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**Report of the Proficiency Testing 2010**  
Organisation and evaluation: J.-L. Gafner

**Samples**

Sample A: Pig Feed

Composition:

Dextrose, protein-hydrolysate of animal origin, dried grape residue, extruded flax seed, extruded wheat bran, monocalciumphosphate.

Sample B: Millet

Origin: Sächsische Landesanstalt für Landwirtschaft Leipzig (D)

**Preparation:**

Sample A: 25 kg of material was mixed manually during 1 hour prior to the confection of 20 laboratory samples weighing each about 1 kg. They were sealed under light vacuum and sent by priority post on September 22, 2011. Lack of time prevented the performance of true homogeneity tests, but preliminary tests in Posieux and in Leipzig showed amounts of microorganisms fit for the counting for groups 1, 2, 3, 5 and 6. The sample was previously known to contain Sporoactinomycetes in significant numbers, as well as moulds: slow growing colonies were observed in these preliminary studies. It can be assumed that homogeneity is sufficient when compared to the robust standard deviation of the results of the participants.

Sample B: 10 kg of whole millet grains were thoroughly mixed like above and ca. 250 g of sample were placed into plastic bags then sealed under light vacuum. The quality had to be judged with the orientation values of wheat as requested in the documentation send with the samples. Its quality was known to be "normal".



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17 laboratories participated to the “global” study; 15 applied the EFMO method like it was requested and 2 labs sent either incomplete results or used other methods.

The following labs, identified by their cities, have sent results:

Altenberge (D), Augustenberg (D), Azores (P), Detmold (D), Leipzig(D), Lichtenwalde(D), Linz (A), Ljubljana (SLO), Luxemburg (L), Neubrandenburg (D), Oberschleissheim (D) , Oldenburg(D) , Posieux (CH), Potsdam (D), Speyer (D), Stade (D) and Zagreb (HR). The results were received via e-mail and the evaluations were made using 2 different statistical approaches:

1. Simple non-robust statistical evaluation was performed, by calculating the average, standard deviation and coefficient of variation; outliers were detected according to the upper and lower limit calculations applying Student’s Test. The outlying values were not taken into account for the final evaluation. This evaluation has been usual to our Organisation’s ringstudies and is presented here.
2. A second evaluation was performed by using an international recognised Standard ( ISO 13528:2005) for this kind of studies, especially the algorithm A for the calculation of robust mean and robust standard deviation.

The evaluations were performed only for the labs applying the EFMO/VDLUFA method. For the Inter-laboratory comparison, the results of 2 labs appear at the bottom of the tables.

A separate study is still necessary to establish the method validation parameters for the different micro-organism groups counts.

## 1. Non-robust statistic evaluation

### Sample A: Pig Feed

**Table 1. Summary for sample (log of laboratory averages)**

Group 1	<b>bacteria, product typical:</b> n= 15 average= 5.6125 SD= 0.8619 CV= 15.4 % no outlier
Group 2	<b>bacteria, spoilage indicating:</b> n= 15 average= 5.6450 SD= 0.8129 CV= 14.4 % no outlier
Group 3	<b>bacteria, spoilage indicating:</b> 1 lab did not detect Sporoactinomycetes n= 14 average= 6.2672 SD=0.3840 CV= 6.1 % outlier: H
Group 4	<b>moulds and dematiaceous fungi, product typical:</b> n= 15 average=3.9951 SD= 1.2792 CV= 32 % no outlier
Group 5	<b>moulds, spoilage indicating:</b> n= 15 average= 4.8391 SD= 0.6104 CV= 12.6 % no outlier
Group 6	<b>moulds:</b> n= 14 average= 4.2122 SD=0.2519 CV= 6.0 % outlier: O
Group 7	<b>Yeasts</b> n= 15 average= 2.8404 SD= 0.5138 CV= 18.16 % no outlier

The arithmetic evaluations gave CV ranging from 60 to 158.8 %.

### Quality judgement

The orientation values (OV) adopted for pig feed are as follows:

MO Group	1	2	3	4	5	6	7
OV	$6 \cdot 10^6$	$10^6$	$10^5$	$5 \cdot 10^4$	$5 \cdot 10^4$	$5 \cdot 10^3$	$8 \cdot 10^4$

The average counts (5 repetitions per participant) are considered in this aspect. This sample was judged with 2 possibilities available to the analysts:

Quality degree 3 was attributed once.

Quality degree 4 was given by all the other judgements.

Laboratories E, H, N and O made wrong judgement when considering the counts obtained.

The decreased quality of this sample was well recognised. MO Groups 3 and 6 were largely responsible for the alteration.

**Table 2. Summary of quality evaluations**

Lab	CFU total typical OV: 6.00E+06	CFU spoil.flora OV: 1.00E+06	CFU Streptomyces OV: 1.00E+05	CFU Total typical moulds OV: 5.00E+04	CFU spoilage flora OV: 3.00E+04	CFU Mucoraceae OV: 2.00E+03	CFU Yeasts OV: 5.00E+04	Quality step attributed	Theoretical quality step
A	3.83	4.26	14.07	0.67	3.57	11.79	0.01	4	4
B	0.19	0.01	17.60	0.06	5.12	6.50	0.00	4	4
C	0.01	2.02	25.20	0.01	7.56	10.70	0.01	4	4
E	0.02	1.30	39.80	7.92	0.45	8.80	0.04	3	4
G	0.22	1.12	74.60	11.62	1.20	7.51	0.01	4	4
H	0.08	0.02	0.01	5.01	0.53	9.20	0.00	4	3
I	0.05	0.68	15.41	0.56	0.32	7.85	0.02	4	4
J	0.38	0.78	36.90	1.74	6.00	23.50	0.03	4	4
L	0.31	2.04	24.70	0.02	2.18	7.05	0.01	4	4
M	0.01	1.60	21.60	0.23	11.48	25.10	0.12	4	4
N	0.09	0.02	10.00	0.07	0.16	3.35	0.02	4	3
O	0.05	0.37	2.67	0.00	0.98	0.01	0.01	4	2
P	0.09	0.74	29.18	5.16	0.23	6.20	0.00	4	4
Q	0.05	1.19	15.90	0.01	6.56	7.85	0.02	4	4
R	0.45	0.86	36.70	0.86	1.22	11.50	0.08	4	4
<b>Non EFMO</b>									
S	0.00	0.00	0.00	0.00	1.80	4.50	0.06	2	2
T	0.45	0.86	2.12	0.00	0.40	1.26	0.08	2	2

Legend
≤ 1 x OV
> 1 - 5 x OV
> 5 - 10 x OV
> 10 x OV

Units: non-transformed contents of micro-organisms divided by their corresponding orientation value (OV).

## Intra-laboratory precision

**Table 3. Repeatability**

Repeatability data has been evaluated for the 15 participants by the determination of the variation coefficient (%) generated by 5 repetitions (log transformed data).

Group 1	<b>bacteria, product typical:</b> n= 14 average= 3.2 SD= 3.5 CV= 111.8% Outlier M (36.1 %)
Group 2	<b>bacteria, spoilage indicating:</b> n= 14 average= 2.6 SD= 2.2 CV= 81.7 % Outlier M (12.9 %)
Group 3	<b>bacteria, spoilage indicating:</b> n= 14 average= 1.7 SD= 1.2 CV= 66.9 % Outlier A (22.5 %)
Group 4	<b>moulds and dematiaceous fungi, product typical:</b> n= 15 average= 9.4 SD= 11.4 CV= 127 %
Group 5	<b>moulds, spoilage indicating:</b> n= 14 average= 3.0 SD= 1.9 CV= 64.0 % Outlier O (10.3%)
Group 6	<b>Moulds (Mucoraceae):</b> n= 14 average= 2.8 SD= 2.5 CV= 87.5 % Outlier G (27.3%)
Group 7	<b>Yeasts</b> n= 15 average= 25.9 SD= 15.8 CV= 61.3 %

## Sample B: Millet

**Table 4. Summary for sample (log of laboratory values)**

Group 1	<b>bacteria, product typical:</b> n= 15 average= 4.8297 SD= 0.4902 CV= 10.1 % no outlier
Group 2	<b>bacteria, spoilage indicating:</b> n= 15 average= 4.0914 SD= 0.5198 CV= 12.7 % no outlier
Group 3	<b>bacteria, spoilage indicating:</b> n= 13 average= 3.9799 SD=0.4013 CV= 6.1 % outliers: C, H
Group 4	<b>moulds and dematiaceous fungi, product typical:</b> n= 15 average=2.4548 SD= 0.7167 CV= 29.2 % no outlier
Group 5	<b>moulds, spoilage indicating:</b> n= 15 average= 3.4446 SD= 0.2863 CV= 8.3 % no outlier
Group 6	<b>moulds:</b> n= 15 average= 2.4008 SD=0.3615 CV= 13.0 % no outlier
Group 7	<b>Yeasts</b> n= 14 average= 2.1094 SD=0.4980 CV= 23.6 % outlier: H

The arithmetic evaluations gave CV ranging from 63 to 180 %.

## Quality judgement

The orientation values (OV) adopted for millet as those of wheat:

MO Group	1	2	3	4	5	6	7
OV	$5.10^6$	$10^6$	$10^5$	$5.10^4$	$3.10^4$	$2.10^3$	$5.10^4$

This sample was judged to be of normal quality by all participants

Laboratory C made a wrong judgement when considering the counts obtained by this participant for MO Group 3.

