



International Cooperative Programme on  
Assessment and Monitoring of  
Air Pollution Effects on Forests

Technical Report QA-RFoliar23

## 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Michael Tatzber



Austrian Research Centre for Forests  
Forest Foliar Co-ordinating Centre  
Seckendorff-Gudent-Weg 8  
A-1131 Vienna/Austria



## **TABLE OF CONTENTS**

<b>1 INTRODUCTION</b>	<b>1</b>
<b>2 TASK, MATERIAL, PARTICIPANTS, EVALUATION</b>	<b>2</b>
2.1 Task	2
2.2 Material	3
2.3 Participants	4
2.4 Data Evaluation	6
<b>3 RESULTS</b>	<b>10</b>
3.1 Main results of the questionnaire	10
3.2 Results of the 25 <sup>th</sup> Interlaboratory Comparison Test	11
3.3 Comparison of the 25 <sup>th</sup> Interlaboratory Test with former tests	15
3.4 Evaluation by element	19
3.4.1 Nitrogen	19
3.4.2 Sulphur	19
3.4.3 Phosphorus	19
3.4.4 Calcium	19
3.4.5 Magnesium	19
3.4.6 Potassium	20
3.4.7 Carbon	20
3.4.8 Zinc	20
3.4.9 Manganese	20
3.4.10 Iron	20
3.4.11 Copper	20
3.4.12 Lead	21
3.4.13 Cadmium	21
3.4.14 Boron	21
3.4.15 Arsenic	21
3.4.16 Cobalt	21
3.4.17 Chromium	22
3.4.18 Mercury	22
3.4.19 Nickel	22
<b>4 CONCLUSIONS</b>	<b>23</b>
<b>5 LITERATURE</b>	<b>25</b>
List of participating laboratories	28
Method Code - Pretreatment	34
Method Code - Determination	35
List of abbreviations	36
ANNEX - Results	37



## 1 INTRODUCTION

A high quality and comparable laboratory standard in all countries is indispensable for a European-wide survey of the state of forests. Small changes in nature should be detected in a reliable way and not the changes in laboratory quality. Important issues on this way are method harmonisations, QA/QC in the laboratory daily routines and an implementation of a regularly performed Interlaboratory Comparison Tests programme.

This Needle/Leaf Interlaboratory Comparison Test programme started with the first European Foliar-Interlaboratory Comparison Test on two certified standards (BCR 100-beech leaves and BCR 101 - spruce needles) in 1993. The data were submitted by post or fax and had to be rechecked from the laboratories. All the data collection and evaluation had to be done manually. The final report was available after some months. The Interlaboratory Comparison Tests were performed biannually till 2002.

Beginning with 2003/2004 (6<sup>th</sup> Interlaboratory Comparison Test) an annual test program was set up and the tests were performed from the Forest Foliar Co-ordinating Centre/Austria (FFCC). The data collection was done via internet. The Needle/Leaf Interlaboratory Comparison Test program was opened for every interested laboratory.

Beginning in 2012 an internet based web interface was used for the data collection, to collect the billing information for the participation fee, for the data evaluation and for the creation of online qualification reports. The interface offers the possibility for first data checks (decimal errors, non plausible results, max LOQ) immediately before the final evaluation. At present the results of the recent ringtest are available within some days, so the laboratories can react – in case of unsatisfactory results – very fast. For this case a re-qualification procedure was set up, starting with the 11<sup>th</sup> Test in 2009 (see: <http://bfw.ac.at/rz/bfwcms2.web?dok=7830>). This feedback procedure is mandatory for all *ICP-Forests laboratories* and showed very a positive effect on the data quality.

To support the participating laboratories and to exchange knowledge between them, meetings of the heads of the laboratories at regular intervals are organized from the ICP-Forests Working Group on quality assurance and quality control in laboratories. Leaf and needle reference materials for method validation and method verification are offered by FFCC (see: <http://bfw.ac.at/rz/bfwcms2.web?dok=5146>).

Today this interlaboratory test program is open for every laboratory and it is financed by participation fee, by advertising, by selling reference materials, by ringtest sample collection and/or sample preparation from participating laboratories. An overview is given on the ICP-Forests webpage, by following link:

<http://icp-forests.net/group/qualityinlaboratories/page/foliage-and-litterfall-ringtest-and-qa-qc-information>

## 2 TASK, MATERIAL, PARTICIPANTS AND EVALUATION

### 2.1 Task

The Forest Foliar Co-ordinating Centre established the following timetable:

- Information of the participating labs (March 2023)
- Registration of the participants via internet (30<sup>th</sup> June 2023)
- Submission of the ring test samples (July 2023)
- Submission of the results from the labs (October-December 2023)
- Deadline of data input (1<sup>st</sup> January 2024)
- Evaluation according to DIN 38402-42:2005-09 (January 2024)
- Submission of the final report and the online qualification reports (February 2024)
- Re-qualification process finished (1<sup>st</sup> September 2024)

The mandatory parameters C, Ca, K, Mg, N, P and S had to be analysed from all *ICP-Forests laboratories*, optional parameters were As, B, Cd, Cr, Co, Cu, Fe, Hg, Mn, Ni, Pb and Zn.

Results from a lot of other elements could be submitted, too. All possible elements are shown in Figure 1.

**Figure 1:** Possible elements

Ia	IIa	IIIb	IVb	Vb	VIb	VIIb	VIIIb				Ib	IIb	IIIa	IVa	Va	VIa	VIIa	VIIIa
1 H																		2 He
3 Li	4 Be												5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg												13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr	
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe	
55 Cs	56 Ba	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	
87 Fr	88 Ra	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Cn	113 Nh	114 Fl	115 Mc	116 Lv	117 Ts	118 Og	
		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb			
		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No			
 Mandatory (for ICP-Forests labs)				 Optional (for ICP-Forests labs)				 Additional (special interest for more labs)				 Possible						

For each parameter four replicates per sample are necessary. The minimum sample weight for mandatory and optional elements should be 250 mg per replicate, in order to ensure the homogeneity of the sample material. All results must be calculated on a dry weight basis (105°C).

In case that an extra milling step is needed for C, N or S determination with a micro elemental-analyzer for C, N or S for solids (sample weight < 100mg), a subsample of the whole sample for milling is recommended to avoid a possible contamination (Cr, Ni, Fe).

The used pre-treatment method and the determination method must be specified by a code. This code was harmonized for all ringtests (foliage & litterfall, deposition & soil solution and soil) after the 4<sup>th</sup> Meeting of the Heads of the Laboratories in Zadar 2013.

For a deeper evaluation - all participant laboratories had to answer a questionnaire to get more information about the status of their quality control systems, about their instrumentation, about their sample number/year and about their methodical knowledge. *ICP-Forests laboratories* had to mark all parameters, if they plan to analyse and submit monitoring results to ICP-FORESTS PCC from the growing season 2022.

## 2.2 Material

In July 2022 the Austrian Federal Research Centre for Forests, Natural Hazards and Landscape (BFW) sent out four dried and powdered plant samples to 43 laboratories in 22 countries.

The samples consisted of:

1. Beech leaves (Austria)
2. Spruce needles (Germany) – same sample as for the 20<sup>th</sup> test (sample 2 there)
3. Spruce needles (Austria)
4. Larch needles (Germany)

**Sample 1** was collected in Lower Austria (Reinhard Hagen & Michael Fransche). **Sample 2** was collected and prepared from Mrs. Gabriele Trefz-Malcher (FVA-Baden-Württemberg). **Sample 3** was collected in Austria. **Sample 4** was collected in Sachsen, Germany (Ulrike Schmidt).

Special thanks to all colleagues who collected and prepared samples for this interlaboratory comparison! The further sample preparation (drying and grinding) - if necessary - was done in the BFW laboratory for air pollution monitoring and plant analyses. Before the samples were sent out they were once more homogenized and filled in PE-bags. Homogeneity was tested for these samples by analysing their B, Ca, Cr, Cu, Fe, K, Hg, Mg, Mn, N, Ni, S and Zn contents in eight randomly selected sub samples. No significant variation (Kruskal-Wallis Test - 95% significance level) could be found between the results of eight sub samples, and they were therefore considered to be homogeneous.

## 2.3 Participants

Table 1 shows the number of countries and laboratories taking part in the interlaboratory comparison test program.

**Table 1:** Numbers of countries and laboratories since the first interlaboratory comparison test

Interlaboratory Comparison Test	Year	Number of countries	Number of laboratories
1 <sup>st</sup>	1993/94	21	24
2 <sup>nd</sup>	1995/96	25	39
3 <sup>rd</sup>	1997/98	29	51
4 <sup>th</sup>	1999/00	29	52
5 <sup>th</sup>	2001/02	29	53
6 <sup>th</sup>	2003/04	26	46
7 <sup>th</sup>	2004/05	23	43
8 <sup>th</sup>	2005/06	30	52
9 <sup>th</sup>	2006/07	28	53
10 <sup>th</sup>	2007/08	29	54
11 <sup>th</sup>	2008/09	28	56
12 <sup>th</sup>	2009/10	30	56
13 <sup>th</sup>	2010/11	29	60
14 <sup>th</sup>	2011/12	28	62
15 <sup>th</sup>	2012/13	28	61
16 <sup>th</sup>	2013/14	25	57
17 <sup>th</sup>	2014/15	25	54
18 <sup>th</sup>	2015/16	25	53
19 <sup>th</sup>	2016/17	22	45
20 <sup>th</sup>	2017/18	23	48
21 <sup>st</sup>	2018/19	24	52
22 <sup>nd</sup>	2019/20	23	47
23 <sup>rd</sup>	2020/21	23	48
24 <sup>th</sup>	2021/22	25	47
25 <sup>th</sup>	2022/23	22	43

One participating laboratory did not send any results until the end of the deadline (A83). With a few exceptions, all other laboratories analysed the complete list of mandatory elements in the 25<sup>th</sup> Interlaboratory Comparison Test (s. Table 2).

**Table 2:** Analysed elements from the participant laboratories (green); no results were submitted (grey); red “X”: monitoring samples will be analyzed from the growing season 2022 and these results will be sent to PCC in 2023 (“*ICP-Forrests laboratory*”)

## 2.4 Data Evaluation

Only in the case that four replicates above the quantification limits are entered for a sample its results can be used for calculating an outlier free laboratory mean value. Results below the quantification limit are marked with "<", followed by the quantification limit of the laboratory (e.g. <0.1).

The results of this interlaboratory comparison test were evaluated according to the normative DIN 38402-42:2005-09. This method identifies three types of outliers: With the Grubbs-test the four replicates from each laboratory are first checked for outliers between them (type 1 outlier). The second step is to compare the recalculated mean values of each lab with the mean value from all labs as well as with the Grubbs-test for outliers (type 2 outlier). Now the outlier free total mean value and the outlier free maximum and minimum mean values of all labs can be calculated. At this point, marked type 1 outliers between the outlier free maximum and minimum mean values are not longer outliers; hence they are not excluded anymore and will be included again for the further evaluation of the interlaboratory comparison test. Third, the recalculated standard deviation from the laboratories must be compared with the total standard deviation (Cochran test) to eliminate laboratories with an excessive standard deviation (outlier type 3). In case of detected type 3 outliers, a re-check for type 2 outliers must be performed. The last step is to calculate the outlier free statistical values.

After calculation of the outlier free mean value for each element/sample and the laboratory mean value the recovery is calculated and compared with the tolerable limits from Tables 3 and 4. Laboratory results inside these tolerable limits are marked in green colour (passed the test); outside they are marked in orange colour (failed the test). This type of evaluation was fixed in the Foliar Expert Panel Meetings of As (1994) and Vienna (1997).

**Table 3:** Tolerable limits for **normal concentrations** in foliage for the mandatory and optional elements

Element	Tolerable deviation from mean in %	Adopted by the Expert Panel Foliage and Litterfall
As	80-120	15 <sup>th</sup> Meeting - Zagreb 2017
B	80-120	6 <sup>th</sup> Meeting - Bonn 1999
C	95-105	6 <sup>th</sup> Meeting - Bonn 1999
Ca	90-110	10 <sup>th</sup> Meeting - Madrid 2007
Cd	70-130	6 <sup>th</sup> Meeting - Bonn 1999
Co	75-125	15 <sup>th</sup> Meeting - Zagreb 2017
Cr	75-125	15 <sup>th</sup> Meeting - Zagreb 2017
Cu	80-120	8 <sup>th</sup> Meeting - Prague 2003
Fe	80-120	6 <sup>th</sup> Meeting - Bonn 1999
Hg	80-120	15 <sup>th</sup> Meeting - Zagreb 2017
K	90-110	10 <sup>th</sup> Meeting - Madrid 2007
Mg	90-110	10 <sup>th</sup> Meeting - Madrid 2007
Mn	85-115	8 <sup>th</sup> Meeting - Prague 2003
N	90-110	6 <sup>th</sup> Meeting - Bonn 1999
Ni	80-120	15 <sup>th</sup> Meeting - Zagreb 2017
P	90-110	10 <sup>th</sup> Meeting - Madrid 2007
Pb	70-130	6 <sup>th</sup> Meeting - Bonn 1999
S	85-115	10 <sup>th</sup> Meeting - Madrid 2007
Zn	85-115	8 <sup>th</sup> Meeting - Prague 2003

**Table 4:** Tolerable limits for **low concentrations** for the mandatory and optional elements (e.g. for non-foliage litterfall). The limits were fixed in Hamburg 2009 (11<sup>th</sup> Meeting of the Expert Panel Foliage and Litterfall) and in Zagreb 2017 (15<sup>th</sup> Meeting of the Expert Panel Foliage and Litterfall)

Element	Tolerable deviation from mean in %	Applied to concentrations below
As	70-130	50 ng/g
B	70-130	5 µg/g
Ca	85-115	3 mg/g
Co	65-135	0.1 µg/g
Cr	65-135	1 µg/g
Fe	70-130	20 µg/g
Hg	70-130	50 ng/g
K	85-115	1 mg/kg
Mg	85-115	0.5 mg/g
Mn	80-120	20 µg/g
N	85-115	5 mg/g
Ni	70-130	1 µg/g
P	85-115	0.5 mg/g
Pb	60-140	0.5 µg/g
S	80-120	0.5 mg/g
Zn	80-120	20 µg/g

If a limit of quantification (LOQ) is entered by a laboratory instead of a measured value, it will be checked first against the maximum acceptable LOQ from Table 5. If it exceeds the maximum acceptable LOQ, the lab will fail (marked in orange colour) – in case that it is equal or lower it will be checked against the outlier free mean. If a submitted LOQ lies within the tolerable limits associated with the mean of all labs, the lab will pass for this sample of the according parameter (marked in green colour). When the submitted LOQ exceeds these tolerable limits, the lab will fail for this sample (marked in orange colour). This evaluation approach for LOQ values was fixed in the 3<sup>rd</sup> Meeting of the Heads of the Laboratories in Arcachon (2011).

In case of very low concentrations, interlaboratory comparison test samples will be excluded from evaluation for the elements which are concerned (see Table 5). This procedure is necessary to avoid wrong qualification results caused by calculations which are then too unreliable. Furthermore, there is seldom a practical need to detect these low concentrations in natural samples, because it gives no additional information about the nutrient status (e.g. < 1 µg Cu/g is always deficiency) or about the pollution impact situation (e.g. < 20 ng Cd/g, < 1 µg Cu/g, < 0.2 µg Pb/g is always not polluted).

**Table 5:** Maximum acceptable limit of quantification (LOQ) and lowest evaluated interlaboratory sample result fixed in Arcachon 2011 (3<sup>rd</sup> Meeting of the Heads of the Laboratories) and in Pallanza 2017 (6<sup>th</sup> Meeting of the Heads of the Laboratories)

Element	Maximum acceptable limit of quantification	Lowest evaluated result
As	50 ng/g	20 ng/g
B	1 µg/g	-
C	10 g/100g	-
Ca	0.5 mg/g	-
Cd	50 ng/g	20 ng/g
Co	0.1 µg/g	0.05 µg/g
Cr	1 µg/g	0.5 µg/g
Cu	1 µg/g	1 µg/g
Fe	5 µg/g	-
Hg	20 ng/g	10 ng/g
K	0.5 mg/kg	-
Mg	0.3 mg/g	-
Mn	5 µg/g	-
N	2 mg/g	-
Ni	1 µg/g	0.5 µg/g
P	0.3 mg/g	-
Pb	0.5 µg/g	0.20 µg/g
S	0.3 mg/g	-
Zn	5 µg/g	-

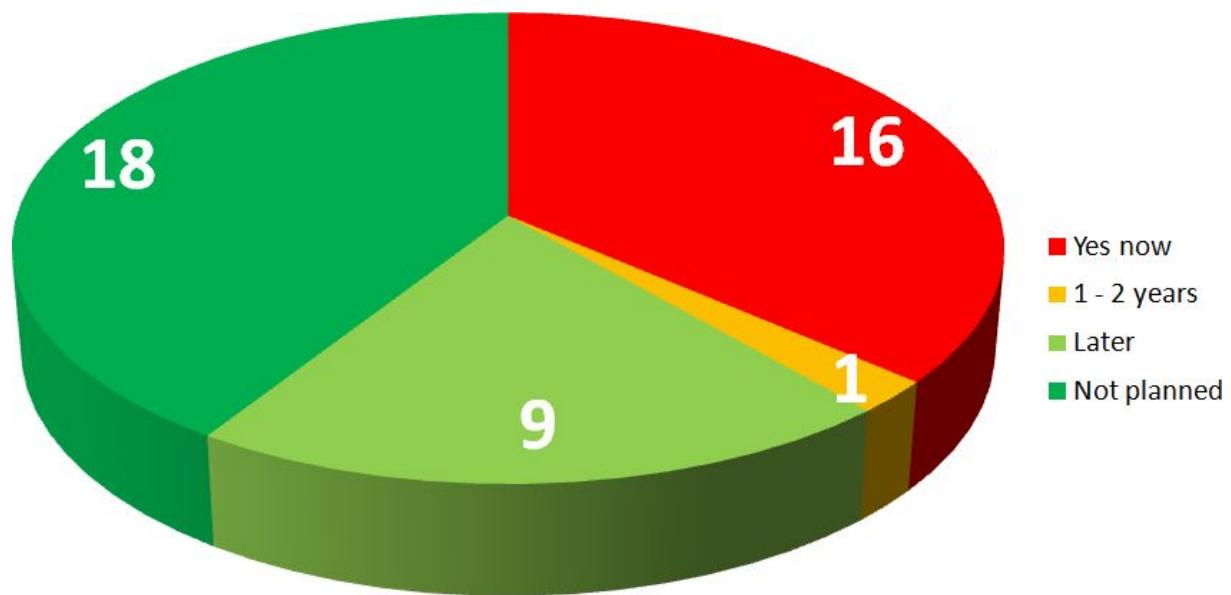
### 3 RESULTS

#### 3.1 Main results of the questionnaire

All participating laboratories answered a questionnaire in order to obtain information about the status and changes of their quality control systems and their instrumentation.

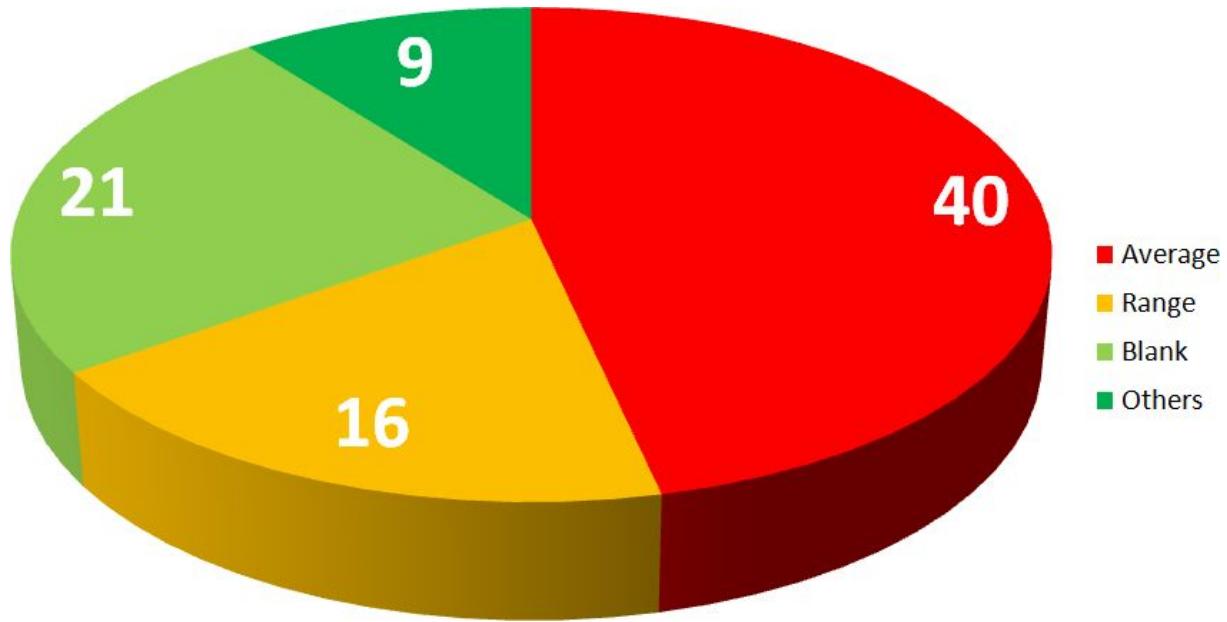
The first questions dealt with the accreditation status of the laboratories and the summarized results are shown in Figure 2.

**Figure 2:** Accreditation status according EN 17025 (n=43)



39.5% of the laboratories are accredited now (17 labs) or plan an accreditation within 1-2 years (1 lab) - 18 laboratories (41.9%) don't plan an accreditation in future.

The next important question was about the usage of control charts for routine quality control (Hovind et al., 2007). 95.3% of these 43 laboratories have indicated that they are using control charts, and most of them are using average control charts – 3 of these 43 laboratories are still using no control chart. Some of the laboratories are using more than one type of control charts (see Figure 3).

**Figure 3:** Types of control charts used in foliar laboratories (multiple answers were possible)

### 3.2 Results of the 25<sup>th</sup> Interlaboratory Comparison Test

Table 6 gives an overview about the test samples analysed by the different laboratories and about correct or failed results of these determinations. This evaluation is based on the tolerable limits from Table 3 and Table 4 and on the maximum acceptable limit of quantification (LOQ) from Table 5. A green marked field means all samples are analysed well, a grey marked field means no results were sent from this laboratory till 1<sup>st</sup> of January 2023. The red marked “<” or “>” characters mean that results were lower or higher than the tolerable limits.

As explained in the description of Table 5, LOQ's are checked against the maximum acceptable LOQ and following they are checked against the lower tolerable limit associated with the mean of all laboratories. In case that it is lower than the maximum acceptable LOQ it is labelled with an “L” (see Table 6).

A further important parameter is the total percentage of correct results per lab, which is calculated from all determinations and if they were correct or not. The following participants have a percentage of correct results being lower than 80%, hence QC/QA-problems in their laboratory should be considered as well:

**A62 (75.00%), F22 (28.57%) and F07 (24.62%)**

Some accepted results are within the tolerable limits, but the statistical evaluation shows an excessive standard deviation (type 1 or 3 outliers, marked with “a” or “c”, respectively) or a high Vi (> 10%, marked with red colour). This means these labs have e.g. contamination influences or other methodological problems. Please keep in mind that such errors have a random character and increase the probability of failed determinations in the future. Hence they should be seen as alarm signs when they occur!

**Table 6:** Results of the 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test – results marked with the limits from Tables 3 and 4 (green = all samples were analysed well; “<” means too low; “>” means too high; white = no results were submitted) and with the maximum acceptable LOQ from Table 5 (L means an LOQ being higher than the maximum acceptable LOQ)

Labcode	N	S	P	Ca	Mg	K	C	Zn	Mn	Fe	Cu	Pb	Cd	B	As	Cr	Co	Hg	Ni
A36																		<	
A42																			
A43	<			<	>>														
A47															<<				
A49																			
A56	<<<<		<	<															
A57				>	<<						>								
A58						<													
A59				<															
A60				>															
A61					<														
A62				<<<<	<<<														
A65																			
A79		>>>		>		>		>		>		>							
A80															LL				
A82					>	>>>				>								>><	
A85				<<	<	<	<	<											
A86																			
A88																			
F01																			
F02																			
F03																			
F05												>							
F06																			
F07		<<><	>><	<<>>	<<>>	<>>			><	<<><	>><<	<><	<	<>>	<<<<	<>>	<>>	<<>>	
F08		>							<		<	<	<						<<
F12																			
F13															>				
F14																<			
F15															>				
F16																			
F18																			
F19														L	L				
F21																			
F22		>>>>	>>>>	>>>>	>>>>			<<<<											
F25																			
F26																			
F27																<			
F28		<		>>	>						>>								
F29		<																	
F32																	>		
F33															>				

**Aufschluss von  
40 Proben  
gleichzeitig!**

## Einfacher als Kaffee kochen:

Mikrowellen-Aufschlüsse im neuen MARS 6

**Einfachste Handhabung: Keine Kabel, kein Werkzeug**  
 Das Mikrowellen-Laborsystem MARS 6 ist für den vielseitigen Einsatz in der Elementanalytik entwickelt worden. Die neue Reaktionsbehälter-Technologie ermöglicht die Behältermontage in nur 15 Sekunden!

Typische Einsatzgebiete:

- Elektroschrott (RoHS/WEEE)	- Lebensmittel
- Kunststoffproben	- Düngemittel
- Pflanzenproben	- Nährstoffe
- Tiergewebe	- Filter
- Abwasser	- Blut, Haare, Serum und Urin
- Fisch, Muscheln und maritime Proben	- Mineralien und Erze
- Sedimente, Boden und Schlamm	- und viele mehr!

Das MARS 6 verfügt über neue berührungslose Sensortechnologien zur Druck- und Temperaturüberwachung in allen Behältern. Die Datenausgabe an einen Drucker sowie an einen externen PC ist ohne weiteres möglich.

Der besondere Clou: **Die Aufschlussbehälter können in ICP-Autosamplern eingesetzt werden!**



*paid advertising*

The calculated outlier-free mean element concentrations for each test sample and the percentage of the non-tolerable laboratory results based on the tolerable limits are provided in Table 7.

Sample 1 had a too low concentration for Pb and sample 4 for Pb, As and Hg. Consequently, their results were excluded from the evaluation.

Three samples in this test were foliage samples (samples 2-4), one sample consisted of twigs (sample 1). The concentration ranges for some heavy metals were low. This explains the higher amount of non-tolerable results for these parameters and samples.

**Table 7:** Mean element concentrations and percentages of non-tolerable results (results evaluated with the tolerable limits for low concentrations are marked in blue colour; samples having too low concentrations that have not been evaluated are marked in grey colour)

Element	Unit	Sample 1 <i>Beech leaves</i>	Sample 2 <i>Spruce needles</i>	Sample 3 <i>Spruce needles</i>	Sample 4 <i>Larch needles</i>
N	mg/g	24.83	15.36	10.66	23.66
	%	0.00	5.13	0.00	0.00
S	mg/g	1.65	1.23	0.94	2.65
	%	11.43	11.43	14.29	11.43
P	mg/g	1.21	1.40	1.94	2.29
	%	13.51	8.11	13.51	13.51
Ca	mg/g	10.19	7.53	2.88	3.49
	%	7.89	10.53	26.32	15.79
Mg	mg/g	2.28	1.61	1.30	1.05
	%	7.89	7.89	13.16	13.16
K	mg/g	9.00	5.13	6.30	8.55
	%	5.26	2.63	7.89	0.00
C	g/100g	49.76	52.47	51.47	51.91
	%	2.78	2.78	2.78	2.78
Zn	µg/g	43.47	44.60	21.11	29.10
	%	3.45	3.45	6.90	3.45
Mn	µg/g	1020.5	1062.8	558.95	1257.0
	%	3.23	3.23	6.45	3.23
Fe	µg/g	100.43	70.20	64.08	205.48
	%	3.45	6.90	6.90	3.45
Cu	µg/g	6.20	4.24	2.46	6.17
	%	3.57	3.57	10.71	10.71
Pb	µg/g	0.205	0.14	0.19	2.69
	%	4.76	-	-	9.52
Cd	ng/g	73.31	242.60	45.39	237.18
	%	4.17	0.00	8.33	4.17
B	µg/g	41.52	20.74	16.31	63.57
	%	5.00	5.00	5.00	5.00
As	ng/g	30.18	15.72	23.21	684.62
	%	23.08	-	15.38	0.00
Cr	µg/g	1.09	1.29	4.22	0.89
	%	15.00	5.00	5.00	5.00
Co	µg/g	0.04	0.13	0.38	0.23
	%	-	7.14	7.14	7.14
Hg	ng/g	16.23	20.38	13.00	40.18
	%	15.38	7.69	15.38	7.69
Ni	µg/g	7.56	12.53	3.38	3.19
	%	4.35	4.35	4.35	4.35

### 3.3 Comparison of the 25<sup>th</sup> Interlaboratory Comparison Test with former tests

Sample 2 of the 20<sup>th</sup> Interlaboratory Comparison Test and sample 2 of the 25<sup>th</sup> Interlaboratory Comparison Test are identical (*Spruce needles - Austria*). For most of the elements the mean values are identical (see Table 8). The well comparable results show that the determined contents of this sample are stable.

