INTI – OAA – IAAC T 005 2010 PROFICIENCY TESTING PROGRAM

"Preservatives in Non Alcoholic Beverages"

FINAL REPORT

Date: December 20, 2010

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INDICE

1. INTRODUCCIÓN

Due to the market and quality systems requirements, the testing and calibration laboratories should demonstrate the quality of their measurements participating in proficiency testing (PT) exercises.

Taking into consideration such requirements the IAAC Laboratories Subcommittee is promoting the organization of proficiency testing exercises within the region.

The Argentinean Accreditation Body (OAA) and INTI (National Institute of Industrial Technology), as PT provider, are collaborating with IAAC in this activity.
Until now four exercises have been organized: INTI – OAA – IAAC T 001 2006 "Water analysis", INTI – OAA – IAAC T002 2008 "Meat analysis" and INTI – OAA – IAAC T003 2009 "Fatty acids composition of edible vegetable oils" and INTI – OAA – IAAC T 005 2010 "Preservatives in Non Alcoholic Beverages"

In 2006 exercise the participant laboratories were 70 laboratories from IAAC region and 30 laboratories from APLAC (Asia – Pacific) region.
In 2008 exercise the participant laboratories are 53 laboratories from IAAC region, 7 laboratories from APLAC region and 10 laboratories from SADCA (South Africa) region.
In 2009 exercise the participant laboratories are 38 laboratories from IAAC region, 13 laboratories from APLAC region and 3 laboratories from SADCA (South Africa) region

In the present exercise, the participant laboratories are 23 from IAAC region, 13 laboratories from APLAC region and 1 laboratory from SADCA (South Africa) region.

2. SAMPLES

2.1. Sample Preparation

There were sent two juice samples containing different concentrations of Potassium Sorbate and Sodium Benzoate.

Sample A consisted of a commercial preparation of lemon juice. Sample B consisted of a commercial preparation of apple juice.

Samples were bottled in glass recipients of 100 cm^3. Before that, the recipients were cleaned with detergent, they were rinsed with running water and, after that, they were rinsed with distilled water 5 times. They were drained and dried in heater at 100-105°C. Finally, the recipients were rinsed with 5 parts of 10ml of the corresponding sample.

2.2. Homogeneity

To asses homogeneity, 10% of the simples were analyzed. The results obtained were satisfactory compared to the repeatability of the measurement method.

2.3. Stability

Samples were analyzed after a period of time similar to the one that would pass until the participants analyze the samples. Comparing with the results obtained in the homogeneity tests, the results obtained were satisfactory.

2.4. Reference Values

To asses the performance of the participant laboratories the **consensus value**, estimated as described in **4** was used.

3. RESULTS REPORTED BY PARTICIPANT LABORATORIES

3.1. Results

The results reported by participant laboratories are given in Table 1 (Annex 1).
The number of significant figures and units appear exactly as they were reported by the laboratories.

In graphs 1 to 4 (Annex 2) are shown the results reported by participant laboratories along with the reported uncertainty.
It can also be observed in these graphs, the consensus mean value and standard deviation obtained as is described in item. 4.

3.2. Métodos de ensayo

Participants used the analytical method of their choice to perform the tests. A summary of the methods used by participants is shown in Table 2. This table also shows the accredited tests for each participant.
In Table 3 are shown the chromatographic conditions reported by the participants that measured by HPLC.

4. STATISTICAL PROCEDURE FOR THE ANALYSIS OF RESULTS

The following method was used to estimate the consensus value and the interlaboratory standard deviation:

Robust Method ISO 5725

The consensus value was estimated as the robust mean of the results reported by participating laboratories. The robust mean was calculated using Algorithm A as described in ISO 5725. (1994) Part 5 (ref. 1)

In this exercise, no anomalous result is discarded before putting this method into practice.

The robust standard deviation was estimated using Algorithm A also described in ISO 5725.

A summary of results obtains through this method is shown in the following table.

	SAMPLE A			SAMPLE B		
Parameter	**Mean Value**	**Standard Deviation**	**Relative Standard Deviation (%)**	**Mean Value**	**Standard Deviation**	**Relative Standard Deviation (%)**
Sodium Benzoate (mg/l)	653,2	68,5	10,5	375,5	29,7	7,9
Potassium Sorbate (mg/l)	338,4	41,4	12,2	182,3	22,2	12,2

The deviations between each laboratory mean value and the consensus value for each analyte can be observed on Table 4

5. ASSESSMENT OF PERFORMANCE

The assessment of performance for the participating laboratories was realized according to international standards quoted in bibliography.
The performance criterion used was "z score", defined as:

$$z = (x_{1/2} - x_{ref}) / s_L$$

where:

$x_{1/2}$ = average for each analyte and participant laboratory = $\sum x_i / r$

x_{ref} = consensus value for each analyte in the sample (estimated by robust method ISO 5725, as described in 4.).

r = number of reported results for each analyte (1, 2, 3)

s_L = standard deviation (s_L was estimated by robust method ISO 5725, as described in **4**.)

