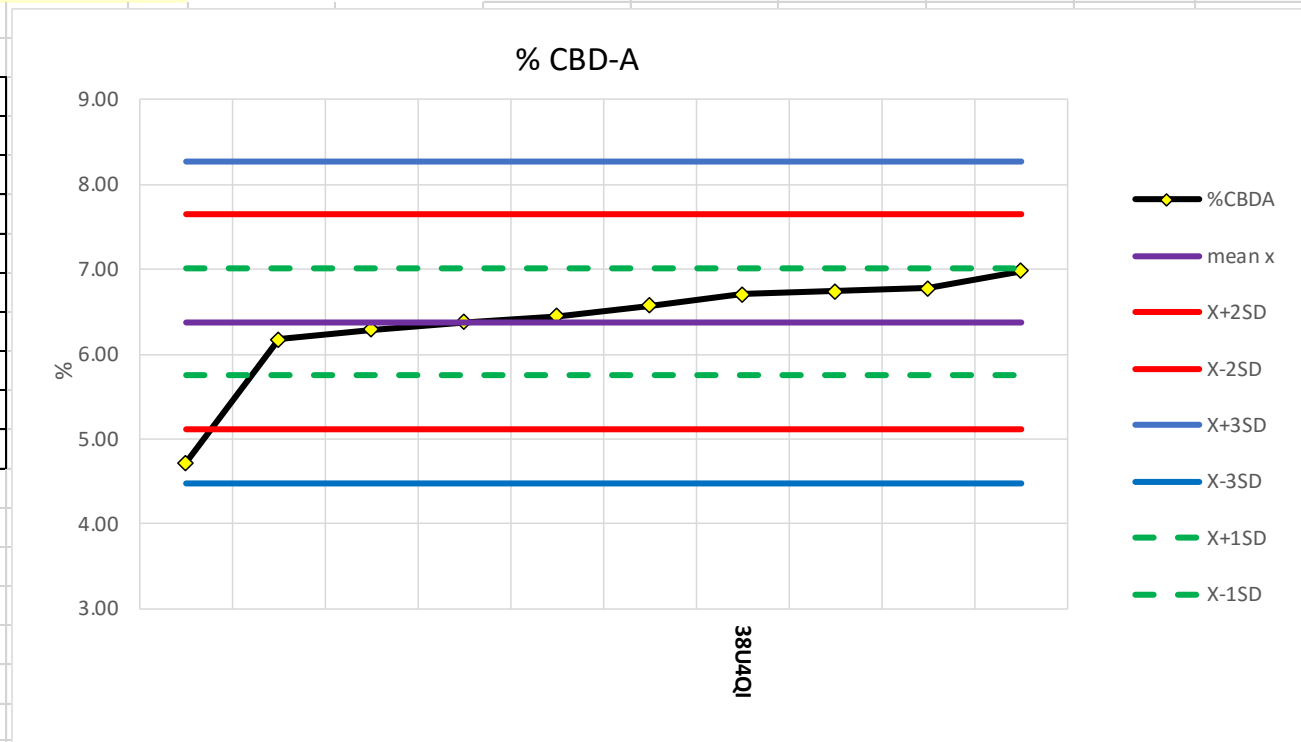
<u>mean</u>	<u>X + 2 SD</u>	<u>X - 2 SD</u>	<u>X + 3SD</u>	<u>X - 3SD</u>	<u>X + 1SD</u>	<u>X - 1SD</u>
4.835	5.95	3.72	6.50	3.17	5.39	4.28

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072716-0103

% CBD-A

Sample ID	Reported Value	Z-Score
	4.72	-2.62
	6.18	-0.32
	6.29	-0.14
	6.38	0.00
	6.45	0.11
	6.57	0.30
38U4QI	6.71	0.52
	6.74	0.57
	6.78	0.63
	6.98	0.95
		<u>Drop 4.72</u>
Mean	6.38	6.56
std. dev.	0.63	0.26
Median	6.51	6.57
% RSD	9.92%	3.98%
Range	2.26	0.80