The ringtest is evaluated on the basis of fixed limits (Tables 3 and 4). These tolerable deviations from the mean were updated in Foliage Expert Panel Meetings in Bonn (1999), Prague (2003), Madrid (2007) and Zagreb (2017) and in the 1<sup>st</sup> Meeting of the Heads of the Laboratories in Hamburg (2009) for some elements. The maximum acceptable limits of quantification (Table 5) were defined in the 3<sup>rd</sup> Meeting of the Heads of the Laboratories in Arcachon (2011) and in the 6<sup>th</sup> Meeting of the Heads of the Laboratories in Pallanza (2017). These maximum acceptable limits were applied from the 14<sup>th</sup> to the 25<sup>th</sup> test. The changes of the percentages of non-tolerable results from the 11<sup>th</sup> to the 25<sup>th</sup> test are accessible in Tables 9a and 9b.

# LECO CNS928

## MACRO CNS ANALYSIS

- High volume - reusable sample boats
- Macro CNS results in ~5 minutes
- New furnace design with special heating elements
- Low energy consumption – low energy dissipation
- Combustion in pure oxygen
- Ballast aliquot principle – up to 4,000 samples with one reduction catalyst
- 100 sample XY-Autoloader

**CHNS / SULFUR/CARBON  
TOC / EC / TIC  
MOISTURE AND ASH**

[EU.LECO.COM](http://EU.LECO.COM)

**LECO**  
EMPOWERING RESULTS

© 2021 LECO

*paid advertising*

**Table 8:** Comparison between Sample 2 of the 20<sup>th</sup> and Sample 2 of the 25<sup>th</sup> Interlaboratory Comparison Test

Element (Unit)	20 <sup>th</sup> Interlaboratory Comparison Test 2017/18 (Sample 2)		25 <sup>th</sup> Interlaboratory Comparison Test 2022/23 (Sample 2)	
	Mean	Number of Labs	Mean	Number of Labs
N mg/g	15.58	41	15.36	39
S mg/g	1.21	39	1.23	35
P mg/g	1.43	45	1.40	37
Ca mg/g	7.56	46	7.53	38
Mg mg/g	1.59	46	1.61	38
K mg/g	5.13	46	5.13	38
C g/100g	52.90	38	52.47	36
Zn μg/g	44.42	36	44.60	29
Mn μg/g	1054.4	38	1062.8	31
Fe μg/g	69.71	36	70.20	29
Cu μg/g	4.24	34	4.24	28
Pb μg/g	0.17	24	0.14	21
Cd ng/g	244.36	25	242.60	24
B μg/g	20.84	22	20.74	20
As ng/g	18.32	13	15.72	13
Cr μg/g	1.35	17	1.29	20
Co μg/g	0.13	23	0.13	14
Hg ng/g	19.80	12	20.38	13
Ni μg/g	12.86	23	12.53	23

**Table 9a:** Percentage of non tolerable results from 12<sup>th</sup> to 18<sup>th</sup> test

Element	Tolerable limits normal (low <sup>1)</sup> (± %)	12 <sup>th</sup> Labtest 2009/2010		13 <sup>th</sup> Labtest 2010/2011		14 <sup>th</sup> Labtest 2011/2012		15 <sup>th</sup> Labtest 2012/2013		16 <sup>th</sup> Labtest 2013/2014		17 <sup>th</sup> Labtest 2014/2015		18 <sup>th</sup> Labtest 2015/2016	
		Non tolerable values (%)	Number of mean values												
N	10 (15)	7,6	212	4,9	224	8,9	224 <sup>1)</sup>	6,0	216	3,1	196	2,1	192	7,9	164 <sup>1)</sup>
S	15 (20)	16,5	200	13,9	208	12,7	220 <sup>1)</sup>	13,9	208	14,8	196	9,9	192	6,4	156 <sup>1)</sup>
P	10 (15)	13,7	212	7,4	216 <sup>1)</sup>	15,9	220 <sup>1)</sup>	9,4	224	18,8	208	14,7	204	15,5	168 <sup>1)</sup>
Ca	10 (15)	9,7	216	8,0	212	14,7	224 <sup>1)</sup>	12,1	224 <sup>1)</sup>	16,3	208	17,7	212	9,1	176 <sup>1)</sup>
Mg	10 (15)	14,4	216	5,7	212	19,3	228 <sup>1)</sup>	5,9	220	8,8	204	12,3	212	14,2	176 <sup>1)</sup>
K	10 (15)	6,0	216	8,5	212	21,0	228 <sup>1)</sup>	18,0	228	9,1	208	11,5	208	15,6	180 <sup>1)</sup>
C	5	8,5	188	6,3	192	15,4	208	7,7	196	10,0	180	7,8	180	9,5	148
Zn	15 (20)	6,4	172	9,7	176 <sup>1)</sup>	4,4	184	5,4	184 <sup>1)</sup>	5,6	180 <sup>1)</sup>	8,1	172	13,5	148
Mn	15 (20)	2,7	176	4,8	188	6,8	192	0,5	188	8,7	184	3,9	180	6,1	148
Fe	20 (30)	4,8	168	0,0	180	14,1	184	3,7	188	9,4	180	6,5	168	12,2	148
Cu	20	21,3	160	9,1	176	10,3	184	9,1	176	14,5	172	15,7	172	4,2	144
Pb	30 (40)	13,3	120	12,5	112 <sup>1)</sup>	15,6	128 <sup>1)</sup>	8,6	105 <sup>2)</sup>	10,7	56 <sup>2)</sup>	7,8	87 <sup>2)</sup>	16,0	75 <sup>1);2)</sup>
Cd	30	10,7	112	9,5	116	10,0	140	7,1	140	4,8	62 <sup>2)</sup>	14,3	112	8,0	112
B	20 (30)	5,4	92	3,3	92	12,0	100 <sup>1)</sup>	5,0	100	6,3	96	5,0	100	11,9	84 <sup>1)</sup>

<sup>1)</sup> special tolerable limits for low concentrations<sup>2)</sup> sample/s excluded because of very low concentration

**Table 9b:** Percentage of non tolerable results from the 19<sup>th</sup> to the 25<sup>th</sup> test

Element	Tolerable limits	19 <sup>th</sup> Labtest 2016/2017		20 <sup>th</sup> Labtest 2017/2018		21 <sup>st</sup> Labtest 2018/2019		22 <sup>nd</sup> Labtest 2019/2020		23 <sup>rd</sup> Labtest 2020/2021		24 <sup>th</sup> Labtest 2021/2022		25 <sup>th</sup> Labtest 2022/2023	
		Non tolerable (%)	Number	Non tolerable (%)	Number	Non tolerable (%)	Number	Non tolerable (%)	Number	Non tolerable (%)	Number	Non tolerable (%)	Number	Non tolerable (%)	Number
N	10 (15)	4,6	152	3,7	164 <sup>1)</sup>	16,1	180	5,1	156	4,7	172	8,9	168	1,3	156
S	15 (20)	7,4	148	16,7	156 <sup>1)</sup>	16,9	172	11,4	140	11,9	160	10,3	156	12,1	140
P	10 (15)	15,4	164	18,3	180 <sup>1)</sup>	16,3	184	9,0	156	16,7	168	7,3	164	12,2	148
Ca	10 (15)	11,3	168 <sup>1)</sup>	12,0	184 <sup>1)</sup>	15,8	184	12,5	160	15,3	176	10,1	168	15,1	152
Mg	10 (15)	13,1	168	10,9	184	10,1	188	10,6	160	7,4	176	8,3	168	10,5	152
K	10 (15)	16,7	168	14,7	184	16,5	188	12,5	160	11,4	176	10,1	168	3,9	152
C	5	8,1	136	7,9	152	14,3	168	2,9	140	3,8	156	7,7	156	2,8	144
Zn	15 (20)	12,1	132	6,3	144 <sup>1)</sup>	5,3	152	10,0	140	9,0	144	6,6	136	4,3	116
Mn	15 (20)	8,8	136	10,5	152 <sup>1)</sup>	3,2	156	11,5	148	9,2	152 <sup>1)</sup>	2,8	144	4,0	124
Fe	20 (30)	13,3	128	4,2	144	5,0	140	6,9	144	8,1	136	2,9	136	5,2	116
Cu	20	15,2	132	8,8	136	6,8	148	12,5	136	7,9	140	6,8	132	7,1	112
Pb	30 (40)	7,7	24 <sup>2)</sup>	8,3	24 <sup>2)</sup>	7,1	84 <sup>1);2)</sup>	22,7	75 <sup>1);2)</sup>	16,7	78 <sup>1);2)</sup>	4,3	46 <sup>1);2)</sup>	3,6	84 <sup>1);2)</sup>
Cd	30	2,1	96	2,7	75 <sup>2)</sup>	10,3	116	14,6	48 <sup>2)</sup>	8,0	50 <sup>2)</sup>	0,0	92	4,2	96
B	20 (30)	13,9	72	6,8	88	4,3	92	13,1	84	10,9	92	11,4	88 <sup>1)</sup>	5,0	80
As	20 (30)	25,6	39 <sup>2)</sup>	48,7	39 <sup>1);2)</sup>	19,6	56 <sup>1)</sup>	37,5	48 <sup>1)</sup>	27,1	48 <sup>1)</sup>	11,1	36 <sup>1);2)</sup>	9,6	52 <sup>1);2)</sup>
Co	25 (35)	4,4	68	11,8	51 <sup>2)</sup>	20,6	63 <sup>2)</sup>	21,9	48 <sup>1);2)</sup>	19,0	42 <sup>1);2)</sup>	7,4	68 <sup>1)</sup>	5,4	56 <sup>2)</sup>
Cr	25 (35)	16,3	92	15,2	92	21,7	92 <sup>1)</sup>	6,3	32 <sup>1);2)</sup>	7,2	69 <sup>2)</sup>	9,5	84 <sup>1)</sup>	7,5	80 <sup>1)</sup>
Hg	20 (30)	19,6	56	0,0	36 <sup>1);2)</sup>	6,3	48 <sup>1);2)</sup>	9,5	42 <sup>1);2)</sup>	8,3	60 <sup>1)</sup>	9,8	51 <sup>1);2)</sup>	11,5	52 <sup>1)</sup>
Ni	20 (30)	7,6	92	16,3	92 <sup>1)</sup>	9,0	100	18,0	100 <sup>1)</sup>	13,0	100 <sup>1)</sup>	3,0	100 <sup>1)</sup>	4,3	92

<sup>1)</sup> special tolerable limits for low concentrations<sup>2)</sup> sample/s excluded because of very low concentration

### 3.4 Evaluation by element

#### 3.4.1 Nitrogen

In comparison with the last Interlaboratory Comparison Test the percentage of non-tolerable results of all laboratories decreased clearly this time (8.9 → 1.3%).

No laboratory failed with three or four samples; hence no requalification will be necessary for this element.

#### 3.4.2 Sulphur

In comparison with the last Interlaboratory Comparison Test the percentage of non-tolerable results of all laboratories increased slightly (10.3 → 12.1%). Four laboratories failed in analyzing all four (A56, F07 and F22) or three (A79) out of four samples correctly. Laboratories A56 and F07 failed in the last test, too. This means that their methodical problems are still not solved!

A requalification is obligatory for the *ICP-Forsts laboratories F07 and F22*.

Three out of these four laboratories used *ICP-AES without Ultrasonic nebulisation* as determination method; all sulphur emission lines are in the lower UV range. A possible reason for the wrong results could be that oxygen from air might be not removed completely from the monochromator for accurate results when determining sulphur.

#### 3.4.3 Phosphorus

In comparison with the last Interlaboratory Comparison Tests the percentage of non-tolerable results increased again (24<sup>th</sup> Labtest: 7.3% → 25<sup>th</sup> Labtest: 12.2%). Three laboratories failed in analyzing all four (A62 and F22) or three (F07) out of four samples correctly.

A requalification is obligatory for the *ICP-Forsts laboratories A62, F07 and F22*.

#### 3.4.4 Calcium

In comparison with the last Interlaboratory Comparison Tests the percentage of non-tolerable results remains on a comparably high level with a slight recent increase compared to the last test (23<sup>rd</sup> Labtest: 15.3 → 24<sup>th</sup> Labtest: 10.1% → 25<sup>th</sup> Labtest: 15.1%). Three laboratories failed in analyzing all four (F07 and F22) or three (A62) out of four samples correctly. Laboratory F22 failed in the last test, too. This means that its methodical problems are still not solved!

A requalification is obligatory for the *ICP-Forsts laboratories A62, F07 and F22*.

#### 3.4.5 Magnesium

In comparison with the last test the percentage of non-tolerable results increased slightly since the 24<sup>th</sup> Labtest (8.3 → 10.5%). Three laboratories failed in analyzing all four (F22 and F07) or three (A82) out of four samples correctly.

A requalification is obligatory for the *ICP-Forsts laboratories F07 and F22*.

### **3.4.6 Potassium**

In comparison with the last test the percentage of non-tolerable results decreased distinctly ( $10.1 \rightarrow 3.9\%$ ). One laboratory failed in analyzing three out of four samples correctly (F07). A re-qualification is obligatory for the ICP-Forsts *laboratory F07*.

### **3.4.7 Carbon**

In comparison with the last Interlaboratory Comparison Test the percentage of non-tolerable results decreased again (23<sup>rd</sup> Labtest: 3.8  $\rightarrow$  24<sup>th</sup> Labtest: 7.7%  $\rightarrow$  25<sup>th</sup> Labtest: 2.8%). Laboratory F22 failed in analyzing all four samples correctly. When using an elemental-analyzer, constant percentages of recovery of all four samples might indicate a calibration error.

A requalification is obligatory for the *ICP-Forsts laboratory F22*.

### **3.4.8 Zinc**

In comparison with the last Interlaboratory Comparison Test the percentage of non-tolerable results is slightly decreased ( $6.6\% \rightarrow 4.3\%$ ). No laboratory failed with three or four samples; hence no requalification will be necessary for this element.

### **3.4.9 Manganese**

In comparison with the last Interlaboratory Comparison Test the percentage of non-tolerable results is quite constant ( $2.8\% \rightarrow 4.0\%$ ). Laboratory F07 failed in analyzing all four samples correctly.

A requalification is obligatory for the *ICP-Forsts laboratory F07*.

### **3.4.10 Iron**

In comparison with the last Interlaboratory Comparison Test the percentage of non-tolerable results increased slightly ( $2.9\% \rightarrow 5.2\%$ ). Laboratory F07 failed in analyzing all four samples correctly.

A requalification is obligatory for the *ICP-Forsts laboratory F07*.

### **3.4.11 Copper**

In comparison with the last test the percentage of non-tolerable results is quite constant ( $6.8\% \rightarrow 7.1\%$ ). Laboratory F07 failed in analyzing three out of four samples correctly.

A requalification is obligatory for the *ICP-Forsts laboratory F07*.

### **3.4.12 Lead**

Samples 2 and 3 had to be excluded from the ringtest evaluation, because of their too low lead concentrations. In comparison with the last test the percentage of non-tolerable results is quite constant (4.3% → 3.6%). Both remaining samples had a lower lead concentration than the limit of the lower concentration range (< 0.5 µg/g). No laboratory failed with more than one of the two remaining samples; hence no requalification will be necessary for this element.

The best analytical choice to analyze these low concentrations is the ICP-MS method. As a matter of experience from previous interlaboratory comparisons, other methods like flameless AAS or especially ICP-AES are here too close to their determination limit for reliable results.

### **3.4.13 Cadmium**

In comparison with the last Interlaboratory Comparison Tests the percentage of non-tolerable results increased (0.0% → 4.2%). Laboratory F07 failed in analyzing three out of four samples correctly.

A requalification is obligatory for the *ICP-Forrests laboratory F07*.

### **3.4.14 Boron**

In comparison with the last test the percentage of non-tolerable results is clearly lower (11.4% → 5.0%). Laboratory F07 failed in analyzing all four samples correctly. Laboratory F07 failed in the last test, too. This means that its methodical problems are still not solved!

A requalification is obligatory for the *ICP-Forrests laboratory F07*.

### **3.4.15 Arsenic**

Sample 2 was excluded from the ringtest evaluation, because of its too low content. Two out of the three remaining samples had a lower arsenic concentration than the limit of the lower concentration range (< 50 ng/g). In comparison with the last test the percentage of non-tolerable results is quite constant (11.1% → 9.6%). Laboratory A47 failed in analyzing two out of three remaining evaluated samples correctly, laboratory A80 failed in analyzing the same number of samples correctly because of a too high LOQ.

### **3.4.16 Cobalt**

Sample 1 was excluded from the ringtest evaluation, because of too low content. In comparison with the last Interlaboratory Comparison Tests the percentage of non-tolerable results decreased slightly (7.4% → 5.4%). Laboratory F07 failed in analyzing the three remaining evaluated samples correctly.

A requalification is obligatory for the *ICP-Forrests laboratory F07*.

### **3.4.17 Chromium**

In comparison with the last Interlaboratory Comparison Test the percentage of non-tolerable results is decreased slightly (9.5% → 7.5%). One out of the four samples had a lower chromium concentration than the limit of the lower concentration range (< 1 µg/g). Laboratory F07 failed in analyzing three out of four samples correctly. This parameter was failed in the last test, too. This means that its methodical problems are still not solved! A requalification is obligatory for the *ICP-Forrests laboratory F07*.

### **3.4.18 Mercury**

In comparison with the last Interlaboratory Comparison Tests the percentage of non-tolerable results increased slightly (9.8% → 11.5%). All four samples had a lower mercury concentration than the limit of the lower concentration range (< 50 ng/g). Laboratory A82 failed with three out of four samples.

### **3.4.19 Nickel**

In comparison with the last Interlaboratory Comparison Tests the percentage of non-tolerable results is quite constant (3.0% → 4.3%). Laboratory F07 failed in analyzing all four samples correctly.

A requalification is obligatory for the *ICP-Forrests laboratory F07*.

## 4 CONCLUSIONS

43 laboratories in 22 countries participated in the 25<sup>th</sup> Needle/Leaf Interlaboratory Test; 42 laboratories submitted their results in time.

A new system for qualification and re-qualification started with the 11<sup>th</sup> test in 2009. This system was enlarged after the manual update in 2010 to all ICP-Forests partners (see Fürst et al. 2020, König et al. 2013, Rautio et al. 2013 and 2020, Ukonmaanaho et al. 2020). With the ring test report, each participant received a qualification report which can be downloaded from the webpage ([https://baw.ac.at/ws/ring\\_nadel.login](https://baw.ac.at/ws/ring_nadel.login)). It has been decided to qualify the results of each parameter separately. A laboratory is qualified when 50% or more (generally two, three or all four samples) of the results for this parameter for all the samples of the ring test are within the tolerable limits. A qualification is mandatory for all ICP-Forests laboratories, if monitoring results (foliage, litterfall, ground vegetation) from the vegetation period 2021 is intended to be submitted to PCC.

In case of an unsuccessful participation, a re-qualification is foreseen (see: <http://baw.ac.at/rz/bawcms2.web?dok=3002>). Only a successful participation in the following ringtest for the element(s) which had to be requalified can successfully complete the re-qualification.

**When an ICP-Forests laboratory did not qualify and did not make efforts to improve the data quality, ICP Forests PCC will send a letter to the National Focal Centre and inform them about the consequence that their data possibly cannot be used for evaluations on a European level.**

The usage of maximum acceptable limits of quantification (LOQ) has been included since the 14<sup>th</sup> Interlaboratory Test. These limits are needed, because many laboratories are using multi element methods (mostly ICP-AES) with higher LOQs for some elements. But for evaluation and classification of the monitoring samples *real* measured results and lower LOQ are sometimes needed. The Working Group QA/QC in Laboratories received a task to fix this problem from the Expert Panel Foliage and Litterfall (12<sup>th</sup> Meeting - Tallinn 2011). Maximum acceptable LOQs for mandatory and optional parameters for foliage, litterfall and ground vegetation were discussed and accepted in the 3<sup>rd</sup> Meeting of the Heads of the Laboratories (Arcachon 2011) and in the 6<sup>th</sup> Meeting of the Heads of the Laboratories (Pallanza 2017).

This problem is more or less fixed now - only two laboratories submitted LOQs higher than the maximum acceptable LOQs (**A80** for As and **F19** for Pb and Cd).

In case of very low concentrations in the test samples, results of these samples were excluded from the evaluation (this was the case for **sample 1**: Co, **sample 2**: Pb and As and **sample 3**: Pb). Excluding these samples was necessary to avoid wrong qualification results caused by calculations which are then too unreliable. Furthermore, there is seldom a practical need to detect these low concentrations in natural samples, because it gives no additional information of the nutrient status or about the pollution impact situation.

The following participating laboratories with a percentage of correct results below 80% have severe QC/QA-problems, a miscalculation of the results and/or methodical problems:

**A62** (75.00%), **F22** (28.57%) and **F07** (24.62%)

Some of the *ICP-Forests laboratories* failed and a re-qualification **is obligatory** for certain parameters (**A62**: P, Ca; **F07**: S, P, Ca, Mg, K, Mn, Fe, Cu, Cd, B, Cr, Co and Ni and **F22**: S, P, Ca, Mg and C). These *ICP-Forests laboratories* have to check and re-validate their methods or employ better applicable methods. FFCC offers ringtest materials from previous tests which were evaluated with outlier-free means as well, if some of these materials are needed for this purpose (see: <http://bfw.ac.at/rz/bfwcms2.web?dok=5146>).

The laboratories **A56** (S), **F07** (S, B and Cr), **F22** (Ca) failed with the identical parameters in the last test(s). **Therefore, their QC/QA-problem or their methodical problem is still not solved!**

All laboratories are invited to take part in the re-qualification program that starts up from now till 1<sup>st</sup> of September 2023 (see details to the procedure and the needed documents: <http://bfw.ac.at/rz/bfwcms2.web?dok=7830>).

As far as the most frequently used analytical methods are concerned, the microwave digestion method is the most common digestion method. With this respect, a clear recommendation for ICP-AES as determination method can be given. Where ICP-AES is not sensitive enough, ICP-AES with ultrasonic nebulizer or better ICP-MS should be used. For determinations of nitrogen and carbon, element analyzers are the best choice.

## 5 LITERATURE

BARTELS, U., 1996: ICP-Forests 2<sup>nd</sup> needle/leaf Interlaboratory Test 1995/1996, North Rhine - Westphalia State Environment Agency, Essen/Germany.

BARTELS, U., 1998: ICP-Forests 3<sup>rd</sup> needle/leaf Interlaboratory Test 1997/1998, North Rhine - Westphalia State Environment Agency, Essen/Germany.

BARTELS, U., 2000: ICP-Forests 4<sup>th</sup> needle/leaf Interlaboratory Test 1999/2000, North Rhine - Westphalia State Environment Agency, Essen/Germany.

BARTELS, U., 2002: ICP-Forests 5<sup>th</sup> needle/leaf Interlaboratory Test 2001/2002, North Rhine - Westphalia State Environment Agency, Essen/Germany.

DIN 38402-42:2005-09: Deutsche Einheitsverfahren zur Wasser-, Abwasser- und Schlammuntersuchung – Allgemeine Angaben (Gruppe A) Ringversuche, Auswertung (A42).

FÜRST, A., 2004: 6<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2003/2004, Austrian Federal Office and Research Centre for Forests (ISBN 3-901347-46-1), Vienna/Austria.

FÜRST, A., 2005: 7<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2004/2005, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 3-901347-52-1), Vienna/Austria.

FÜRST, A., 2006: 8<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2005/2006, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 3-901347-60-7), Vienna/Austria.

FÜRST, A., 2007: 9<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2006/2007, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-901347-66-5), Vienna/Austria.

FÜRST, A., 2008: 10<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2007/2008, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-901347-73-3), Vienna/Austria.

FÜRST, A., 2009: 11<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2008/2009, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-901347-79-5), Vienna/Austria.

FÜRST, A., 2010: 12<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2009/2010, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-901347-89-4), Vienna/Austria.

FÜRST, A., 2011: 13<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2010/2011, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-902762-03-0), Vienna/Austria.

FÜRST, A., 2012: 14<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2011/2012, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-902762-13-9), Vienna/Austria.

FÜRST, A., 2013: 15<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2012/2013, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-902762-20-7), Vienna/Austria.

FÜRST, A., 2014: 16<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2013/2014, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-902762-28-3), Vienna/Austria.

FÜRST, A., 2015: 17<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2014/2015, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-902762-37-5), Vienna/Austria.

FÜRST, A., 2016: 18<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2015/2016, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-902762-52-8), Vienna/Austria.

FÜRST, A., 2017: 19<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2016/2017, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-902762-72-6), Vienna/Austria.

FÜRST, A., 2018: 20<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2017/2018, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-902762-90-0), Vienna/Austria.

FÜRST, A., 2019: 21<sup>st</sup> Needle/Leaf Interlaboratory Comparison Test 2018/2019, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-903258-12-9), Vienna/Austria.

FÜRST, A., 2020: 22<sup>nd</sup> Needle/Leaf Interlaboratory Comparison Test 2019/2020, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-903258-20-4), Vienna/Austria.

FÜRST, A., TATZBER, M., 2021: 23<sup>rd</sup> Needle/Leaf Interlaboratory Comparison Test 2020/2021, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-903258-30-3), Vienna/Austria.

FÜRST, A., KOWALSKA, A., BRUNIALTI, G., CLARKE, N., COOLS, N., DE VOS, B., DEROME, J., DEROME, K., FERRETTI, M., JAKOVLJEVIĆ, T., KÖNIG, N., MARCHETTO, A., MOSELLO, R., O'DEA, P., TARTARI, GA., ULRICH, E., 2020: Part XVI: Quality Assurance and Control in Laboratories. Version 2020-1. In: UNECE, ICP Forests Programme Co-ordinating Centre (ed.): Manual on methods and criteria for harmonized sampling, assessment, monitoring and analysis of the effects of air pollution on

forests. Thünen Institute of Forest Ecosystems, Eberswalde, Germany, 46 p. + Annex [<http://www.icp-forests.org/manual.htm>] ISBN: 978-3-86576-162-0

HOVIND, H., MAGNUSSON, B., KRYSELL, M., LUND, U., MÄKINEN, I., 2007: Internal Quality Control – Handbook for Chemical Laboratories. NORDTEST REPORT 569, Ed.3. 46p.

KÖNIG, N., COOLS, N., DEROME, K., KOWALSKA, A., DE VOS, B., FÜRST, A., MARCETTO, A., O'DEA, P., AND TARTARI, G.A., 2013: Data Quality in Laboratories: Methods and Results for Soil, Foliar, and Water Chemical Analyses. In: Forest Monitoring: Methods for Terrestrial Investigations in Europe with an Overview of North America and Asia.; Developments in Environmental Science, Amsterdam, (12): 415-453.

RAUTIO, P., FÜRST, A., STEFAN, K., RAITIO, H., BARTELS, U., 2020: Part XII: Sampling and Analysis of Needles and Leaves. Version 2020-2. In: UNECE ICP Forests Programme Co-ordinating Centre (ed.): Manual on methods and criteria for harmonized sampling, assessment, monitoring and analysis of the effects of air pollution on forests. Thünen Institute of Forest Ecosystems, Eberswalde, Germany, 16 p. + Annex [<http://www.icp-forests.org/Manual.htm>].

ISBN: 978-3-86576-162-0

RAUTIO, P., FÜRST, A., 2013: Tree Foliage: Sampling and Chemical Analyses. In: Forest Monitoring: Methods for Terrestrial Investigations in Europe with an Overview of North America and Asia.; Developments in Environmental Science, Amsterdam, (12): 223-236.

UKONMAANAHO, L., PITMAN, R., BASTRUP-BIRK, A., BREDA, N., RAUTIO, P., 2020: Part XIII: Sampling and Analysis of Litterfall. Version 2020-1. In: UNECE ICP Forests Programme Co-ordinating Centre (ed.): Manual on methods and criteria for harmonized sampling, assessment, monitoring and analysis of the effects of air pollution on forests. Thünen Institute for Forests Ecosystems, Eberswalde, Germany, 18 p. + Annex [<http://www.icp-forests.org/manual.htm>].

ISBN: 978-3-86576-162-0

STEFAN, K., FÜRST, A., HACKER, R., BARTELS, U., 1997: Forest Foliar Condition in Europe - Results of large-scale foliar chemistry surveys, ISBN 3-901347-05-4, EC-UN/ECE -FBVA 1997.

TATZBER, M., FÜRST, A., 2022: 24<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2021/2022, Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape (ISBN 978-3-903258-58-7), Vienna/Austria.