The calculated "z scores" for each fatty acid and participant laboratory are shown in Table 5 and graphs 5 to 8.
According to the definition in annex 3, it is possible to classify scores as:

$|z| \leq 2$ satisfactory, $2 < |z| < 3$ questionable, $|z| \geq 3$ unsatisfactory

6. COMENTARIOS

A summary of the number of satisfactory, questionable and non satisfactory determinations evaluated by z score is shown in the following table:

Parameter	$|z| < 2$	$2 < |z| < 3$	$|z| \geq 3$
Sample A			
Sodium Benzoate	29	2	1
Potassium Sorbate	25	4	1
Sample B			
Sodium Benzoate	25	3	4
Potassium Sorbate	24	4	2

- The participants submitted their results with different number of significant figures. The laboratories should be aware that this number should be in agreement with the uncertainty of that particular measurement

- 34% of the participants do not estimate uncertainty. Some of the participants that do report uncertainty may be evaluating it incorrectly. These are some examples:
    - Laboratories that submit too low uncertainty: 23 and 36.
    - Laboratories with replicates that vary more than their reported uncertainty: 11,22,27,36, etc

ANNEX 1
TABLES

Table 1 - Results Reported By Participant Laboratories

	Sample A									
	Sodium Benzoate (mg/l)					Potassium Sorbate (mg/l)				
Lab. Nº	Result 1	Result 2	Result 3	Mean Value	Exp U	Result 1	Result 2	Result 3	Mean Value	Exp U
1	**ndr**	**ndr**	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr
2	727,21	720,92	720,01	722,71	7,84	369,79	367,18	366,16	367,71	3,74
3	673,27	673,69	676,59	674,50	11	326,46	326,74	325,67	326,29	7
4	575,2	574,2	578,7	576,00	ndr	358,0	355,1	349,8	354,3	ndr
5	550,72	567,63	579,90	566,08	0,5388	268,74	279,27	286,73	278,25	0,4038
6	805,4	786,8	804,3	ndr	ndr	386,7	376,4	394,3	ndr	ndr
7	657	658	709	675	108	339	338	360	346	55
8	670,4	675,9	678,2	674,8	35,8	340,6	341,9	343,4	342,0	23,3
9	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr
10	493	454	446	ndr	ndr	252	239	237	ndr	ndr
11	662,0	667,9	660,8	663,6	0,12	342,3	343,2	351,6	345,7	0,03
12.	710,78	713,26	713,40	712,48	67,52	339,33	336,73	337,20	337,75	9,71
13	686	685	690	ndr	13	379	380	378	ndr	6
14	537	536	537	ndr	15	198	198	199	ndr	6
15	629	635	643	ndr	46	344	343	347	ndr	33
16	693,25	696,75	692,00	694,0	6,3	236,00	238,60	237,50	237,4	2,7
17	696	718	709	709,00	1,19	359	366	363	363	1,19
18	525,35	527,19	524,89	ndr	ndr	ndr	ndr	ndr	ndr	ndr
19	663,72	680,04	703,90	682,56	9,20	355,94	362,27	366,67	361,63	3,70
20	626	606	606	613	12%	245	265	249	253	10%
21	187,18	187,54	168,78	ndr	ndr	ndr	ndr	ndr	ndr	ndr
22	542,29	545,76	546,59	544,88	0,04	239,88	241,94	234,51	238,78	0,06
23	674,4	676,0	676,5	ndr	0,00096	376,0	376,5	374,5	ndr	0,00078
24	645	671	676	664	25	325	337	340	334	80
25	707,13	713,97	712,79	ndr	ndr	364,51	367,64	367,77	ndr	ndr
26	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr
27	610,9	610,1	607,7	ndr	12,3	296,5	294,9	294,3	ndr	1,1
28	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr
29	617	613	610	613	ndr	322	320	316	320	ndr
30	679,2	678,1	676,7	ndr	ndr	359,8	359,9	359,8	ndr	ndr
31	689,3	704,9	710,6	ndr	14,7	356,0	364,7	367,8	ndr	5,4
32	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr
33	694	699	693	ndr	ndr	368	354	377	ndr	ndr
34	690	700	700	700	ndr	360	370	370	370	ndr
35	683,925	689,65	691,425	ndr	ndr	371,775	374,650	375,000	ndr	ndr
36	688,6	690,0	691,1	ndr	0,038	367,2	366,3	367,1	ndr	0,035
37	729,3	720,5	610,0	ndr	19,37%	341,7	335,0	381,9	ndr	14,38%