**Table 5. Summary of quality evaluations**

Lab	CFU total typical OV: 5.00E+06	CFU spoil.flora OV: 1.00E+06	CFU Streptomyces OV: 1.00E+05	CFU Total typical moulds OV: 5.00E+04	CFU spoilage flora OV: 3.00E+04	CFU Mucoraceae OV: 2.00E+03	CFU Yeasts OV: 5.00E+04	Quality step attributed	Theoretical quality step
A	0.04	0.22	0.03	0.00	0.05	0.37	0.01	1	1
B	0.01	0.01	0.06	0.01	0.18	0.50	0.01	1	1
C	0.02	0.01	1.50	0.00	0.15	0.25	0.00	1	2
E	0.02	0.01	0.03	0.00	0.11	0.09	0.00	1	1
G	0.01	0.02	0.06	0.08	0.03	0.05	0.00	1	1
H	0.01	0.00	0.00	0.01	0.04	0.10	0.09		1
I	0.01	0.02	0.06	0.02	0.07	0.08	0.00	1	1
J	0.00	0.01	0.21	0.00	0.06	0.10	0.00	1	1
L	0.01	0.03	0.06	0.00	0.30	0.10	0.01	1	1
M	0.02	0.00	0.60	0.00	0.11	0.25	0.00	1	1
N	0.00	0.01	0.05	0.03	0.13	0.38	0.00	1	1
O	0.01	0.02	0.08	0.02	0.10	0.08	0.00	1	1
P	0.01	0.01	0.18	0.01	0.10	0.08	0.00	1	1
Q	0.01	0.02	0.24	0.00	0.00	0.00	0.00	1	1
R	0.43	0.04	0.25	0.14	0.22	0.03	0.03	1	1
<b>Non EFMO</b>									
S	0.00	0.00	0.00	0.00	0.00	0.02	0.03	1	1
T	0.00	0.02	0.35	0.00	0.20	0.08	0.03	1	1

Legend: see Table 2.

## Discussion

The overall study shows a satisfying unity in the global judgment of the feed quality. It is still a fact that some labs are not able to identify correctly the present micro-organisms; for example in Sample A, labs C and M did not recognise micro-organisms of Group 1, and found only bacteria from MO Group 2. The consequence of that is that these two labs are shifted to higher values in the MO Group 2.

Table 6 summarises the difficulties of micro-organisms classification and/or detection:

**Table 6.**

Lab	MO Groups
M, C	1
B, H, N	2
H	3
O	4
O	6

A further unresolved problem is the unusual presence of a slow growing mould in sample A. Identified by 3 labs in this study, it appeared to be *Geomyces pannorum* (confirmed by the DSM, Deutsche Sammlung von Microorganismen). Most of the participants classified this mould in MO Group 5, although no greater knowledge is yet available of its signification. This mould is known to be found in soils, perhaps on plant material, in indoor environments and it was also reported on clinical material. It was also suggested that it could have been in the packing bag of the sample, something that is unfortunately no more possible to check.

## 2. Evaluation according to ISO 13528:2005

### Legend

Criterion	List of the criteria to be quantified by the lab
X	assigned value for the proficiency testing: value attributed to the criterion for proficiency testing scheme (or conventional true value). It is most often calculated with the robust algorithm A from ISO 13528 Standard.
$u_x$	standard uncertainty of the assigned value it is used to quantify the confidence that can be given to the assigned value. It depends on the mathematical model applied (algorithm A) and is a function of the standard deviation and the number of results used for the estimation of the assigned value. It is calculated as indicated in the § 5.6.2 of the ISO 13528 Standard
$s^*_x$	robust standard deviation standard deviation calculated with the robust algorithm A from ISO 13528 from all results which did participate to the estimation of the assigned value
$p_x$	number of results number of results which did participate to the estimation of the assigned value
$VT=2\sigma$	tolerance value Two times the standard deviation for proficiency testing, as defined in ISO 13528
$X + VT$	maximum value upper limit of the tolerance interval (assigned value + tolerance value)
$X - VT$	minimum value lower limit of the tolerance interval (assigned value - tolerance value)
$p_D$	number of untrue results number of results out of the tolerance interval
$p_{CA}$	number of results number of participants
$x^*_{tot}$	robust mean mean calculated with the robust algorithm A from ISO 13528 with all quantified results
$s^*_{tot}$	robust standard deviation standard deviation calculated with the robust algorithm A from ISO 13528 with all quantified results
$p_{tot}$	number of results number of received quantitative results
$p_{INC}$	number of incoherent results
Lab	laboratories list of registered laboratories for the test
x	result measurement result
z-score	expression of the result of the laboratory as value without unit, calculated using the robust mean and the robust standard deviation of all the results
$x_T$	log transformed measurement result
$z_T$	expression of the log transformed result of the laboratory as value without unit, calculated using the robust mean and the robust standard deviation of all the log transformed results

## Sample A: Pig Feed

MO Group 1 (mean of 5 determinations)

Criterion	Group1	logGroup1					
Units	CFU/ g						
Assigned value							
X	523434	5.719					
$u_x$		0.178					
$s_x^*$		0.550					
$p_x$	15	15					
Proficiency							
VT		0.825					
X+VT		6.544					
X-VT		4.894					
$p_d$		3					
Population							
$p_{CA}$		15					
$X_{tot}^*$	583033	5.719					
$S_{tot}^*$		0.550					
$p_{tot}$		15					
$p_{INC}$		0					
Results							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	8753992		6.9422	2.224		x	1.2233
B	1099082		6.0410	0.586			0.3222
C	50000		4.6990	-1.854		x	-1.0199
E	111405		5.0469	-1.222			-0.6720
G	864807		5.9369	0.396			0.2181
H	454995		5.6580	-0.111			-0.0609
I	279836		5.4469	-0.494			-0.2720
J	2042509		6.3102	1.075			0.5913
L	1274289		6.1053	0.703			0.3864
M	1657		3.2194	-4.545		x	-2.4995
N	526981		5.7218	0.005			0.0029
O	293359		5.4674	-0.457			-0.2515
P	540811		5.7330	0.026			0.0142
Q	284817		5.4546	-0.481			-0.2643
R	2544983		6.4057	1.249			0.6868

<b>S (one value)</b>	2600		3.4150				
<b>T</b>	-		-				

**MO Group 2** (mean of 5 determinations)

Criterion	Group2	logGroup2					
Units	CFU/ g						
<b>Assigned value</b>							
X	795157	5.900					
$u_x$		0.119					
$s_x^*$		0.370					
$p_x$	15	15					
<b>Proficiency</b>							
VT		0.554					
X+VT		6.455					
X-VT		5.346					
$p_d$		3					
<b>Population</b>							
$p_{CA}$		15					
$x_{tot}^*$	894554	5.900					
$s_{tot}^*$		0.370					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	2168184		6.3361	1.179			0.4356
B	7667		3.8846	-5.455		x	-2.0158
C	2012800		6.3038	1.091			0.4033
E	1193337		6.0768	0.477			0.1763
G	1056104		6.0237	0.334			0.1233
H	16438		4.2158	-4.559		x	-1.6846
I	664156		5.8223	-0.212			-0.0782
J	690858		5.8394	-0.165			-0.0611
L	1962042		6.2927	1.061			0.3923
M	1413610		6.1503	0.676			0.2499
N	19950		4.2999	-4.331		x	-1.6005
O	368750		5.5667	-0.903			-0.3337
P	744039		5.8716	-0.078			-0.0289
Q	1177545		6.0710	0.461			0.1705
R	833475		5.9209	0.055			0.0204

<b>S (one value)</b>	3900		3.5911				
<b>T</b>	-		-				

**MO Group 3** (mean of 5 determinations)

Criterion	Group3	logGroup3					
Units	CFU/ g						
<b>Assigned value</b>							
X	1895751	6.278					
$u_x$		0.108					
$s_x^*$		0.334					
$p_x$	15	15					
<b>Proficiency</b>							
VT		0.501					
X+VT		6.779					
X-VT		5.776					
$p_d$		4					
<b>Population</b>							
$p_{CA}$		15					
$x_{tot}^*$	2167837	6.278					
$s_{tot}^*$		0.334					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	401262		5.6034	-2.018		x	-0.6744
B	1726080		6.2371	-0.122			-0.0407
C	2486847		6.3956	0.353			0.1179
E	3869653		6.5877	0.927			0.3099
G	7208964		6.8579	1.736		x	0.5801
H	1320		3.1204	-9.447		x	-3.1574
I	1510039		6.1790	-0.296			-0.0988
J	3511258		6.5455	0.801			0.2677
L	2345292		6.3702	0.277			0.0924
M	2128441		6.3281	0.150			0.0503
N	997992		5.9991	-0.834			-0.2787
O	266394		5.4255	-2.550		x	-0.8523
P	2871743		6.4581	0.540			0.1804
Q	1560529		6.1933	-0.253			-0.0845
R	3635948		6.5606	0.846			0.2828

<b>S (one value)</b>	5		3.4150				
<b>T</b>	210000		5.3105				

**MO Group 4** (mean of 5 determinations)

Criterion	Group4	logGroup4					
Units	CFU/ g						
<b>Assigned value</b>							
X	10834	4.035					
$u_x$		0.439					
$s_x^*$		1.361					
$p_x$	15	15					
<b>Proficiency</b>							
VT		2.041					
X+VT		6.076					
X-VT		1.994					
$p_d$		1					
<b>Population</b>							
$p_{CA}$		15					
$x_{tot}^*$	28578	4.035					
$s_{tot}^*$		1.361					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	5679		3.7543	-0.206			-0.2805
B	1904		3.2796	-0.555			-0.7552
C	500		2.6990	-0.982			-1.3358
E	392791		5.5942	1.146			1.5594
G	572667		5.7579	1.267			1.7231
H	245803		5.3906	0.997			1.3558
I	21180		4.3259	0.214			0.2911
J	77475		4.8892	0.628			0.8544
L	1110		3.0454	-0.727			-0.9894
M	3881		3.5889	-0.328			-0.4459
N	3323		3.5215	-0.377			-0.5133
O	25		1.3979	-1.938		x	-2.6369
P	256577		5.4092	1.010			1.3744
Q	472		2.6740	-1.000			-1.3608
R	39666		4.5984	0.414			0.5636