## List of participating laboratories

### Austria

#### **A 10 Land Steiermark**

Referat Boden- und Pflanzenanalytik  
Ragnitzstraße 193  
8047 - Graz

#### **BOKU University Vienna**

Forest Ecology  
Peter Jordan Straße 82  
1190 - Vienna

#### **Bundesforschungszentrum für Wald**

Pflanzenanalyse  
Seckendorff-Gudent-Weg 8  
A-1131 - Vienna

### Belgium / Flanders

#### **Research Institute for Nature and Forest**

INBO laboratory  
Gaverstraat 35  
B-9500 - Geraardsbergen

### Belgium/Wallonia

#### **Université de Louvain**

MOCA  
Croix du Sud 1 - Boltzmann - A073  
B-1348 - Louvain-La-Neuve

### Bulgaria

#### **Executive Environment Agency**

Quality of soil  
136 Tzar Boris III blvd.  
1618 - Sofia

### Croatia

#### **HRVATSKI SUMARSKI INSTITUT**

Division for forest ecology  
Cvjetno naselje 41  
HR-10450 - Jastrebarsko

## Czech Republic

### Forestry and Game Management Res. Inst.

Testing Laboratories (25)

Strnady 136

CZ-15604 - Praha 5- Zbraslav

## Denmark

### Geosciences & Natural Resources Management

BioGeoLab

Rolighedsvej 23

DK-1958 - Frederiksberg C

## Estonia

### Estonian Environmental Research Centre

Tartu Department

Vaksali 17a

EST-50410 - Tartu

## Finland

### Natural Resources Institute Finland

Viikki B2

Latokartanonkaari 9

FIN-00790 - Helsinki

## Germany

### Bay. LA f. Wald u. Forstwirtschaft

Stabsstelle L3 - Labor

Hans-Carl-von-Carlowitz-Platz 1

D-85354 - Freising

### Bayerisches Landesamt für Umwelt

Referat 72 - Schwermetallanalytik

Bürgermeister-Ulrich-Straße 160

86179 - Augsburg

Eurofins Food Testing Süd GmbH

Ob dem Himmelreich 9

72074 - Tübingen

### Fraunhofer IME

Trace Analysis and Environmental Monitor

Auf dem Aberg 1

57392 - Schmallenberg

## **Germany**

### **FVA-Baden-Württemberg**

Abt. Boden und Umwelt  
Wonnhaldestraße 4  
D-79100 - Freiburg

### **HNE Eberswalde**

Zentrales ökologisches Labor  
Schicklerstraße 5  
D-16225 - Eberswalde

### **LANUV Nordrhein-Westfalen**

LANUV; FB 65  
Gartenstraße 27  
D-45699 - Herten

### **LECO Instrumente GmbH**

LECO EATC Berlin  
Max-Dohrn-Str. 8-10  
10589 - Berlin

### **LMS Agrarberatung GmbH**

LUFA Rostock  
Graf-Lippe-Str. 1  
D-18059 - Rostock

### **LUFA NRW**

Zentrale anorganische Analytik  
Nevinghoff 40  
48147 - Münster

### **LUFA NRW**

Spezielle Analytik  
Nevinghoff 40  
D-48147 - Münster

### **LUFA Speyer**

Abt. 3 Referat 2  
Obere Langgasse 40  
D-67346 - Speyer

### **Nordwestdeutsche Forstl.Versuchsanstalt**

Abt. D, Umweltanalytik  
Grätzelstr. 2  
D-37079 - Göttingen

## **Germany**

**Ökopedologie der gemäßigten Zonen (PGZ)**  
Büsgenweg 2  
D-37077 - Göttingen

**Staatsbetrieb Sachsenforst**  
Abt. 4 Ref. 43  
Bonnewitzer Str. 34  
D-01796 - Pirna OT Graupa

**Thuer. Landesamt f. Landw. (TLLLR)**  
Untersuchungswesen  
Naumburger Str. 98  
07743 - Jena

**TU - München**  
Lehrgebiet Waldernährung+ Wasserhaushalt  
H.C.v.Carlowitz-Platz 2  
D-85354 - Freising

**Universität Trier, FB VI, Geobotanik**  
Geobotanisches Labor  
Behringstraße 21  
D-54296 - Trier

## **Greece**

**Forest Research Institute of Athens**  
Forest Soils  
Terma Alkmanos  
115 28 - Athens

## **Hungary**

**University of Sopron**  
Ecology Laboratory  
H-9400 - Sopron

## **Italy**

**In. of Research in Terrestrial Ecosystem**  
CNR-IRET  
Via Salaria km 29,300  
I-00015 - Monterotondo Scalo (RM)

## Norway

### Norwegian Institute of Bioeconomy Research

Chemical Laboratories

Pb 115

NO-1431 - As

## Poland

### Forest Research Institute

Lab. of Natural Environment Chemistry

3, Braci Lesnej

PL-05-090 - Sekocin Stary

## Romania

### INCDS

Lab. de analize pedologice si foliare

Closca no 13

500040 - Brasov

### INCDS

Forestry-Ecology Laboratory

B-dul Eroilor, nr.128

RO-077190 - Voluntari-Jud. Ilfov

### INCDS

Chemistry laboratory

Calea Bucovinei, 73 bis

725100 - Campulung Moldovenesc

## Slovakia

### National Forest Centre

Central Forest Laboratory

T.G.Masaryka 22

SK-96001 - Zvolen

## Slovenia

### Slovenian Forestry Institute

Laboratory for Forest Ecology

Vecna pot 2

SI-1000 - Ljubljana

## **Spain**

**Universidad de Navarra**  
Departamento de Química  
Irunlarrea, 1  
31008 - Pamplona (Navarra)

## **Switzerland**

**Eidg. Forschungsanstalt WSL**  
Zentrallabor  
Zürcherstrasse 111  
CH-8903 - Birmensdorf

## **Turkey**

**Ege Forestry Research Institute**  
Soil and Ecology Laboratory  
Mustafa Kemal Blv. No: 75 Zeytinalanı  
35515 - Izmir

## **United Kingdom**

**Forest Research**  
Environmental Research Laboratory  
Alice Holt Lodge  
GU10 4LH - Farnham, Surrey

## Method Codes – Pretreatment (P)

### Extraction methods

- PA06 Extraction with diluted HNO<sub>3</sub>  
 PA99 Other extraction method

### Digestion methods (open system)

- PB02 Open digestion with H<sub>2</sub>SO<sub>4</sub>/H<sub>2</sub>O<sub>2</sub>  
 PB03 Open digestion with HNO<sub>3</sub>  
 PB04 Open digestion with HNO<sub>3</sub> /H<sub>2</sub>SO<sub>4</sub>  
 PB05 Open digestion with HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>  
 PB06 Open digestion with HNO<sub>3</sub>/HClO<sub>4</sub>  
 PB07 Kjeldahl H<sub>2</sub>SO<sub>4</sub> with Se or Cu catalyst  
 PB08 Modified Kjeldahl H<sub>2</sub>SO<sub>4</sub> with Ti/Cu catalyst  
 PB99 Other digestion method (open system)

### Pressure digestion methods

- PC01 Pressure digestion HNO<sub>3</sub>  
 PC02 Pressure digestion HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>  
 PC03 Pressure digestion HNO<sub>3</sub>/HF (total digestion)  
 PC99 Other pressure digestion method

### Microwave pressure digestion methods

- PD01 Microwave pressure digestion HNO<sub>3</sub>  
 PD02 Microwave pressure digestion HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>  
 PD03 Microwave pressure digestion HNO<sub>3</sub>/H<sub>2</sub>O<sub>2</sub>/HCl  
 PD04 Microwave digestion HNO<sub>3</sub>/HClO<sub>4</sub>  
 PD05 Microwave pressure digestion HNO<sub>3</sub>/HF (total digestion)  
 PD99 Other microwave pressure digestion method

### Dry ashing digestion methods

- PE01 Oxygen ashing (Schöniger)  
 PE99 Other dry ashing method

### Other methods

- PZ01 Material melted and formed (tablet) for XRF methods  
 PZ02 Material pressed (pellet) for XRF methods  
 PZ98 No pretreatment  
 PZ99 Pretreatment method not in this list

## Method Codes – Determination (D)

### Element analyzer

DA01	Macro Elemental-analyzers for C, N or S for solids (Sample > 100mg)
DA02	Micro Elemental-analyzers for C, N or S for solids (Sample ≤ 100mg) with an extra milling step
DA05	Hg-Analyzer
DA99	Other Element analyzer method

### Atomic Absorption or Emission Spectroscopy

DB01	AAS-flame technique (C <sub>2</sub> H <sub>2</sub> /Air)
DB02	AAS-flame technique (C <sub>2</sub> H <sub>2</sub> /N <sub>2</sub> O)
DB03	AAS-cold vapor technique
DB04	AAS-hydride technique
DB05	AAS-flameless (electrothermal technique)
DB06	AES-Flame technique (Flame photometry)
DB07	AFS-hydride-technique
DB08	ICP-AES without Ultrasonic nebulisation
DB09	ICP-AES with Ultrasonic nebulisation
DB10	ICP-MS
DB99	Other Atomic Absorption or Emission Spectroscopy method

### Physical techniques

DD01	X-ray-energy dispersive
DD02	X-ray-wavelength dispersive
DD99	Other physical technique

### UV-VIS Spectrophotometry techniques

DE01	UV-VIS-spectrophotometry-technique
DE03	Continuous flow UV-VIS-spectrophotometry-technique
DE05	Flow injection UV-VIS-spectrophotometry-technique
DE99	Other UV-VIS Spectrophotometry technique

### Electrochemical methods

DF03	Ion selective electrodes (except pH-Electrodes)
DF08	Other Potentiometric titration
DF99	Other Electrochemical method

### Other methods

DZ02	N-Determination (after Kjeldahl digestion)
DZ99	Detection method not in this list

## List of abbreviations

No.	Number of results ordered by Lab. mean
Lab. Code	Code of the laboratory / Laboratory which are analysing level II samples are marked with x
P	Code for pre-treatment method (s. method code pre-treatment)
D	Code for determination method (s. method code determination)
Lab. mean	Mean of the results of each laboratory without outliers type 1
n	Number of all results from all laboratories without outliers type 1, 2, 3
I	Number of all laboratories without outliers type 2, 3
Mean	Total mean value from all results without outliers type 1, 2, 3
s <sub>i</sub>	Standard deviation from each laboratory without outliers type 1
s <sub>r</sub>	Mean Standard deviation for all laboratories without outliers type 1, 2, 3
V <sub>i</sub>	s <sub>i</sub> *100/Lab. Mean (marked in red if >10%)
CV <sub>r</sub>	s <sub>r</sub> *100/Mean
s <sub>R</sub>	Standard deviation from all results without outliers
CV <sub>R</sub>	s <sub>R</sub> *100/Mean
Recovery %	Lab.mean * 100/Mean
a	Outlier type 1
b	Outlier type 2
c	Outlier type 3
*	Not tolerable mean value from one laboratory (see tables 3 & 4)
**	Higher than maximum acceptable limit of quantification (see table 5)

## **Annex - Results**

Mandatory parameters (N, S, P, Ca, Mg, K, C)

Optional parameters (Zn, Mn, Fe, Cu, Pb, Cd, B, As, Cr, Co, Hg, Ni)

Additional parameters



# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: N      Sample: 1

Unit: mg/g

No.	Lab. Code	Method code P	Method code D	Replications				n	Lab.mean		Lab.standard dev.	Recovery
				1	2	3	4		s <sub>i</sub>	V <sub>i</sub>	%	
1	A43x	PB08	DZ02	22,71	23,13	22,67	23,13	4	22,91		0,25	92,26
2	F02x	PZ98	DA01	23,10	23,70	23,20	23,00	4	23,25		0,31	93,63
3	F26x	PB08	DZ02	23,76	23,75	23,79	23,79	4	23,77		0,02	95,73
4	F33x	PZ98	DA02	24,04	23,42	23,62	24,46	4	23,89		0,46	96,19
5	A59	PZ98	DA02	23,93	23,90	23,77	24,08	4	23,92		0,13	96,33
6	F25	PZ98	DA01	24,17	24,13	24,01	24,18	4	24,12		0,08	97,14
7	F29x	PB07	DF08	24,09	24,18	24,12	24,15	4	24,14		0,04	97,19
8	A62x	PZ98	DA01	24,10	24,30	24,40	24,20	4	24,25		0,13	97,66
9	A36	PB07	DZ02	24,50	24,18	24,29	24,18	4	24,29		0,15	97,81
10	F18x	PB07	DZ02	24,40	24,50	24,40	24,40	4	24,43		0,05	98,36
11	F01x	PB07	DZ02	24,58	24,64	24,41	24,35	4	24,50		0,14	98,64
12	A85x	PZ98	DA01	24,59	24,60	24,58	24,62	4	24,60		0,02	99,06
13	F19x	PZ98	DA01	24,60	24,60	24,40	24,80	4	24,60		0,16	99,07
14	A49x	PZ98	DA02	23,94	24,47	24,81	25,35	4	24,64		0,59	99,24
15	F07x	PZ98	DA01	24,68	24,58	24,84	24,55	4	24,66		0,13	99,32
16	A65	PZ98	DA02	24,85	24,86	24,80	24,51	4	24,76		0,17	99,69
17	A57	PZ98	DA01	24,55	24,61	25,44	24,77	4	24,84		0,41	100,04
18	F05x	PZ98	DA01	24,90	24,90	24,90	24,90	4	24,90		0,00	100,27
19	F32x	PZ98	DA01	24,20	24,00	25,70	25,80	4	24,93		0,96	100,37
20	A58	PZ98	DA99	24,55	25,17	24,62	25,44	4	24,95		0,43	100,46
21	F14x	PZ98	DA01	25,50	24,80	24,70	24,80	4	24,95		0,37	100,48
22	F15x	PZ98	DA01	25,04	24,97	24,98	24,84	4	24,96		0,08	100,51
23	F03x	PZ98	DA01	24,97	25,11	25,16	24,87	4	25,03		0,13	100,79
24	A61x	PZ98	DA02	25,06	24,95	25,18	25,04	4	25,06		0,09	100,91
25	F16x	PZ98	DA02	25,52	24,49	24,94	25,42	4	25,09		0,47	101,05
26	F28x	PZ98	DA01	24,90	25,20	24,80	25,60	4	25,13		0,36	101,18
27	A86	PZ98	DA01	25,10	25,60	24,80	25,10	4	25,15		0,33	101,28
28	F27x	PZ98	DA01	24,93	25,39	25,04	25,58	4	25,24		0,30	101,62
29	A47	PZ98	DA02	24,57	25,65	25,32	25,54	4	25,27		0,49	101,76
30	F06x	PZ98	DA02	25,67	25,63	24,64	25,21	4	25,29		0,48	101,83
31	A82	PZ98	DA02	25,40	25,75	25,40	25,30	4	25,46		0,20	102,54
32	A56	PZ98	DA01	25,30	26,00	25,80	25,60	4	25,68		0,30	103,40
33	F21x	PZ98	DA01	25,65	25,77	25,76	25,72	4	25,73		0,05	103,60
34	F13x	PZ98	DA01	25,70	25,80	25,70	25,70	4	25,73		0,05	103,60
35	F12x	PZ98	DA02	25,55	25,79	25,50	26,09	4	25,73		0,27	103,62
36	F22x	PZ98	DA02	24,95	26,53	26,23	25,90	4	25,90		0,68	104,32
37	A60x	PZ98	DA02	25,74	25,98	26,07	25,92	4	25,93		0,14	104,41
38	A88	PB07	DZ02	25,51	26,04	26,36	26,04	4	25,99		0,35	104,65
39	F08x	PZ98	DA01	28,79	27,75	25,46	25,48	0	26,87	c	1,67	108,20
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

\* = non tolerable mean because more than +/-

n	Mean	S <sub>r</sub>	CV <sub>r</sub>
all labs	152	24,83	0,258
10	% from the mean		1,037

I	S <sub>R</sub>	CV <sub>R</sub>
38	0,722	2,908

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: N      Sample: 2

Unit: mg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.	Recovery	
		P	D	1	2	3	4		S <sub>i</sub>	V <sub>i</sub>			
1	A43x	PB08	DZ02	13,70	13,70	13,41	13,61	0	13,61	b *	0,14	1,01	88,58
2	F25	PZ98	DA01	14,13	14,05	14,00	14,09	4	14,07		0,06	0,40	91,59
3	F02x	PZ98	DA01	14,00	14,30	14,60	14,40	4	14,33		0,25	1,75	93,27
4	A62x	PZ98	DA01	14,10	14,50	14,40	15,00	4	14,50		0,37	2,58	94,41
5	F26x	PB08	DZ02	14,66	14,68	14,68	14,68	4	14,68		0,01	0,07	95,55
6	F32x	PZ98	DA01	13,50	13,40	16,20	16,40	0	14,88	c	1,65	11,08	96,85
7	A65	PZ98	DA02	15,09	15,08	14,78	14,90	4	14,96		0,15	1,00	97,42
8	A59	PZ98	DA02	14,29	14,74	15,27	15,58	4	14,97		0,57	3,81	97,47
9	F19x	PZ98	DA01	15,00	14,90	15,00	15,30	4	15,05		0,17	1,15	97,99
10	F01x	PB07	DZ02	15,00	15,23	14,97	15,18	4	15,10		0,13	0,86	98,28
11	A36	PB07	DZ02	15,22	15,22	15,11	14,90	4	15,11		0,15	1,00	98,39
12	F29x	PB07	DF08	15,01	15,25	14,99	15,27	4	15,13		0,15	1,00	98,51
13	A61x	PZ98	DA02	15,01	15,25	14,87	15,40	4	15,13		0,24	1,57	98,52
14	F03x	PZ98	DA01	15,19	15,11	15,21	15,16	4	15,17		0,04	0,29	98,75
15	F07x	PZ98	DA01	15,06	15,16	15,35	15,20	4	15,19		0,12	0,79	98,92
16	F18x	PB07	DZ02	15,10	15,20	15,20	15,30	4	15,20		0,08	0,54	98,96
17	F22x	PZ98	DA02	15,05	15,04	15,54	15,21	4	15,21		0,23	1,54	99,02
18	A85x	PZ98	DA01	15,24	15,20	15,20	15,27	4	15,23		0,03	0,22	99,14
19	A49x	PZ98	DA02	15,31	15,09	15,43	15,20	4	15,26		0,15	0,96	99,34
20	A58	PZ98	DA99	15,44	15,17	15,28	15,15	4	15,26		0,13	0,87	99,35
21	F15x	PZ98	DA01	15,29	15,31	15,26	15,35	4	15,30		0,04	0,25	99,63
22	F05x	PZ98	DA01	15,40	15,40	15,40	15,40	4	15,40		0,00	0,00	100,27
23	A57	PZ98	DA01	15,40	15,38	15,15	15,77	4	15,43		0,26	1,66	100,43
24	F06x	PZ98	DA02	15,23	15,34	15,51	15,69	4	15,44		0,20	1,30	100,54
25	F28x	PZ98	DA01	15,50	15,40	15,40	15,60	4	15,48		0,10	0,62	100,75
26	A86	PZ98	DA01	15,40	15,50	15,30	15,70	4	15,48		0,17	1,10	100,75
27	A82	PZ98	DA02	15,50	15,60	15,50	15,60	4	15,55		0,06	0,37	101,24
28	A56	PZ98	DA01	15,70	15,70	15,60	15,40	4	15,60		0,14	0,91	101,57
29	A60x	PZ98	DA02	15,92	15,82	15,43	15,64	4	15,70		0,22	1,38	102,24
30	F16x	PZ98	DA02	15,63	15,61	16,11	15,69	4	15,76		0,24	1,50	102,61
31	F13x	PZ98	DA01	15,70	15,90	15,70	15,80	4	15,78		0,10	0,61	102,71
32	F12x	PZ98	DA02	15,50	15,75	15,90	16,05	4	15,80		0,23	1,47	102,85
33	F21x	PZ98	DA01	15,71	16,03	16,08	15,94	4	15,94		0,16	1,03	103,78
34	F14x	PZ98	DA01	16,10	15,80	15,60	16,40	4	15,98		0,35	2,19	104,01
35	F33x	PZ98	DA02	16,02	15,91	16,02	16,13	4	16,02		0,09	0,56	104,30
36	A88	PB07	DZ02	15,36	16,52	16,57	15,74	4	16,05		0,60	3,71	104,48
37	A47	PZ98	DA02	15,96	16,28	16,07	15,96	4	16,07		0,15	0,94	104,61
38	F27x	PZ98	DA01	16,92	16,14	16,52	16,97	4	16,64		0,39	2,33	108,32
39	F08x	PZ98	DA01	18,33	18,14	16,04	15,59	0	17,03	b *	1,41	8,30	110,85
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n	Mean	S <sub>r</sub>	CV <sub>r</sub>
all labs	144	15,36	0,181
10	% from the mean		1,180

I  
36                    S<sub>R</sub>                    CV<sub>R</sub>  
0,515                3,352

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: N      Sample: 3

Unit: mg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$s_i$	$V_i$		
1	A62x	PZ98	DA01	9,72	9,87	9,49	9,50	4	9,65		0,18	90,46
2	A43x	PB08	DZ02	9,89	10,04	9,89	10,34	4	10,04		0,21	94,16
3	A57	PZ98	DA01	9,56	10,32	10,77	10,19	4	10,21		0,50	95,76
4	F25	PZ98	DA01	10,19	10,29	10,23	10,27	4	10,25		0,04	96,09
5	F19x	PZ98	DA01	10,30	10,10	10,30	10,30	4	10,25		0,10	96,13
6	A65	PZ98	DA02	10,15	10,15	10,28	10,50	4	10,27		0,17	96,32
7	A36	PB07	DZ02	10,47	10,37	10,26	10,15	4	10,31		0,14	96,72
8	A61x	PZ98	DA02	10,21	10,45	10,42	10,42	4	10,38		0,11	97,31
9	F02x	PZ98	DA01	10,20	11,10	10,00	10,30	4	10,40		0,48	97,54
10	F29x	PB07	DF08	10,39	10,43	10,48	10,51	4	10,45		0,05	98,03
11	F26x	PB08	DZ02	10,47	10,48	10,47	10,47	4	10,47		0,00	98,22
12	F03x	PZ98	DA01	10,49	10,46	10,46	10,54	4	10,49		0,04	98,36
13	A86	PZ98	DA01	10,60	10,50	10,10	10,80	4	10,50		0,29	98,48
14	A59	PZ98	DA02	10,73	10,45	10,51	10,35	4	10,51		0,16	98,57
15	F07x	PZ98	DA01	10,65	10,48	10,62	10,39	4	10,54		0,12	98,81
16	F22x	PZ98	DA02	10,24	10,30	11,09	10,54	4	10,54		0,39	98,86
17	F28x	PZ98	DA01	10,40	10,60	10,50	10,70	4	10,55		0,13	98,95
18	A88	PB07	DZ02	10,48	11,01	10,48	10,37	4	10,59		0,29	99,28
19	F15x	PZ98	DA01	10,65	10,63	10,56	10,54	4	10,60		0,05	99,37
20	F32x	PZ98	DA01	8,91	10,20	11,80	11,50	0	10,60	c	1,32	12,50
21	A58	PZ98	DA99	10,52	10,81	10,43	10,85	4	10,65		0,21	99,91
22	A85x	PZ98	DA01	10,73	10,65	10,71	10,74	4	10,71		0,04	100,42
23	F18x	PB07	DZ02	10,70	10,80	10,70	10,70	4	10,73		0,05	100,59
24	F06x	PZ98	DA02	10,55	10,98	10,69	10,69	4	10,73		0,18	100,61
25	F05x	PZ98	DA01	10,80	10,70	10,80	10,70	4	10,75		0,06	100,82
26	F01x	PB07	DZ02	11,02	10,56	10,56	10,96	4	10,77		0,25	101,05
27	F13x	PZ98	DA01	10,80	10,80	10,80	10,70	4	10,78		0,05	101,06
28	F12x	PZ98	DA02	10,76	10,54	10,91	11,07	4	10,82		0,23	101,49
29	F27x	PZ98	DA01	10,91	10,73	10,85	10,88	4	10,84		0,08	101,69
30	A56	PZ98	DA01	11,00	11,00	10,90	10,90	4	10,95		0,06	102,70
31	A49x	PZ98	DA02	10,60	11,05	10,86	11,30	4	10,95		0,30	102,72
32	F14x	PZ98	DA01	11,20	11,00	10,90	11,00	4	11,03		0,13	103,40
33	A47	PZ98	DA02	11,05	10,95	11,16	11,05	4	11,05		0,09	103,66
34	A60x	PZ98	DA02	11,14	11,13	11,33	10,64	4	11,06		0,30	103,73
35	F21x	PZ98	DA01	11,30	11,04	11,00	11,11	4	11,11		0,13	104,22
36	A82	PZ98	DA02	10,85	11,60	11,45	10,65	4	11,14		0,46	104,46
37	F16x	PZ98	DA02	11,36	11,00	11,04	11,29	4	11,17		0,18	104,79
38	F33x	PZ98	DA02	11,39	11,39	11,39	11,39	4	11,39		0,00	106,83
39	F08x	PZ98	DA01	11,82	11,15	11,87	11,41	4	11,56		0,35	108,45
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$

all labs    152    10,66    0,173    1,627

10 % from the mean

\* = non tolerable mean because more than +/-

I       $s_R$        $CV_R$

38    0,380    3,568

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: N      Sample: 4

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev.		Recovery %	
		P	D	1	2	3		s <sub>i</sub>	v <sub>i</sub>	s <sub>i</sub>	v <sub>i</sub>		
1	A43x	PB08	DZ02	21,61	21,61	22,37	22,83	4	22,11	c	0,60	2,72	93,43
2	F02x	PZ98	DA01	22,60	21,80	22,40	21,80	4	22,15		0,41	1,86	93,62
3	A59	PZ98	DA02	22,54	22,25	22,30	22,25	4	22,34		0,14	0,62	94,40
4	F32x	PZ98	DA01	20,60	22,10	24,40	24,40	0	22,88		1,86	8,15	96,68
5	F25	PZ98	DA01	22,94	22,94	22,86	22,86	4	22,90		0,05	0,20	96,79
6	A62x	PZ98	DA01	22,40	22,90	23,20	23,20	4	22,93		0,38	1,65	96,89
7	A49x	PZ98	DA02	22,89	23,02	23,02	23,04	4	22,99		0,07	0,30	97,18
8	F26x	PB08	DZ02	23,06	23,08	23,07	23,08	4	23,07		0,01	0,04	97,51
9	A36	PB07	DZ02	23,50	22,85	23,07	22,96	4	23,10		0,28	1,23	97,61
10	F29x	PB07	DF08	23,22	23,25	23,27	23,45	4	23,30		0,10	0,45	98,47
11	A86	PZ98	DA01	23,60	23,40	23,50	23,30	4	23,45		0,13	0,55	99,11
12	F18x	PB07	DZ02	23,50	23,50	23,50	23,60	4	23,53		0,05	0,21	99,43
13	A57	PZ98	DA01	23,48	23,59	23,23	23,82	4	23,53		0,25	1,04	99,45
14	A85x	PZ98	DA01	23,62	23,51	23,61	23,50	4	23,56		0,06	0,27	99,57
15	F05x	PZ98	DA01	23,60	23,60	23,60	23,50	4	23,58		0,05	0,21	99,64
16	F19x	PZ98	DA01	23,50	23,60	23,60	23,60	4	23,58		0,05	0,21	99,64
17	A65	PZ98	DA02	23,62	23,55	23,83	23,68	4	23,67		0,12	0,50	100,04
18	F01x	PB07	DZ02	23,74	23,80	23,74	23,62	4	23,72		0,07	0,31	100,26
19	F07x	PZ98	DA01	23,69	23,70	23,85	23,79	4	23,76		0,08	0,32	100,41
20	A56	PZ98	DA01	23,90	23,70	23,90	23,70	4	23,80		0,12	0,49	100,59
21	F06x	PZ98	DA02	24,09	24,08	23,60	23,56	4	23,83		0,29	1,23	100,73
22	A61x	PZ98	DA02	23,89	23,59	24,07	23,79	4	23,84		0,20	0,84	100,74
23	F15x	PZ98	DA01	23,83	23,85	23,84	23,93	4	23,86		0,05	0,19	100,85
24	F03x	PZ98	DA01	23,97	23,81	23,89	23,87	4	23,89		0,07	0,28	100,95
25	F27x	PZ98	DA01	24,22	23,69	23,68	24,01	4	23,90		0,26	1,10	101,01
26	F33x	PZ98	DA02	23,96	24,07	23,75	23,85	4	23,91		0,14	0,58	101,04
27	A58	PZ98	DA99	23,92	23,74	24,07	23,94	4	23,92		0,14	0,57	101,09
28	F28x	PZ98	DA01	23,90	23,80	24,10	24,30	4	24,03		0,22	0,92	101,54
29	A82	PZ98	DA02	23,95	23,90	24,15	24,10	4	24,03		0,12	0,50	101,54
30	F16x	PZ98	DA02	24,00	24,11	24,17	23,99	4	24,07		0,09	0,36	101,72
31	F22x	PZ98	DA02	24,14	23,98	24,27	24,13	4	24,13		0,12	0,48	101,99
32	F14x	PZ98	DA01	23,90	24,20	24,30	24,20	4	24,15		0,17	0,72	102,07
33	F21x	PZ98	DA01	24,37	24,22	24,32	24,30	4	24,30		0,06	0,26	102,71
34	A47	PZ98	DA02	24,64	24,21	24,32	24,10	4	24,32		0,23	0,96	102,78
35	F12x	PZ98	DA02	23,90	24,27	24,52	24,61	4	24,32		0,32	1,31	102,80
36	A60x	PZ98	DA02	24,32	24,87	23,75	24,41	4	24,34		0,46	1,89	102,87
37	F13x	PZ98	DA01	24,60	24,50	24,70	24,40	4	24,55		0,13	0,53	103,76
38	A88	PB07	DZ02	24,68	25,42	24,63	25,41	4	25,04		0,44	1,75	105,81
39	F08x	PZ98	DA01	25,78	26,25	24,47	23,91	0	25,10	c	1,09	4,35	106,09
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n      Mean  
all labs    148    23,66  
10      % from the mean