ndr: no data reported

Table 1 (cont) - Results Reported By Participant Laboratories

Lab. Nº	Sample B									
	Sodium Benzoate (mg/l)					Potassium Sorbate (mg/l)				
	Result 1	Result 2	Result 3	Mean Value	Exp U	Result 1	Result 2	Result 3	Mean Value	Exp U
1	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr
2	403,48	401,12	399,09	401,23	4,40	195,40	193,44	195,11	194,65	2,12
3	370,29	369,94	373,09	371,11	6	174,34	174,57	173,54	174,15	4
4	289,8	283,3	288,6	287,2	ndr	195,7	195,1	193,2	194,7	ndr
5	380,87	382,07	365,16	376,03	0,4059	186,04	184,84	181,47	184,12	0,4015
6	419,7	417,4	419	ndr	ndr	212,7	214,2	207,5	ndr	ndr
7	367	369	401	379	61	181	181	192	185	30
8	390,6	372,8	374,1	379,2	18,7	191,2	182,9	183,7	185,9	12,3
9	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr
10	286	294	285	ndr	ndr	128	132	130	ndr	ndr
11	361,1	369,4	363,4	364,6	0,12	190,2	192,9	188,9	190,7	0,03
12	410,13	390,66	386,69	395,83	23,15	197,27	185,52	184,01	188,93	6,18
13	389	389	391	ndr	7	202	199	200	ndr	4
14	304	305	305	ndr	9	105	106	106	ndr	3
15	391	400	389	ndr	37	190	192	190	ndr	29
16	372,25	376,50	376,50	375,1	5,8	123,10	123,80	124,40	123,8	2,0
17	370	388	380	380	1,19	184	192	187	187	1,19
18	678,98	676,0	674,05	ndr	ndr	ndr	ndr	ndr	ndr	ndr
19	381,70	385,63	393,97	387,10	5,00	185,69	190,23	194,45	190,12	3,56
20	334	334	366	345	30%	138	132	129	133	17%
21	257,19	257,48	257,23	ndr	ndr	ndr	ndr	ndr	ndr	ndr
22	290,99	289,25	288,16	289,47	0,04	124,40	123,44	122,52	123,45	0,06
23	373,4	371,3	375,7	ndr	0,00096	167,9	167,2	168,7	ndr	0,00078
24	366	374	368	369	25	176	179	176	177	80
25	402,69	413,34	402,95	ndr	ndr	196,64	201,58	196,24	ndr	ndr
26	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr
27	124,9	128,6	132,1	ndr	2,6	158,63	158,30	159,16	ndr	0,53
28	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr
29	395	414	393	400	ndr	194	203	195	197	ndr
30	381,4	383,3	381,9	ndr	ndr	185,7	185,7	184,5	ndr	ndr
31	393,0	397,0	392,9	ndr	8,3	192,7	194,5	193,3	ndr	2,9
32	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr	ndr
33	389	391	386	ndr	ndr	201	195	197	ndr	ndr
34	390	390	390	390	ndr	190	190	200	190	ndr
35	378,200	375,400	380,600	ndr	ndr	202,200	200,000	203,000	ndr	ndr
36	387,2	385,73	380,3	ndr	0,038	439,5	437,8	435,1	ndr	0,035
37	424,5	395,6	347,9	ndr	19,87%	136,3	172,9	172,2	ndr	15,2%

ndr: no data reported

Table 2
Reference Standards – Accredited Laboratories

Lab n°	Reference Standard	Accredited test?	In process of accreditation?
1	-	no	no
2	Sodium Benzoate (100,34%). Sorbic acid (99,82%)	no	yes
3	Standard Reference material Benzoic acid (NIST) - Reference Material Sorbid acid (Institute of industrial organic Chemistry Analytical Department)	yes	yes
4	no informa	no	no
5	AOAC Official Method 929.08 - Legend Chromatographic method	no	yes
6	Chromcircle 2.0 Merck HPLC Application Note 960055	no	no
7	GB/T 5009.29-2003	yes	-
8	Sodium Benzoate Fluka. Potasium Sorbate Fluka	no	-
9	-	yes	-
10	Manual, métodos de análisis fisicoquímicos de alimentos, aguas y suelos. Instituto de Salud Publica de Chile, pag 151,1995	no	no
11	no informa	yes	-
12	Benzoic acid: SRM 350b; sorbic acid: RM N° IPO F170	yes	yes
13	Fuleki, T., Pelayo E. Palabay R.B (1993) "Carboxylic Acid composition of authentic varietal and commercial grape juices". JAOAC Int 76(3), 59i-599 - Hyoung, S.L. (1995) "Liquid chromatographic determination of benzoic acid juice. Interlaboratory study"JAOAC int 78(1), 80-82	yes	-
14	United State Department of Agriculture. Food Safety and Inspection Service, Office of Public Health Science. Determination of Benzoic acid, Sorbic acid, and Methyl, Propyl and Butyl Parabens by HPLC.	no	no
15	AOAC VOL II, 16th edition HPLC-DAD, AOAC, 979.08	-	yes
16	Benzpic acid 99,9% (Supelco). Sorbic Acid 99,9% (supelco)	no	no
17	Chromcircle (version 1.3) - Merck KgaA, 64271 Darmstadt, Germany	no	no

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Table 2 (cont)
Reference Standards – Accredited Laboratories

Lab N°	Reference Standard	Accredited test?	In process of accreditation?
18	AOAC 960,38 15va edición, método espectrofotométrico	no	no
19	Benzpic acid 99,9%- Supelco. Sorbic Acid 99,9%- Supelco	no	yes
20	ISO 22855:2008	no	yes
21	IRAM 15717	no	no
22	In house method based on HPLC Analysis (waters)	yes	-
23	Manual, métodos de análisis fisicoquímicos de alimentos, aguas y suelos. Instituto de Salud Publica de Chile, pag 151, año1998	yes	-
24	Sodium Benzoate. Potasium Sorbate	yes	-
25	Método interno	no	no
26	-	no	no
27	método propio basado en Tfouni, S.A.V. and Toledo, M.C.F. "Determination of Benzoic and Sorbid Acids in Brazillia Food", Food Contrl 13(2002) 117-123	no	no
28	-	no	no
29	ISO 22855:2008€ Fruit and Vegetable Products - Determination of Benzoic Acid and Sorbic Acid Concentrations - high Performance Liquis Chromatographic methos.	no	yes
30	-	no	-
31	AOAC Officil Method 979.08 - Benzoate, Caffeine, and Saccharine in Soda Beverages.- Liquid Chromatographic Method. AOAC INTERNATIONAL 17th Edition - Vol II, Chapter 29, p.2, modificado	no	no
32	-	yes	-
33	Métodos Fisico-Químicos para el análisis de alimentos/Ministerio de Salud, Agencia nacional de Vigilancia Sanitaria. IV Edicion. Brasilia, Ministerio de Salud 2005	no	no
34	Bui and Cooper JAOAC Vol 70 No5 1987 Page892. Sorbic and potasium salt ≥99%, sigma. Product number 51751. Benzoic Acis, 99,9, product 10052	yes	-
35	Método propio validado	no	no
36	Manual de análisis fisicoquímico de alimentos y suelos. Instituto de Salud Pública de Chile. Pag 151. 1998	no	-
37	Electroforesis capilar	no	no