<b>S (one value)</b>	5		0.6990				
<b>T</b>	50		1.6990				

**MO Group 5** (mean of 5 determinations)

Criterion	Group5	logGroup5					
Units	CFU/ g						
<b>Assigned value</b>							
X	69045	4.839					
$u_x$		0.223					
$s_x^*$		0.692					
$p_x$	15	15					
<b>Proficiency</b>							
VT		1.038					
X+VT		5.877					
X-VT		3.801					
$p_d$		0					
<b>Population</b>							
$p_{CA}$		15					
$x_{tot}^*$	112360	4.839					
$s_{tot}^*$		0.692					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	131075		5.1175	0.402			0.2784
B	254719		5.4061	0.819			0.5669
C	376680		5.5760	1.065			0.7368
E	21937		4.3412	-0.719			-0.4980
G	54843		4.7391	-0.144			-0.1000
H	24765		4.3938	-0.643			-0.4453
I	15977		4.2035	-0.918			-0.6356
J	278439		5.4447	0.875			0.6056
L	107332		5.0307	0.277			0.1916
M	553632		5.7432	1.306			0.9041
N	7545		3.8777	-1.389			-0.9615
O	27172		4.4341	-0.585			-0.4050
P	10993		4.0411	-1.153			-0.7980
Q	326134		5.5134	0.974			0.6743
R	53065		4.7248	-0.165			-0.1143

<b>S (one value)</b>	54000		4.7324				
<b>T</b>	12800		4.1065				

**MO Group 6** (mean of 5 determinations)

Criterion	Group6	logGroup6					
Units	CFU/ g						
<b>Assigned value</b>							
X	15422	4.188					
$u_x$		0.055					
$s^*_x$		0.172					
$p_x$	15	15					
<b>Proficiency</b>							
VT		0.258					
X+VT		4.446					
X-VT		3.931					
$p_d$		5					
<b>Population</b>							
$p_{CA}$		15					
$x^*_{tot}$	16054	4.188					
$s^*_{tot}$		0.172					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	17076		4.2324	0.258			0.0442
B	12923		4.1113	-0.447			-0.0768
C	21325		4.3289	0.819			0.1407
E	17513		4.2434	0.321			0.0552
G	5697		3.7556	-2.519		x	-0.4325
H	17481		4.2426	0.317			0.0544
I	15672		4.1951	0.041			0.0070
J	44777		4.6511	2.695		x	0.4629
L	13729		4.1376	-0.294			-0.0505
M	46893		4.6711	2.812		x	0.4830
N	6564		3.8171	-2.160		x	-0.3710
O	25		1.3979	-16.247		x	-2.7902
P	12358		4.0920	-0.560			-0.0962
Q	15193		4.1816	-0.038			-0.0065
R	20477		4.3113	0.717			0.1231

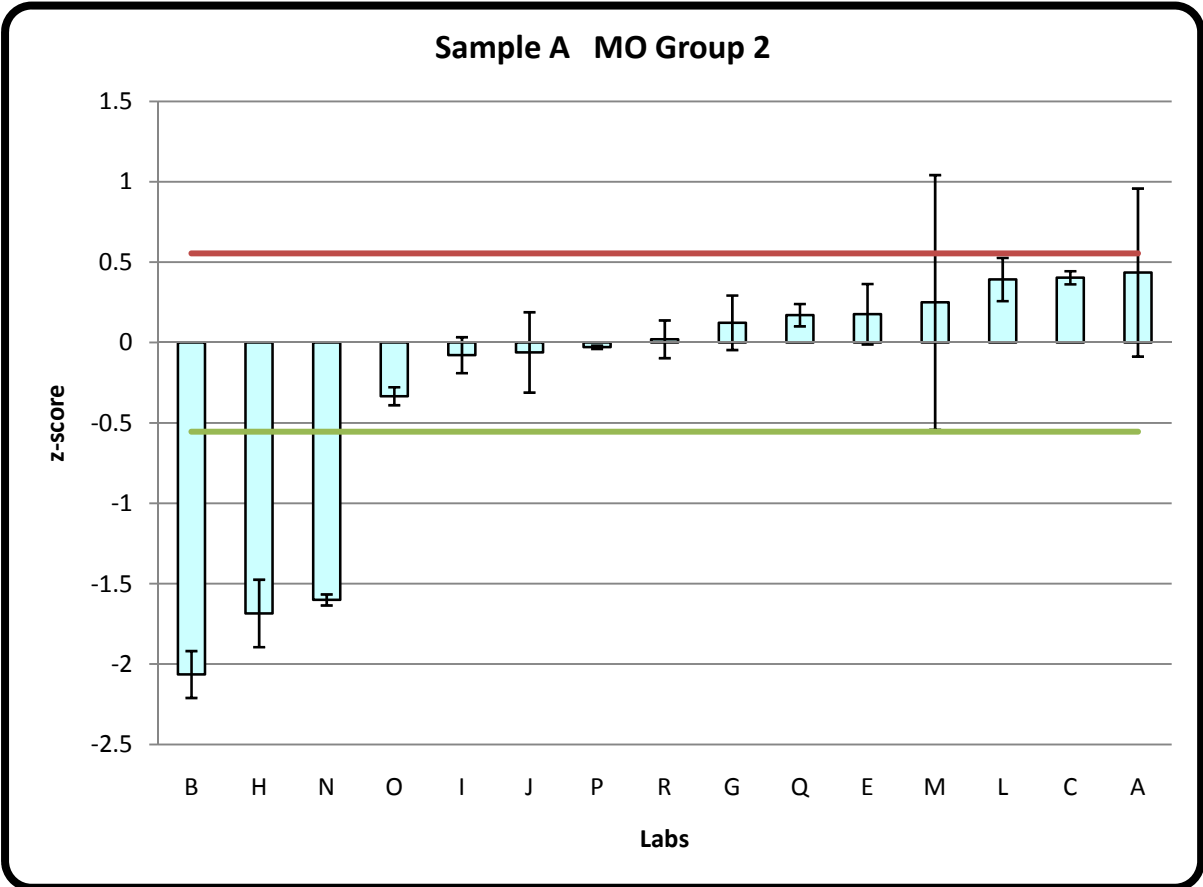
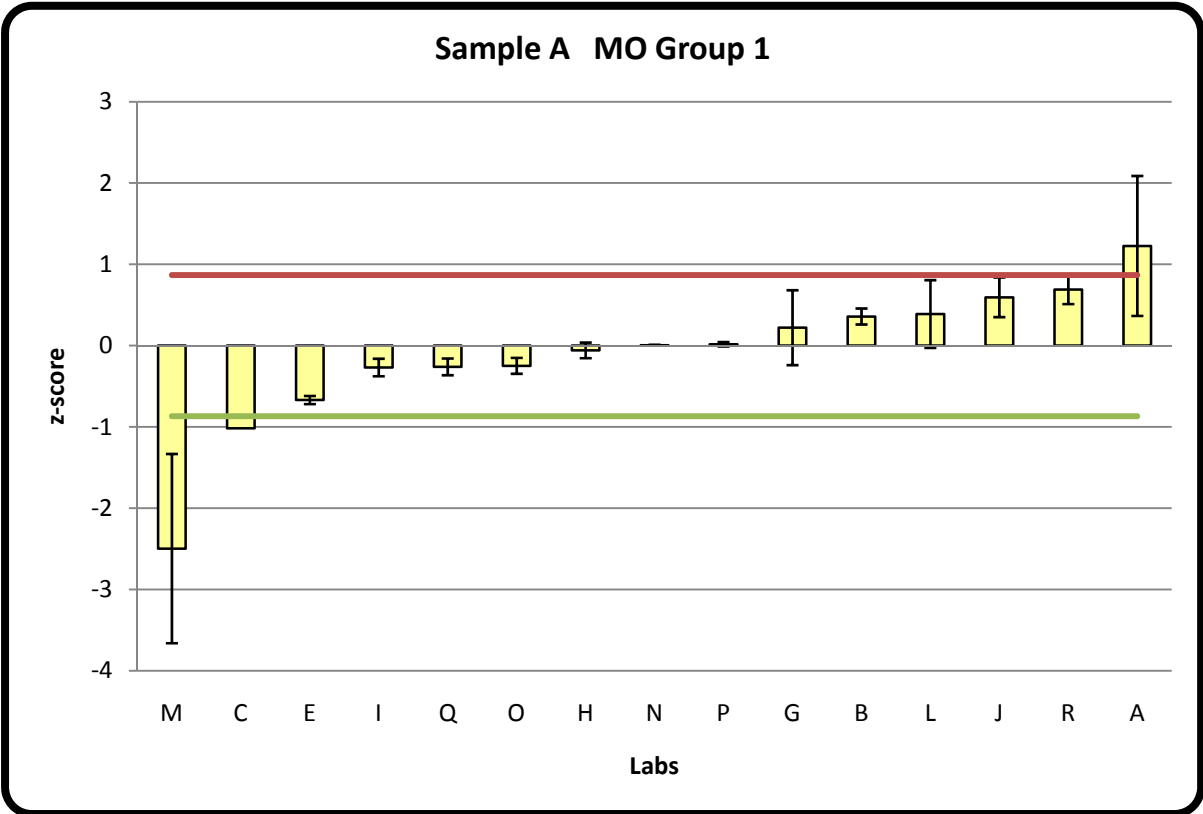
<b>S (one value)</b>	9000		3.9542				
<b>T</b>	2500		3.1701				