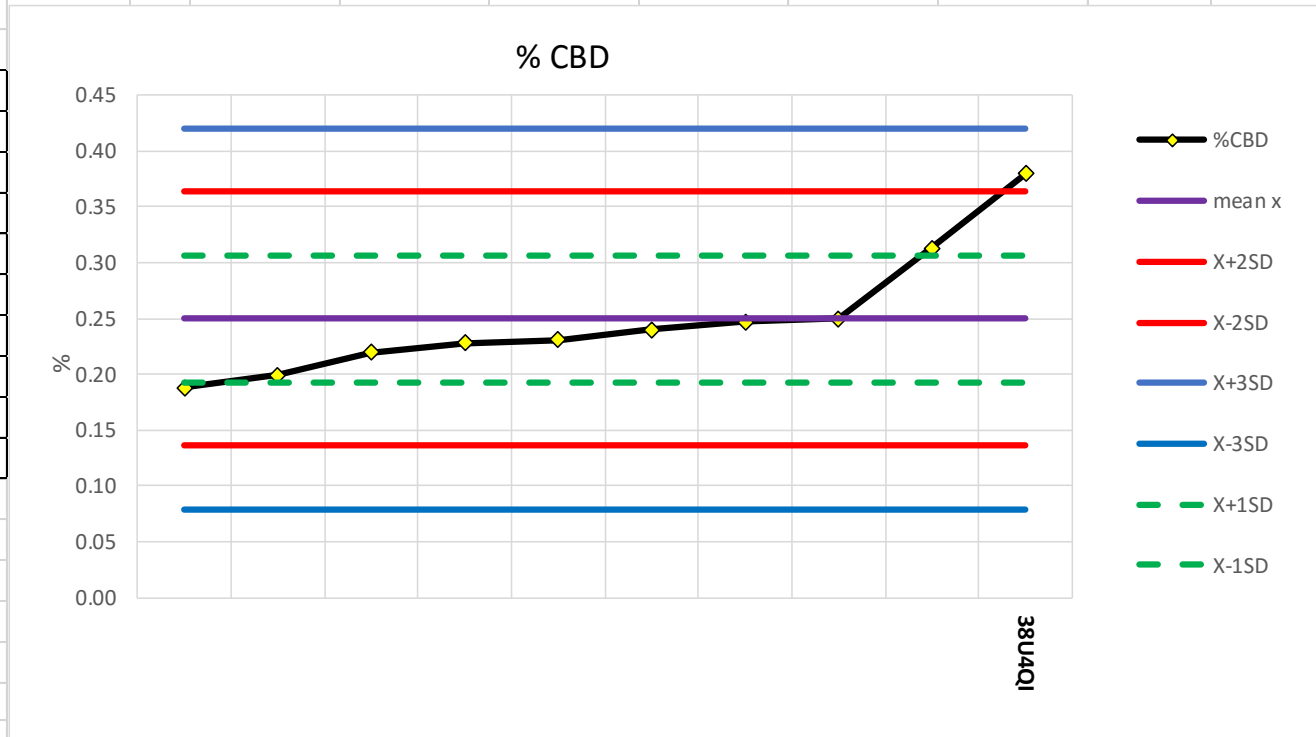


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072716-0103

% CBD

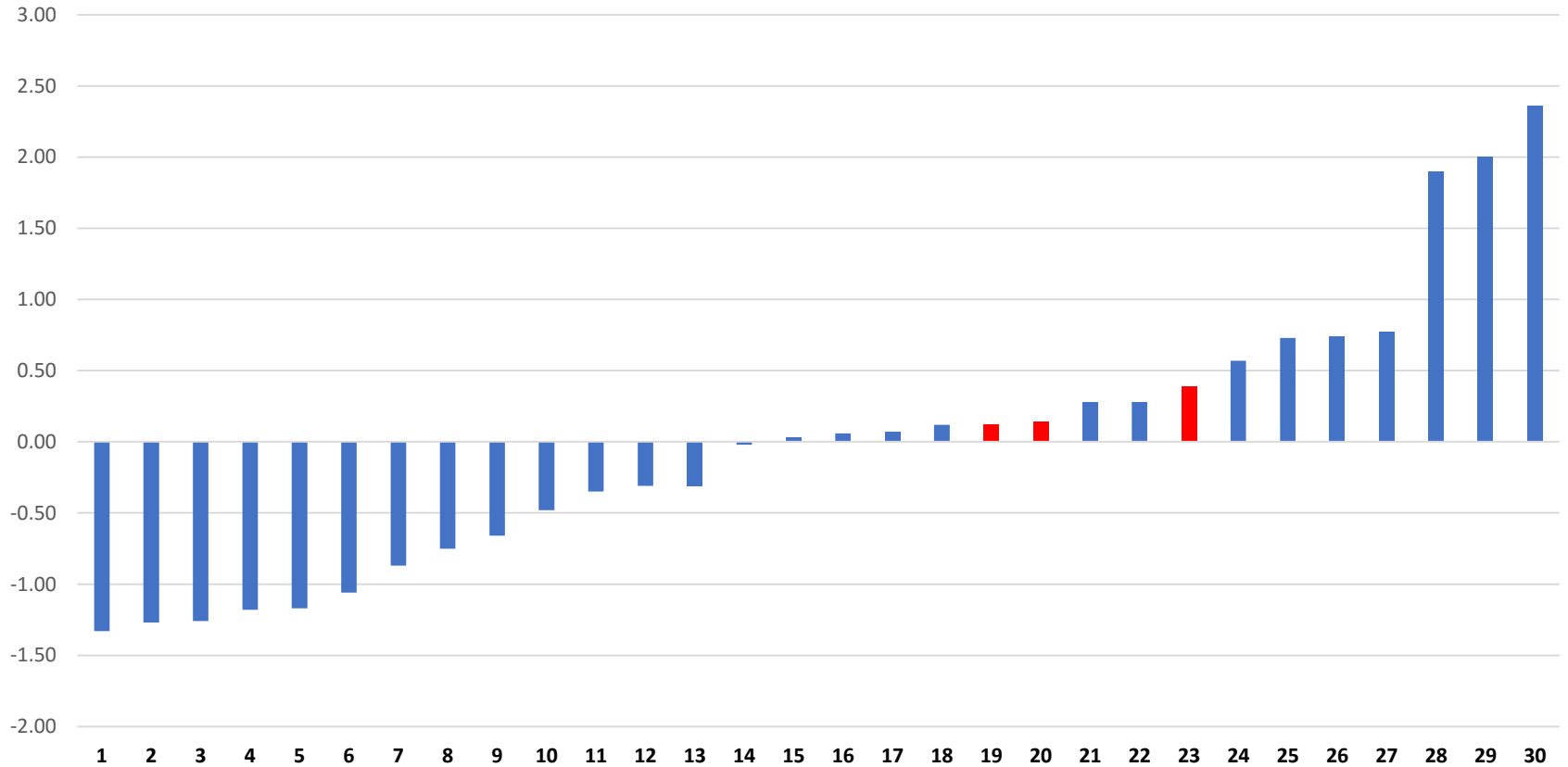
Sample ID	Reported Value	Z-Score
	0.19	-1.09
	0.20	-0.89
	0.22	-0.53
	0.23	-0.39
	0.23	-0.33
	0.24	-0.18
	0.25	-0.05
	0.25	0.00
	0.31	1.11
38U4QI	0.38	2.28
Mean	0.25	
std. dev.	0.06	
Median	0.24	
% RSD	22.81%	
Range	0.19	