Table 3
Chromatographic conditions

Lab n°	Stationary Phase	Particle Size (µm)	Column dimensions (mm x mm)	Mobile phase	Wavelength (nm)	Flow rate (ml/min)	Volume (µl)	Type injection
2	C18	5	250 x 0,6	Buffer fosfato:metanol (94:6)	225	1,0	20	Manual
3	Hypersil ODS C18	5	250 x 4,0	Ammonium Acetate buffer: Methanol	238	1,0	10	Automatic
4	C18	5	250 x 4,6	Buffer sodium acetate/acetonitrile (80:20)	254	1,5	20	Loop lleno
5	Hypersil ODS (C18)	0,5	250 x 4,6	Acetonitrile-10 5mM Ammonium Acetate/H_2O (pH 5)-90	254	1,0	20	Automatic
6	C18 Agilent Eclipse XDB	5	150 x 4,6	KH_2PO_4 0,05M pH 3,9/Acetonitrilo 87/13	230	2	10	Automatic
7	C18	5	250 x 4,6	MeOH:0,02M NH_4OAc = 5:95	230	1	10	Automatic
8	C18	5	150 x 4,6	Acetonitrile-Acetate Buffer (20-80) pH4,5	234	0,5	20	Automatic
10	Ultremex C18 phenomenex	5	150 x 4,60	Buffer fosfato:metanol (95:5) pH=6,5	232	1,0	20	Manual
11	no data reported	no data reported	no data reported	no data reported	no data reported	no data reported	no data reported	no data reported
12	Hypersil gold	5	150 x 4,6	Ammonium acetate buffer Methanol	240	1	10	Automatic
13	C18 KROMASIL	5	250 x 4,6	Acetonitrilo:30 Acetato de sodio:70 (20mM)	214	1,0	20	Manual
14	Columna ultra acuosa C18	5	250 x 4,6	15 mL Ácido Acético + 15g Acetato de Amonio en 1 litro de agua Metanol 50:50	230 Benzoato 254 Sorbato	1	20	Loop 20µL
15	Diisobutyl n-octadecilisilano Agilent Zorbax	3,5	75 x 4,6	95% Sn de Acético 5% en agua 5% Sn Acetonitrilo: Agua 75:25	237 y 265	1	5	Automatic

Table 3 (cont)
Chromatographic conditions

Lab n°	Stationary Phase	Particle Size (µm)	Column dimensions (mm x mm)	Mobile phase	Wavelength (nm)	Flow rate (ml/min)	Volume (µl)	Type injection
16	Octadesyl group	5	150 x 46	50 mM CH_3C00NH_4 (pH 4,4)/Metanol	254/257	1	20	Manual
17	Columna Sorbax SB-C8	3,5	75 x 4,6	Buffer fosfatos pH 6.8: Metanol (10:1)	226	0,7	20	Loop lleno
19	ODS-A	5	25 x 0,46	Trisodium citrate buffer:Acetonitrile:Metanol pH(4) 7:2:1	254	1,50	25.0	Automatic
20	C 18	5	250 x 4,6	Buffer Amonium Acetate Metanol pH 4,6	235	1,1	5	Automatic
21	XDB-C8	3,5	150 x 4,6	Buffer fosfato 90% pH 6,5 CH3OH 10%	227	1,0	20	Automatic
22	Lichrocart RP-18	5	125 x 4,6	CH_3CooNH_4:ACN 85:15	254	1,0	10	Manual
23	µ Bondapak C18 WATERS	10	300 x 3,9	Buffer fosfato: metanol (95:5)	232	1	20	Automatic
24	Supelcosil C18	5	250	80-20 3,28g/2L Sodium acetate pH 4,3 Acetonitrile	254 230	1,3	10	Automatic
25	Licrospher 100 RP-18	5	125 x 4	A: Buffer 4,3 (Acido acetico 2% - Acetato de sodio):Metanol (80:20)	240	1,2	10	Automatic
27	ZORBAX XDB C18	5	150 x 4,6	Agua: Acetonitrilo: Buffer acetato de amonio 0,005M 81:17:2	Benz 228 Sorb 260	2	20	Automatic
29	Microsorb-MV 100 C8 5µm	5	250 x 4,6	Buffer MeOH - HAcO/NaAcO (pH 4,6)	235	1,2	10	Manual with 10 µl loop
30	Lichrospher 100	5	125 x 4	Buffer fosfato pH 6,7: Metanol HPLC (90:10)	225	1	5	Automatic
31	ODS – Supelcosil LC 18 DB-Supelco	5	250 x 4,6	MeOH 40% - Buffer HAcO/NaAcO (pH 4,3) 60%	Benz 227 Sorb 258	1	10	Automatic
33	Lichrospher 100 RP-18	5	125 x 4	Fosfato 0,03 (pH 4,8):Acetronitrilo (90:10)	230	2	20	manual
34	Merck Lichrospher 100 Rp-18	5	125 x 45	10% MeOH + 90% phosphate buffer (pH 6,5)	227	0,8	20	Automatic
35	Resina poliestireno divinilbenceno-Amino. Catión H (Bio Rad)	8	30 x 4,6	Ácido sulfúrico	242	0,5	50	Automatic
36	C-18	5	150 x 4,6	Buffer pH 6,5 metanol (90:10)	232	1	10	Automatic