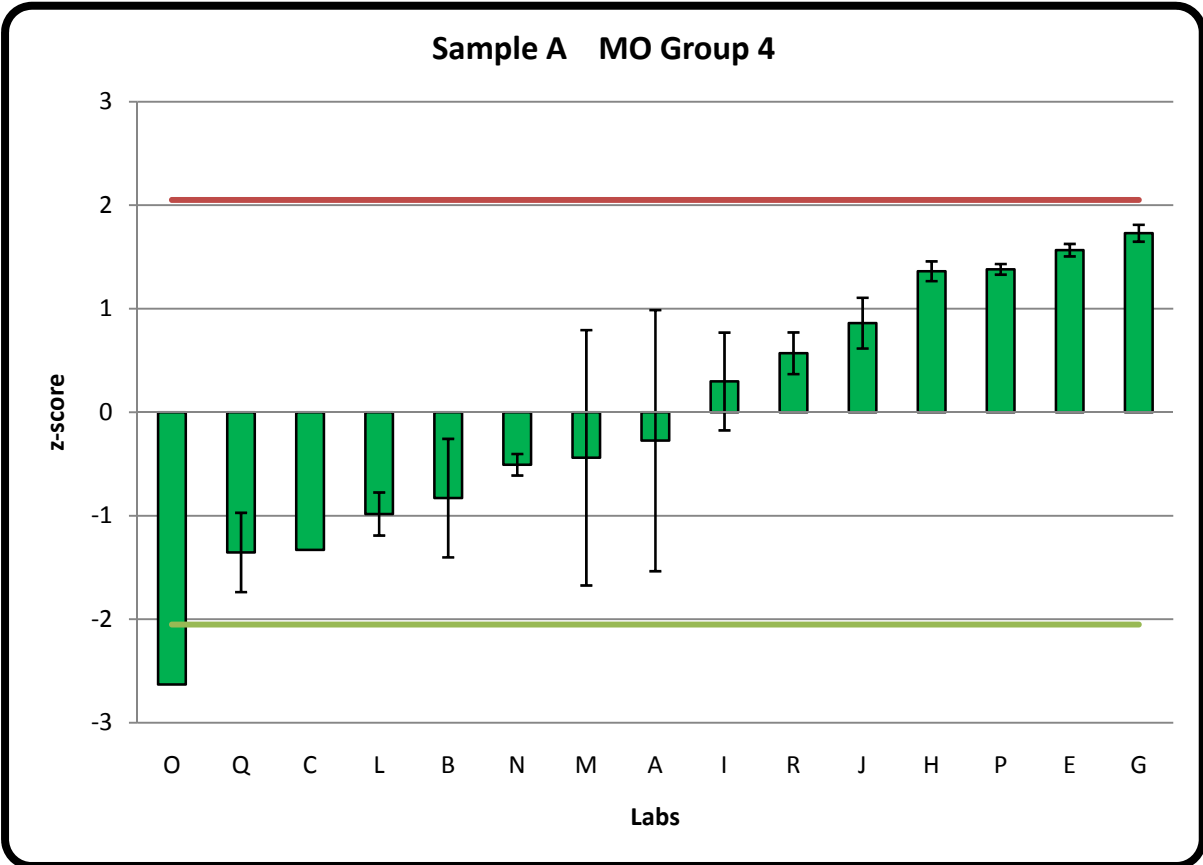
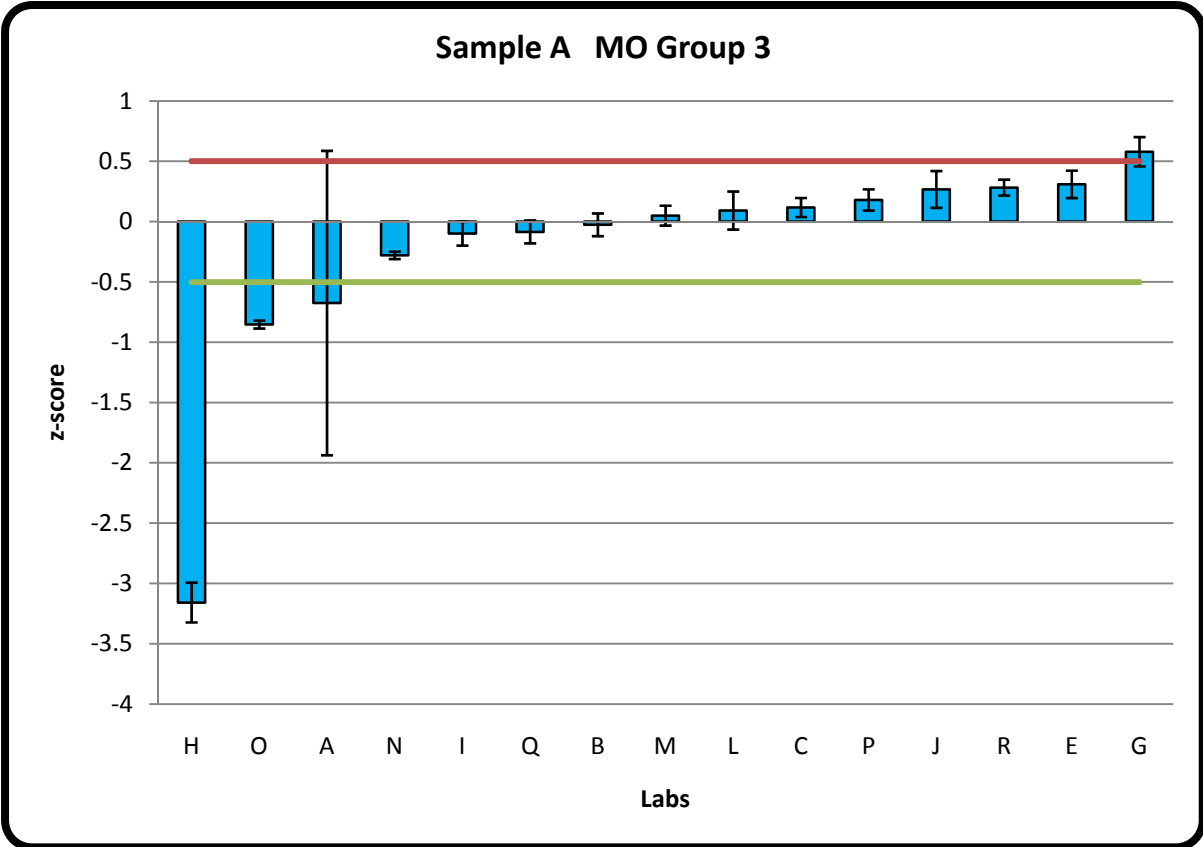
**MO Group 7** (mean of 5 determinations)