mean	X + 2 SD	X - 2 SD	X + 3SD	X - 3SD	X + 1 SD	X - 1 SD
0.25	0.36	0.14	0.42	0.08	0.31	0.19

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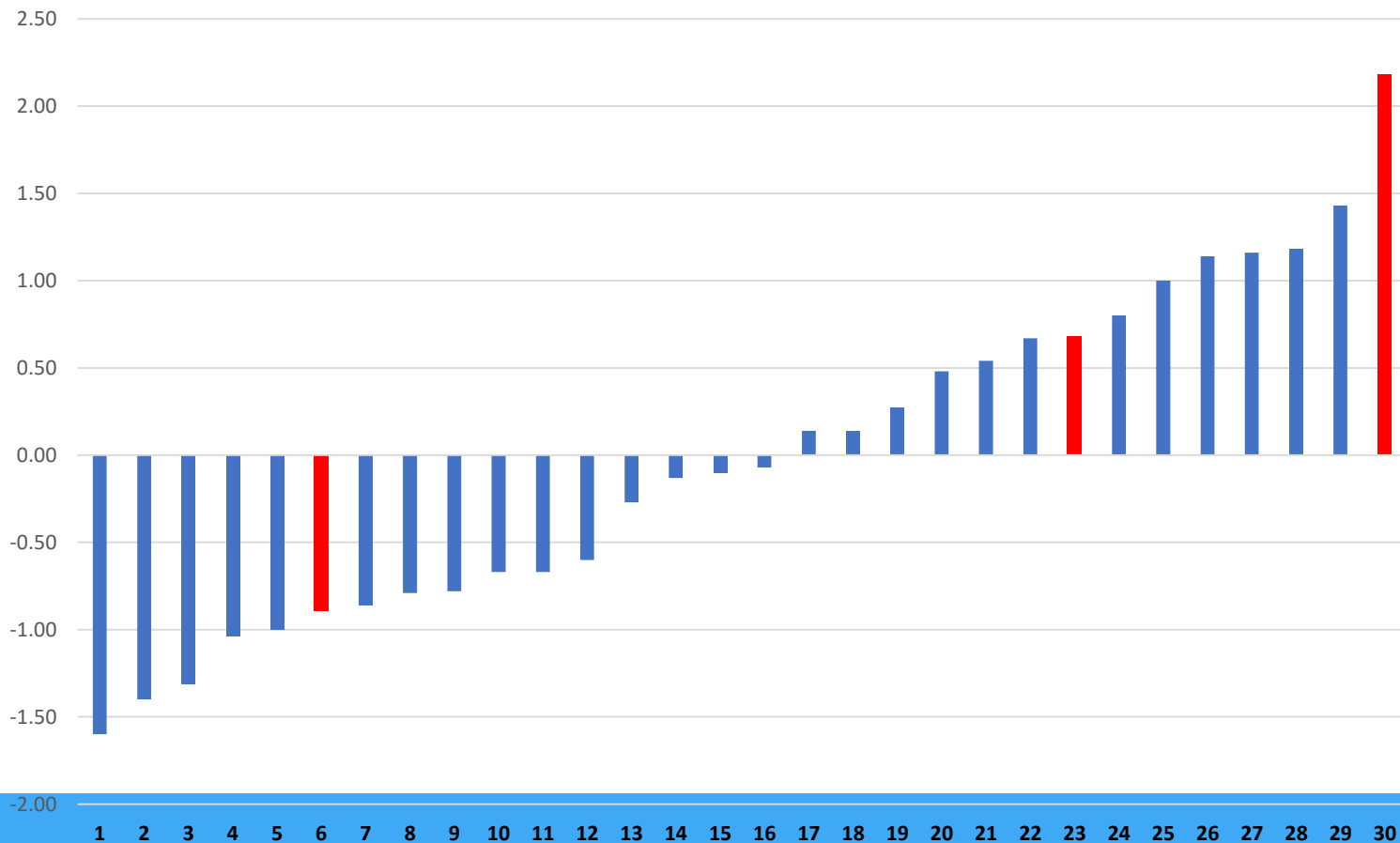
% THCA Z-Score all Samples
Standard Manufacturer and Exp. Date