Table 4
Deviation from consensus value

nº Lab	SAMPLE A				SAMPLE B			
	Sodium Benzoate (mg/l)		Potassium Sorbate (mg/l)		Sodium Benzoate (mg/l)		Potassium Sorbate (mg/l)	
	Mean Value	% dev. from consensus value	Mean Value	% dev. from consensus value	Mean Value	% dev. from consensus value	Mean Value	% dev. from consensus value
1	-	-	-	-	-	-	-	-
2	722,71	10,6	367,71	8,7	401,23	6,8	194,65	6,8
3	674,52	3,3	326,29	-3,6	371,11	-1,2	174,15	-4,5
4	576,03	-11,8	354,30	4,7	287,23	-23,5	194,67	6,8
5	566,08	-13,3	278,25	-17,8	376,03	0,1	184,12	1,0
6	798,83	22,3	385,80	14,0	418,70	11,5	211,47	16,0
7	674,67	3,3	345,67	2,1	379,00	0,9	184,67	1,3
8	674,83	3,3	341,97	1,1	379,17	1,0	185,93	2,0
9	-	-	-	-	-	-	-	-
10	464,33	-28,9	242,67	-28,3	288,33	-23,2	130,00	-28,7
11	663,57	1,6	345,70	2,2	364,63	-2,9	190,67	4,6
12	712,48	9,1	337,75	-0,2	395,83	5,4	188,93	3,6
13	687,00	5,2	379,00	12,0	389,67	3,8	200,33	9,9
14	536,67	-17,8	198,33	-41,4	304,67	-18,9	105,67	-42,0
15	635,67	-2,7	344,67	1,9	393,33	4,7	190,67	4,6
16	694,00	6,2	237,37	-29,9	375,08	-0,1	123,77	-32,1
17	707,67	8,3	362,67	7,2	379,33	1,0	187,67	2,9
18	525,81	-19,5	-	-	676,34	80,1	-	-
19	682,55	4,5	361,63	6,9	387,10	3,1	190,12	4,3
20	612,67	-6,2	253,00	-25,2	344,67	-8,2	133,00	-27,1
21	181,17	-72,3	-	-	257,30	-31,5	-	-
22	544,88	-16,6	238,78	-29,4	289,47	-22,9	123,45	-32,3
23	675,63	3,4	375,67	11,0	373,47	-0,6	167,93	-7,9
24	664,00	1,7	334,00	-1,3	369,33	-1,7	177,00	-2,9
25	711,30	8,9	366,64	8,3	406,33	8,2	198,15	8,7
26	-	-	-	-	-	-	-	-
27	609,57	-6,7	295,23	-12,8	128,53	-65,8	158,70	-13,0
28	-	-	-	-	-	-	-	-
29	613,33	-6,1	319,33	-5,6	400,67	6,7	197,33	8,2
30	678,00	3,8	359,83	6,3	382,20	1,8	185,30	1,6
31	701,60	7,4	362,83	7,2	394,30	5,0	193,50	6,1
32	-	-	-	-	-	-	-	-
33	695,33	6,4	366,33	8,3	388,67	3,5	197,67	8,4
34	696,67	6,7	366,67	8,4	390,00	3,8	193,33	6,0
35	688,33	5,4	373,81	10,5	378,07	0,7	201,73	10,6
36	689,90	5,6	366,87	8,4	384,41	2,4	437,47	139,9
37	686,60	5,1	352,87	4,3	389,33	3,7	160,47	-12,0

Table 5 – Z Score

Parameter	Sample A		Sample B	
Laboratory	Sodium Benzoate	Potassium Sorbate	Sodium Benzoate	Potassium Sorbate
1	-	-	-	-
2	1,0	0,7	0,9	0,6
3	0,3	-0,3	-0,1	-0,4
4	-1,1	0,4	-3,0	0,6
5	-1,3	-1,5	0,0	0,1
6	2,1	1,1	1,5	1,3
7	0,3	0,2	0,1	0,1
8	0,3	0,1	0,1	0,2
9	-	-	-	-
10	-2,8	-2,3	-2,9	-2,4
11	0,2	0,2	-0,4	0,4
12	0,9	0,0	0,7	0,3
13	0,5	1,0	0,5	0,8
14	-1,7	-3,4	-2,4	-3,5
15	-0,3	0,2	0,6	0,4
16	0,6	-2,4	0,0	-2,6
17	0,8	0,6	0,1	0,2
18	-1,9	-	10,1	-
19	0,4	0,6	0,4	0,4
20	-0,6	-2,1	-1,0	-2,2
21	-6,9	-	-4,0	-
22	-1,6	-2,4	-2,9	-2,7
23	0,3	0,9	-0,1	-0,6
24	0,2	-0,1	-0,2	-0,2
25	0,8	0,7	1,0	0,7
26	-	-	-	-
27	-0,6	-1,0	-8,3	-1,1
28	-	-	-	-
29	-0,6	-0,5	0,8	0,7
30	0,4	0,5	0,2	0,1
31	0,7	0,6	0,6	0,5
32	-	-	-	-
33	0,6	0,7	0,4	0,7
34	0,6	0,7	0,5	0,5
35	0,5	0,9	0,1	0,9
36	0,5	0,7	0,3	11,5
37	0,5	0,3	0,5	-1,0