s<sub>r</sub>      CV<sub>r</sub>  
0,176    0,744

I      s<sub>R</sub>      CV<sub>R</sub>  
37    0,637    2,693

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: S      Sample: 1

Unit: mg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.	Recovery	
		P	D	1	2	3	4		S <sub>i</sub>	V <sub>i</sub>			
1	F07x	PD03	DB08	0,60	0,61	0,58	0,58	0	0,59	b *	0,02	2,64	35,78
2	A56	PC01	DB08	1,38	1,41	1,40	1,40	0	1,40	b *	0,01	1,05	84,62
3	F21x	PZ98	DA01	1,51	1,48	1,47	1,48	4	1,49		0,02	1,17	89,86
4	F08x	PZ99	DB08	1,50	1,51	1,51	1,54	4	1,52		0,02	1,36	91,70
5	F33x	PD01	DB10	1,54	1,57	1,55	1,57	4	1,56		0,02	0,96	94,25
6	A82	PD01	DB08	1,57	1,59	1,56	1,55	4	1,56		0,02	1,04	94,66
7	A58	PZ98	DA99	1,59	1,59	1,54	1,58	4	1,57		0,02	1,47	95,26
8	F05x	PZ98	DA01	1,58	1,59	1,60	1,60	4	1,59		0,01	0,60	96,37
9	A47	PD01	DB08	1,61	1,60	1,60	1,60	4	1,60		0,00	0,25	96,96
10	A62x	PZ98	DA01	1,59	1,61	1,59	1,62	4	1,60		0,02	0,94	96,97
11	A36	PD02	DB08	1,61	1,57	1,71	1,56	0	1,61	c	0,07	4,25	97,58
12	A85x	PZ98	DA01	1,63	1,62	1,59	1,62	4	1,62		0,02	1,07	97,73
13	F18x	PD99	DB08	1,63	1,61	1,64	1,61	4	1,62		0,01	0,92	98,18
14	F02x	PZ98	DA01	1,62	1,63	1,60	1,64	4	1,62		0,02	1,05	98,18
15	A59	PC01	DB08	1,62	1,63	1,63	1,61	4	1,62		0,01	0,72	98,23
16	A57	PZ02	DD02	1,62	1,63	1,63	1,63	4	1,63		0,00	0,31	98,48
17	A61x	PC01	DB08	1,61	1,62	1,63	1,67	4	1,63		0,03	1,61	98,79
18	F29x	PZ98	DA02	1,63	1,67	1,65	1,63	4	1,65		0,02	1,17	99,54
19	F13x	PD01	DB08	1,63	1,66	1,67	1,63	4	1,65		0,02	1,25	99,69
20	F16x	PC01	DB08	1,68	1,66	1,69	1,68	4	1,68		0,01	0,65	101,54
21	A86	PZ98	DA01	1,68	1,68	1,69	1,68	4	1,68		0,00	0,18	101,87
22	F12x	PC01	DB08	1,72	1,69	1,68	1,67	4	1,69		0,02	1,23	102,13
23	F14x	PC01	DB08	1,69	1,70	1,69	1,69	4	1,69		0,01	0,30	102,42
24	F28x	PZ98	DA01	1,69	1,73	1,71	1,65	4	1,70		0,03	2,02	102,57
25	F19x	PD02	DB08	1,65	1,69	1,73	1,71	4	1,70		0,03	2,02	102,57
26	F15x	PC01	DB08	1,70	1,69	1,70	1,69	4	1,70		0,01	0,34	102,57
27	F06x	PD02	DB08	1,71	1,69	1,73	1,70	4	1,71		0,02	0,94	103,28
28	A88	PZ98	DA01	1,75	1,74	1,69	1,75	4	1,73		0,03	1,66	104,84
29	F32x	PD01	DB08	1,73	1,75	1,73	1,72	4	1,73		0,01	0,73	104,84
30	A60x	PD01	DB10	1,65	1,77	1,74	1,79	4	1,74		0,06	3,45	105,03
31	A65	PD01	DB08	1,71	1,73	1,75	1,78	4	1,74		0,03	1,71	105,44
32	F25	PB06	DB08	1,74	1,75	1,76	1,75	4	1,75		0,01	0,49	105,65
33	F27x	PZ98	DA01	1,91	1,78	1,82	1,80	4	1,82		0,06	3,07	110,40
34	A79	PD01	DB08	2,09	2,05	2,06	2,03	0	2,06	b *	0,02	1,17	124,53
35	F22x	PD02	DA02	2,21	2,21	2,18	2,20	0	2,20	b *	0,02	0,72	133,13
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n                  Mean                  S<sub>r</sub>                  CV<sub>r</sub>  
 all labs    120    1,65    0,019    1,167  
 15                  % from the mean

I                  S<sub>R</sub>                  CV<sub>R</sub>  
 30                  0,075    4,530

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: S      Sample: 2

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3		$b^*$	$b^*$		
1	F07x	PD03	DB08	0,83	0,83	0,83	0,8651a	0	0,83	$b^*$	67,92
2	A56	PC01	DB08	1,02	1,02	1,02	1,01	0	1,02	$b^*$	82,99
3	F33x	PD01	DB10	1,10	1,13	1,09	1,13	4	1,11		90,68
4	A82	PD01	DB08	1,13	1,11	1,14	1,11	4	1,12		91,31
5	F08x	PZ99	DB08	1,11	1,14	1,16	1,18	4	1,15		93,56
6	A58	PZ98	DA99	1,17	1,17	1,13	1,16	4	1,16		94,49
7	A62x	PZ98	DA01	1,18	1,15	1,13	1,19	4	1,16		94,76
8	A60x	PD01	DB10	1,26	1,13	1,07	1,22	0	1,17	$c$	95,29
9	A47	PD01	DB08	1,17	1,17	1,17	1,17	4	1,17		95,41
10	F02x	PZ98	DA01	1,20	1,19	1,18	1,20	4	1,19		97,20
11	A36	PD02	DB08	1,18	1,20	1,23	1,16	4	1,19		97,20
12	A59	PC01	DB08	1,18	1,21	1,20	1,20	4	1,20		97,45
13	F21x	PZ98	DA01	1,19	1,20	1,22	1,20	4	1,20		98,02
14	F05x	PZ98	DA01	1,23	1,23	1,17	1,18	4	1,20		98,02
15	A85x	PZ98	DA01	1,21	1,21	1,22	1,21	4	1,21		98,83
16	F16x	PC01	DB08	1,22	1,23	1,21	1,22	4	1,22		99,22
17	A61x	PC01	DB08	1,25	1,24	1,19	1,23	4	1,23		100,06
18	F28x	PZ98	DA01	1,25	1,24	1,26	1,20	4	1,24		100,87
19	F14x	PC01	DB08	1,24	1,24	1,25	1,25	4	1,25		101,48
20	F27x	PZ98	DA01	1,29	1,26	1,20	1,24	4	1,25		101,52
21	F06x	PD02	DB08	1,25	1,24	1,26	1,23	4	1,25		101,52
22	F12x	PC01	DB08	1,26	1,25	1,25	1,24	4	1,25		101,65
23	F19x	PD02	DB08	1,22	1,25	1,27	1,29	4	1,26		102,50
24	F15x	PC01	DB08	1,25	1,28	1,26	1,25	4	1,26		102,71
25	A86	PZ98	DA01	1,27	1,27	1,25	1,28	4	1,27		103,30
26	F13x	PD01	DB08	1,25	1,28	1,29	1,29	4	1,28		104,13
27	F32x	PD01	DB08	1,28	1,28	1,27	1,29	4	1,28		104,34
28	F18x	PD99	DB08	1,28	1,31	1,27	1,27	4	1,28		104,54
29	A88	PZ98	DA01	1,30	1,31	1,26	1,29	4	1,29		105,15
30	A65	PD01	DB08	1,32	1,30	1,29	1,28	4	1,30		105,76
31	A57	PZ02	DD02	1,31	1,31	1,31	1,35a	3	1,31		106,78
32	F29x	PZ98	DA02	1,42	1,22	1,33	1,39	0	1,34	$c$	109,17
33	F25	PB06	DB08	1,33	1,35	1,35	1,33	4	1,34		109,23
34	A79	PD01	DB08	1,53	1,54	1,53	1,53	0	1,53	$b^*$	125,04
35	F22x	PD02	DA02	1,60	1,60	1,63	1,61	0	1,61	$b^*$	131,14
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											

\* = non tolerable mean because more than +/-

n      Mean       $s_r$        $CV_r$   
 all labs    115    1,23    0,017    1,385  
 15      % from the mean

I       $s_R$        $CV_R$   
 29      0,057    4,613

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: S      Sample: 3

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev.		Recovery %	
		P	D	1	2	3		S <sub>i</sub>	V <sub>i</sub>	S <sub>r</sub>	V <sub>r</sub>		
1	A56	PC01	DB08	0,77	0,80	0,76	0,74	4	0,77	*	0,03	3,74	81,55
2	F28x	PZ98	DA01	0,80	0,78	0,79	0,77	4	0,79	*	0,01	1,64	83,65
3	F33x	PD01	DB10	0,93	0,80	0,76	0,79	0	0,82	c	0,08	9,18	87,38
4	A82	PD01	DB08	0,88	0,84	0,85	0,85	4	0,85		0,02	1,85	91,02
5	A60x	PD01	DB10	0,98	0,74	0,95	0,81	0	0,87	c	0,11	13,07	92,98
6	A36	PD02	DB08	0,90	0,88	0,88	0,87	4	0,88		0,01	1,43	94,05
7	F08x	PZ99	DB08	0,89	0,89	0,92	0,83	4	0,88		0,04	4,15	94,26
8	A47	PD01	DB08	0,90	0,90	0,91	0,90	4	0,90		0,01	0,56	96,04
9	A59	PC01	DB08	0,91	0,90	0,92	0,91	4	0,91		0,01	1,19	96,84
10	A85x	PZ98	DA01	0,93	0,93	0,91	0,91	4	0,92		0,01	1,26	98,04
11	A58	PZ98	DA99	0,91	0,91	0,93	0,94	4	0,92		0,01	1,61	98,23
12	F02x	PZ98	DA01	0,92	0,92	0,93	0,93	4	0,93		0,01	0,62	98,57
13	F16x	PC01	DB08	0,93	0,93	0,92	0,93	4	0,93		0,01	0,68	98,69
14	F14x	PC01	DB08	0,93	0,92	0,93	0,93	4	0,93		0,01	0,54	98,84
15	F29x	PZ98	DA02	0,93	0,92	0,90	0,99	4	0,93		0,04	4,20	99,53
16	F12x	PC01	DB08	0,96	0,94	0,92	0,95	4	0,94		0,02	1,76	100,12
17	F13x	PD01	DB08	0,94	0,93	0,93	0,96	4	0,94		0,01	1,55	100,41
18	A86	PZ98	DA01	0,95	0,94	0,94	0,95	4	0,95		0,00	0,37	100,76
19	F19x	PD02	DB08	0,96	0,94	0,94	0,96	4	0,95		0,01	1,30	101,03
20	A61x	PC01	DB08	0,94	0,95	0,95	0,96	4	0,95		0,01	0,86	101,24
21	F15x	PC01	DB08	0,95	0,95	0,95	0,95	4	0,95		0,00	0,00	101,24
22	F06x	PD02	DB08	0,97	0,96	0,96	0,97	4	0,96		0,01	0,84	102,71
23	F27x	PZ98	DA01	0,94	0,97	0,95	1,00	4	0,97		0,03	2,88	102,94
24	F05x	PZ98	DA01	0,98	0,97	0,97	0,97	4	0,97		0,01	0,68	103,48
25	A88	PZ98	DA01	0,97	1,02	0,98	0,97	4	0,99		0,02	2,42	104,97
26	A57	PZ02	DD02	0,99	0,98	0,99	0,98	4	0,99		0,01	0,59	104,97
27	A65	PD01	DB08	0,99	0,99	0,99	0,98	4	0,99		0,01	0,51	105,23
28	A62x	PZ98	DA01	0,97	0,94	1,02	1,08	4	1,00		0,06	6,12	106,83
29	F32x	PD01	DB08	1,01	1,01	1,00	1,00	4	1,01		0,01	0,57	107,10
30	F18x	PD99	DB08	1,02	1,02	1,00	1,02	4	1,02		0,01	0,99	108,17
31	F25	PB06	DB08	1,02	1,03	1,02	1,04	4	1,03		0,01	0,81	109,44
32	F21x	PZ98	DA01	1,02	1,00	1,08	1,03	4	1,03		0,03	3,30	110,03
33	A79	PD01	DB08	1,21	1,23	1,21	1,25	0	1,22	b *	0,02	1,34	130,52
34	F22x	PD02	DA02	1,22	1,28	1,19	1,23	0	1,23	b *	0,04	3,20	131,27
35	F07x	PD03	DB08	1,34	1,34	1,35	1,38	0	1,35	b *	0,02	1,52	144,05
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
all labs    120    0,94    0,015    1,623

15 % from the mean

\* = non tolerable mean because more than +/-

I      S<sub>R</sub>      CV<sub>R</sub>  
30    0,062    6,586

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: S      Sample: 4

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev.		Recovery %	
		P	D	1	2	3		S <sub>i</sub>	V <sub>i</sub>	S <sub>r</sub>	V <sub>r</sub>		
1	F07x	PD03	DB08	0,89	0,86	0,90	0,92	0	0,89	b *	0,02	2,71	33,74
2	A56	PC01	DB08	2,14	2,18	2,15	2,19	4	2,17	*	0,03	1,25	81,74
3	F29x	PZ98	DA02	2,10	2,38	1,99	2,28	0	2,19	c *	0,18	8,05	82,59
4	F33x	PD01	DB10	2,28	2,22	2,23	2,28	4	2,25		0,03	1,42	85,03
5	A58	PZ98	DA99	2,29	2,33	2,33	2,32	4	2,31		0,02	0,81	87,37
6	F16x	PC01	DB08	2,40	2,44	2,41	2,44	4	2,42		0,02	0,90	91,44
7	A82	PD01	DB08	2,50	2,49	2,48	2,49	4	2,49		0,01	0,31	94,07
8	A85x	PZ98	DA01	2,52	2,52	2,54	2,52	4	2,53		0,01	0,40	95,32
9	F08x	PZ99	DB08	2,51	2,46	2,56	2,64	4	2,54		0,08	3,12	95,97
10	A57	PZ02	DD02	2,54	2,54	2,55	2,55	4	2,55		0,01	0,23	96,07
11	F27x	PZ98	DA01	2,51	2,53	2,62	2,63	4	2,57		0,06	2,29	97,14
12	A36	PD02	DB08	2,61	2,64	2,51	2,54	4	2,58		0,06	2,34	97,20
13	F05x	PZ98	DA01	2,57	2,61	2,62	2,59	4	2,60		0,02	0,85	98,05
14	A47	PD01	DB08	2,61	2,61	2,61	2,61	4	2,61		0,00	0,07	98,40
15	A59	PC01	DB08	2,60	2,63	2,61	2,60	4	2,61		0,02	0,60	98,55
16	A61x	PC01	DB08	2,65	2,60	2,66	2,67	4	2,65		0,03	1,18	99,84
17	F13x	PD01	DB08	2,64	2,64	2,68	2,66	4	2,66		0,02	0,72	100,22
18	A86	PZ98	DA01	2,69	2,68	2,67	2,60	4	2,66		0,04	1,53	100,40
19	F18x	PD99	DB08	2,66	2,66	2,65	2,70	4	2,67		0,02	0,83	100,69
20	F28x	PZ98	DA01	2,68	2,69	2,70	2,67	4	2,69		0,01	0,48	101,35
21	A60x	PD01	DB10	2,66	2,62	2,69	2,78	4	2,69		0,07	2,61	101,49
22	A88	PZ98	DA01	2,68	2,63	2,75	2,76	4	2,71		0,06	2,27	102,11
23	F12x	PC01	DB08	2,74	2,74	2,69	2,71	4	2,72		0,03	0,96	102,65
24	A62x	PZ98	DA01	2,73	2,72	2,72	2,78	4	2,74		0,03	1,05	103,34
25	F14x	PC01	DB08	2,75	2,77	2,75	2,77	4	2,76		0,01	0,42	104,19
26	F02x	PZ98	DA01	2,78	2,76	2,77	2,76	4	2,77		0,01	0,35	104,47
27	F15x	PC01	DB08	2,74	2,78	2,84	2,76	4	2,78		0,04	1,55	104,94
28	F19x	PD02	DB08	2,79	2,81	2,80	2,80	4	2,80		0,01	0,29	105,70
29	F21x	PZ98	DA01	2,77	2,80	2,85	2,82	4	2,81		0,03	1,20	106,07
30	F06x	PD02	DB08	2,82	2,80	2,84	2,79	4	2,81		0,02	0,76	106,21
31	A65	PD01	DB08	2,81	2,81	2,82	2,83	4	2,82		0,01	0,34	106,36
32	F32x	PD01	DB08	2,84	2,86	2,88	2,88	4	2,87		0,02	0,67	108,15
33	F25	PB06	DB08	2,94	2,95	2,98	2,97	4	2,96		0,02	0,66	111,72
34	A79	PD01	DB08	2,98	3,03	3,02	3,03	4	3,01		0,02	0,79	113,76
35	F22x	PD02	DA02	3,50	3,53	3,58	3,54	0	3,54	b *	0,04	0,99	133,49
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
all labs    128    2,65    0,027    1,030

15 % from the mean

\* = non tolerable mean because more than +/-

I      S<sub>R</sub>      CV<sub>R</sub>  
32    0,186    7,035

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: P      Sample: 1

Unit: mg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.	Recovery	
		P	D	1	2	3	4		s <sub>i</sub>	v <sub>i</sub>			
1	A62x	PB99	DE01	0,65	0,53	0,57	0,61	0	0,59	b *	0,05	8,75	48,62
2	A43	PB06	DE01	1,11	1,10	1,04	1,04	4	1,08	*	0,04	3,40	88,61
3	A85x	PB06	DB08	1,16	1,11	1,12	1,06	4	1,11		0,04	3,73	91,68
4	F21x	PC02	DE01	1,12	1,13	1,10	1,12	4	1,12		0,01	1,13	92,09
5	A88	PD01	DB08	1,15	1,12	1,12	1,12	4	1,13		0,01	1,33	92,91
6	A59	PC01	DB08	1,12	1,13	1,13	1,16	4	1,13		0,02	1,50	93,45
7	A56	PC01	DB08	1,14	1,15	1,14	1,13	4	1,14		0,01	0,63	94,08
8	A61x	PB02	DB08	1,15	1,18	1,19	1,18	4	1,18		0,02	1,47	96,83
9	A57	PZ02	DD02	1,17	1,17	1,18	1,18	4	1,18		0,01	0,49	96,83
10	F29x	PD99	DE01	1,24	1,21	1,20	1,11	4	1,19		0,05	4,59	98,02
11	F01x	PD02	DE01	1,21	1,19	1,18	1,19	4	1,19		0,01	1,06	98,27
12	F26x	PC02	DB09	1,20	1,18	1,19	1,22	4	1,20		0,02	1,43	98,68
13	F05x	PD02	DB08	1,20	1,20	1,20	1,20	4	1,20		0,00	0,00	98,89
14	A82	PD01	DB08	1,21	1,22	1,22	1,21	4	1,21		0,00	0,41	99,90
15	A47	PD01	DB08	1,22	1,21	1,21	1,21	4	1,21		0,01	0,44	99,90
16	F06x	PD02	DB08	1,22	1,21	1,22	1,21	4	1,21		0,01	0,67	99,98
17	A58	PD02	DE01	1,20	1,23	1,20	1,23	4	1,22		0,02	1,43	100,12
18	F02x	PD02	DB08	1,23	1,19	1,24	1,21	4	1,22		0,02	1,82	100,33
19	F16x	PC01	DB08	1,22	1,21	1,23	1,21	4	1,22		0,01	0,84	100,39
20	F27x	PD01	DE01	1,24	1,22	1,25	1,19	4	1,22		0,03	2,09	100,89
21	F15x	PC01	DB08	1,24	1,23	1,23	1,24	4	1,23		0,00	0,27	101,73
22	A36	PD02	DB08	1,22	1,20	1,32	1,20	0	1,24	c	0,06	4,65	101,77
23	F19x	PD02	DB08	1,22	1,23	1,25	1,25	4	1,24		0,02	1,21	101,98
24	F13x	PD01	DB08	1,24	1,24	1,23	1,25	4	1,24		0,01	0,66	102,18
25	F18x	PD99	DB08	1,23	1,24	1,24	1,25	4	1,24		0,01	0,66	102,18
26	F33x	PD01	DB10	1,23	1,25	1,27	1,23	4	1,25		0,02	1,54	102,60
27	F14x	PC01	DB08	1,26	1,25	1,26	1,27	4	1,26		0,01	0,65	103,83
28	A65	PD01	DB08	1,26	1,25	1,26	1,27	4	1,26		0,01	0,65	103,83
29	F12x	PC01	DB08	1,26	1,26	1,26	1,26	4	1,26		0,00	0,26	103,98
30	F32x	PD01	DB08	1,27	1,28	1,26	1,25	4	1,27		0,01	1,02	104,24
31	F25	PB06	DB08	1,27	1,26	1,27	1,26	4	1,27		0,00	0,21	104,26
32	F08x	PE99	DB08	1,25	1,24	1,29	1,29	4	1,27		0,03	2,19	104,54
33	F28x	PD02	DB08	1,27	1,28	1,28	1,27	4	1,28		0,01	0,49	105,11
34	A79	PD01	DB08	1,31	1,29	1,29	1,29	4	1,29		0,01	1,02	106,59
35	A60x	PD01	DB10	1,34	1,36	1,34	1,35	4	1,35	*	0,01	0,43	111,11
36	F07x	PD03	DB08	1,46	1,47	1,38	1,40	0	1,43	b *	0,04	3,09	117,68
37	F22x	PD02	DB08	1,58	1,59	1,56	1,58	0	1,58	b *	0,01	0,61	130,06
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    132    1,21    0,014    1,181  
 10      % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
 33      0,058    4,806

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: P      Sample: 2

Unit: mg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %		
		P	D	1	2	3	4		b	*				
1	A62x	PB99	DE01	0,69	0,74	0,82	0,86	0	0,78	b	*	0,08	9,87	55,34
2	A85x	PB06	DB08	1,28	1,04a	1,28	1,26	3	1,27			0,01	0,64	90,64
3	F21x	PC02	DE01	1,31	1,28	1,30	1,27	4	1,29			0,02	1,42	91,82
4	A56	PC01	DB08	1,29	1,30	1,30	1,28	4	1,29			0,01	0,69	91,96
5	A88	PD01	DB08	1,34	1,33	1,26	1,24	4	1,29			0,05	3,86	92,00
6	F29x	PD99	DE01	1,30	1,30	1,30	1,30	4	1,30			0,00	0,20	92,52
7	A59	PC01	DB08	1,30	1,32	1,34	1,30	4	1,32			0,02	1,51	93,60
8	A58	PD02	DE01	1,34	1,34	1,35	1,36	4	1,35			0,01	0,71	95,92
9	F01x	PD02	DE01	1,38	1,32	1,35	1,37	4	1,36			0,03	1,95	96,45
10	A47	PD01	DB08	1,36	1,35	1,35	1,36	4	1,36			0,00	0,13	96,45
11	A61x	PB02	DB08	1,36	1,37	1,36	1,35	4	1,36			0,01	0,60	96,81
12	A82	PD01	DB08	1,36	1,36	1,35	1,37	4	1,36			0,01	0,48	96,93
13	F27x	PD01	DE01	1,41	1,40	1,37	1,32	4	1,38			0,04	2,85	97,91
14	F06x	PD02	DB08	1,39	1,38	1,40	1,37	4	1,38			0,02	1,09	98,48
15	F16x	PC01	DB08	1,38	1,39	1,38	1,39	4	1,38			0,01	0,49	98,52
16	F05x	PD02	DB08	1,40	1,40	1,40	1,40	4	1,40			0,00	0,00	99,65
17	A43	PB06	DE01	1,36	1,49	1,39	1,38	4	1,41			0,06	4,12	100,06
18	F26x	PC02	DB09	1,40	1,41	1,42	1,40	4	1,41			0,01	0,68	100,19
19	F33x	PD01	DB10	1,42	1,42	1,37	1,44	4	1,41			0,03	2,11	100,54
20	A36	PD02	DB08	1,41	1,42	1,46	1,37	4	1,42			0,04	2,61	100,72
21	F19x	PD02	DB08	1,40	1,43	1,43	1,45	4	1,43			0,02	1,44	101,61
22	F02x	PD02	DB08	1,38	1,45	1,42	1,49	4	1,44			0,05	3,24	102,15
23	F15x	PC01	DB08	1,42	1,45	1,44	1,44	4	1,44			0,01	0,80	102,27
24	F18x	PD99	DB08	1,45	1,44	1,45	1,45	4	1,45			0,01	0,35	103,04
25	F08x	PE99	DB08	1,41	1,40	1,49	1,49	4	1,45			0,05	3,60	103,04
26	F12x	PC01	DB08	1,46	1,45	1,45	1,44	4	1,45			0,01	0,64	103,11
27	F13x	PD01	DB08	1,43	1,45	1,46	1,46	4	1,45			0,01	0,98	103,21
28	F14x	PC01	DB08	1,45	1,46	1,46	1,46	4	1,46			0,01	0,34	103,75
29	A65	PD01	DB08	1,48	1,46	1,46	1,45	4	1,46			0,01	0,86	104,10
30	F32x	PD01	DB08	1,46	1,48	1,44	1,48	4	1,47			0,02	1,31	104,28
31	F28x	PD02	DB08	1,48	1,46	1,44	1,49	4	1,47			0,02	1,52	104,53
32	F25	PB06	DB08	1,49	1,49	1,49	1,48	4	1,49			0,00	0,14	105,74
33	A79	PD01	DB08	1,51	1,51	1,49	1,50	4	1,50			0,01	0,63	106,75
34	A57	PZ02	DD02	1,51	1,53	1,53	1,56	4	1,53			0,02	1,35	109,09
35	A60x	PD01	DB10	1,56	1,54	1,51	1,56	4	1,54			0,03	1,67	109,82
36	F07x	PD03	DB08	1,73	1,71	1,70	1,79	0	1,73	b	*	0,04	2,24	123,22
37	F22x	PD02	DB08	1,78	1,78	1,83	1,80	0	1,80	b	*	0,02	1,33	127,97
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														
51														
52														
53														
54														
55														

\* = non tolerable mean because more than +/-

n      Mean       $s_r$        $CV_r$   
all labs    135    1,40    0,019    1,323

10      % from the mean       $s_R$        $CV_R$   
34                               0,070    5,016

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: P      Sample: 3

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3		$b^*$	$V_i$		
1	F07x	PD03	DB08	1,20	1,19	1,20	1,18	0	1,19	$b^*$	61,55
2	A62x	PB99	DE01	1,43	1,31	1,19	1,35	0	1,32	$b^*$	68,15
3	A85x	PB06	DB08	1,75	1,62	1,67	1,77	4	1,70	*	87,86
4	A43	PB06	DE01	1,75	1,76	1,74	1,74	4	1,75	0,01	90,19
5	A59	PC01	DB08	1,76	1,76	1,79	1,76	4	1,77	0,02	91,34
6	A56	PC01	DB08	1,77	1,86	1,74	1,70	4	1,77	0,07	91,40
7	F29x	PD99	DE01	1,80	1,84	1,82	1,83	4	1,82	0,02	94,05
8	F27x	PD01	DE01	1,84	1,82	1,87	1,83	4	1,84	0,02	95,00
9	A88	PD01	DB08	1,85	1,86	1,89	1,79	4	1,85	0,04	95,38
10	A61x	PB02	DB08	1,88	1,86	1,88	1,93	4	1,89	0,03	97,45
11	F13x	PD01	DB08	1,87	1,91	1,92	1,89	4	1,90	0,02	97,96
12	A36	PD02	DB08	1,94	1,91	1,90	1,86	4	1,90	0,03	98,22
13	F16x	PC01	DB08	1,91	1,89	1,91	1,91	4	1,90	0,01	98,27
14	A58	PD02	DE01	1,96	1,92	1,92	1,93	4	1,93	0,02	99,77
15	A82	PD01	DB08	1,94	1,93	1,93	1,93	4	1,93	0,00	99,87
16	A47	PD01	DB08	1,94	1,93	1,93	1,94	4	1,94	0,00	99,94
17	A57	PZ02	DD02	1,94	1,93	1,94	1,94	4	1,94	0,01	100,03
18	F01x	PD02	DE01	1,93	1,98	1,90	1,94	4	1,94	0,03	100,03
19	F05x	PD02	DB08	1,95	1,95	1,95	1,92	4	1,94	0,02	100,29
20	F06x	PD02	DB08	1,98	1,93	1,95	1,96	4	1,95	0,02	100,87
21	F19x	PD02	DB08	1,98	1,95	1,96	1,98	4	1,97	0,02	101,58
22	F26x	PC02	DB09	1,98	1,97	1,96	1,98	4	1,97	0,01	101,84
23	F12x	PC01	DB08	2,02	1,97	1,95	1,99	4	1,99	0,03	102,48
24	F14x	PC01	DB08	2,00	1,98	1,98	1,99	4	1,99	0,01	102,61
25	F21x	PC02	DE01	1,89	2,04	2,02	2,01	4	1,99	0,07	102,74
26	F33x	PD01	DB10	2,05	2,01	1,97	1,96	4	2,00	0,04	103,13
27	F02x	PD02	DB08	2,05	1,96	1,97	2,03	4	2,00	0,04	103,38
28	F08x	PE99	DB08	1,97	1,93	2,06	2,06	4	2,01	0,07	103,60
29	F15x	PC01	DB08	2,01	2,02	2,00	2,01	4	2,01	0,01	103,64
30	F18x	PD99	DB08	2,00	2,02	2,04	2,01	4	2,02	0,02	104,16
31	A65	PD01	DB08	2,02	2,02	2,03	2,00	4	2,02	0,01	104,16
32	F28x	PD02	DB08	2,02	2,07	1,98	2,01	4	2,02	0,04	104,22
33	F25	PB06	DB08	2,07	2,08	2,08	2,08	4	2,08	0,00	107,17
34	F32x	PD01	DB08	2,10	2,11	2,10	2,11	4	2,11	0,01	108,68
35	A60x	PD01	DB10	2,10	2,10	2,14	2,08	4	2,11	0,03	108,69
36	A79	PD01	DB08	2,36	2,37	2,35	2,36	0	2,36	$b^*$	121,79
37	F22x	PD02	DB08	2,41	2,41	2,42	2,41	0	2,41	$b^*$	124,51
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											