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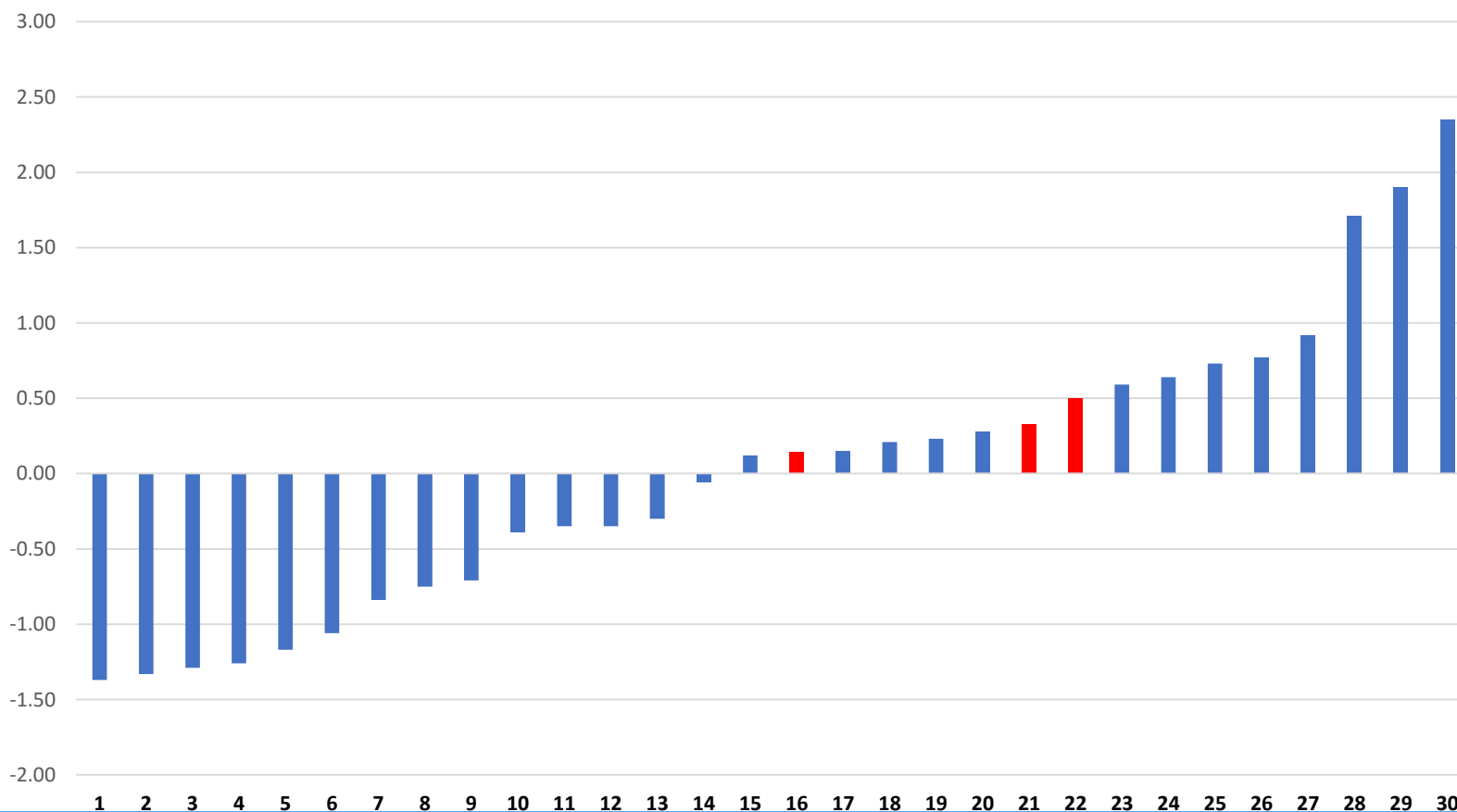
**% $\Delta 9$ THC Z-Score all Samples
Standard Manufacturer and Exp. Date**