ANNEX 2
GRAPHS

Graph 1
Values Reported by Participants - Sample A- Sodium Benzoate
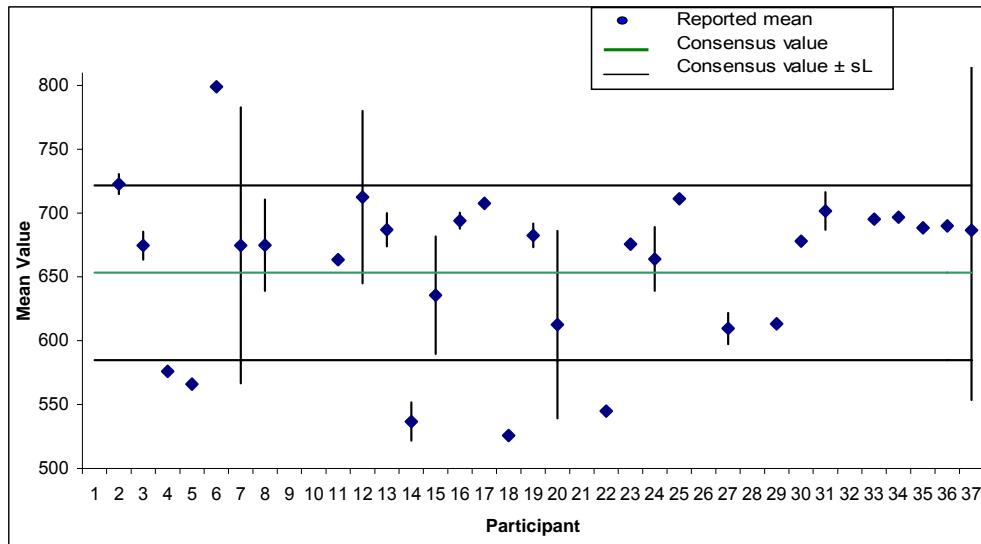

Out of Scale Participant

Lab	Mean Value
21	181,17
10	464,33

Graph 2
Values Reported by Participants - Sample A- Potassium Sorbate
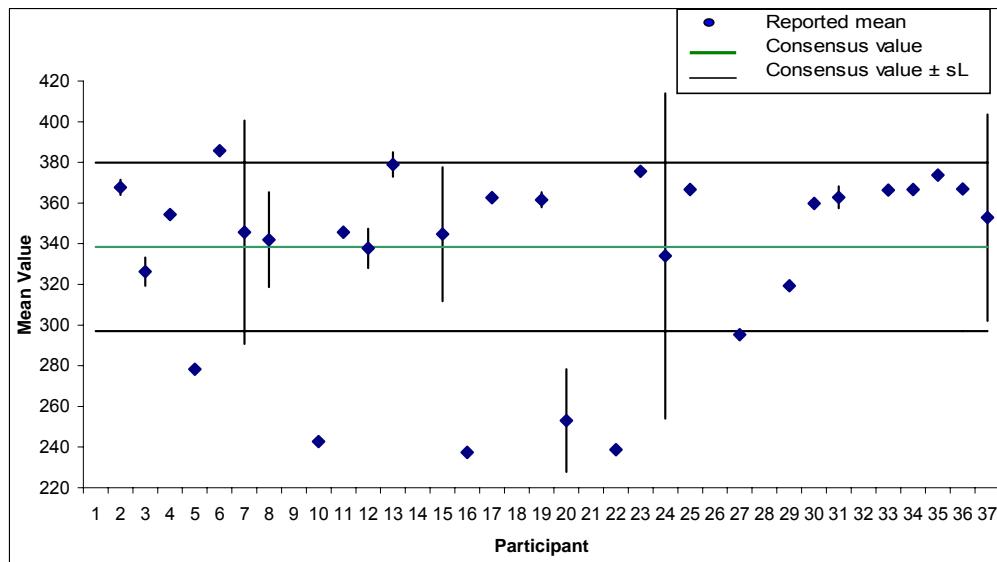
Out of Scale Participant