\* = non tolerable mean because more than +/-

n	Mean	$s_r$	$CV_r$
all labs	132	1,94	0,025
10	% from the mean		1,313

I	$s_R$	$CV_R$
33	0,098	5,063

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: P      Sample: 4

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev.		Recovery %	
		P	D	1	2	3		S <sub>i</sub>	V <sub>i</sub>	S <sub>r</sub>	V <sub>r</sub>		
1	A62x	PB99	DE01	1,80	1,63	1,55	1,76	0	1,69	b *	0,12	6,86	73,71
2	A59	PC01	DB08	2,02	2,07	2,05	2,01	4	2,04	*	0,03	1,25	89,13
3	A85x	PB06	DB08	1,91	2,13	2,01	2,12	4	2,04	*	0,11	5,15	89,34
4	A56	PC01	DB08	2,03	2,08	2,04	2,08	4	2,06	*	0,03	1,24	89,95
5	A57	PZ02	DD02	2,15	2,13	2,15	2,15	4	2,15		0,01	0,47	93,83
6	F29x	PD99	DE01	2,13	2,17	2,21	2,16	4	2,17		0,03	1,49	94,82
7	A88	PD01	DB08	2,15	2,23	2,19	2,13	4	2,18		0,04	2,04	95,14
8	F27x	PD01	DE01	2,17	2,20	2,15	2,19	4	2,18		0,02	0,89	95,14
9	F07x	PD03	DB08	2,22	2,15	2,18	2,24	4	2,20		0,04	1,67	96,10
10	A61x	PB02	DB08	2,22	2,26	2,19	2,20	4	2,22		0,03	1,40	97,00
11	A82	PD01	DB08	2,25	2,22	2,23	2,22	4	2,23		0,01	0,55	97,48
12	F16x	PC01	DB08	2,24	2,25	2,25	2,23	4	2,24		0,01	0,52	98,10
13	A36	PD02	DB08	2,29	2,29	2,20	2,22	4	2,25		0,05	2,08	98,42
14	F13x	PD01	DB08	2,26	2,25	2,25	2,26	4	2,26		0,01	0,26	98,64
15	F05x	PD02	DB08	2,27	2,27	2,26	2,26	4	2,27		0,01	0,25	99,08
16	F01x	PD02	DE01	2,27	2,31	2,23	2,26	4	2,27		0,03	1,46	99,19
17	A58	PD02	DE01	2,29	2,29	2,27	2,26	4	2,28		0,02	0,66	99,63
18	A47	PD01	DB08	2,30	2,29	2,29	2,29	4	2,29		0,00	0,10	100,29
19	F26x	PC02	DB09	2,29	2,29	2,33	2,30	4	2,30		0,02	0,82	100,72
20	F18x	PD99	DB08	2,31	2,31	2,30	2,30	4	2,31		0,01	0,25	100,83
21	F06x	PD02	DB08	2,28	2,31	2,34	2,30	4	2,31		0,02	1,02	100,93
22	F08x	PE99	DB08	2,26	2,21	2,41	2,40	4	2,32		0,10	4,35	101,39
23	F33x	PD01	DB10	2,35	2,32	2,34	2,30	4	2,33		0,02	0,95	101,81
24	F02x	PD02	DB08	2,29	2,38	2,38	2,29	4	2,34		0,05	2,23	102,14
25	F12x	PC01	DB08	2,36	2,37	2,29	2,33	4	2,34		0,04	1,55	102,20
26	F15x	PC01	DB08	2,32	2,36	2,39	2,31	4	2,35		0,04	1,63	102,65
27	F28x	PD02	DB08	2,40	2,37	2,34	2,31	4	2,36		0,04	1,55	103,05
28	F19x	PD02	DB08	2,36	2,36	2,36	2,37	4	2,36		0,01	0,21	103,35
29	F14x	PC01	DB08	2,38	2,39	2,36	2,38	4	2,38		0,01	0,53	104,00
30	A65	PD01	DB08	2,38	2,38	2,40	2,39	4	2,39		0,01	0,40	104,44
31	F25	PB06	DB08	2,42	2,46	2,46	2,45	4	2,45		0,02	0,68	107,12
32	F32x	PD01	DB08	2,43	2,45	2,47	2,48	4	2,46		0,02	0,90	107,50
33	A60x	PD01	DB10	2,52	2,48	2,43	2,46	4	2,47		0,04	1,52	108,20
34	A43	PB06	DE01	2,67	2,53	2,58	2,12	0	2,47	c	0,24	9,74	108,23
35	F21x	PC02	DE01	2,52	2,47	2,49	2,50	4	2,50		0,02	0,83	109,14
36	A79	PD01	DB08	2,48	2,51	2,50	2,50	4	2,50		0,01	0,41	109,23
37	F22x	PD02	DB08	2,81	2,87	2,88	2,85	0	2,85	b *	0,03	1,02	124,85
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n	Mean	S <sub>r</sub>	CV <sub>r</sub>
all labs	136	2,29	0,027
10	% from the mean		1,198

I	S <sub>R</sub>	CV <sub>R</sub>
34	0,120	5,246

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Ca      Sample: 1

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev.	Recovery
		P	D	1	2	3		S <sub>i</sub>	V <sub>i</sub>		
1	A61x	PB02	DB08	0,99	1,01	1,02	1,03	0	1,01	b *	9,95
2	F07x	PD03	DB08	4,54	4,44	4,55	4,46	0	4,50	b *	44,13
3	A62x	PB99	DB01	9,65	9,22	9,14	9,10	4	9,28	0,25	91,08
4	A85x	PB06	DB08	9,87	9,30	9,37	8,84	4	9,34	0,42	91,73
5	A56	PC01	DB08	9,46	9,41	9,45	9,33	4	9,41	0,06	92,41
6	A57	PZ02	DD02	9,44	9,44	9,54	9,49	4	9,48	0,05	93,05
7	A59	PC01	DB08	9,58	9,70	9,65	9,75	4	9,67	0,07	94,93
8	F01x	PD02	DB01	9,75	9,85	9,81	9,88	4	9,82	0,06	96,43
9	F26x	PC02	DB09	9,89	9,92	9,93	9,91	4	9,91	0,02	97,32
10	A58	PD02	DB02	9,88	10,34	10,07	9,49	4	9,95	0,36	97,64
11	F33x	PD01	DB10	10,08	10,40	9,74	9,84	4	10,02	0,29	98,32
12	F15x	PC01	DB08	10,08	10,00	10,03	10,10	4	10,05	0,05	98,69
13	F05x	PD02	DB08	10,00	10,10	10,10	10,10	4	10,08	0,05	98,91
14	F21x	PC02	DB09	9,65	10,43	10,32	9,96	4	10,09	0,36	99,06
15	F16x	PC01	DB08	10,08	10,14	10,06	10,12	4	10,10	0,04	99,16
16	F25	PB06	DB08	10,11	10,12	10,17	10,12	4	10,13	0,03	99,40
17	F28x	PD02	DB08	10,32	9,99	10,14	10,11	4	10,14	0,14	99,55
18	F29x	PD02	DB01	10,57	10,16	9,82	10,36	4	10,23	0,32	100,40
19	F06x	PD02	DB08	10,37	10,18	10,34	10,18	4	10,27	0,10	99,80
20	F13x	PD01	DB08	10,20	10,30	10,30	10,40	4	10,30	0,08	101,12
21	A47	PD01	DB08	10,23	10,30	10,49	10,26	4	10,32	0,12	101,30
22	A60x	PD01	DB10	10,36	10,50	10,27	10,27	4	10,35	0,11	101,63
23	A43	PB06	DB01	10,38	10,44	10,54	10,05	4	10,35	0,21	101,64
24	A65	PD01	DB08	10,33	10,31	10,37	10,40	4	10,35	0,04	101,64
25	A82	PD01	DB08	10,35	10,42	10,47	10,32	4	10,39	0,07	102,01
26	F32x	PD01	DB08	10,40	10,60	10,40	10,20	4	10,40	0,16	102,10
27	A79	PD01	DB08	10,48	10,34	10,40	10,43	4	10,41	0,06	102,23
28	F19x	PD03	DB08	10,30	10,40	10,50	10,60	4	10,45	0,13	102,60
29	F12x	PC01	DB08	10,41	10,45	10,54	10,40	4	10,45	0,07	102,61
30	F02x	PD02	DB08	9,90	10,50	11,00	10,70	0	10,53	c	103,33
31	A36	PD02	DB08	10,42	10,25	11,31a	10,16	3	10,28	0,13	100,89
32	A42	PB04	DB01	10,67	10,46	10,52	10,84	4	10,62	0,17	104,29
33	F08x	PE99	DB08	10,33	10,42	10,83	10,94	4	10,63	0,30	104,37
34	F14x	PC01	DB08	10,65	10,61	10,62	10,75	4	10,66	0,06	104,63
35	F27x	PD01	DB01	10,67	10,48	10,96	10,55	4	10,66	0,21	104,68
36	F18x	PD99	DB08	10,80	10,80	10,80	10,80	4	10,80	0,00	106,03
37	A88	PD01	DB08	11,01	10,89	10,81	11,11	4	10,96	0,13	107,55
38	F22x	PD02	DB08	14,69	14,64	14,52	14,61	0	14,61	b *	143,46
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											

\* = non tolerable mean because more than +/-

n	Mean	S <sub>r</sub>	CV <sub>r</sub>
all labs	135	10,19	0,139
10	% from the mean		1,360

I	S <sub>R</sub>	CV <sub>R</sub>
34	0,407	3,995

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Ca      Sample: 2

Unit: mg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		s <sub>i</sub>	V <sub>i</sub>			
1	F07x	PD03	DB08	3,75	3,57	3,79	3,52	0	3,66	b *	0,13	3,62	48,56
2	A62x	PB99	DB01	6,85	6,56	6,44	6,61	4	6,62	*	0,17	2,60	87,82
3	A56	PC01	DB08	6,89	6,91	6,85	6,70	4	6,84		0,10	1,42	90,78
4	A85x	PB06	DB08	6,93	7,16	7,05	6,86	4	7,00		0,13	1,91	92,91
5	A58	PD02	DB02	6,94	7,04	7,07	7,03	4	7,02		0,06	0,80	93,19
6	F21x	PC02	DB09	7,08	7,10	7,09	7,10	4	7,09		0,01	0,13	94,16
7	A59	PC01	DB08	7,12	7,17	7,29	7,14	4	7,18		0,07	1,02	95,33
8	F01x	PD02	DB01	7,33	7,06	7,07	7,27	4	7,18		0,14	1,92	95,35
9	F26x	PC02	DB09	7,16	7,21	7,21	7,22	4	7,20		0,03	0,38	95,58
10	F33x	PD01	DB10	7,33	7,30	7,26	7,66	4	7,39		0,18	2,49	98,07
11	A61x	PB02	DB08	7,39	7,44	7,45	7,34	4	7,41		0,05	0,68	98,30
12	F15x	PC01	DB08	7,39	7,44	7,49	7,45	4	7,44		0,04	0,55	98,80
13	F16x	PC01	DB08	7,45	7,52	7,44	7,45	4	7,46		0,04	0,53	99,09
14	F06x	PD02	DB08	7,52	7,47	7,54	7,39	4	7,48		0,07	0,87	99,33
15	F25	PB06	DB08	7,53	7,48	7,48	7,49	4	7,49		0,03	0,34	99,46
16	F05x	PD02	DB08	7,50	7,51	7,49	7,52	4	7,51		0,01	0,17	99,63
17	A47	PD01	DB08	7,53	7,48	7,55	7,52	4	7,52		0,03	0,41	99,81
18	F13x	PD01	DB08	7,55	7,51	7,52	7,70	4	7,57		0,09	1,17	100,49
19	A43	PB06	DB01	7,98	7,77	6,92	7,61	0	7,57	c	0,46	6,06	100,49
20	A60x	PD01	DB10	7,72	7,62	7,48	7,50	4	7,58		0,11	1,48	100,58
21	F28x	PD02	DB08	7,58	7,46	7,76	7,55	4	7,59		0,12	1,64	100,75
22	F19x	PD03	DB08	7,51	7,59	7,67	7,66	4	7,61		0,07	0,97	100,99
23	F32x	PD01	DB08	7,67	7,77	7,48	7,82	4	7,69		0,15	1,95	102,02
24	F29x	PD02	DB01	7,73	7,57	7,72	7,73	4	7,69		0,08	1,06	102,07
25	F12x	PC01	DB08	7,73	7,70	7,71	7,66	4	7,70		0,03	0,40	102,22
26	F02x	PD02	DB08	7,84	7,83	7,66	7,55	4	7,72		0,14	1,82	102,49
27	F08x	PE99	DB08	7,53	7,52	7,94	7,92	4	7,72		0,24	3,05	102,55
28	A65	PD01	DB08	7,88	7,75	7,75	7,68	4	7,77		0,08	1,07	103,08
29	F27x	PD01	DB01	8,24	7,63	8,09	7,11	0	7,77	c	0,51	6,57	103,10
30	A79	PD01	DB08	7,80	7,83	7,76	7,72	4	7,78		0,05	0,60	103,25
31	F14x	PC01	DB08	7,84	7,79	7,85	7,80	4	7,82		0,03	0,38	103,81
32	F18x	PD99	DB08	7,85	7,82	7,83	7,85	4	7,84		0,01	0,19	104,05
33	A36	PD02	DB08	7,78	7,86	8,16	7,61	4	7,85		0,23	2,93	104,24
34	A88	PD01	DB08	8,00	8,32	7,89	7,49	4	7,93		0,34	4,32	105,21
35	A82	PD01	DB08	8,05	8,07	8,20	8,09	4	8,10		0,07	0,83	107,53
36	A57	PZ02	DD02	8,10	8,10	8,13	8,24	4	8,14		0,07	0,82	108,09
37	A42	PB04	DB01	8,45	8,42	8,43	8,62a	3	8,43	*	0,02	0,18	111,96
38	F22x	PD02	DB08	10,57	10,29	10,58	10,48	0	10,48	b *	0,13	1,26	139,14
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n	Mean	s <sub>r</sub>	CV <sub>r</sub>
all labs	135	7,53	0,091
10	% from the mean		1,206

I	s <sub>R</sub>	CV <sub>R</sub>
34	0,377	4,999

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Ca      Sample: 3

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev.		Recovery %		
		P	D	1	2	3		S <sub>i</sub>	V <sub>i</sub>	S <sub>r</sub>	V <sub>r</sub>			
1	A85x	PB06	DB08	2,57	2,37	2,46	2,55	4	2,49	*	0,09	3,72	86,28	
2	A62x	PB99	DB01	2,57	2,53	2,55	2,54	4	2,55	*	0,02	0,67	88,42	
3	A58	PD02	DB02	2,57	2,56	2,60	2,58	4	2,58	*	0,02	0,66	89,46	
4	A56	PC01	DB08	2,61	2,76	2,64	2,55	4	2,64		0,09	3,35	91,71	
5	A42	PB04	DB01	2,60	2,84	2,60	2,56	4	2,65		0,13	4,83	91,98	
6	A59	PC01	DB08	2,69	2,67	2,67	2,71	4	2,68		0,02	0,68	93,13	
7	F01x	PD02	DB01	2,67	2,76	2,71	2,68	4	2,71		0,04	1,49	93,89	
8	F26x	PC02	DB09	2,73	2,72	2,76	2,75	4	2,74		0,02	0,67	95,10	
9	F25	PB06	DB08	2,75	2,74	2,75	2,76	4	2,75		0,01	0,33	95,43	
10	A61x	PB02	DB08	2,72	2,79	2,76	2,83	4	2,78		0,05	1,68	96,32	
11	F33x	PD01	DB10	2,96	2,75	2,64	2,76	4	2,78		0,13	4,80	96,41	
12	F15x	PC01	DB08	2,79	2,78	2,78	2,77	4	2,78		0,01	0,29	96,49	
13	F21x	PC02	DB09	2,75	2,83	2,79	2,80	4	2,79		0,03	1,18	96,93	
14	F05x	PD02	DB08	2,82	2,84	2,84	2,81	4	2,83		0,01	0,53	98,14	
15	F12x	PC01	DB08	2,87	2,82	2,79	2,86	4	2,83		0,04	1,43	98,34	
16	F13x	PD01	DB08	2,81	2,82	2,89	2,83	4	2,84		0,04	1,27	98,49	
17	A47	PD01	DB08	2,91	2,83	2,81	2,85	4	2,85		0,04	1,46	98,85	
18	F27x	PD01	DB01	2,70	2,84	2,95	2,92	4	2,85		0,11	3,93	99,04	
19	A60x	PD01	DB10	2,88	2,87	2,88	2,81	4	2,86		0,03	1,19	99,30	
20	F18x	PD99	DB08	2,84	2,87	2,85	2,90	4	2,87		0,03	0,92	99,44	
21	F16x	PC01	DB08	2,89	2,84	2,89	2,88	4	2,87		0,02	0,76	99,75	
22	F19x	PD03	DB08	2,90	2,90	2,87	2,89	4	2,89		0,01	0,49	100,31	
23	A36	PD02	DB08	2,96	2,90	2,89	2,85	4	2,90		0,05	1,57	100,66	
24	F06x	PD02	DB08	2,95	2,90	2,91	2,92	4	2,92		0,02	0,66	101,40	
25	A65	PD01	DB08	2,96	2,92	2,93	2,91	4	2,93		0,02	0,74	101,70	
26	F14x	PC01	DB08	2,91	2,95	2,93	2,94	4	2,93		0,02	0,58	101,79	
27	F08x	PE99	DB08	2,88	2,88	3,28	3,06	0	3,03	c	0,19	6,34	105,07	
28	F02x	PD02	DB08	3,01	3,08	3,06	2,98	4	3,03		0,05	1,51	105,26	
29	F32x	PD01	DB08	3,07	3,06	3,05	3,09	4	3,07		0,02	0,56	106,47	
30	A88	PD01	DB08	3,09	3,11	3,16	3,04	4	3,10		0,05	1,60	107,60	
31	F29x	PD02	DB01	3,20	3,13	3,12	3,15	4	3,15		0,03	1,06	109,24	
32	F28x	PD02	DB08	3,03	3,15	3,28	3,22	4	3,17	*	0,11	3,42	110,07	
33	A82	PD01	DB08	3,20	3,20	3,22	3,19	4	3,20	*	0,01	0,37	111,15	
34	A43	PB06	DB01	3,24	3,26	3,21	3,21	4	3,23	*	0,02	0,76	112,11	
35	A79	PD01	DB08	3,31	3,32	3,31	3,31	4	3,31	*	0,01	0,20	115,04	
36	A57	PZ02	DD02	3,43	3,43	3,48a	3,43	3	3,43	*	0,00	0,00	119,05	
37	F22x	PD02	DB08	3,98	4,02	3,93	3,98	0	3,98	b	0,03	0,88	138,01	
38	F07x	PD03	DB08	5,19	5,00	5,13	5,12	0	5,11	b	*	0,08	1,59	177,32
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														
51														
52														
53														
54														
55														

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
all labs    139    2,88    0,040    1,381

\* = non tolerable mean because more than +/- 10 % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
35    0,218    7,539

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Ca      Sample: 4

Unit: mg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$c^*$	$v_i$		
1	A62x	PB99	DB01	3,19	3,10	2,78	2,80	0	2,97	<b>c</b> *	0,21	7,02
2	A56	PC01	DB08	3,10	3,11	3,07	3,14	4	3,10	*	0,03	0,92
3	A85x	PB06	DB08	2,876a	3,22	3,22	3,23	3	3,22	*	0,01	0,32
4	A59	PC01	DB08	3,17	3,24	3,24	3,25	4	3,22		0,04	1,18
5	F33x	PD01	DB10	3,24	3,25	3,24	3,31	4	3,26		0,03	1,03
6	A58	PD02	DB02	3,24	3,28	3,26	3,30	4	3,27		0,03	0,79
7	F21x	PC02	DB09	3,29	3,39	3,31	3,33	4	3,33		0,04	1,30
8	F01x	PD02	DB01	3,39	3,34	3,28	3,33	4	3,34		0,05	1,35
9	A42	PB04	DB01	3,28	3,28	3,37	3,44	4	3,34		0,08	2,32
10	A61x	PB02	DB08	3,42	3,45	3,33	3,38	4	3,40		0,05	1,53
11	F15x	PC01	DB08	3,37	3,41	3,45	3,38	4	3,40		0,04	1,06
12	F26x	PC02	DB09	3,40	3,41	3,46	3,43	4	3,43		0,03	0,77
13	F05x	PD02	DB08	3,43	3,44	3,43	3,43	4	3,43		0,00	0,15
14	F25	PB06	DB08	3,43	3,46	3,46	3,40	4	3,44		0,03	0,85
15	F13x	PD01	DB08	3,48	3,45	3,40	3,45	4	3,45		0,03	0,96
16	F12x	PC01	DB08	3,48	3,50	3,36	3,48	4	3,45		0,07	1,89
17	A47	PD01	DB08	3,47	3,44	3,48	3,44	4	3,46		0,02	0,65
18	A60x	PD01	DB10	3,49	3,52	3,40	3,43	4	3,46		0,05	1,58
19	F16x	PC01	DB08	3,45	3,47	3,48	3,48	4	3,47		0,01	0,39
20	F18x	PD99	DB08	3,47	3,47	3,47	3,48	4	3,47		0,00	0,14
21	F08x	PE99	DB08	3,41	3,34	3,57	3,59	4	3,48		0,12	3,57
22	F27x	PD01	DB01	3,58	3,52	3,43	3,48	4	3,50		0,07	1,90
23	A36	PD02	DB08	3,60	3,58	3,43	3,47	4	3,52		0,08	2,35
24	F19x	PD03	DB08	3,54	3,50	3,50	3,54	4	3,52		0,02	0,66
25	A65	PD01	DB08	3,56	3,52	3,52	3,54	4	3,54		0,02	0,54
26	F06x	PD02	DB08	3,55	3,52	3,57	3,52	4	3,54		0,03	0,74
27	F14x	PC01	DB08	3,60	3,60	3,60	3,60	4	3,60		0,00	0,00
28	A79	PD01	DB08	3,55	3,63	3,61	3,64	4	3,61		0,04	1,09
29	F29x	PD02	DB01	3,71	3,55	3,48	3,89	0	3,66	<b>c</b>	0,18	4,93
30	F02x	PD02	DB08	3,67	3,63	3,69	3,80	4	3,70		0,07	1,97
31	A88	PD01	DB08	3,74	3,86	3,71	3,64	4	3,74		0,09	2,46
32	F32x	PD01	DB08	3,67	3,73	3,77	3,79	4	3,74		0,05	1,41
33	A82	PD01	DB08	3,92	3,81	3,84	3,79	4	3,84		0,06	1,49
34	A57	PZ02	DD02	3,84	3,83	3,87	3,84	4	3,85		0,02	0,45
35	F28x	PD02	DB08	3,92	3,84	3,98	3,78	4	3,88	*	0,09	2,26
36	A43	PB06	DB01	3,91	3,91	3,91	4,02a	3	3,91	*	0,00	0,00
37	F22x	PD02	DB08	4,79	4,79	4,86	4,82	0	4,82	<b>b</b>	* 0,03	0,67
38	F07x	PD03	DB08	5,61	5,30	5,60	5,75	0	5,57	<b>b</b>	* 0,19	3,38
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$

all labs    134    3,50    0,041    1,183

10 % from the mean

\* = non tolerable mean because more than +/-

I       $s_R$        $CV_R$

34    0,196    5,614

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Mg      Sample: 1

Unit: mg/g

No.	Lab. Code	Method code P      D	Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
			1	2	3	4					
1	F07x	PD03	DB08	1,04	1,05	1,01	0,97	0	1,02	b *	44,67
2	A85x	PB06	DB08	2,18	2,05	2,09	1,93	0	2,06	c	90,50
3	F27x	PD01	DB01	2,07	2,11	2,09	2,09	4	2,09		91,67
4	F26x	PC02	DB09	2,14	2,15	2,13	2,11	4	2,13		93,60
5	F21x	PC02	DB09	2,13	2,14	2,18	2,11	4	2,14		93,93
6	A58	PD02	DB01	2,15	2,19	2,18	2,14	4	2,17		95,03
7	A56	PC01	DB08	2,17	2,19	2,17	2,17	4	2,17		95,42
8	A57	PZ02	DD02	2,16	2,17	2,19	2,20	4	2,18		95,69
9	F33x	PD01	DB10	2,22	2,16	2,24	2,20	4	2,21		96,78
10	A59	PC01	DB08	2,20	2,19	2,21	2,23	4	2,21		96,84
11	A61x	PB02	DB08	2,15	2,23	2,22	2,23	4	2,21		96,89
12	F18x	PD99	DB08	2,23	2,24	2,23	2,24	4	2,24		98,10
13	F29x	PD02	DB01	2,25	2,25	2,28	2,22	4	2,25		98,74
14	F05x	PD02	DB08	2,27	2,27	2,27	2,26	4	2,27		99,53
15	A62x	PB99	DB01	2,32	2,27	2,26	2,24	4	2,27		99,75
16	F06x	PD02	DB08	2,29	2,24	2,30	2,26	4	2,27		99,76
17	F01x	PD02	DB01	2,31	2,23	2,25	2,32	4	2,28		99,97
18	F16x	PC01	DB08	2,28	2,28	2,29	2,28	4	2,28		100,19
19	A36	PD02	DB08	2,28	2,23	2,44	2,21	0	2,29	c	100,51
20	A47	PD01	DB08	2,31	2,29	2,30	2,31	4	2,30		101,00
21	F28x	PC02	DB08	2,30	2,29	2,31	2,34	4	2,31		101,40
22	F25	PB06	DB08	2,30	2,31	2,34	2,31	4	2,31		101,54
23	F15x	PC01	DB08	2,33	2,32	2,33	2,33	4	2,33		102,16
24	A79	PD01	DB08	2,34	2,32	2,33	2,34	4	2,33		102,23
25	F13x	PD01	DB08	2,34	2,36	2,30	2,32	4	2,33		102,27
26	F08x	PE99	DB08	2,26	2,27	2,42	2,38	4	2,33		102,30
27	F12x	PC01	DB08	2,40	2,18	2,39	2,38	0	2,34	c	102,65
28	A60x	PD01	DB10	2,35	2,36	2,34	2,32	4	2,35		102,94
29	F14x	PC01	DB08	2,35	2,34	2,35	2,36	4	2,35		103,15
30	F32x	PD01	DB08	2,35	2,40	2,35	2,31	4	2,35		103,26
31	A88	PD01	DB08	2,36	2,40	2,29	2,37	4	2,36		103,37
32	A65	PD01	DB08	2,36	2,35	2,37	2,37	4	2,36		103,70
33	A42	PB04	DB01	2,35	2,38	2,35	2,40	4	2,37		104,03
34	F02x	PD02	DB08	2,44	2,32	2,40	2,37	4	2,38		104,57
35	A43	PB06	DB01	2,39	2,39	2,39	2,5a	3	2,39		104,90
36	F19x	PD02	DB08	2,38	2,43	2,47	2,43	4	2,43		106,55
37	A82	PD01	DB08	2,60	2,59	2,60	2,554a	0	2,60	b *	114,03
38	F22x	PD02	DB08	2,89	2,89	2,87	2,88	0	2,88	b *	126,45
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											

\* = non tolerable mean because more than +/-

n      Mean       $s_r$        $CV_r$   
 all labs    127    2,28    0,023    1,028  
 10      % from the mean