CT=Cerillant, CM=Cayman, R=Restek, AB=Absolute Standards



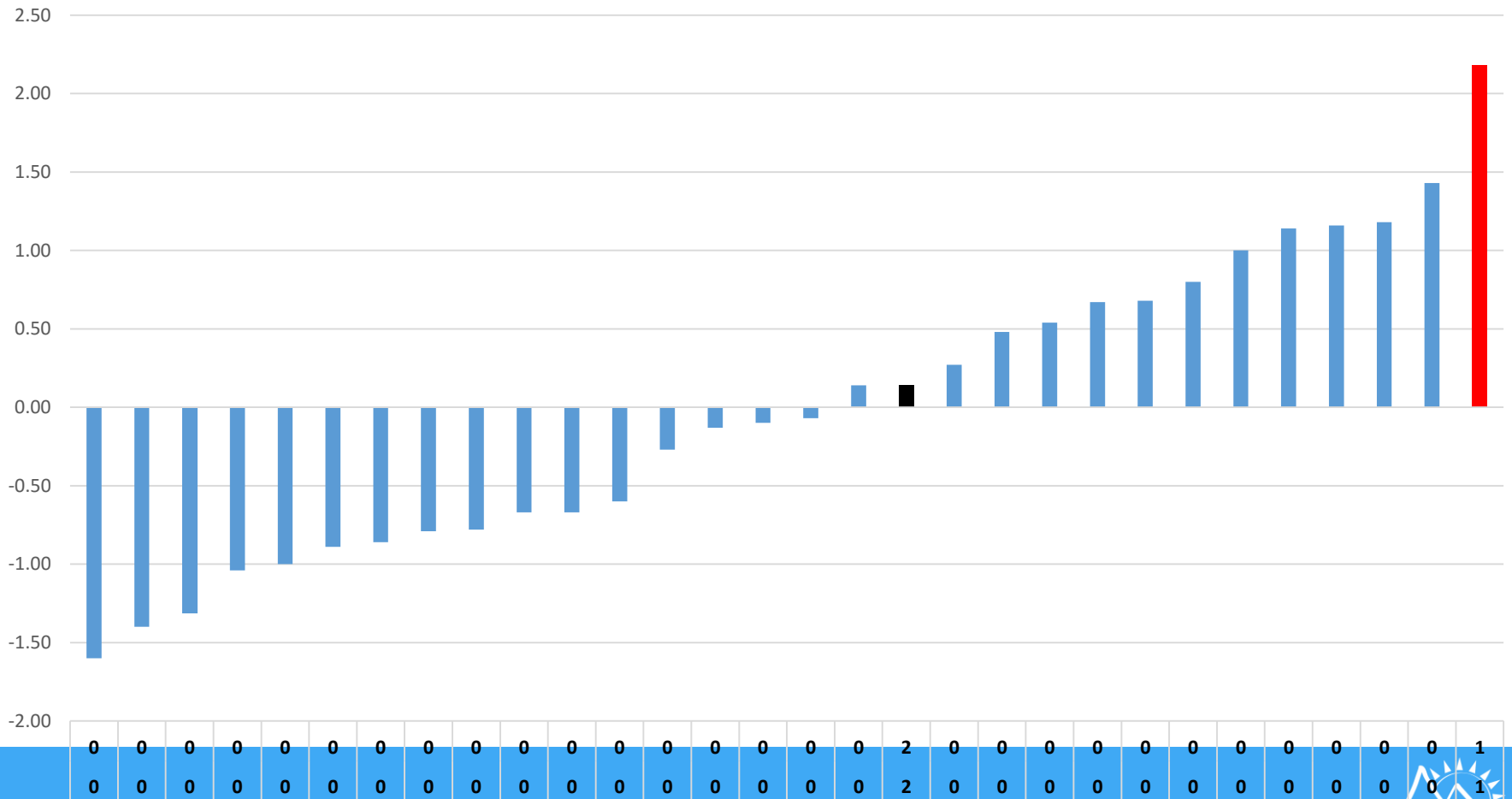
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Total THC: Z-Score all Samples
Standard Manuf and Exp. Date THCA STD