Lab	Mean Value
14	198,33

Graph 3
Values Reported by Participants - Sample B- Sodium Benzoate
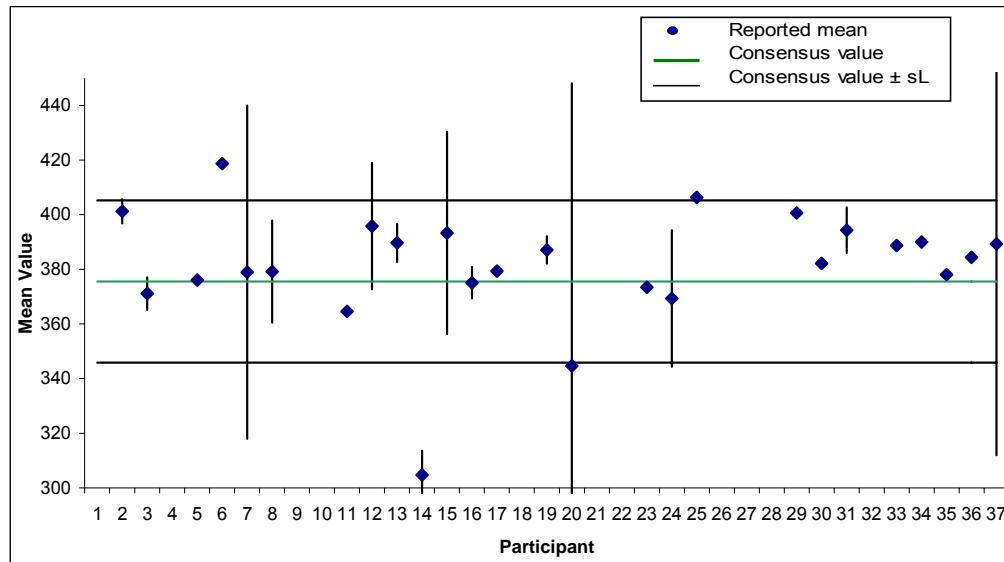
Out of Scale Participant

Lab	Mean Value	Lab	Mean Value
18	676,34	10	288,33
27	128,53	21	257,30
4	287,23	22	289,47

Graph 4
Values Reported by Participants - Sample B- Potassium Sorbate
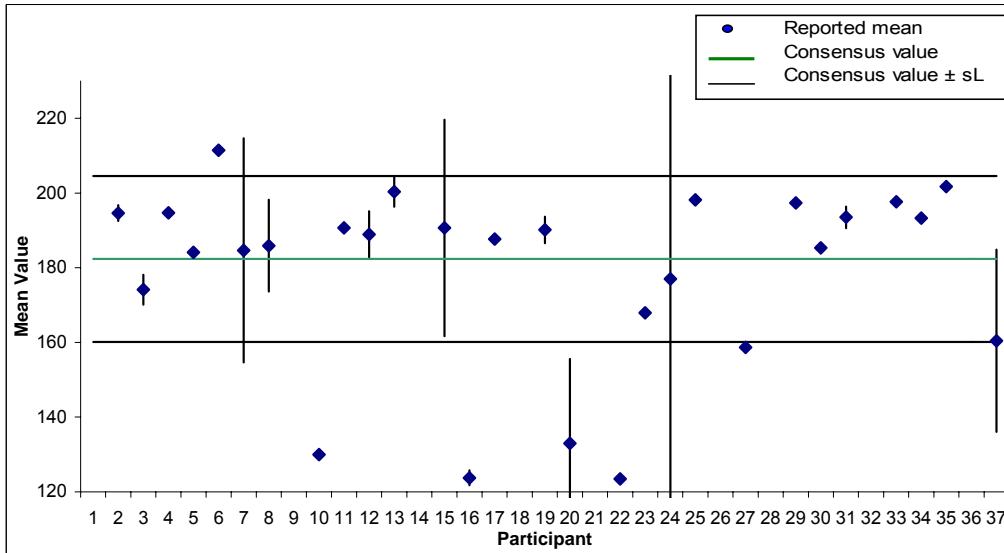

Out of Scale Participant

Lab	Mean Value
36	437,47
14	105,67

Graph 5
Z Score- Sample A- Sodium Benzoate
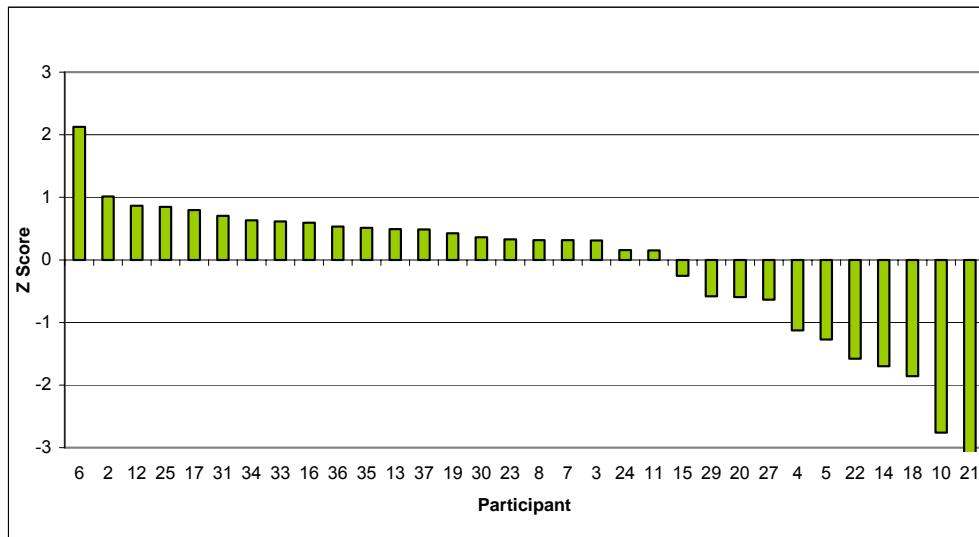
Out of Scale Participant