I       $s_R$        $CV_R$   
 32      0,085    3,726

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Mg      Sample: 2

Unit: mg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		s <sub>i</sub>	v <sub>i</sub>			
1	F07x	PD03	DB08	1,21	1,17	1,19	1,26	0	1,21	b *	0,04	3,10	75,03
2	A57	PZ02	DD02	1,43	1,43	1,44	1,46	4	1,44	*	0,01	0,98	89,30
3	A62x	PB99	DB01	1,51	1,50	1,45	1,50	4	1,49		0,03	1,82	92,40
4	F33x	PD01	DB10	1,52	1,53	1,47	1,46	4	1,50		0,04	2,35	92,71
5	A85x	PB06	DB08	1,52	1,53	1,50	1,45	4	1,50		0,03	2,16	92,96
6	A58	PD02	DB01	1,52	1,56	1,48	1,45	4	1,50		0,05	3,19	93,17
7	A56	PC01	DB08	1,54	1,52	1,53	1,50	4	1,52		0,02	1,26	94,53
8	F21x	PC02	DB09	1,53	1,54	1,49	1,55	4	1,53		0,03	1,72	94,72
9	F26x	PC02	DB09	1,53	1,53	1,52	1,53	4	1,53		0,01	0,33	94,72
10	A61x	PB02	DB08	1,54	1,56	1,54	1,54	4	1,55		0,01	0,65	95,81
11	A59	PC01	DB08	1,57	1,56	1,55	1,55	4	1,56		0,01	0,63	96,54
12	F27x	PD01	DB01	1,60	1,52	1,60	1,58	4	1,57		0,04	2,26	97,64
13	F18x	PD99	DB08	1,58	1,58	1,58	1,58	4	1,58		0,00	0,00	97,98
14	A47	PD01	DB08	1,58	1,58	1,59	1,58	4	1,58		0,00	0,17	98,07
15	F16x	PC01	DB08	1,59	1,60	1,61	1,61	4	1,60		0,01	0,53	99,36
16	F06x	PD02	DB08	1,62	1,61	1,62	1,58	4	1,61		0,02	1,22	99,62
17	F29x	PD02	DB01	1,63	1,65	1,62	1,55	4	1,61		0,04	2,74	99,89
18	F05x	PD02	DB08	1,62	1,62	1,62	1,62	4	1,62		0,00	0,00	100,46
19	F01x	PD02	DB01	1,65	1,64	1,61	1,59	4	1,62		0,03	1,70	100,61
20	A88	PD01	DB08	1,65	1,71	1,61	1,54	4	1,63		0,07	4,38	100,93
21	A36	PD02	DB08	1,62	1,64	1,68	1,57	4	1,63		0,05	2,81	100,93
22	F32x	PD01	DB08	1,62	1,58	1,66	1,66	4	1,63		0,04	2,35	101,08
23	A60x	PD01	DB10	1,66	1,63	1,61	1,63	4	1,63		0,02	1,09	101,26
24	F02x	PD02	DB08	1,64	1,63	1,65	1,62	4	1,64		0,01	0,79	101,39
25	F15x	PC01	DB08	1,64	1,63	1,64	1,65	4	1,64		0,01	0,50	101,70
26	F12x	PC01	DB08	1,69	1,54	1,67	1,67	4	1,64		0,07	4,35	101,73
27	F14x	PC01	DB08	1,66	1,65	1,65	1,65	4	1,65		0,01	0,30	102,48
28	F13x	PD01	DB08	1,66	1,67	1,68	1,69	4	1,68		0,01	0,77	103,87
29	A79	PD01	DB08	1,67	1,69	1,67	1,67	4	1,68		0,01	0,60	103,89
30	F25	PB06	DB08	1,67	1,69	1,68	1,67	4	1,68		0,01	0,33	104,06
31	A65	PD01	DB08	1,69	1,68	1,69	1,68	4	1,68		0,01	0,38	104,48
32	F19x	PD02	DB08	1,65	1,66	1,70	1,73	4	1,69		0,04	2,19	104,49
33	F28x	PC02	DB08	1,67	1,68	1,69	1,70	4	1,69		0,01	0,81	104,49
34	F08x	PE99	DB08	1,70	1,67	1,74	1,75	4	1,71		0,03	1,95	106,34
35	A42	PB04	DB01	1,70	1,82	1,73	1,68	4	1,73		0,06	3,57	107,44
36	A82	PD01	DB08	1,76	1,75	1,78	1,75	4	1,76		0,01	0,78	109,05
37	A43	PB06	DB01	1,70	1,81	1,81	1,77	4	1,77		0,05	2,93	109,92
38	F22x	PD02	DB08	2,00	1,98	2,04	2,01	0	2,01	b *	0,02	1,05	124,45
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      s<sub>r</sub>      CV<sub>r</sub>  
all labs    144    1,61    0,024    1,519

10      % from the mean

\* = non tolerable mean because more than +/-

I      s<sub>R</sub>      CV<sub>R</sub>  
36      0,080    4,935

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Mg      Sample: 3

Unit: mg/g

No.	Lab. Code	Method code P	Method code D	Replications				n	Lab.mean	Lab.standard dev.	Recovery
				1	2	3	4		$S_i$	$V_i$	%
1	F07x	PD03	DB08	0,77	0,75	0,74	0,76	0	0,75	b *	57,80
2	A85x	PB06	DB08	1,19	1,11	1,12	1,20	4	1,15	*	88,46
3	A57	PZ02	DD02	1,19	1,18	1,19	1,19	4	1,19	0,01	91,22
4	A62x	PB99	DB01	1,17	1,18	1,18	1,23	4	1,19	0,03	91,41
5	F27x	PD01	DB01	1,20	1,22	1,19	1,18	4	1,20	0,02	92,12
6	A56	PC01	DB08	1,23	1,30	1,19	1,20	4	1,23	0,05	94,46
7	F21x	PC02	DB09	1,22	1,24	1,23	1,25	4	1,24	0,01	94,87
8	F26x	PC02	DB09	1,23	1,23	1,24	1,26	4	1,24	0,01	95,25
9	A61x	PB02	DB08	1,23	1,22	1,24	1,27	4	1,24	0,02	95,25
10	A58	PD02	DB01	1,27	1,23	1,23	1,24	4	1,24	0,02	95,45
11	A43	PB06	DB01	1,26	1,26	1,26	1,23	4	1,25	0,01	96,06
12	F33x	PD01	DB10	1,30	1,23	1,23	1,25	4	1,25	0,03	96,21
13	F18x	PD99	DB08	1,29	1,27	1,29	1,28	4	1,28	0,01	98,52
14	A36	PD02	DB08	1,31	1,29	1,28	1,25	4	1,28	0,03	98,52
15	A59	PC01	DB08	1,30	1,28	1,29	1,27	4	1,28	0,02	98,67
16	F16x	PC01	DB08	1,28	1,29	1,28	1,29	4	1,28	0,01	98,69
17	F01x	PD02	DB01	1,30	1,27	1,28	1,32	4	1,29	0,02	99,29
18	F13x	PD01	DB08	1,31	1,29	1,29	1,34	4	1,31	0,02	100,44
19	F06x	PD02	DB08	1,32	1,29	1,30	1,32	4	1,31	0,01	100,52
20	A60x	PD01	DB10	1,30	1,32	1,32	1,29	4	1,31	0,02	100,62
21	F29x	PD02	DB01	1,31	1,33	1,32	1,30	4	1,32	0,02	101,02
22	F14x	PC01	DB08	1,33	1,32	1,32	1,32	4	1,32	0,01	101,59
23	F12x	PC01	DB08	1,35	1,32	1,29	1,33	4	1,32	0,02	101,67
24	F05x	PD02	DB08	1,33	1,31	1,33	1,33	4	1,33	0,01	101,78
25	F28x	PC02	DB08	1,33	1,38	1,35	1,29	4	1,34	0,04	102,59
26	A47	PD01	DB08	1,34	1,34	1,36	1,35	4	1,35	0,01	103,32
27	F15x	PC01	DB08	1,35	1,34	1,35	1,35	4	1,35	0,01	103,51
28	A88	PD01	DB08	1,36	1,35	1,38	1,32	4	1,35	0,02	103,90
29	F19x	PD02	DB08	1,37	1,34	1,35	1,37	4	1,36	0,02	104,28
30	A65	PD01	DB08	1,38	1,35	1,38	1,35	4	1,36	0,02	104,70
31	F25	PB06	DB08	1,36	1,38	1,38	1,37	4	1,37	0,01	105,49
32	F02x	PD02	DB08	1,40	1,40	1,35	1,35	4	1,38	0,03	105,63
33	F32x	PD01	DB08	1,37	1,40	1,37	1,38	4	1,38	0,01	106,01
34	F08x	PE99	DB08	1,36	1,34	1,41	1,41	4	1,38	0,04	106,16
35	A42	PB04	DB01	1,45	1,33	1,42	1,42	4	1,41	0,05	107,93
36	A82	PD01	DB08	1,49	1,50	1,49	1,48	4	1,49	*	114,36
37	A79	PD01	DB08	1,54	1,53	1,53	1,56	0	1,54	b *	118,28
38	F22x	PD02	DB08	1,61	1,61	1,59	1,60	0	1,60	b *	123,26
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											

n      Mean       $S_r$        $CV_r$   
 all labs    140    1,30    0,020    1,529

\* = non tolerable mean because more than +/-

10 % from the mean

I       $S_R$        $CV_R$   
 35    0,071    5,445

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Mg      Sample: 4

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
		P	D	1	2	3		$\bar{x}$	$S_i$			
1	A57	PZ02	DD02	0,90	0,89	0,89	0,89	0,89	*	0,01	0,56	85,36
2	A62x	PB99	DB01	0,99	0,96	0,94	0,94	0,96		0,02	2,47	91,58
3	A85x	PB06	DB08	0,91	0,98	0,99	0,98	0,96		0,04	3,85	92,25
4	A58	PD02	DB01	0,96	0,98	0,97	0,96	0,97		0,01	0,99	92,54
5	F27x	PD01	DB01	0,98	0,96	0,97	0,96	0,97		0,01	0,63	92,66
6	A56	PC01	DB08	0,98	0,96	0,97	0,98	0,97		0,01	0,64	92,86
7	F21x	PC02	DB09	0,97	0,98	0,99	0,99	0,98		0,01	0,97	93,97
8	F33x	PD01	DB10	1,00	0,98	1,03	0,99	1,00		0,02	2,16	95,65
9	A61x	PB02	DB08	1,01	1,02	0,99	1,00	1,01		0,01	1,28	96,12
10	A79	PD01	DB08	1,00	1,02	1,02	1,01	1,01		0,01	0,70	96,98
11	F29x	PD02	DB01	1,05	1,01	1,01	1,00	1,01		0,02	2,27	97,06
12	F26x	PC02	DB09	1,01	1,03	1,02	1,02	1,02		0,01	0,80	97,56
13	F18x	PD99	DB08	1,02	1,02	1,02	1,02	1,02		0,00	0,00	97,56
14	A59	PC01	DB08	1,01	1,02	1,04	1,03	1,02		0,01	1,00	98,01
15	F16x	PC01	DB08	1,03	1,03	1,02	1,03	1,03		0,00	0,36	98,28
16	A36	PD02	DB08	1,05	1,05	1,00	1,02	1,03		0,02	2,38	98,52
17	A60x	PD01	DB10	1,06	1,04	1,04	1,03	1,04		0,01	1,00	99,84
18	F01x	PD02	DB01	1,06	1,04	1,03	1,06	1,05		0,02	1,43	100,19
19	F05x	PD02	DB08	1,05	1,05	1,05	1,05	1,05		0,00	0,00	100,43
20	F06x	PD02	DB08	1,06	1,05	1,07	1,04	1,05		0,01	0,83	100,79
21	F13x	PD01	DB08	1,05	1,05	1,06	1,06	1,06		0,01	0,55	100,91
22	F15x	PC01	DB08	1,07	1,07	1,08	1,05	1,07		0,01	1,18	102,10
23	F12x	PC01	DB08	1,08	1,08	1,04	1,07	1,07		0,02	1,94	102,17
24	F14x	PC01	DB08	1,08	1,07	1,07	1,07	1,07		0,01	0,47	102,58
25	F02x	PD02	DB08	1,08	1,05	1,11	1,08	1,08		0,02	2,27	103,30
26	A65	PD01	DB08	1,09	1,08	1,08	1,08	1,08		0,00	0,46	103,35
27	A43	PB06	DB01	1,09	1,09	1,08	1,09	1,09		0,00	0,32	103,80
28	F08x	PE99	DB08	1,12	1,04	1,10	1,11	1,09		0,03	3,03	104,48
29	A47	PD01	DB08	1,10	1,10	1,10	1,10	1,10		0,00	0,15	105,21
30	A88	PD01	DB08	1,08	1,15	1,11	1,07	1,10		0,04	3,26	105,45
31	F32x	PD01	DB08	1,08	1,11	1,11	1,12	1,11		0,02	1,57	105,69
32	F25	PB06	DB08	1,11	1,10	1,12	1,11	1,11		0,01	0,67	105,98
33	F19x	PD02	DB08	1,13	1,13	1,13	1,12	1,13		0,00	0,44	107,84
34	A42	PB04	DB01	1,12	1,13	1,13	1,18a	1,13		0,01	0,51	107,76
35	F28x	PC02	DB08	1,19	1,18	1,16	1,14	1,16	*	0,02	1,81	111,40
36	A82	PD01	DB08	1,17	1,17	1,16	1,17	1,17	*	0,00	0,30	111,74
37	F22x	PD02	DB08	1,27	1,29	1,29	1,28	1,28	b	0,01	0,88	122,57
38	F07x	PD03	DB08	1,35	1,32	1,36	1,38	1,35	b	0,03	1,98	129,38
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

\* = non tolerable mean because more than +/-

n      Mean       $s_r$        $CV_r$   
 all labs    143    1,05    0,013    1,197  
 10      % from the mean

I       $s_R$        $CV_R$   
 36      0,061    5,860

## 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: K      Sample: 1

Unit: mg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$b^*$	$V_i$		
1	F07x	PD03	DB08	6,81	6,78	6,72	6,73	0	6,76	$b^*$	0,05	75,10
2	F26x	PC02	DB09	8,06	8,09	8,04	8,03	4	8,06	*	0,03	89,47
3	A85x	PB06	DB08	8,43	8,18	8,63	7,22	0	8,11	c	0,62	90,13
4	A57	PZ02	DD02	8,44	8,45	8,56	8,58	4	8,51		0,07	94,50
5	A42	PB04	DB01	8,48	8,25	8,72	8,63	4	8,52		0,21	94,64
6	F27x	PD01	DB06	8,40	8,46	8,62	8,62	4	8,52		0,11	94,69
7	A59	PC01	DB08	8,49	8,54	8,54	8,57	4	8,53		0,03	94,79
8	A56	PC01	DB08	8,57	8,54	8,59	8,55	4	8,56		0,02	95,09
9	A61x	PB02	DB08	8,38	8,68	8,77	8,76	4	8,65		0,18	96,06
10	F21x	PC02	DB09	8,65	8,74	8,69	8,68	4	8,69		0,04	96,53
11	F28x	PD02	DB08	8,85	8,76	8,69	8,56	4	8,72		0,12	96,81
12	F18	PD99	DB08	8,75	8,76	8,68	8,73	4	8,73		0,04	96,97
13	F32x	PD01	DB08	8,71	8,92	8,75	8,57	4	8,74		0,14	97,06
14	F33x	PD01	DB10	8,51	8,97	9,15	8,49	4	8,78		0,33	97,53
15	F05x	PD02	DB08	8,78	8,82	8,79	8,75	4	8,79		0,03	97,58
16	A58	PD02	DB01	8,81	8,80	8,83	8,80	4	8,81		0,01	97,86
17	F22x	PD02	DB08	8,90	8,88	8,81	8,86	4	8,86		0,04	98,44
18	F29x	PD02	DB01	8,93	8,93	8,98	8,77	4	8,90		0,09	98,87
19	A65	PD01	DB08	8,97	8,89	9,05	9,05	4	8,99		0,08	99,86
20	F01x	PD02	DB01	8,95	8,86	9,10	9,24	4	9,04		0,17	100,39
21	F16x	PC01	DB08	9,06	9,03	9,15	9,05	4	9,07		0,05	100,77
22	F08x	PZ99	DB08	8,97	8,88	9,30	9,18	4	9,08		0,19	100,91
23	F06x	PD02	DB08	9,12	9,08	9,24	9,10	4	9,13		0,07	101,46
24	F15x	PC01	DB08	9,19	9,13	9,15	9,09	4	9,14		0,04	101,53
25	F25	PB06	DB08	8,94	9,03	9,45	9,32	4	9,18		0,24	102,00
26	A88	PD01	DB08	9,26	9,31	9,03	9,22	4	9,21		0,12	102,25
27	A60x	PD01	DB10	9,29	9,35	9,10	9,11	4	9,21		0,13	102,33
28	A82	PD01	DB08	9,34	9,30	9,26	9,33	4	9,31		0,04	103,40
29	A36	PD02	DB08	9,27	9,18	9,89	9,04	4	9,35		0,38	103,80
30	F12x	PC01	DB08	9,26	9,36	9,44	9,37	4	9,36		0,07	103,94
31	F19x	PD02	DB08	9,24	9,35	9,49	9,38	4	9,37		0,10	104,03
32	F14x	PC01	DB08	9,44	9,35	9,40	9,40	4	9,40		0,04	104,39
33	A43	PB06	DB01	9,29	9,19	9,57	9,60	4	9,41		0,20	104,55
34	F13x	PD01	DB08	9,55	9,44	9,42	9,31	4	9,43		0,10	104,75
35	A62x	PD02	DB01	9,54	9,49	9,53	9,35	4	9,48		0,09	105,28
36	A79	PD01	DB08	9,60	9,50	9,37	9,49	4	9,49		0,09	105,41
37	F02x	PD02	DB08	9,54	9,32	9,51	9,61	4	9,50		0,12	105,47
38	A47	PD01	DB08	9,58	9,68	9,34	9,79	4	9,60		0,19	106,60
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

\* = non tolerable mean because more than +/-

all labs	n	Mean	$s_r$	$CV_r$
144	9,00		0,111	1,237
10	% from the mean			
		I	$s_R$	$CV_R$
		36	0,372	4,129

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: K      Sample: 2

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev.		Recovery %	
		P	D	1	2	3		S <sub>i</sub>	V <sub>i</sub>	S <sub>r</sub>	V <sub>r</sub>		
1	F26x	PC02	DB09	4,74	4,72	4,75	4,75	4	4,74	0,01	0,30	92,38	
2	F27x	PD01	DB06	4,70	4,85	4,86	4,73	4	4,78	0,08	1,69	93,24	
3	F22x	PD02	DB08	4,82	4,78	4,92	4,84	4	4,84	0,06	1,19	94,31	
4	A85x	PB06	DB08	4,96	4,94	4,81	4,70	4	4,85	0,12	2,53	94,58	
5	A56	PC01	DB08	4,87	4,90	4,92	4,80	4	4,87	0,05	1,04	94,94	
6	A59	PC01	DB08	4,89	4,92	4,90	4,82	4	4,88	0,04	0,85	95,15	
7	A42	PB04	DB01	4,76	4,75	5,08	4,96	4	4,89	0,16	3,29	95,26	
8	A58	PD02	DB01	4,85	4,92	4,84	5,00	4	4,90	0,07	1,51	95,55	
9	F32x	PD01	DB08	4,91	4,99	4,82	5,01	4	4,93	0,09	1,75	96,13	
10	A61x	PB02	DB08	4,96	5,01	4,98	4,92	4	4,97	0,04	0,76	96,81	
11	F33x	PD01	DB10	4,97	5,07	4,97	5,07	4	5,02	0,06	1,15	97,84	
12	F18	PD99	DB08	4,97	5,00	5,08	5,08	4	5,03	0,06	1,12	98,08	
13	A43	PB06	DB01	5,48	5,21	4,58	4,89	0	5,04	c	0,39	7,74	98,23
14	F08x	PZ99	DB08	4,87	4,87	5,27	5,23	4	5,06	0,22	4,36	98,61	
15	A62x	PD02	DB01	5,17	5,04	4,92	5,13	4	5,07	0,11	2,19	98,71	
16	F21x	PC02	DB09	4,94	5,28	5,02	5,10	4	5,09	0,15	2,86	99,10	
17	F05x	PD02	DB08	5,09	5,10	5,09	5,09	4	5,09	0,00	0,10	99,25	
18	A82	PD01	DB08	5,08	5,12	5,07	5,11	4	5,10	0,03	0,50	99,33	
19	F29x	PD02	DB01	5,12	5,27	5,11	5,11	4	5,15	0,08	1,53	100,41	
20	A88	PD01	DB08	5,18	5,36	5,20	4,91	4	5,16	0,19	3,61	100,61	
21	F16x	PC01	DB08	5,20	5,14	5,20	5,16	4	5,17	0,03	0,60	100,84	
22	F06x	PD02	DB08	5,20	5,16	5,23	5,11	4	5,18	0,05	1,02	100,88	
23	F15x	PC01	DB08	5,20	5,16	5,15	5,24	4	5,19	0,04	0,79	101,10	
24	A65	PD01	DB08	5,30	5,19	5,19	5,20	4	5,22	0,05	1,03	101,74	
25	A57	PZ02	DD02	5,21	5,20	5,24	5,23	4	5,22	0,02	0,35	101,74	
26	F19x	PD02	DB08	5,15	5,17	5,25	5,37	4	5,24	0,10	1,91	102,03	
27	A60x	PD01	DB10	5,37	5,27	5,17	5,24	4	5,26	0,08	1,53	102,54	
28	F02x	PD02	DB08	5,38	5,37	5,28	5,21	4	5,31	0,08	1,51	103,49	
29	F01x	PD02	DB01	5,36	5,34	5,32	5,25	4	5,32	0,05	0,90	103,64	
30	F14x	PC01	DB08	5,33	5,33	5,34	5,31	4	5,33	0,01	0,24	103,83	
31	A36	PD02	DB08	5,30	5,38	5,48	5,17	4	5,33	0,13	2,46	103,93	
32	F12x	PC01	DB08	5,39	5,33	5,34	5,27	4	5,33	0,05	0,97	103,95	
33	F28x	PD02	DB08	5,38	5,28	5,43	5,47	4	5,39	0,08	1,52	105,00	
34	F13x	PD01	DB08	5,28	5,45	5,47	5,47	4	5,42	0,09	1,70	105,58	
35	A47	PD01	DB08	5,44	5,42	5,41	5,42	4	5,42	0,01	0,22	105,72	
36	F25	PB06	DB08	5,40	5,46	5,44	5,46	4	5,44	0,03	0,53	106,01	
37	A79	PD01	DB08	5,60	5,53	5,52	5,46	4	5,52	0,06	1,03	107,67	
38	F07x	PD03	DB08	6,27	6,14	6,17	6,52	0	6,27	b *	0,17	2,75	122,28
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
all labs    144    5,13    0,072    1,400

10 % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
36    0,207    4,037

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: K      Sample: 3

Unit: mg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
		P	D	1	2	3	4		$s_i$	$V_i$			
1	A85x	PB06	DB08	5,65	5,33	5,70	5,82	4	5,63	*	0,21	3,70	89,32
2	F27x	PD01	DB06	5,76	5,75	5,80	5,78	4	5,77		0,02	0,35	91,64
3	F26x	PC02	DB09	5,78	5,85	5,80	5,84	4	5,82		0,03	0,57	92,36
4	F22x	PD02	DB08	5,90	5,78	5,88	5,85	4	5,85		0,05	0,90	92,90
5	A43	PB06	DB01	5,72	6,10	5,72	5,99	4	5,88		0,19	3,28	93,39
6	A56	PC01	DB08	5,90	6,22	5,85	5,72	4	5,92		0,21	3,55	94,05
7	A42	PB04	DB01	6,00	5,82	5,92	6,20	4	5,99		0,16	2,69	95,02
8	A59	PC01	DB08	6,03	5,99	6,20	5,88	4	6,02		0,13	2,24	95,60
9	A58	PD02	DB01	6,13	6,18	6,01	6,07	4	6,10		0,07	1,21	96,81
10	A57	PZ02	DD02	6,12	6,10	6,21	6,12	4	6,14		0,05	0,80	97,44
11	F21x	PC02	DB09	5,93	6,35	6,23	6,05	4	6,14		0,19	3,04	97,48
12	A61x	PB02	DB08	6,09	6,09	6,14	6,31	4	6,16		0,10	1,69	97,76
13	F32x	PD01	DB08	6,18	6,18	6,18	6,27	4	6,20		0,04	0,73	98,47
14	F33x	PD01	DB10	6,42	6,21	6,20	6,16	4	6,25		0,12	1,87	99,19
15	F18	PD99	DB08	6,20	6,32	6,33	6,31	4	6,29		0,06	0,96	99,86
16	A82	PD01	DB08	6,34	6,34	6,35	6,37	4	6,35		0,01	0,18	100,80
17	F05x	PD02	DB08	6,34	6,35	6,36	6,36	4	6,35		0,01	0,15	100,85
18	F29x	PD02	DB01	6,36	6,35	6,33	6,45	4	6,37		0,05	0,83	101,14
19	A65	PD01	DB08	6,42	6,37	6,49	6,31	4	6,40		0,08	1,19	101,57
20	F16x	PC01	DB08	6,36	6,45	6,40	6,42	4	6,41		0,04	0,59	101,74
21	F08x	PZ99	DB08	6,33	6,28	6,54	6,54	4	6,42		0,14	2,12	101,94
22	A36	PD02	DB08	6,53	6,49	6,42	6,26	4	6,43		0,12	1,85	102,01
23	F13x	PD01	DB08	6,42	6,46	6,35	6,48	4	6,43		0,06	0,89	102,05
24	F28x	PD02	DB08	6,62	6,38	6,46	6,27	4	6,43		0,15	2,27	102,11
25	A60x	PD01	DB10	6,42	6,58	6,48	6,38	4	6,46		0,09	1,39	102,60
26	F19x	PD02	DB08	6,53	6,39	6,43	6,53	4	6,47		0,07	1,10	102,72
27	A62x	PD02	DB01	6,38	6,49	6,49	6,55	4	6,48		0,07	1,09	102,84
28	F06x	PD02	DB08	6,53	6,46	6,47	6,50	4	6,49		0,03	0,48	103,03
29	F01x	PD02	DB01	6,45	6,53	6,47	6,60	4	6,51		0,07	1,04	103,39
30	F12x	PC01	DB08	6,64	6,49	6,42	6,52	4	6,52		0,09	1,40	103,45
31	F15x	PC01	DB08	6,49	6,56	6,52	6,56	4	6,53		0,03	0,52	103,71
32	F14x	PC01	DB08	6,55	6,51	6,53	6,56	4	6,54		0,02	0,34	103,79
33	A88	PD01	DB08	6,53	6,55	6,65	6,52	4	6,56		0,06	0,91	104,19
34	A47	PD01	DB08	6,78	6,78	6,76	6,77	4	6,77		0,01	0,14	107,53
35	F02x	PD02	DB08	6,87	6,95	6,70	6,78	4	6,83		0,11	1,59	108,36
36	F25	PB06	DB08	6,86	6,89	6,85	6,84	4	6,86		0,02	0,27	108,88
37	A79	PD01	DB08	7,67	7,65	7,71	7,69	0	7,68	b *	0,03	0,33	121,89
38	F07x	PD03	DB08	9,06	8,87	8,78	9,01	0	8,93	b *	0,13	1,45	141,78
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n	Mean	$s_r$	$CV_r$
all labs	144	6,30	0,082
10	% from the mean		1,310