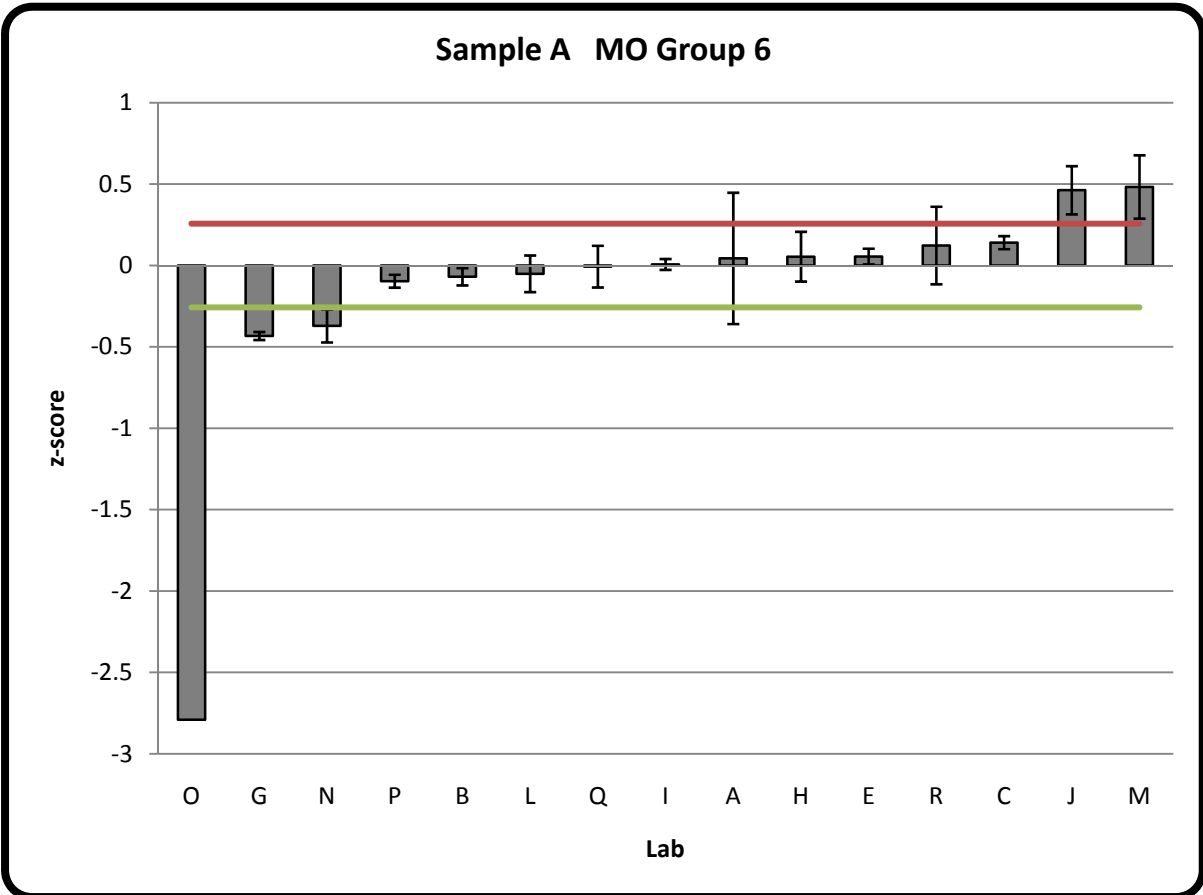
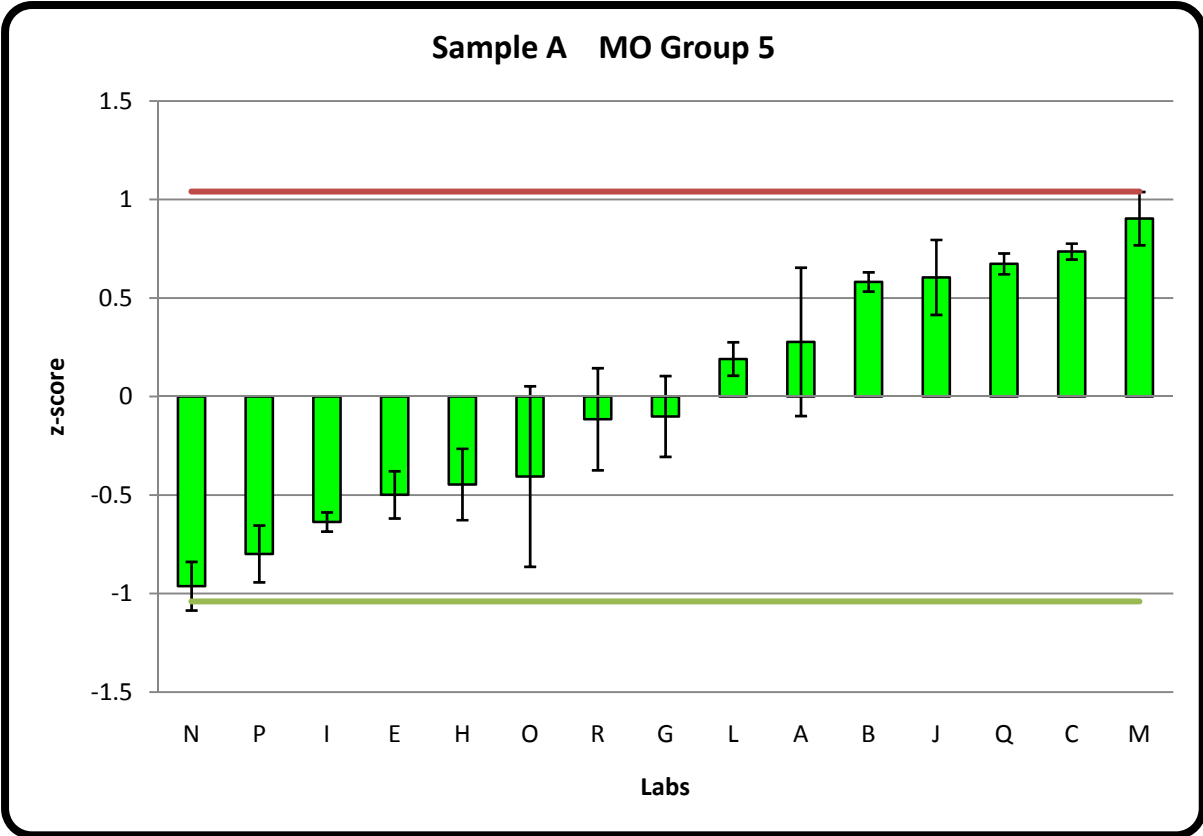
Criterion	Group7	logGroup7					
Units	CFU/ g						
<b>Assigned value</b>							
X	665	2.823					
$u_x$		0.214					
$s_x^*$		0.663					
$p_x$	15	15					
<b>Proficiency</b>							
VT		0.995					
X+VT		3.818					
X-VT		1.827					
$p_d$		3					
<b>Population</b>							
$p_{CA}$		15					
$x_{tot}^*$	662	2.823					
$s_{tot}^*$		0.663					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	5242		3.7195	1.352			0.8970
B	250		2.3979	-0.640			-0.4246
C	500		2.6990	-0.186			-0.1235
E	250		2.3979	-0.640			-0.4246
G	7860		3.8954	1.617		x	1.0729
H	1380		3.1398	0.478			0.3173
I	100		2.0000	-1.240			-0.8225
J	134		2.1266	-1.049			-0.6959
L	1351		3.1306	0.464			0.3081
M	2731		3.4364	0.925			0.6139
N	574		2.7592	-0.095			-0.0633
O	25		1.3979	-2.147		x	-1.4246
P	532		2.7257	-0.146			-0.0968
Q	9666		3.9852	1.753		x	1.1627
R	623		2.7944	-0.042			-0.0281

<b>S (one value)</b>	3000		3.4771				
<b>T</b>	50		1.6990				

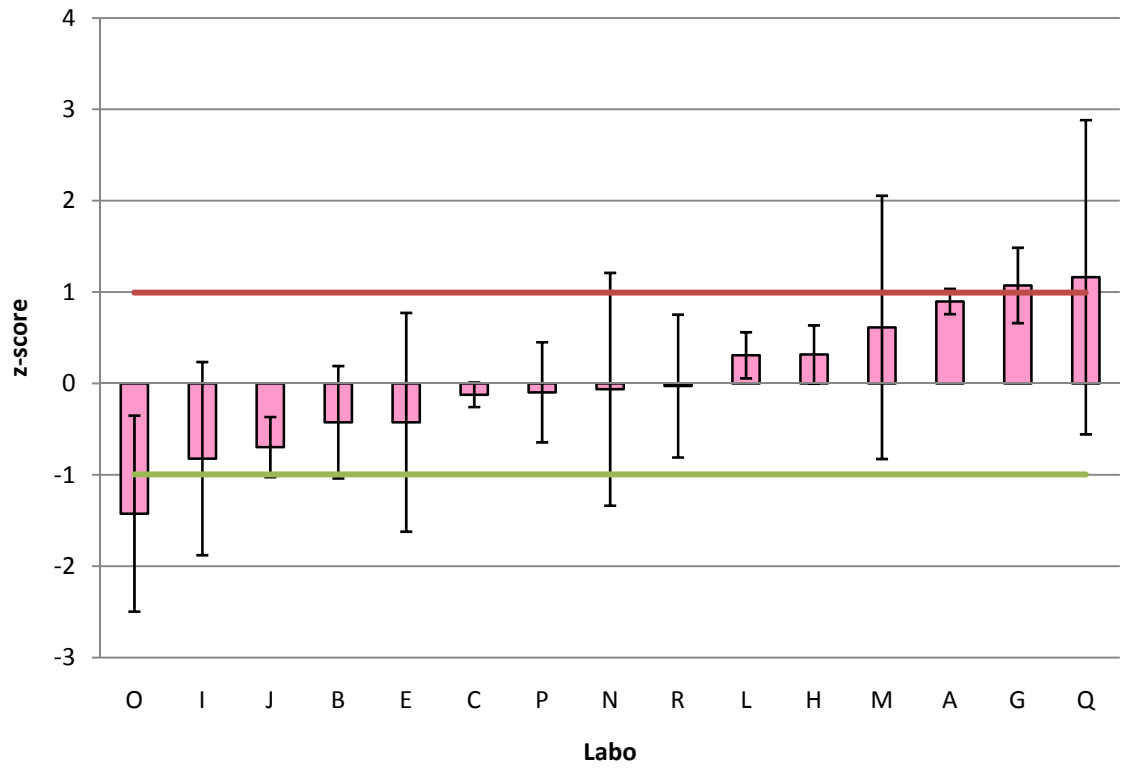
On the following pages are the graphs representing the EFMO Method results, z-scores and standard deviation for each Lab, sorted out by increasing values. The robust mean has been set on 0.







### Sample A MO Group 7



## Sample B: Millet

MO Group 1 (1 determination)

Criterion	Group1	logGroup1					
Units	CFU/ g						
Assigned value							
X	55823						4.747
u <sub>x</sub>							0.095
s* <sub>x</sub>							0.295
p <sub>x</sub>	15						15
Proficiency							
VT							0.442
X+VT							5.189
X-VT							4.305
p <sub>d</sub>							3
Population							
p <sub>CA</sub>							15
x* <sub>tot</sub>	55823						4.747
s* <sub>tot</sub>							0.295
p <sub>tot</sub>							15
p <sub>INC</sub>							0
Results							
Lab	x	z	x <sub>T</sub>	z <sub>T</sub>	INC	outlier	x-x*
A	189000		5.2765	1.796		x	0.5297
B	36000		4.5563	-0.646			-0.1905
C	100000		5.0000	0.859			0.2532
E	95000		4.9777	0.783			0.2309
G	47000		4.6721	-0.253			-0.0747
H	69000		4.8388	0.312			0.0920
I	45594		4.6589	-0.298			-0.0879
J	18500		4.2672	-1.627		x	-0.4796
L	32500		4.5119	-0.797			-0.2349
M	75000		4.8751	0.435			0.1283
N	21500		4.3324	-1.405			-0.4144
O	38885		4.5898	-0.533			-0.1570
P	65800		4.8182	0.242			0.0714
Q	55000		4.7404	-0.022			-0.0064
R	2140000		6.3304	5.371		x	1.5836
S	4100		3.6128				
T	17000		4.2304				

**MO Group 2 (1 determination)**

Criterion	Group2	logGroup2					
Units	CFU/ g						
<b>Assigned value</b>							
X	12021	4.080					
$u_x$		0.131					
$s_x^*$		0.405					
$p_x$	15	15					
<b>Proficiency</b>							
VT		0.608					
X+VT		4.688					
X-VT		3.472					
$p_d$		2					
<b>Population</b>							
$p_{CA}$		15					
$x_{tot}^*$	12021	4.080					
$s_{tot}^*$		0.405					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	215000		5.3324	3.089		x	1.2525
B	6700		3.8261	-0.626			-0.2539
C	5000		3.6990	-0.940			-0.3810
E	10000		4.0000	-0.197			-0.0799
G	17000		4.2304	0.371			0.1505
H	1000		3.0000	-2.664		x	-1.0799
I	22797		4.3579	0.686			0.2780
J	13300		4.1239	0.108			0.0439
L	29000		4.4624	0.943			0.3825
M	4000		3.6021	-1.179			-0.4779
N	6000		3.7782	-0.744			-0.3018
O	10837		4.0349	-0.111			-0.0450
P	12000		4.0792	-0.002			-0.0007
Q	20000		4.3010	0.545			0.2211
R	35000		4.5441	1.145			0.4641
S	3300		3.5185				
T	18000		4.2553				