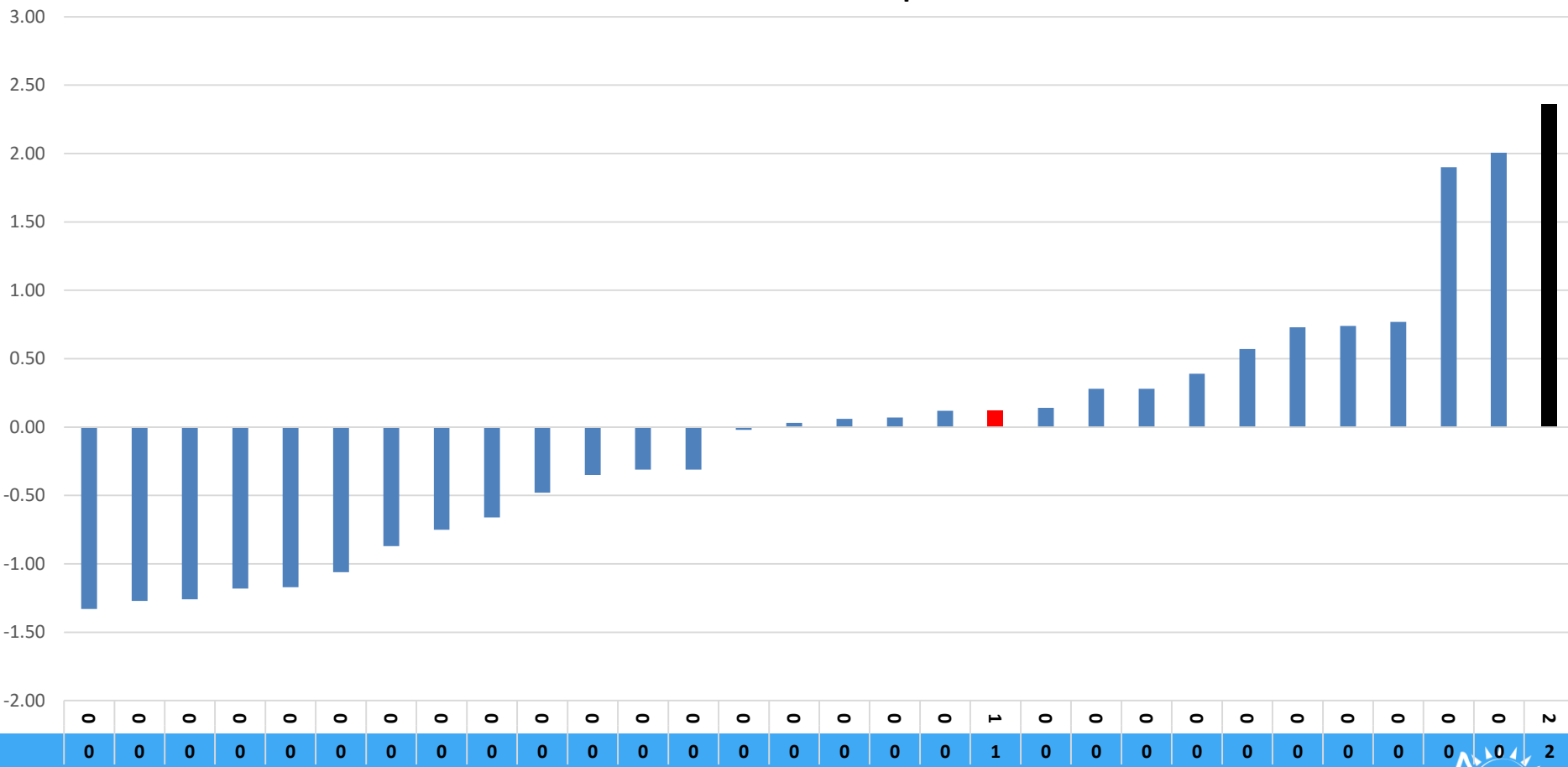
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**% Δ9 THC Z-Score all Samples
Standard Manufacturer and Exp. Date**