Lab	z
21	-6,89

Graph 6
Z Score- Sample A- Potassium Sorbate
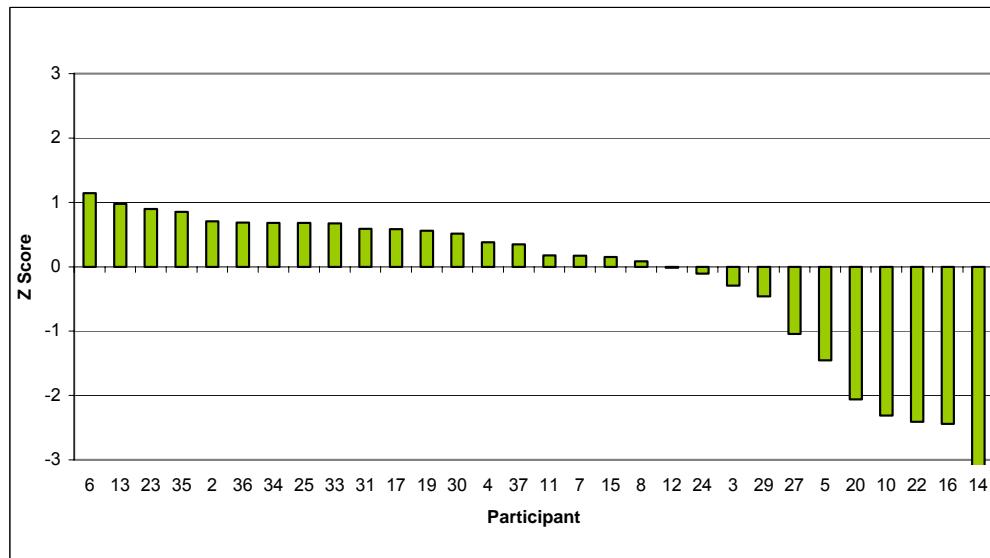
Out of Scale Participant

Lab	z
14	-3,38

Graph 7
Z Score- Sample B- Sodium Benzoate
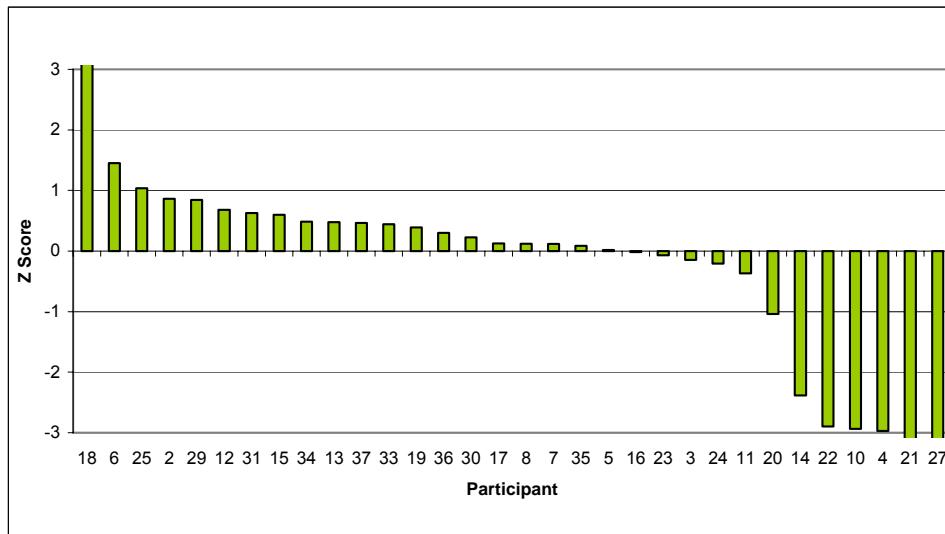
Out of Scale Participant

Lab	z
18	10,12
27	-8,31
21	-3,98

Graph 8
Z Score- Sample B- Potassium Sorbate
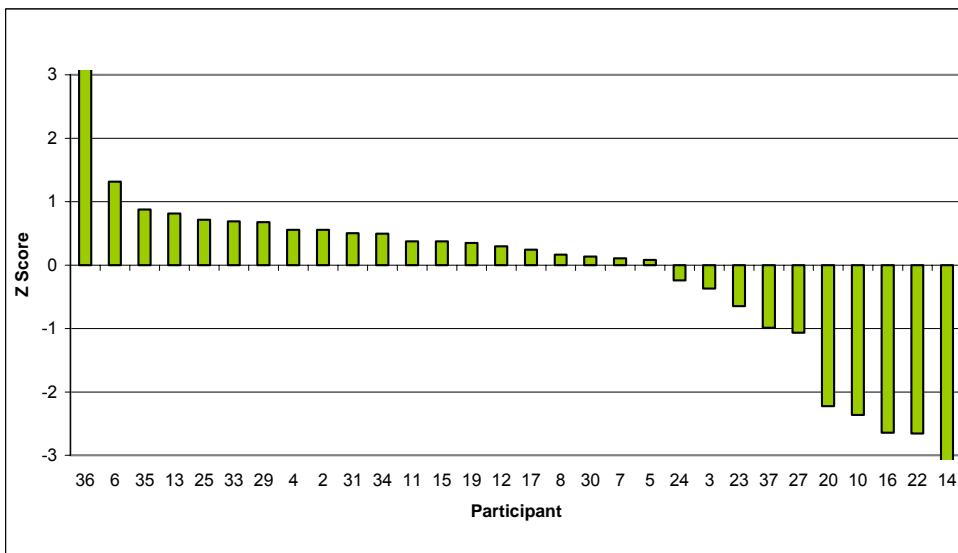
Out of Scale Participant

Lab	z
36	11,51
14	-3,46

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