**MO Group 3** (1 determination)

Criterion	Group3	logGroup3					
Units	CFU/ g						
<b>Assigned value</b>							
X	8315	3.920					
$u_x$		0.153					
$s_x^*$		0.474					
$p_x$	15	15					
<b>Proficiency</b>							
VT		0.710					
X+VT		4.630					
X-VT		3.209					
$p_d$		3					
<b>Population</b>							
$p_{CA}$		15					
$x_{tot}^*$	8315	3.920					
$s_{tot}^*$		0.474					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	2950		3.4698	-0.950			-0.4500
B	6000		3.7782	-0.299			-0.1417
C	150000		5.1761	2.652		x	1.2562
E	3100		3.4914	-0.905			-0.4285
G	6000		3.7782	-0.299			-0.1417
H	250		2.3979	-3.213		x	-1.5219
I	5699		3.7558	-0.346			-0.1641
J	21100		4.3243	0.854			0.4044
L	5500		3.7404	-0.379			-0.1795
M	60000		4.7782	1.812		x	0.8583
N	5000		3.6990	-0.466			-0.2209
O	3975		3.5993	-0.677			-0.3206
P	18000		4.2553	0.708			0.3354
Q	23500		4.3711	0.953			0.4512
R	25000		4.3979	1.009			0.4781
S	5		0.6990				
T	35000		4.5441				

**MO Group 4 (1 determination)**

Criterion	Group4	logGroup4					
Units	CFU/ g						
<b>Assigned value</b>							
X	258	2.411					
$u_x$		0.215					
$s_x^*$		0.665					
$p_x$	15	15					
<b>Proficiency</b>							
VT		0.998					
X+VT		3.409					
X-VT		1.413					
$p_d$		4					
<b>Population</b>							
$p_{CA}$		15					
$x_{tot}^*$	258	2.411					
$s_{tot}^*$		0.665					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	100		2.0000	-0.618			-0.4110
B	250		2.3979	-0.020			-0.0131
C	100		2.0000	-0.618			-0.4110
E	90		1.9542	-0.687			-0.4568
G	4050		3.6075	1.799		x	1.1964
H	250		2.3979	-0.020			-0.0131
I	1000		3.0000	0.886			0.5890
J	170		2.2304	-0.272			-0.1806
L	150		2.1761	-0.353			-0.2349
M	25		1.3979	-1.523		x	-1.0131
N	1550		3.1903	1.172			0.7793
O	481		2.6824	0.408			0.2714
P	350		2.5441	0.200			0.1331
Q	25		1.3979	-1.523		x	-1.0131
R	7000		3.8451	2.156		x	1.4341
S	5		0.6990				
T	50		1.6990				

**MO Group 5 (1 determination)**

Criterion	Group5	logGroup5					
Units	CFU/ g						
<b>Assigned value</b>							
X	2831	3.452					
$u_x$		0.093					
$s_x^*$		0.288					
$p_x$	15	15					
<b>Proficiency</b>							
VT		0.432					
X+VT		3.884					
X-VT		3.020					
$p_d$		2					
<b>Population</b>							
$p_{CA}$		15					
$x_{tot}^*$	2831	3.452					
$s_{tot}^*$		0.288					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	1470		3.1673	-0.989			-0.2847
B	5300		3.7243	0.945			0.2723
C	4500		3.6532	0.699			0.2012
E	3200		3.5051	0.184			0.0531
G	800		2.9031	-1.906		x	-0.5489
H	1100		3.0414	-1.426			-0.4106
I	2100		3.3222	-0.451			-0.1298
J	1840		3.2648	-0.650			-0.1872
L	9000		3.9542	1.744		x	0.5022
M	3400		3.5315	0.276			0.0795
N	3750		3.5740	0.424			0.1220
O	1982		3.2972	-0.538			-0.1549
P	2960		3.4713	0.067			0.0193
Q	2800		3.4472	-0.017			-0.0049
R	6500		3.8129	1.253			0.3609
S	10		1.0000				
T	6000		3.7782				

**MO Group 6** (1 determination)

Criterion	Group6	logGroup6
Units	CFU/ g	
<b>Assigned value</b>		
X	235	2.370
$u_x$		0.098
$s_x^*$		0.304
$p_x$	15	15
<b>Proficiency</b>		
VT		0.457
X+VT		2.827
X-VT		1.914
$p_d$		4
<b>Population</b>		
$p_{CA}$		15
$x_{tot}^*$	235	2.370
$s_{tot}^*$		0.304
$p_{tot}$		15
$p_{INC}$		0

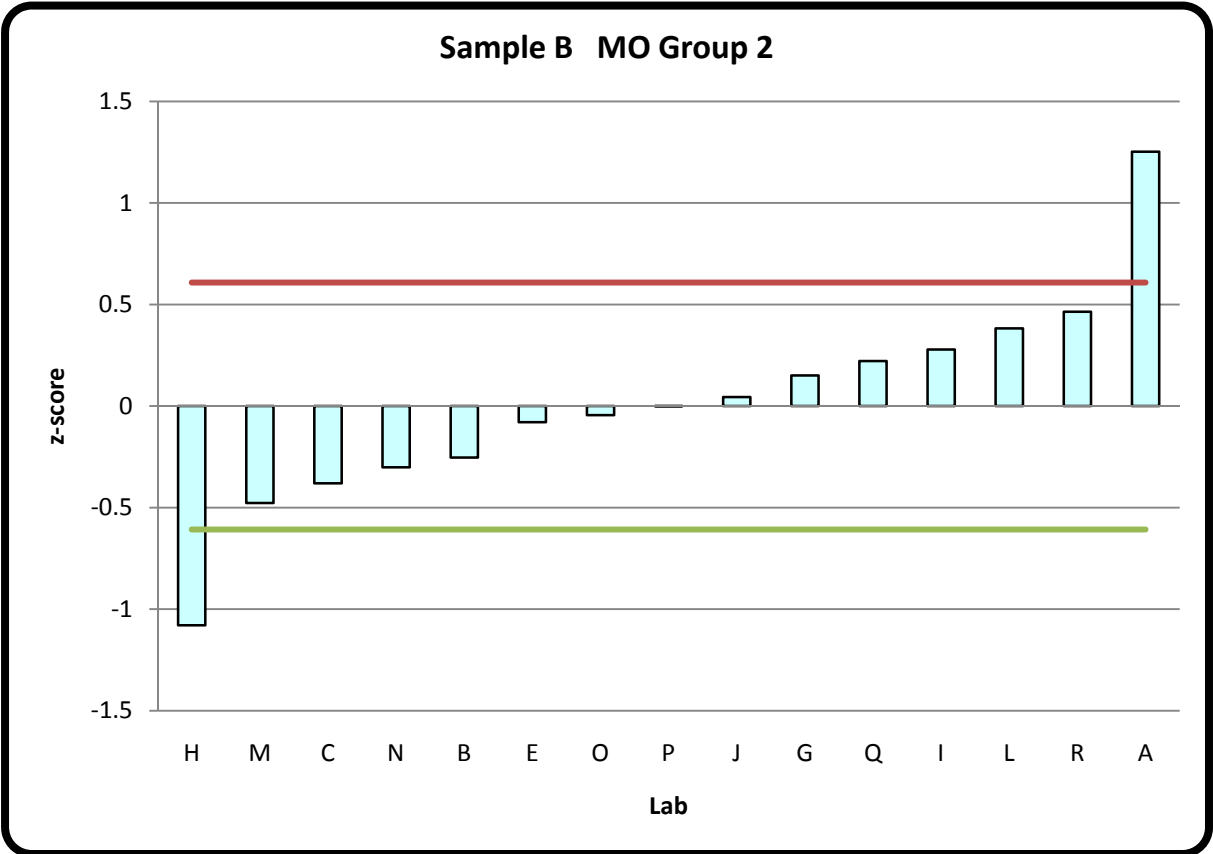
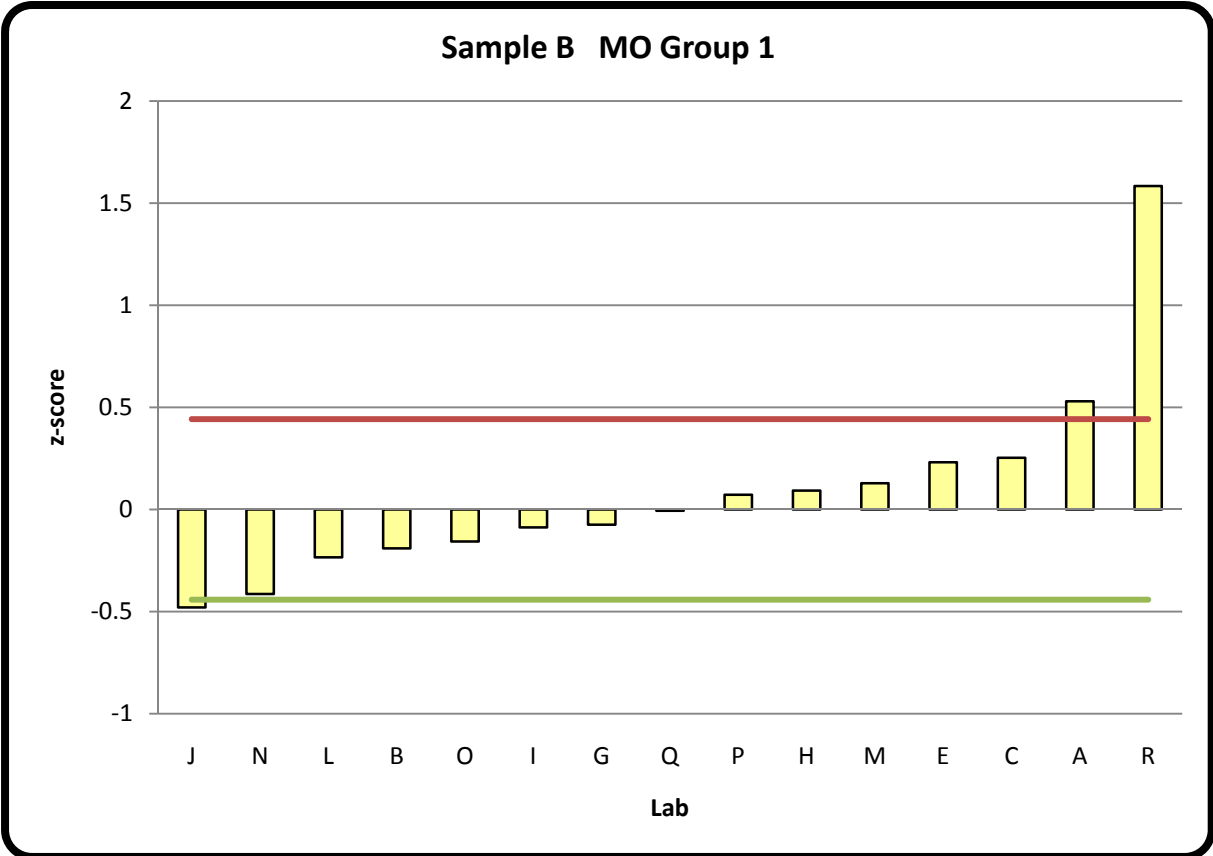
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	730		2.8633	1.620		x	0.4930
B	1000		3.0000	2.069		x	0.6297
C	500		2.6990	1.080			0.3287
E	180		2.2553	-0.378			-0.1150
G	100		2.0000	-1.216			-0.3703
H	200		2.3010	-0.227			-0.0692
I	150		2.1761	-0.638			-0.1942
J	190		2.2788	-0.301			-0.0915
L	200		2.3010	-0.227			-0.0692
M	500		2.6990	1.080			0.3287
N	750		2.8751	1.658		x	0.5048
O	163		2.2114	-0.522			-0.1589
P	150		2.1761	-0.638			-0.1942
Q	300		2.4771	0.351			0.1068
R	50		1.6990	-2.205		x	-0.6713