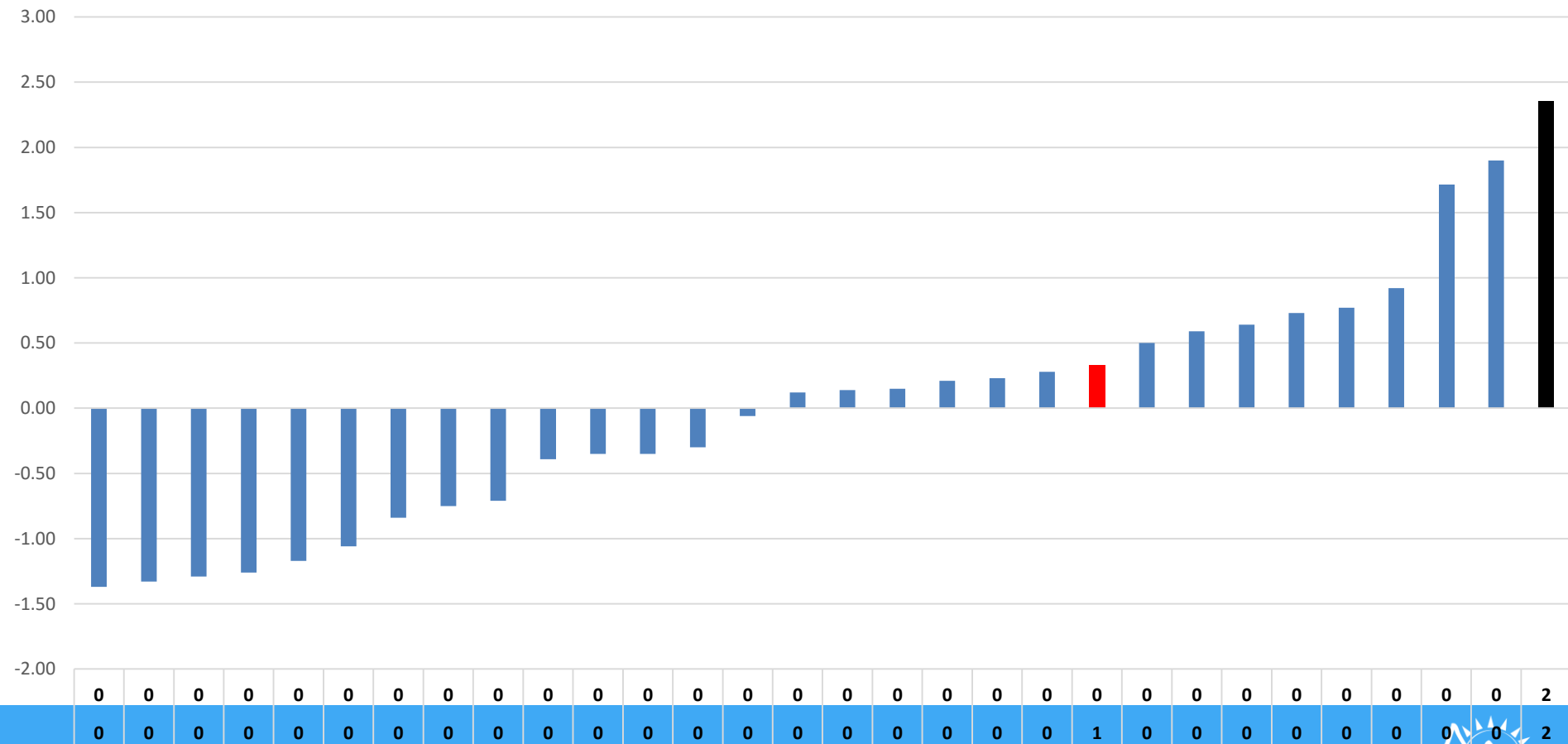
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% THCA Z-Score all Samples
Standard Manufacturer and Exp. Date