I	$s_R$	$CV_R$
36	0,297	4,714

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: K      Sample: 4

Unit: mg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3		$\bar{x}$	$s_i$		
1	A56	PC01	DB08	7,67	7,83	7,73	7,89	7,78	0,10	1,26	90,98
2	F22x	PD02	DB08	7,88	7,90	8,07	7,95	7,95	0,08	1,07	92,97
3	F26x	PC02	DB09	7,94	7,98	7,96	7,97	7,96	0,02	0,21	93,14
4	F21x	PC02	DB09	7,98	8,07	8,21	8,05	8,08	0,10	1,19	94,49
5	A59	PC01	DB08	8,05	8,17	8,10	8,01	8,08	0,07	0,85	94,56
6	F27x	PD01	DB06	8,01	8,19	8,02	8,18	8,10	0,10	1,20	94,74
7	A85x	PB06	DB08	7,80	8,09	8,39	8,14	8,10	0,24	2,99	94,80
8	A42	PB04	DB01	8,15	7,91	8,31	8,26	8,16	0,18	2,18	95,42
9	A57	PZ02	DD02	8,26	8,20	8,26	8,25	8,24	0,03	0,35	96,42
10	A58	PD02	DB01	8,37	8,31	8,17	8,17	8,26	0,10	1,23	96,56
11	F18	PD99	DB08	8,27	8,28	8,35	8,35	8,31	0,04	0,52	97,23
12	A61x	PB02	DB08	8,44	8,50	8,20	8,28	8,36	0,14	1,66	97,73
13	F29x	PD02	DB01	8,24	8,13	8,52	8,63	8,38	0,23	2,77	98,00
14	F32x	PD01	DB08	8,22	8,34	8,52	8,59	8,42	0,17	2,00	98,46
15	A43	PB06	DB01	8,80	7,99	8,37	8,59	8,44	c	0,35	4,10
16	F05x	PD02	DB08	8,49	8,48	8,48	8,49	8,49	0,01	0,07	99,25
17	A65	PD01	DB08	8,53	8,45	8,45	8,55	8,50	0,05	0,62	99,37
18	F01x	PD02	DB01	8,69	8,74	8,54	8,39	8,59	0,16	1,84	100,48
19	F07x	PD03	DB08	8,69	8,51	8,54	8,69	8,60	0,10	1,12	100,64
20	F08x	PZ99	DB08	8,42	8,48	8,82	8,73	8,61	0,19	2,25	100,75
21	F33x	PD01	DB10	8,67	8,56	8,57	8,70	8,63	0,07	0,82	100,89
22	A82	PD01	DB08	8,68	8,70	8,70	8,67	8,69	0,01	0,16	101,61
23	F16x	PC01	DB08	8,69	8,66	8,73	8,73	8,70	0,03	0,35	101,79
24	A60x	PD01	DB10	8,83	8,74	8,64	8,66	8,72	0,09	0,99	101,96
25	F15x	PC01	DB08	8,83	8,68	8,88	8,63	8,76	0,12	1,36	102,41
26	A36	PD02	DB08	8,89	8,93	8,49	8,76	8,77	0,20	2,27	102,56
27	F28x	PD02	DB08	8,96	8,80	8,60	8,73	8,77	0,15	1,69	102,63
28	A88	PD01	DB08	8,81	8,86	8,74	8,73	8,79	0,06	0,70	102,76
29	A47	PD01	DB08	8,82	8,84	8,81	8,83	8,83	0,01	0,13	103,23
30	A62x	PD02	DB01	8,79	8,75	8,82	8,95	8,83	0,09	0,98	103,26
31	F13x	PD01	DB08	8,86	8,86	8,86	8,81	8,85	0,02	0,28	103,49
32	F12x	PC01	DB08	8,95	8,96	8,65	8,84	8,85	0,14	1,59	103,52
33	F06x	PD02	DB08	8,91	8,84	8,96	8,75	8,86	0,09	1,01	103,69
34	F14x	PC01	DB08	9,00	9,00	9,00	9,00	9,00	0,00	0,00	105,28
35	F02x	PD02	DB08	8,95	9,06	9,01	9,21	9,06	0,11	1,23	105,95
36	F19x	PD02	DB08	9,07	9,07	9,08	9,06	9,07	0,01	0,09	106,10
37	F25	PB06	DB08	8,95	9,20	9,14	9,08	9,10	0,11	1,17	106,39
38	A79	PD01	DB08	9,08	9,06	9,13	9,14	9,10	0,04	0,39	106,48
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											

\* = non tolerable mean because more than +/-

all labs	n	Mean	$s_r$	$CV_r$
148	8,55		0,093	1,089
10	% from the mean			

I	$s_R$	$CV_R$
37	0,360	4,214

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: C      Sample: 1

Unit: g/100g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		b *	$V_i$		
1	F22x	PZ98	DA02	45,65	45,21	47,56	46,14	0	46,14	b *	1,02	92,73
2	A59	PZ98	DA02	47,87	47,99	47,76	47,95	4	47,89		0,10	96,26
3	F02x	PZ98	DA01	48,34	48,69	47,88	47,74	4	48,16		0,44	96,80
4	A49x	PZ98	DA02	48,44	48,46	48,33	48,54	4	48,44		0,09	97,36
5	F25	PZ98	DA01	48,86	49,04	48,90	48,87	4	48,91		0,08	98,31
6	F08x	PZ98	DA01	49,04	48,67	49,28	49,03	4	49,00		0,25	98,49
7	A57	PZ98	DA01	49,12	49,20	49,15	48,84	4	49,08		0,16	98,64
8	A58	PZ98	DA99	49,10	49,16	49,03	49,07	4	49,09		0,05	98,66
9	A82	PZ98	DA02	49,18	49,29	49,24	49,39	4	49,28		0,09	99,03
10	F07x	PZ98	DA01	49,26	49,36	49,29	49,38	4	49,32		0,06	99,13
11	A86	PZ98	DA01	49,31	49,33	49,28	49,38	4	49,33		0,04	99,13
12	A61x	PZ98	DA02	49,37	49,44	49,50	49,17	4	49,37		0,14	99,23
13	F19x	PZ98	DA01	49,30	49,40	49,40	49,50	4	49,40		0,08	99,29
14	A85x	PZ98	DA01	49,44	49,45	49,42	49,39	4	49,42		0,03	99,33
15	A62x	PZ98	DA01	49,60	49,40	50,00	49,20	4	49,55		0,34	99,59
16	F15x	PZ98	DA01	49,61	49,59	49,57	49,51	4	49,57		0,04	99,63
17	A56	PZ98	DA01	49,68	49,82	49,70	49,84	4	49,76		0,08	100,01
18	F05x	PZ98	DA01	49,80	49,80	49,80	49,80	4	49,80		0,00	100,09
19	F16x	PZ98	DA02	49,79	49,74	49,84	49,86	4	49,81		0,05	100,10
20	F06x	PZ98	DA02	49,93	49,97	49,72	49,78	4	49,85		0,12	100,19
21	F32x	PZ98	DA01	50,10	50,20	49,80	49,30	4	49,85		0,40	100,19
22	A47	PZ98	DA02	49,68	49,42	50,22	50,20	4	49,88		0,40	100,25
23	F28x	PZ98	DA01	49,90	50,10	49,50	50,40	4	49,98		0,38	100,44
24	F03x	PZ98	DA01	49,96	49,94	50,03	50,12	4	50,01		0,08	100,52
25	A65	PZ98	DA02	49,94	50,06	50,09	50,14	4	50,06		0,08	100,61
26	F14x	PZ98	DA01	50,20	50,10	50,20	50,20	4	50,18		0,05	100,84
27	F18x	PZ98	DA01	50,30	50,10	50,30	50,10	4	50,20		0,12	100,89
28	F13x	PZ98	DA01	50,46	50,29	50,12	50,02	4	50,22		0,19	100,94
29	F12x	PZ98	DA02	50,14	50,34	50,34	50,29	4	50,28		0,10	101,05
30	F29x	PZ98	DA02	50,12	50,96	50,23	50,32	4	50,41		0,38	101,31
31	A88	PZ98	DA01	50,63	50,37	50,60	50,43	4	50,51		0,13	101,51
32	F33x	PZ98	DA02	50,85	50,75	50,90	50,93	4	50,86		0,08	102,21
33	A60x	PZ98	DA02	50,79	50,82	50,93	50,96	4	50,87		0,08	102,24
34	F26x	PZ98	DA02	51,00	50,90	50,80	50,90	4	50,90		0,08	102,30
35	F21x	PZ98	DA01	50,81	50,97	50,99	50,92	4	50,92		0,08	102,35
36	F27x	PZ98	DA01	51,24	51,42	51,21	51,31	4	51,30		0,09	103,09
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

\* = non tolerable mean because more than +/-

n      Mean       $s_r$        $CV_r$   
 all labs    140    49,76    0,142    0,286  
 5      % from the mean

I       $s_R$        $CV_R$   
 35    0,778    1,564

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: C      Sample: 2

Unit: g/100g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
		P	D	1	2	3	4		b	*			
1	F22x	PZ98	DA02	47,70	50,40	49,50	49,20	0	49,20	b *	1,12	2,28	93,77
2	A59	PZ98	DA02	50,61	50,50	50,77	50,63	4	50,63		0,11	0,22	96,49
3	A62x	PZ98	DA01	50,80	50,60	51,30	50,60	4	50,83		0,33	0,65	96,87
4	F02x	PZ98	DA01	50,87	51,04	50,48	51,55	4	50,99		0,44	0,87	97,17
5	A49x	PZ98	DA02	51,09	51,19	51,31	51,07	4	51,17		0,11	0,21	97,51
6	A86	PZ98	DA01	51,62	51,51	51,25	51,33	4	51,43		0,17	0,33	98,01
7	A58	PZ98	DA99	51,60	51,56	51,64	51,65	4	51,61		0,04	0,08	98,37
8	A82	PZ98	DA02	51,79	52,04	52,06	51,44	4	51,83		0,29	0,56	98,79
9	F25	PZ98	DA01	51,94	51,84	51,80	51,91	4	51,87		0,06	0,12	98,86
10	A57	PZ98	DA01	52,14	52,14	52,18	52,01	4	52,12		0,07	0,14	99,33
11	F19x	PZ98	DA01	52,10	52,10	52,20	52,20	4	52,15		0,06	0,11	99,39
12	F07x	PZ98	DA01	52,25	52,20	52,01	52,15	4	52,15		0,10	0,20	99,40
13	A61x	PZ98	DA02	52,25	52,19	52,20	52,27	4	52,23		0,04	0,07	99,54
14	F03x	PZ98	DA01	52,17	52,19	52,18	52,37	4	52,23		0,10	0,18	99,54
15	A56	PZ98	DA01	52,32	52,21	52,32	52,22	4	52,27		0,06	0,12	99,62
16	F08x	PZ98	DA01	52,61	52,14	52,29	52,05	4	52,27		0,25	0,47	99,62
17	F15x	PZ98	DA01	52,34	52,33	52,25	52,31	4	52,31		0,04	0,08	99,69
18	F28x	PZ98	DA01	52,30	52,20	52,80	52,50	4	52,45		0,26	0,50	99,96
19	F32x	PZ98	DA01	52,70	52,90	52,00	52,30	4	52,48		0,40	0,77	100,01
20	A85x	PZ98	DA01	52,59	52,60	52,59	52,58	4	52,59		0,01	0,02	100,22
21	F29x	PZ98	DA02	52,57	52,73	52,86	52,25	4	52,60		0,26	0,50	100,25
22	F06x	PZ98	DA02	52,71	52,67	52,56	52,57	4	52,63		0,07	0,14	100,30
23	F16x	PZ98	DA02	52,80	52,71	52,74	52,78	4	52,76		0,04	0,08	100,55
24	F05x	PZ98	DA01	53,00	52,80	52,80	52,80	4	52,85		0,10	0,19	100,73
25	F18x	PZ98	DA01	52,80	52,80	52,80	53,10	4	52,88		0,15	0,28	100,77
26	F14x	PZ98	DA01	52,90	52,90	52,90	52,90	4	52,90		0,00	0,00	100,82
27	A88	PZ98	DA01	53,16	53,47	52,87	52,28	4	52,95		0,51	0,96	100,91
28	A60x	PZ98	DA02	53,11	52,93	53,27	53,16	4	53,12		0,14	0,26	101,24
29	F33x	PZ98	DA02	53,17	52,98	53,23	53,10	4	53,12		0,11	0,20	101,24
30	A65	PZ98	DA02	53,14	53,12	53,19	53,11	4	53,14		0,03	0,06	101,28
31	F13x	PZ98	DA01	53,41	53,28	53,22	53,09	4	53,25		0,13	0,25	101,49
32	A47	PZ98	DA02	52,94	53,20	53,25	53,80	4	53,30		0,36	0,68	101,58
33	F12x	PZ98	DA02	53,28	53,42	53,24	53,59	4	53,38		0,16	0,30	101,73
34	F27x	PZ98	DA01	53,82	53,81	53,71	53,83	4	53,79		0,06	0,10	102,52
35	F26x	PZ98	DA02	53,90	53,80	53,80	53,80	4	53,83		0,05	0,09	102,58
36	F21x	PZ98	DA01	54,21	54,42	54,46	54,36	4	54,36		0,11	0,20	103,61
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n	Mean	$s_r$	$CV_r$
all labs	140	52,47	0,149
5	% from the mean		0,285

I	$s_R$	$CV_R$
35	0,850	1,621

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: C      Sample: 3

Unit: g/100g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
		P	D	1	2	3	4		b	*	$v_i$		
1	F22x	PZ98	DA02	47,46	48,75	48,14	48,12	0	48,12	b *	0,53	1,10	93,48
2	A59	PZ98	DA02	49,82a	49,96	49,95	49,93	3	49,95		0,02	0,03	97,04
3	F25	PZ98	DA01	50,23	49,93	50,14	50,01	4	50,08		0,13	0,27	97,29
4	A49x	PZ98	DA02	50,19	50,11	49,98	50,11	4	50,10		0,09	0,17	97,33
5	F02x	PZ98	DA01	50,77	50,12	50,04	50,05	4	50,25		0,35	0,70	97,62
6	A57	PZ98	DA01	49,92	51,13	51,00	50,28	4	50,58		0,58	1,14	98,27
7	A86	PZ98	DA01	50,52	50,55	50,68	50,80	4	50,64		0,13	0,25	98,38
8	A58	PZ98	DA99	50,61	50,77	50,67	50,62	4	50,67		0,07	0,14	98,44
9	F19x	PZ98	DA01	50,70	50,70	50,80	50,80	4	50,75		0,06	0,11	98,60
10	F07x	PZ98	DA01	51,15	50,92	50,72	50,94	4	50,93		0,18	0,35	98,95
11	A82	PZ98	DA02	51,14	50,62	51,16	51,14	4	51,02		0,26	0,52	99,11
12	A61x	PZ98	DA02	51,12	51,10	51,16	51,11	4	51,12		0,03	0,05	99,32
13	F32x	PZ98	DA01	51,50	51,90	51,40	50,90	4	51,43		0,41	0,80	99,91
14	F15x	PZ98	DA01	51,47	51,49	51,50	51,51	4	51,49		0,02	0,03	100,04
15	F08x	PZ98	DA01	51,68	51,46	51,43	51,54	4	51,53		0,11	0,21	100,11
16	F03x	PZ98	DA01	51,75	51,30	51,55	51,64	4	51,56		0,19	0,37	100,17
17	F06x	PZ98	DA02	51,54	51,59	51,66	51,46	4	51,56		0,08	0,16	100,18
18	A85x	PZ98	DA01	51,54	51,56	51,57	51,59	4	51,56		0,02	0,04	100,18
19	F29x	PZ98	DA02	51,53	51,20	51,66	51,90	4	51,57		0,29	0,57	100,20
20	A56	PZ98	DA01	51,60	51,65	51,72	51,33	4	51,58		0,17	0,33	100,20
21	F28x	PZ98	DA01	51,20	51,40	51,80	52,20	4	51,65		0,44	0,86	100,35
22	F13x	PZ98	DA01	51,85	51,72	51,55	51,51	4	51,66		0,16	0,30	100,36
23	A62x	PZ98	DA01	51,50	52,30	51,50	51,40	4	51,68		0,42	0,81	100,40
24	F05x	PZ98	DA01	51,70	51,70	51,70	51,70	4	51,70		0,00	0,00	100,45
25	A47	PZ98	DA02	51,80	51,99	51,68	51,78	4	51,81		0,13	0,25	100,66
26	F16x	PZ98	DA02	51,72	51,67	52,04	51,83	4	51,82		0,16	0,32	100,67
27	F14x	PZ98	DA01	51,90	52,10	51,80	52,00	4	51,95		0,13	0,25	100,93
28	F33x	PZ98	DA02	52,15	51,91	52,19	51,83	4	52,02		0,18	0,34	101,07
29	F12x	PZ98	DA02	51,87	52,04	52,44	51,78	4	52,03		0,29	0,56	101,09
30	A88	PZ98	DA01	52,62	51,59	52,37	51,65	4	52,06		0,52	0,99	101,14
31	A60x	PZ98	DA02	52,19	52,28	52,14	51,99	4	52,15		0,12	0,24	101,32
32	F18x	PZ98	DA01	52,30	52,30	52,00	52,00	4	52,15		0,17	0,33	101,32
33	A65	PZ98	DA02	52,08	52,23	52,32	52,04	4	52,17		0,13	0,25	101,35
34	F27x	PZ98	DA01	52,21	52,34	52,43	52,32	4	52,33		0,09	0,17	101,66
35	F26x	PZ98	DA02	52,80	52,70	52,80	52,70	4	52,75		0,06	0,11	102,49
36	F21x	PZ98	DA01	52,76	52,92	52,82	52,83	4	52,83		0,07	0,12	102,65
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n	Mean	$s_r$	$CV_r$
all labs	139	51,47	0,179
5	% from the mean		0,347

I	$s_R$	$CV_R$
35	0,731	1,421

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: C      Sample: 4

Unit: g/100g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		b	*	S <sub>i</sub>	V <sub>i</sub>	
1	F22x	PZ98	DA02	49,16	48,81	47,15	48,38	0	48,38	b *	0,88	1,81	93,20
2	A59	PZ98	DA02	49,78	50,05	49,93	50,04	4	49,95		0,13	0,25	96,23
3	A62x	PZ98	DA01	50,10	50,00	50,60	50,00	4	50,18		0,29	0,57	96,66
4	A49x	PZ98	DA02	50,52	50,52	50,44	50,42	4	50,48		0,05	0,10	97,24
5	F02x	PZ98	DA01	51,12	50,13	50,91	50,09	4	50,56		0,53	1,05	97,41
6	A86	PZ98	DA01	50,83	50,48	50,53	50,86	4	50,68		0,20	0,39	97,63
7	A58	PZ98	DA99	50,81	50,79	50,82	50,85	4	50,82		0,03	0,05	97,90
8	A57	PZ98	DA01	51,14	51,08	51,12	51,06	4	51,10		0,04	0,07	98,45
9	F25	PZ98	DA01	51,13	51,19	51,06	51,12	4	51,13		0,05	0,11	98,49
10	A61x	PZ98	DA02	51,52	51,35	51,42	51,41	4	51,43		0,07	0,14	99,07
11	A56	PZ98	DA01	51,45	51,43	51,45	51,40	4	51,43		0,02	0,05	99,09
12	F07x	PZ98	DA01	51,42	51,81	51,42	51,55	4	51,55		0,18	0,36	99,31
13	F29x	PZ98	DA02	51,82	51,18	51,31	51,94	4	51,56		0,37	0,72	99,34
14	F19x	PZ98	DA01	51,50	51,60	51,80	51,60	4	51,63		0,13	0,24	99,46
15	A82	PZ98	DA02	51,68	51,59	51,71	51,66	4	51,66		0,05	0,10	99,53
16	F08x	PZ98	DA01	51,95	52,07	51,86	51,43	4	51,83		0,28	0,54	99,85
17	F15x	PZ98	DA01	51,99	51,94	51,93	52,00	4	51,97		0,04	0,07	100,11
18	A85x	PZ98	DA01	52,05	52,03	51,98	51,98	4	52,01		0,03	0,06	100,20
19	F03x	PZ98	DA01	52,05	52,02	52,17	51,87	4	52,03		0,12	0,24	100,23
20	F06x	PZ98	DA02	52,15	52,31	52,09	52,07	4	52,16		0,11	0,21	100,48
21	A88	PZ98	DA01	52,10	51,90	53,21	51,68	4	52,22		0,68	1,30	100,61
22	F16x	PZ98	DA02	52,23	52,25	52,29	52,33	4	52,28		0,04	0,08	100,71
23	F33x	PZ98	DA02	52,31	52,33	52,44	52,09	4	52,29		0,15	0,28	100,74
24	F05x	PZ98	DA01	52,20	52,40	52,30	52,30	4	52,30		0,08	0,16	100,76
25	F32x	PZ98	DA01	52,70	52,90	51,90	52,00	4	52,38		0,50	0,95	100,90
26	A47	PZ98	DA02	52,30	52,30	52,85	52,31	4	52,44		0,27	0,52	101,03
27	F28x	PZ98	DA01	52,30	52,80	53,20	51,70	4	52,50		0,65	1,23	101,14
28	F13x	PZ98	DA01	52,81	52,66	52,47	52,28	4	52,56		0,23	0,44	101,25
29	F14x	PZ98	DA01	52,70	52,50	52,60	52,50	4	52,58		0,10	0,18	101,29
30	F12x	PZ98	DA02	52,54	52,87	52,80	52,85	4	52,76		0,15	0,29	101,65
31	A65	PZ98	DA02	52,79	52,83	52,79	52,74	4	52,79		0,03	0,07	101,70
32	F18x	PZ98	DA01	52,90	52,80	52,60	53,00	4	52,83		0,17	0,32	101,77
33	A60x	PZ98	DA02	52,90	52,72	52,92	53,11	4	52,91		0,16	0,31	101,94
34	F26x	PZ98	DA02	52,90	53,00	53,10	53,20	4	53,05		0,13	0,24	102,20
35	F21x	PZ98	DA01	53,07	53,32	53,29	53,23	4	53,23		0,11	0,21	102,55
36	F27x	PZ98	DA01	53,29	53,78	53,63	53,31	4	53,50		0,24	0,45	103,08
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n	Mean	S <sub>r</sub>	CV <sub>r</sub>
all labs	140	51,91	0,183
5	% from the mean		0,353

I	S <sub>R</sub>	CV <sub>R</sub>
35	0,888	1,711

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Zn      Sample: 1

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
		P	D	1	2	3	4		$s_i$	$V_i$			
1	A88	PD01	DB08	36,78	37,31	36,85	39,56	4	37,63		1,31	3,49	86,56
2	F08x	PE99	DB08	38,44	38,02	40,56	40,12	4	39,28		1,24	3,17	90,37
3	A58	PD02	DB01	39,46	39,47	39,10	39,14	4	39,29		0,20	0,51	90,39
4	A59	PC01	DB08	40,66	40,97	40,83	41,21	4	40,92		0,23	0,57	94,13
5	F27	PD01	DB01	42,33	42,57	40,73	39,26	4	41,22		1,54	3,74	94,83
6	A57	PZ02	DD02	41,80	41,90	42,50	42,30	4	42,13		0,33	0,78	96,91
7	F19x	PD02	DB08	42,30	42,60	42,70	42,10	4	42,43		0,28	0,65	97,60
8	F28x	PD02	DB08	43,20	42,96	41,73	42,02	4	42,48		0,71	1,68	97,72
9	F05x	PD02	DB08	42,20	42,90	42,80	42,30	4	42,55		0,35	0,83	97,89
10	F29x	PD02	DB01	41,96	42,34	43,76	42,20	4	42,57		0,81	1,91	97,92
11	A65	PD01	DB08	43,00	42,70	42,50	43,00	4	42,80		0,24	0,57	98,46
12	A47	PD01	DB08	44,60	42,60	41,90	42,60	4	42,93		1,16	2,71	98,75
13	F33x	PD01	DB10	42,95	42,98	44,25	42,16	4	43,09		0,86	2,01	99,12
14	A82	PD01	DB08	42,43	43,33	43,66	43,05	4	43,12		0,52	1,21	99,19
15	F25	PB06	DB08	43,06	45,68	41,28	42,75	4	43,19		1,83	4,24	99,36
16	F18x	PD99	DB10	42,50	42,40	44,00	44,70	4	43,40		1,13	2,61	99,84
17	A36	PD02	DB08	42,93	42,39	46,55	42,07	4	43,49		2,07	4,77	100,04
18	F32x	PD01	DB08	43,50	44,60	43,60	43,10	4	43,70		0,64	1,46	100,53
19	F12x	PC01	DB10	41,00	46,73	45,91	41,32	0	43,74	c	3,00	6,86	100,62
20	F14x	PC01	DB08	43,70	43,70	43,90	44,20	4	43,88		0,24	0,54	100,93
21	F13x	PD01	DB08	44,00	44,30	44,10	44,80	4	44,30		0,36	0,80	101,91
22	F02x	PD02	DB08	45,80	43,60	43,20	44,70	4	44,33		1,17	2,64	101,97
23	A79	PD01	DB10	45,50	45,30	45,52	43,31	4	44,91		1,07	2,38	103,31
24	F16x	PC01	DB08	46,18	44,63	46,36	45,42	4	45,65		0,79	1,73	105,01
25	F15x	PC01	DB08	46,00	46,00	46,00	47,00	4	46,25		0,50	1,08	106,40
26	F06x	PD02	DB08	47,60	45,60	46,40	45,40	4	46,25		1,00	2,16	106,40
27	A60x	PD01	DB10	46,46	47,17	46,97	47,71	4	47,07		0,52	1,09	108,29
28	A80	PD03	DB10	47,40	47,40	49,30	48,70	4	48,20		0,96	1,98	110,88
29	F07x	PD03	DB08	50,77	51,97	49,01	48,70	4	50,11	*	1,54	3,07	115,28
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n	Mean	$s_r$	$CV_r$
all labs	112	0,843	1,940
15	43,47		

% from the mean

I	$s_R$	$CV_R$
28	2,658	6,115

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Zn      Sample: 2

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. S <sub>i</sub>	Recovery %
		P	D	1	2	3	4		b	*	V <sub>i</sub>	
1	F07x	PD03	DB08	21,55	21,46	22,41a	21,69	0	21,57	b *	0,12	48,36
2	A88	PD01	DB08	40,19	38,84	40,43	39,17	4	39,66		0,77	88,92
3	F08x	PE99	DB08	39,96	39,69	42,32	42,76	4	41,18		1,58	92,33
4	A59	PC01	DB08	42,71	43,09	42,51	42,73	4	42,76		0,24	95,88
5	F18x	PD99	DB10	42,40	43,50	43,10	43,60	4	43,15		0,54	96,75
6	F33x	PD01	DB10	43,92	43,55	42,50	42,78	4	43,19		0,66	96,84
7	A82	PD01	DB08	42,69	43,30	44,00	43,31	4	43,33		0,54	97,15
8	A58	PD02	DB01	43,98	43,55	43,28	42,63	4	43,36		0,57	97,22
9	F27	PD01	DB01	44,15	44,24	42,19	44,05	4	43,66		0,98	97,89
10	F25	PB06	DB08	43,77	43,61	43,53	43,91	4	43,71		0,17	98,00
11	A47	PD01	DB08	45,30	43,50	43,30	42,80	4	43,73		1,09	98,04
12	F19x	PD02	DB08	42,70	43,80	44,10	44,40	4	43,75		0,74	98,10
13	F28x	PD02	DB08	43,59	44,19	44,78	42,89	4	43,86		0,81	98,35
14	A65	PD01	DB08	44,10	44,00	44,30	44,00	4	44,10		0,14	98,88
15	F29x	PD02	DB01	43,98	44,66	44,68	43,91	4	44,31		0,42	99,35
16	F12x	PC01	DB10	42,75	46,72	42,91	44,87	4	44,31		1,87	99,36
17	F05x	PD02	DB08	44,20	43,90	44,60	44,90	4	44,40		0,44	99,56
18	A36	PD02	DB08	44,49	44,60	46,83	43,21	4	44,78		1,50	100,41
19	F14x	PC01	DB08	45,20	44,80	45,00	44,80	4	44,95		0,19	100,79
20	F32x	PD01	DB08	44,70	45,60	44,00	46,00	4	45,08		0,90	101,07
21	F16x	PC01	DB08	44,93	45,71	45,42	45,54	4	45,40		0,34	101,80
22	F13x	PD01	DB08	46,00	46,30	46,60	46,10	4	46,25		0,26	103,70
23	A80	PD03	DB10	46,40	46,70	45,80	46,20	4	46,28		0,38	103,76
24	F15x	PC01	DB08	47,00	48a	47,00	47,00	3	47,00		0,00	105,39
25	F06x	PD02	DB08	49,10	47,10	47,60	46,60	4	47,60		1,08	106,73
26	F02x	PD02	DB08	45,90	47,70	47,30	49,50	4	47,60		1,48	106,73
27	A60x	PD01	DB10	47,52	47,27	47,78	48,06	4	47,66		0,34	106,85
28	A57	PZ02	DD02	48,10	47,70	47,90	47,20	4	47,73		0,39	107,01
29	A79	PD01	DB10	47,07	47,77	50,79a	46,96	3	47,27		0,44	105,98
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    110    44,60    0,674    1,511