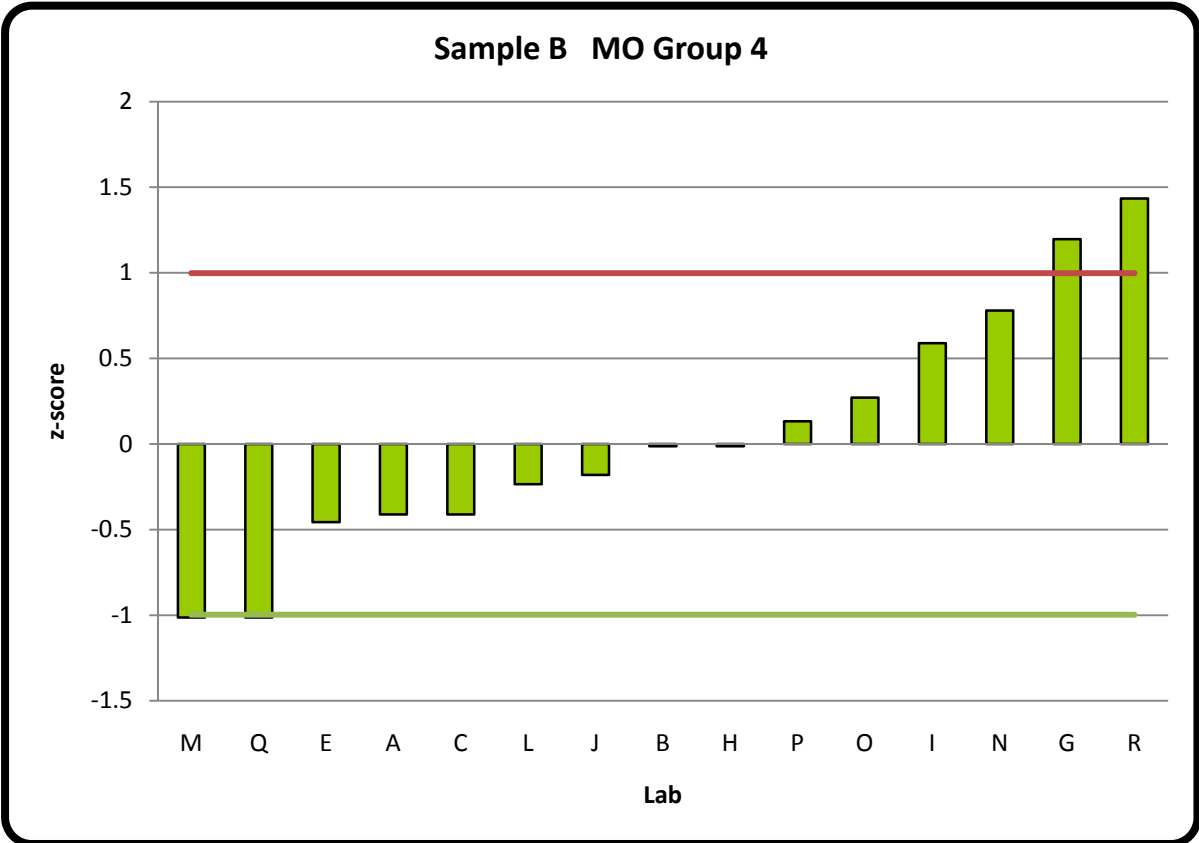
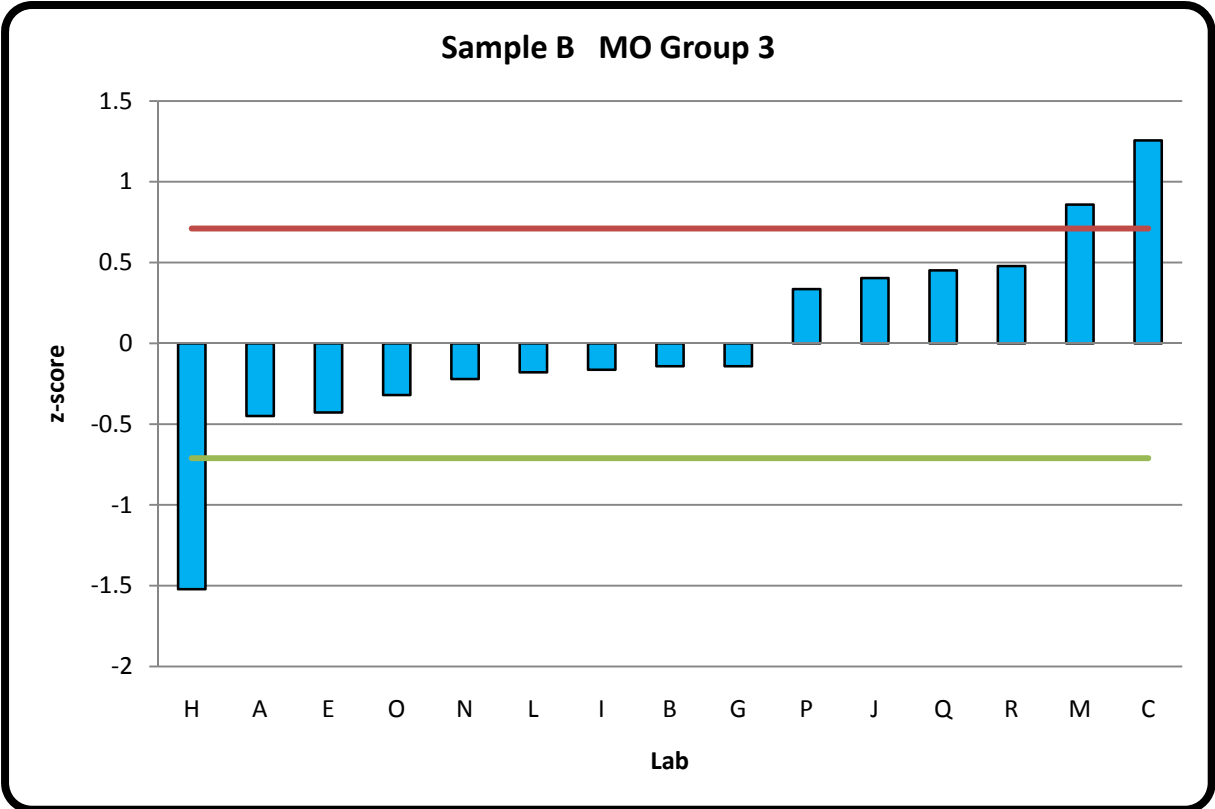
S	30		1.4771				
T	150		2.1761				