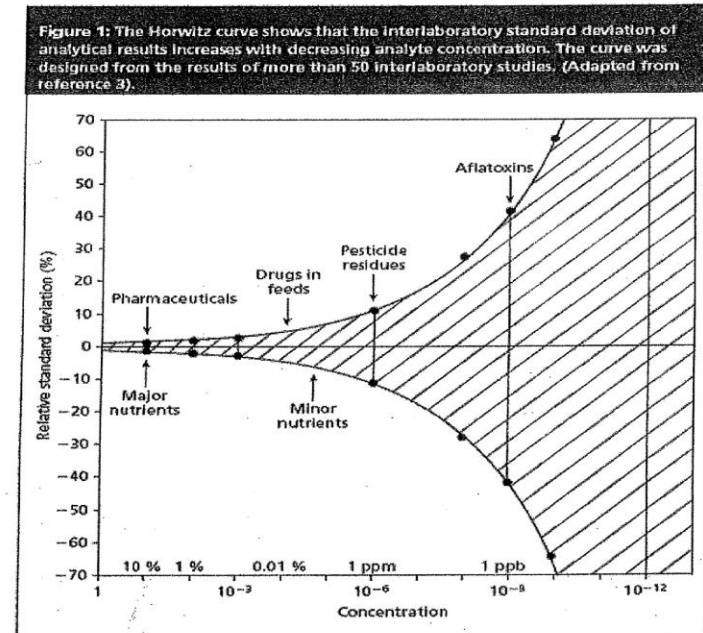
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**Total THC: Z-Score all Samples
Standard Manuf and Exp. Date THCA STD**



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W Horwitz, L R Kamps, K W Boyer,
J Assoc Off Anal Chem, 1980, 63, 1344.



PLATINUM BLUE DREAM

	<u>Δ-9 THC</u>	<u>THC-A</u>	<u>CBD</u>	<u>CBDA</u>	<u>Total THC</u>
Mean	0.93	21.83	na	na	20.07
std. dev.	0.15	2.87	na	na	2.49
Median	0.92	22.17	na	na	20.38
% RSD	15.67%	13.12%	na	na	12.43%
Range	0.42	9.02	na	na	7.9

072716-0102

	<u>Δ-9 THC</u>	<u>THC-A</u>	<u>CBD</u>	<u>CBDA</u>	<u>Total THC</u>
Mean	4.08	13.55	0.06	0.32	15.95
std. dev.	0.35	2.19	0.01	0.05	2.02
Median	4.21	13.61	0.06	0.32	16.26
% RSD	8.49%	16.16%	19.05%	16.51%	12.64%
Range	0.96	7.3	0.04	0.18	6.2

072716-0103

	<u>Δ-9 THC</u>	<u>THC-A</u>	<u>CBD</u>	<u>CBDA</u>	<u>Total THC</u>
Mean	0.55	4.88	0.25	6.38	4.83
std. dev.	0.05	0.63	0.06	0.63	0.56
Median	0.54	4.80	0.27	6.51	4.74
% RSD	8.88%	12.83%	22.81%	9.20%	11.49%
Range	0.156	2.27	0.19	2.26	2.02

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And a quick look at the math:

RSD% = (Standard Deviation / Mean) x 100

Std. Deviation (STDEV in Excel) $\sqrt{\frac{\sum (x - \bar{x})^2}{(n-1)}}$

Mean = AVG (Excel)

Range = Max - Min

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Thank You:

Scott Rumburg, National Agricultural Statistics Service, USDA
NV Department of Agriculture
NV Division of Public and Behavioral Health
Dr. Jian Zhang, Mr. Lynn Hettrick

And all of the Independent MM Laboratories for your participation and input!