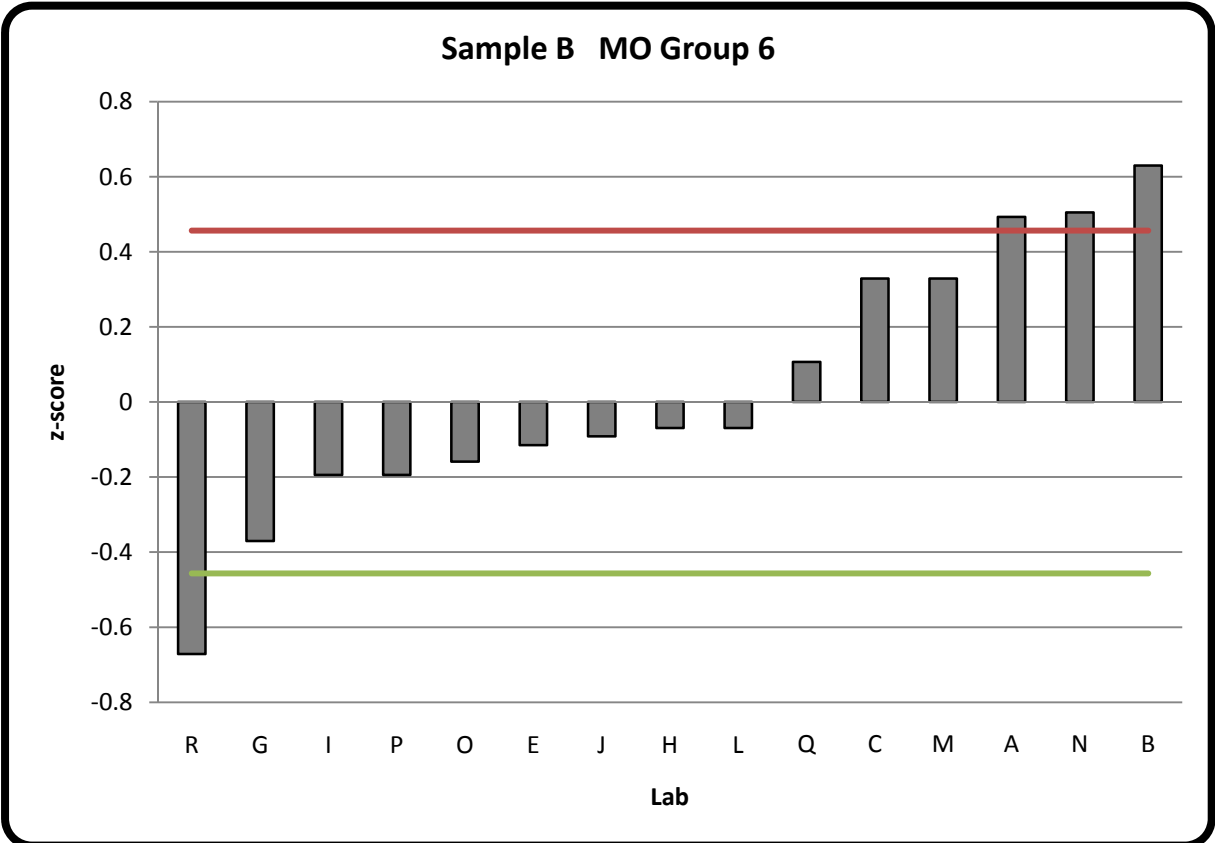
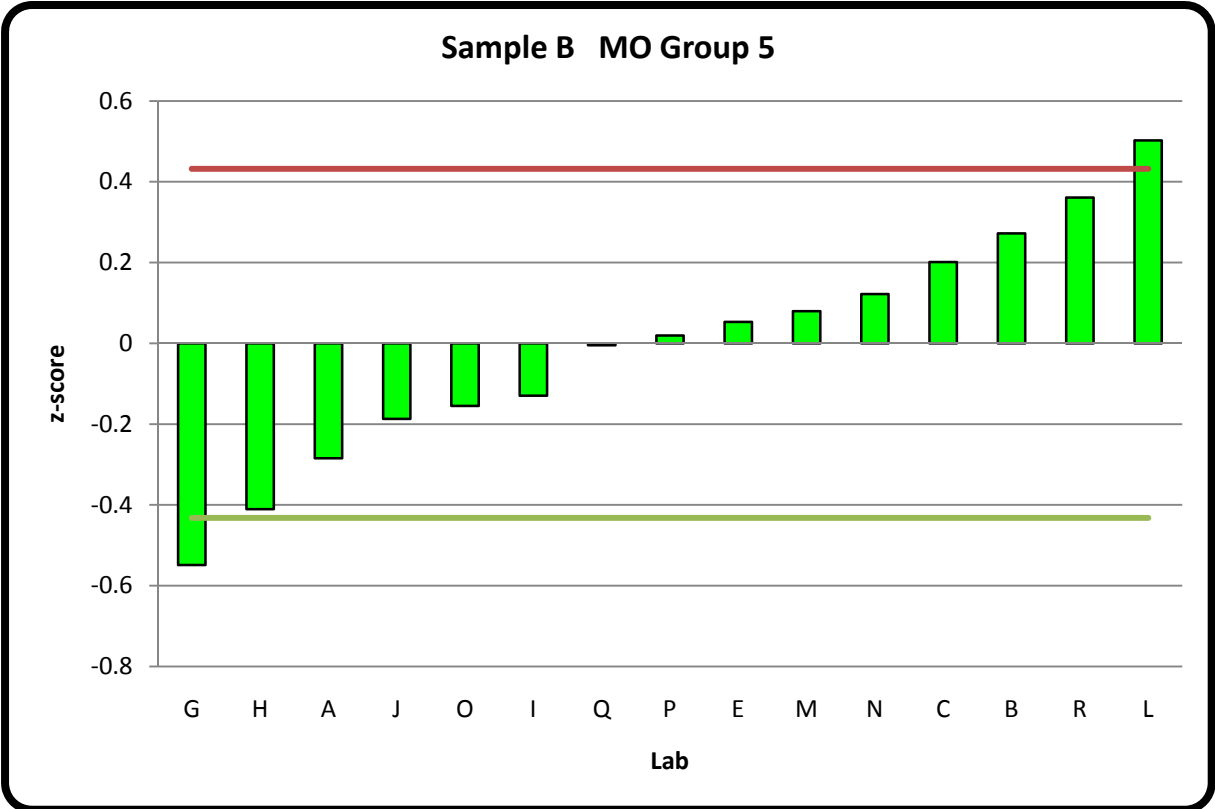
**MO Group 7** (1 determination)

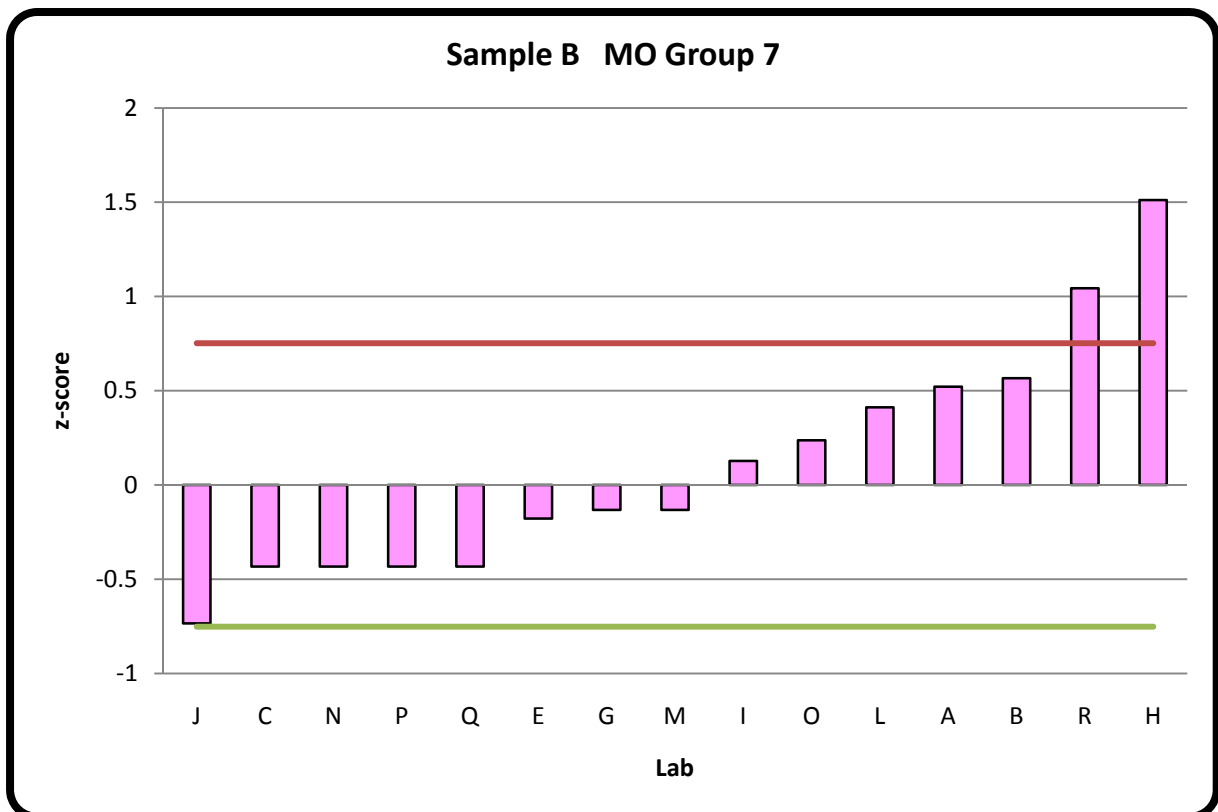
Criterion	Group7	logGroup7					
Units	CFU/ g						
<b>Assigned value</b>							
X	136	2.132					
$u_x$		0.162					
$s_x^*$		0.501					
$p_x$	15	15					
<b>Proficiency</b>							
VT		0.752					
X+VT		2.884					
X-VT		1.380					
$p_d$		2					
<b>Population</b>							
$p_{CA}$		15					
$x_{tot}^*$	136	2.132					
$s_{tot}^*$		0.501					
$p_{tot}$		15					
$p_{INC}$		0					
<b>Results</b>							
Lab	x	z	$x_T$	$z_T$	INC	outlier	$x-x^*$
A	450		2.6532	1.039			0.5210
B	500		2.6990	1.130			0.5667
C	50		1.6990	-0.864			-0.4333
E	90		1.9542	-0.355			-0.1780
G	100		2.0000	-0.264			-0.1322
H	4400		3.6435	3.014		x	1.5112
I	182		2.2601	0.255			0.1278
J	25		1.3979	-1.465			-0.7343
L	350		2.5441	0.821			0.4118
M	100		2.0000	-0.264			-0.1322
N	50		1.6990	-0.864			-0.4333
O	234		2.3691	0.472			0.2369
P	50		1.6990	-0.864			-0.4333
Q	50		1.6990	-0.864			-0.4333
R	1500		3.1761	2.082		x	1.0439
S	5		0.6990				
T	50		1.6990				

On the following pages are the graphs representing the EFMO Method results and z-scores for each Lab, sorted out by increasing values. The robust mean has been set on 0.









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J.-L. Gafner/14.04.2011