15 % from the mean

\* = non tolerable mean because more than +/-

I      S<sub>R</sub>      CV<sub>R</sub>  
 28    1,995    4,468

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Zn      Sample: 3

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
		P	D	1	2	3	4		Lab.mean	$s_i$	$V_i$		
1	F27	PD01	DB01	19,04	19,51	18,09	18,51	4	18,79	0,62	3,29	88,99	
2	A88	PD01	DB08	18,30	19,28	19,39	20,35	4	19,33	0,84	4,34	91,56	
3	A59	PC01	DB08	20,20	19,97	19,97	19,67	4	19,95	0,22	1,09	94,51	
4	F12x	PC01	DB10	20,04	20,39	19,86	19,88	4	20,04	0,24	1,21	94,92	
5	A58	PD02	DB01	20,82	19,26	19,58	20,59	4	20,06	0,76	3,78	95,03	
6	F08x	PE99	DB08	19,31	20,06	20,50	20,49	4	20,09	0,56	2,79	95,16	
7	F25	PB06	DB08	20,01	20,47	19,85	20,14	4	20,12	0,26	1,31	95,29	
8	F19x	PD02	DB08	20,50	20,10	20,30	20,60	4	20,38	0,22	1,09	96,51	
9	A36	PD02	DB08	21,06	20,52	20,63	20,20	4	20,60	0,36	1,72	97,59	
10	F33x	PD01	DB10	21,32	21,08	20,22	20,71	4	20,83	0,48	2,30	98,68	
11	F14x	PC01	DB08	21,00	20,90	20,80	20,90	4	20,90	0,08	0,39	99,00	
12	A47	PD01	DB08	21,80	20,70	20,60	20,80	4	20,98	0,56	2,65	99,35	
13	F07x	PD03	DB08	20,92	21,02	20,67	21,44	4	21,01	0,32	1,53	99,53	
14	A57	PZ02	DD02	21,00	20,80	20,90	21,40	4	21,03	0,26	1,25	99,59	
15	F18x	PD99	DB10	20,60	21,00	20,80	21,80	4	21,05	0,53	2,50	99,71	
16	F16x	PC01	DB08	20,75	21,57	21,13	21,55	4	21,25	0,39	1,84	100,65	
17	A65	PD01	DB08	21,40	21,30	21,50	21,10	4	21,33	0,17	0,80	101,01	
18	A80	PD03	DB10	21,30	21,40	21,70	21,90	4	21,58	0,28	1,28	102,19	
19	F05x	PD02	DB08	21,70	21,50	21,70	21,80	4	21,68	0,13	0,58	102,67	
20	F28x	PD02	DB08	20,84	22,22	21,52	23,39	4	21,99	1,09	4,95	104,17	
21	F32x	PD01	DB08	21,90	22,20	21,80	22,20	4	22,03	0,21	0,94	104,32	
22	F13x	PD01	DB08	21,80	22,70	21,60	22,10	4	22,05	0,48	2,17	104,44	
23	F29x	PD02	DB01	22,10	21,94	22,37	21,88	4	22,07	0,22	0,99	104,56	
24	A60x	PD01	DB10	22,52	22,29	22,69	22,23	4	22,43	0,22	0,96	106,25	
25	F15x	PC01	DB08	24,00	22,00	22,00	22,00	4	22,50	1,00	4,44	106,57	
26	F06x	PD02	DB08	23,40	22,50	22,40	23,10	4	22,85	0,48	2,10	108,23	
27	F02x	PD02	DB08	23,40	24,00	22,40	22,70	4	23,13	0,72	3,11	109,53	
28	A82	PD01	DB08	22,35	25,68	22,85	26,98	0	24,47	b *	2,23	9,10	115,88
29	A79	PD01	DB10	24,73	25,05	24,80	24,95	0	24,88	b *	0,14	0,58	117,86
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean       $s_r$        $CV_r$   
 all labs    108    21,11    0,432    2,048

\* = non tolerable mean because more than +/-

15 % from the mean

I       $s_R$        $CV_R$   
 27    1,073    5,081

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Zn      Sample: 4

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
		P	D	1	2	3	4		$\bar{x}$	$s_i$			
1	F08x	PE99	DB08	24,35	25,08	24,76	24,72	4	24,73	*	0,30	84,97	
2	F27	PD01	DB01	26,76	27,00	25,10	26,01	4	26,22	0,86	3,27	90,09	
3	A58	PD02	DB01	26,12	27,33	27,39	25,59	4	26,61	0,90	3,37	91,43	
4	A88	PD01	DB08	27,01	27,91	27,61	26,59	4	27,28	0,59	2,17	93,74	
5	A59	PC01	DB08	27,33	27,84	28,30	27,09	4	27,64	0,54	1,95	94,98	
6	F18x	PD99	DB10	27,20	28,30	28,10	28,00	4	27,90	0,48	1,73	95,87	
7	F28x	PD02	DB08	27,05	27,81	29,12	28,58	4	28,14	0,90	3,21	96,70	
8	F12x	PC01	DB10	27,41	28,17	29,46	27,61	4	28,17	0,92	3,28	96,78	
9	A47	PD01	DB08	29,40	28,20	28,30	28,40	4	28,58	0,56	1,95	98,19	
10	A36	PD02	DB08	29,18	29,29	27,90	28,33	4	28,68	0,67	2,34	98,54	
11	F33x	PD01	DB10	29,13	28,46	28,88	28,52	4	28,75	0,32	1,10	98,79	
12	F05x	PD02	DB08	29,00	28,90	28,90	28,90	4	28,93	0,05	0,17	99,40	
13	F19x	PD02	DB08	29,00	29,30	29,00	28,80	4	29,03	0,21	0,71	99,74	
14	F16x	PC01	DB08	28,92	29,63	28,48	29,59	4	29,16	0,56	1,91	100,19	
15	F25	PB06	DB08	29,39	29,51	29,15	29,07	4	29,28	0,20	0,70	100,62	
16	F14x	PC01	DB08	29,40	29,50	29,30	29,30	4	29,38	0,10	0,33	100,94	
17	A57	PZ02	DD02	29,80	30,00	29,60	29,40	4	29,70	0,26	0,87	102,06	
18	A65	PD01	DB08	29,80	29,80	30,20	30,00	4	29,95	0,19	0,64	102,92	
19	F07x	PD03	DB08	30,59	29,39	29,20	30,75	4	29,98	0,80	2,67	103,03	
20	A80	PD03	DB10	30,10	30,50	30,20	30,50	4	30,33	0,21	0,68	104,21	
21	F13x	PD01	DB08	30,60	30,20	30,20	30,70	4	30,43	0,26	0,86	104,55	
22	F29x	PD02	DB01	30,24	30,42	31,26	30,44	4	30,59	0,46	1,50	105,11	
23	F02x	PD02	DB08	30,60	31,50	30,50	30,40	4	30,75	0,51	1,65	105,67	
24	F15x	PC01	DB08	30,00	31,00	31,00	31,00	4	30,75	0,50	1,63	105,67	
25	A79	PD01	DB10	30,68	30,93	31,02	30,51	4	30,79	0,23	0,76	105,79	
26	F32x	PD01	DB08	30,20	30,70	31,00	31,30	4	30,80	0,47	1,52	105,84	
27	F06x	PD02	DB08	31,20	31,10	31,20	30,90	4	31,10	0,14	0,45	106,87	
28	A60x	PD01	DB10	30,90	31,34	31,37	31,34	4	31,24	0,22	0,72	107,34	
29	A82	PD01	DB08	32,42	29,91	30,90	33,02	0	31,56	c	1,42	4,49	108,46
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean       $s_r$        $CV_r$   
 all labs    112    29,10    0,443    1,522

\* = non tolerable mean because more than +/-

15 % from the mean

I       $s_R$        $CV_R$   
 28    1,611    5,538

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Mn      Sample: 1

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %		
		P	D	1	2	3	4		b	*				
1	F07x	PD03	DB08	134,40	135,50	134,00	131,10	0	133,75	b	*	1,88	1,40	13,11
2	A56	PC01	DB08	930,70	941,90	940,10	927,40	4	935,03			7,07	0,76	91,62
3	F08x	PE99	DB08	942,08	942,25	973,67	953,04	4	952,76			14,85	1,56	93,36
4	A57	PZ02	DD02	957,00	956,50	967,60	971,90	4	963,25			7,71	0,80	94,39
5	A59	PC01	DB08	963,51	976,02	963,63	971,93	4	968,77			6,24	0,64	94,93
6	F27	PD01	DB01	979,90	977,20	981,50	976,20	4	978,70			2,43	0,25	95,90
7	F15x	PC01	DB08	984,00	987,00	997,00	995,00	4	990,75			6,24	0,63	97,08
8	F16x	PC01	DB08	994,60	984,20	993,80	993,60	4	991,55			4,92	0,50	97,16
9	F18x	PD99	DB08	996,00	995,00	995,00	993,00	4	994,75			1,26	0,13	97,47
10	F33x	PD01	DB10	990,00	1011,00	1012,00	976,00	4	997,25			17,42	1,75	97,72
11	F05x	PD02	DB08	1012,00	1002,00	1004,00	1001,00	4	1004,75			4,99	0,50	98,45
12	F19x	PD02	DB08	993,00	1000,00	1030,00	1020,00	4	1010,75			17,19	1,70	99,04
13	A58	PD02	DB01	1002,99	1026,49	1013,21	1004,17	4	1011,72			10,86	1,07	99,14
14	F13x	PD01	DB08	1020,00	1010,00	1020,00	1000,00	4	1012,50			9,57	0,95	99,21
15	F29x	PD02	DB10	967,00	1015,00	1028,00	1045,00	4	1013,75			33,50	3,30	99,34
16	F25	PB06	DB08	1017,00	1023,00	1019,00	1012,00	4	1017,75			4,57	0,45	99,73
17	A60x	PD01	DB10	1010,94	1039,23	1009,32	1019,84	4	1019,83			13,74	1,35	99,93
18	F28x	PD02	DB08	1009,00	1015,90	1024,30	1035,50	4	1021,18			11,42	1,12	100,06
19	F14x	PC01	DB08	1028,00	1018,00	1021,00	1024,00	4	1022,75			4,27	0,42	100,22
20	F12x	PC01	DB08	1047,00	1038,00	1010,00	1032,00	4	1031,75			15,76	1,53	101,10
21	A65	PD01	DB08	1021,00	1022,00	1041,00	1044,00	4	1032,00			12,19	1,18	101,12
22	A43	PB06	DB01	1038,00	1016,00	1044,00	1033,00	4	1032,75			12,04	1,17	101,20
23	A36	PD02	DB08	1019,40	1008,70	1102,50	1004,50	0	1033,78	c		46,24	4,47	101,30
24	A47	PD01	DB08	1033,00	1027,00	1044,00	1037,00	4	1035,25			7,14	0,69	101,44
25	F06x	PD02	DB08	1040,00	1031,00	1049,00	1031,00	4	1037,75			8,62	0,83	101,69
26	F02x	PD02	DB08	1043,00	1018,00	1045,00	1050,00	4	1039,00			14,31	1,38	101,81
27	A79	PD01	DB10	1084,00	1045,00	1092,00	1047,00	4	1067,00			24,48	2,29	104,55
28	A88	PD01	DB08	1087,10	1068,42	1058,32	1078,05	4	1072,97			12,39	1,16	105,14
29	A82	PD01	DB08	1089,00	1089,00	1084,00	1087,00	4	1087,25			2,36	0,22	106,54
30	F32x	PD01	DB08	1091,00	1080,00	1123,00	1144,00	4	1109,50			29,35	2,65	108,72
31	A80	PD03	DB10	1118,00	1123,00	1175,00	1153,00	4	1142,25			26,75	2,34	111,93
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														
51														
52														
53														
54														
55														

\* = non tolerable mean because more than +/-

n      Mean       $s_r$        $CV_r$   
 all labs    116    1020,53    11,850    1,161  
 15      % from the mean

I       $s_R$        $CV_R$   
 29      44,899    4,400

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Mn      Sample: 2

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %		
		P	D	1	2	3	4		b	*				
1	F07x	PD03	DB08	37,25	37,71	37,51	36,91	0	37,35	b	*	0,35	0,93	3,51
2	A56	PC01	DB08	968,60	969,30	967,70	939,5a	3	968,53			0,80	0,08	91,13
3	A59	PC01	DB08	1007,18	1008,86	1020,36	1004,93	4	1010,33			6,88	0,68	95,06
4	F27	PD01	DB01	1013,60	1011,80	1011,40	1011,20	4	1012,00			1,10	0,11	95,22
5	A58	PD02	DB01	1020,26	1026,30	1015,90	1016,14	4	1019,65			4,86	0,48	95,94
6	F33x	PD01	DB10	1037,00	1014,00	993,00	1036,00	4	1020,00			20,90	2,05	95,97
7	F08x	PE99	DB08	1003,74	1017,26	1036,38	1027,13	4	1021,13			13,97	1,37	96,08
8	F18x	PD99	DB08	1030,00	1030,00	1030,00	1030,00	4	1030,00			0,00	0,00	96,91
9	F15x	PC01	DB08	1037,00	1034,00	1036,00	1038,00	4	1036,25			1,71	0,16	97,50
10	F19x	PD02	DB08	1040,00	1040,00	1040,00	1050,00	4	1042,50			5,00	0,48	98,09
11	F16x	PC01	DB08	1046,00	1037,00	1051,00	1044,00	4	1044,50			5,80	0,56	98,28
12	F28x	PD02	DB08	1038,40	1016,20	1062,80	1077,40	4	1048,70			26,99	2,57	98,67
13	F05x	PD02	DB08	1050,00	1050,00	1050,00	1050,00	4	1050,00			0,00	0,00	98,79
14	A47	PD01	DB08	1045,00	1057,00	1047,00	1053,00	4	1050,50			5,51	0,52	98,84
15	A60x	PD01	DB10	1048,53	1052,04	1051,47	1061,11	4	1053,28			5,44	0,52	99,10
16	F29x	PD02	DB10	1051,00	1061,00	1057,00	1067,00	4	1059,00			6,73	0,64	99,64
17	F13x	PD01	DB08	1070,00	1060,00	1060,00	1070,00	4	1065,00			5,77	0,54	100,20
18	F14x	PC01	DB08	1072,00	1064,00	1069,00	1065,00	4	1067,50			3,70	0,35	100,44
19	F12x	PC01	DB08	1077,00	1065,00	1064,00	1069,00	4	1068,75			5,91	0,55	100,56
20	F06x	PD02	DB08	1079,00	1072,00	1072,00	1054,00	4	1069,25			10,69	1,00	100,60
21	F25	PB06	DB08	1069,00	1076,00	1071,00	1068,00	4	1071,00			3,56	0,33	100,77
22	A36	PD02	DB08	1065,50	1078,20	1119,70	1044,20	4	1076,90			31,80	2,95	101,32
23	A65	PD01	DB08	1081,00	1072,00	1084,00	1076,00	4	1078,25			5,32	0,49	101,45
24	F02x	PD02	DB08	1065,00	1105,00	1076,00	1127,00	4	1093,25			28,12	2,57	102,86
25	A57	PZ02	DD02	1090,90	1095,20	1103,40	1098,70	4	1097,05			5,30	0,48	103,22
26	A79	PD01	DB10	1100,00	1087,00	1092,00	1110,00	4	1097,25			10,05	0,92	103,24
27	A88	PD01	DB08	1113,76	1158,56	1107,02	1046,90	0	1106,56	c		45,88	4,15	104,12
28	A82	PD01	DB08	1113,00	1115,00	1116,00	1109,00	4	1113,25			3,10	0,28	104,74
29	A43	PB06	DB01	1107,00	1107,00	1149,00	1120,00	4	1120,75			19,81	1,77	105,45
30	A80	PD03	DB10	1163,00	1177,00	1160,00	1170,00	4	1167,50			7,59	0,65	109,85
31	F32x	PD01	DB08	1174,00	1206a	1174,00	1174,00	3	1174,00			0,00	0,00	110,46
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														
51														
52														
53														
54														
55														

n      Mean       $s_r$        $CV_r$   
all labs    114    1062,82    8,496    0,799

\* = non tolerable mean because more than +/-

15 % from the mean

I       $s_R$        $CV_R$   
29    44,690    4,204

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Mn      Sample: 3

Unit: µg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3		$s_i$	$V_i$		
1	A56	PC01	DB08	503,70	528,60	493,40	486,50	4	503,05	18,44	90,00
2	F27	PD01	DB01	506,60	509,40	518,30	520,00	4	513,58	6,57	91,88
3	F28x	PD02	DB08	536,93	522,97	497,12	515,45	4	518,12	16,59	92,70
4	F08x	PE99	DB08	525,90	536,13	542,99	537,29	4	535,58	7,11	95,82
5	F19x	PD02	DB08	546,00	545,00	539,00	543,00	4	543,25	3,10	97,19
6	F33x	PD01	DB10	560,00	548,00	541,00	534,00	4	545,75	11,09	97,64
7	F16x	PC01	DB08	546,00	549,40	548,00	549,20	4	548,15	1,56	98,07
8	F18x	PD99	DB08	549,00	548,00	549,00	547,00	4	548,25	0,96	98,09
9	A59	PC01	DB08	548,57	545,25	562,93	541,81	4	549,64	9,28	98,34
10	A60x	PD01	DB10	549,21	549,06	552,20	549,11	4	549,90	1,54	98,38
11	A57	PZ02	DD02	549,90	547,30	557,00	551,10	4	551,33	4,10	98,64
12	F15x	PC01	DB08	555,00	551,00	553,00	549,00	4	552,00	2,58	98,76
13	A47	PD01	DB08	549,00	551,00	556,00	561,00	4	554,25	5,38	99,16
14	F12x	PC01	DB08	565,00	552,00	542,00	560,00	4	554,75	10,05	99,25
15	F29x	PD02	DB10	551,00	548,00	560,00	580,00	4	559,75	14,43	100,14
16	A58	PD02	DB01	563,64	575,34	564,95	546,12	4	562,51	12,12	100,64
17	F14x	PC01	DB08	564,00	564,00	564,00	564,00	4	564,00	0,00	100,90
18	F05x	PD02	DB08	565,00	563,00	565,00	563,00	4	564,00	1,15	100,90
19	A36	PD02	DB08	576,10	562,21	563,27	556,86	4	564,61	8,16	101,01
20	F25	PB06	DB08	566,20	567,40	564,60	566,30	4	566,13	1,15	101,28
21	F06x	PD02	DB08	573,80	565,70	564,30	573,10	4	569,23	4,92	101,84
22	F13x	PD01	DB08	573,00	564,00	565,00	580,00	4	570,50	7,51	102,07
23	A65	PD01	DB08	578,00	566,00	581,00	563,00	4	572,00	8,83	102,34
24	A43	PB06	DB01	615,00	551,00	556,00	574,00	0	574,00	c	29,06
25	F32x	PD01	DB08	580,00	581,00	577,00	584,00	4	580,50	2,89	103,86
26	A82	PD01	DB08	584,80	583,10	583,30	587,40	4	584,65	1,98	104,60
27	F02x	PD02	DB08	606,00	614,00	583,00	581,00	4	596,00	16,51	106,63
28	A88	PD01	DB08	605,50	608,10	615,38	591,17	4	605,04	10,15	108,25
29	A80	PD03	DB10	615,00	619,00	628,00	634,00	4	624,00	8,60	111,64
30	A79	PD01	DB10	648,80	660,00	651,60	649,80	0	652,55	b *	116,75
31	F07x	PD03	DB08	774,80	753,10	749,70	756,70	0	758,58	b *	135,72
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											

\* = non tolerable mean because more than +/-

n      Mean       $S_r$        $CV_r$   
 all labs    112    558,95    7,027    1,257  
 15      % from the mean

I       $S_R$        $CV_R$   
 28      25,657    4,590

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Mn      Sample: 4

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.	Recovery	
		P	D	1	2	3	4		S <sub>i</sub>	V <sub>i</sub>			
1	F07x	PD03	DB08	1004,00	960,00	980,90	997,40	0	985,58	b *	19,62	1,99	78,41
2	A56	PC01	DB08	1095,30	1102,20	1099,40	1108,60	4	1101,38		5,59	0,51	87,62
3	F08x	PE99	DB08	1119,08	1156,56	1178,75	1161,68	4	1154,02		25,15	2,18	91,81
4	F28x	PD02	DB08	1204,50	1215,40	1151,70	1095,10	0	1166,68	c	55,23	4,73	92,82
5	A58	PD02	DB01	1184,29	1173,20	1159,22	1161,98	4	1169,67		11,47	0,98	93,05
6	F27	PD01	DB01	1163,90	1168,60	1183,50	1186,80	4	1175,70		11,16	0,95	93,53
7	A59	PC01	DB08	1155,74	1181,93	1193,48	1187,40	4	1179,64		16,62	1,41	93,85
8	F18x	PD99	DB08	1230,00	1230,00	1220,00	1230,00	4	1227,50		5,00	0,41	97,65
9	A57	PZ02	DD02	1228,70	1224,00	1233,50	1231,80	4	1229,50		4,17	0,34	97,81
10	F33x	PD01	DB10	1230,00	1233,00	1220,00	1242,00	4	1231,25		9,07	0,74	97,95
11	F16x	PC01	DB08	1239,00	1244,00	1200,00	1242,00	4	1231,25		20,93	1,70	97,95
12	F15x	PC01	DB08	1237,00	1249,00	1259,00	1228,00	4	1243,25		13,57	1,09	98,91
13	F12x	PC01	DB08	1262,00	1265,00	1211,00	1252,00	4	1247,50		24,96	2,00	99,25
14	F19x	PD02	DB08	1250,00	1240,00	1240,00	1260,00	4	1247,50		9,57	0,77	99,25
15	A60x	PD01	DB10	1236,99	1261,51	1247,08	1252,90	4	1249,62		10,30	0,82	99,41
16	F13x	PD01	DB08	1260,00	1250,00	1240,00	1250,00	4	1250,00		8,16	0,65	99,44
17	A47	PD01	DB08	1264,00	1258,00	1257,00	1237,00	4	1254,00		11,75	0,94	99,76
18	A43	PB06	DB01	1266,00	1255,00	1250,00	1256,00	4	1256,75		6,70	0,53	99,98
19	F05x	PD02	DB08	1257,00	1257,00	1257,00	1257,00	4	1257,00		0,00	0,00	100,00
20	A65	PD01	DB08	1262,00	1260,00	1252,00	1273,00	4	1261,75		8,66	0,69	100,38
21	A36	PD02	DB08	1287,55	1287,55	1236,05	1242,49	4	1263,41		28,00	2,22	100,51
22	F29x	PD02	DB10	1253,00	1286,00	1272,00	1312,00	4	1280,75		24,84	1,94	101,89
23	F06x	PD02	DB08	1289,00	1284,00	1302,00	1268,00	4	1285,75		14,06	1,09	102,29
24	F14x	PC01	DB08	1291,00	1290,00	1282,00	1290,00	4	1288,25		4,19	0,33	102,49
25	F25	PB06	DB08	1296,00	1295,00	1293,00	1290,00	4	1293,50		2,65	0,20	102,90
26	A82	PD01	DB08	1304,00	1303,00	1305,00	1307,00	4	1304,75		1,71	0,13	103,80
27	F02x	PD02	DB08	1297,00	1315,00	1331,00	1297,00	4	1310,00		16,37	1,25	104,22
28	A79	PD01	DB10	1309,00	1310,00	1324,00	1320,00	4	1315,75		7,41	0,56	104,67
29	A88	PD01	DB08	1356,97	1388,56	1347,67	1313,76	4	1351,74		30,78	2,28	107,54
30	A80	PD03	DB10	1358,00	1395,00	1378,00	1395,00	4	1381,50		17,60	1,27	109,91
31	F32x	PD01	DB08	1429,00	1429,00	1375,00	1407,00	4	1410,00		25,53	1,81	112,17
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    116    1256,99    12,964    1,031  
 15      % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
 29      65,101    5,179

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Fe      Sample: 1

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		s <sub>i</sub>	V <sub>i</sub>			
1	F07x	PD03	DB08	58,78	59,72	58,98	60,64	0	59,53	b *	0,84	1,42	59,27
2	F08x	PE99	DB08	85,92	82,06	89,76	86,54	4	86,07		3,16	3,67	85,70
3	F32x	PD01	DB08	90,90	92,20	89,20	87,40	4	89,93		2,08	2,32	89,54
4	F13x	PD01	DB08	90,90	95,40	90,80	94,10	4	92,80		2,31	2,49	92,40
5	A82	PD01	DB08	92,52	95,16	92,80	92,23	4	93,18		1,34	1,44	92,77
6	F19x	PD02	DB08	92,90	92,80	97,10	94,50	4	94,33		2,01	2,13	93,92
7	F27	PD01	DB01	96,00	96,19	92,05	93,26	4	94,38		2,05	2,17	93,97
8	A60x	PD01	DB10	97,14	96,66	95,42	93,85	4	95,77		1,47	1,53	95,35
9	F29x	PD02	DB01	96,36	97,45	98,27	99,13	4	97,80		1,18	1,21	97,38
10	F06x	PD02	DB08	100,50	95,91	98,94	96,89	4	98,06		2,06	2,10	97,64
11	F25	PB06	DB08	98,74	98,40	101,00	98,91	4	99,26		1,18	1,19	98,83
12	F16x	PC01	DB08	100,30	99,02	100,50	99,50	4	99,83		0,69	0,69	99,40
13	F14x	PC01	DB08	101,00	99,50	101,00	100,40	4	100,48		0,71	0,71	100,04
14	F28x	PD02	DB08	101,38	99,46	97,97	103,80	4	100,65		2,52	2,50	100,22
15	A36	PD02	DB08	100,66	97,25	108,65	98,00	4	101,14		5,22	5,16	100,70
16	F05x	PD02	DB08	100,00	103,00	102,00	102,00	4	101,75		1,26	1,24	101,31
17	F18x	PD99	DB08	104,00	100,00	104,00	101,00	4	102,25		2,06	2,02	101,81
18	A59	PC01	DB08	102,41	104,40	102,93	102,40	4	103,04		0,94	0,92	102,59
19	F02x	PD02	DB08	103,00	103,00	101,00	107,00	4	103,50		2,52	2,43	103,05
20	A58	PD02	DB01	103,73	104,84	104,27	102,79	4	103,91		0,87	0,84	103,46
21	F33x	PD01	DB10	103,00	102,00	107,40	103,90	4	104,08		2,35	2,26	103,62
22	A47	PD01	DB08	105,10	102,80	103,20	106,50	4	104,40		1,72	1,65	103,95
23	A79	PD01	DB10	107,30	106,30	106,70	101,60	4	105,48		2,62	2,48	105,02
24	A65	PD01	DB08	102,40	105,40	106,70	108,10	4	105,65		2,43	2,30	105,19
25	F12x	PC01	DB08	107,70	105,50	104,70	105,90	4	105,95		1,27	1,20	105,49
26	A57	PZ02	DD02	107,60	113,10	114,60	108,60	4	110,98		3,40	3,06	110,49
27	F15x	PC01	DB08	105,00	101,00	133a	107,00	3	104,33		3,06	2,93	103,88
28	A80	PD03	DB10	110,00	112,00	118,00	115,00	4	113,75		3,50	3,08	113,26
29	A88	PD01	DB08	123,96	110,04	108,00	114,18	0	114,05	c	7,09	6,22	113,55
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n	Mean	S <sub>r</sub>	CV <sub>r</sub>
all labs	107	100,43	2,073
20	% from the mean	6,162	2,064

I	S <sub>R</sub>	CV <sub>R</sub>
27		6,133

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Fe      Sample: 2

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$\bar{x}$	$s_i$		
1	F32x	PD01	DB08	60,20	60,60	57,50	61,90	4	60,05	1,85	3,08	85,55
2	F15x	PC01	DB08	60,00	59,00	60,00	62,00	4	60,25	1,26	2,09	85,83
3	F08x	PE99	DB08	60,92	61,25	61,28	64,82	4	62,07	1,84	2,97	88,42
4	A82	PD01	DB08	63,24	63,35	63,85	63,19	4	63,41	0,30	0,48	90,33
5	A60x	PD01	DB10	65,53	64,55	65,53	65,27	4	65,22	0,46	0,71	92,91
6	F19x	PD02	DB08	65,20	65,90	66,50	66,70	4	66,08	0,68	1,02	94,13
7	F06x	PD02	DB08	67,43	65,97	67,54	64,74	4	66,42	1,33	2,00	94,62
8	F18x	PD99	DB08	67,30	68,10	67,40	67,50	4	67,58	0,36	0,53	96,27
9	F16x	PC01	DB08	69,06	68,01	68,67	68,29	4	68,51	0,46	0,67	97,59
10	A58	PD02	DB01	69,11	67,75	69,20	69,26	4	68,83	0,72	1,05	98,05
11	F14x	PC01	DB08	69,10	68,50	69,80	68,30	4	68,93	0,68	0,98	98,19
12	F27	PD01	DB01	69,19	70,00	66,63	70,56	4	69,10	1,74	2,51	98,43
13	F29x	PD02	DB01	69,79	70,06	67,53	69,13	4	69,13	1,13	1,64	98,47
14	F13x	PD01	DB08	70,10	68,20	69,20	69,40	4	69,23	0,78	1,13	98,62
15	F33x	PD01	DB10	68,00	69,60	69,60	70,50	4	69,43	1,04	1,50	98,90
16	A47	PD01	DB08	69,70	69,00	68,80	70,80	4	69,58	0,90	1,30	99,11
17	F28x	PD02	DB08	66,61	69,10	71,08	72,04	4	69,71	2,40	3,44	99,30
18	A36	PD02	DB08	69,51	71,21	73,02	68,65	4	70,60	1,93	2,74	100,57
19	A59	PC01	DB08	71,62	72,73	68,83	70,56	4	70,94	1,66	2,34	101,05
20	F12x	PC01	DB08	71,90	77,20	69,20	72,80	4	72,78	3,32	4,57	103,67
21	F05x	PD02	DB08	72,30	72,30	73,40	73,60	4	72,90	0,70	0,96	103,85
22	A65	PD01	DB08	77,00	73,60	70,70	73,10	4	73,60	2,60	3,53	104,85
23	F25	PB06	DB08	73,06	74,56	73,83	73,61	4	73,77	0,62	0,84	105,08
24	F02x	PD02	DB08	72,00	75,00	74,00	77,00	4	74,50	2,08	2,79	106,13
25	A80	PD03	DB10	76,40	77,40	74,60	75,40	4	75,95	1,22	1,60	108,20
26	A79	PD01	DB10	72,89	80,86	80,88	73,75	0	77,10	4,37	5,67	109,83
27	A88	PD01	DB08	82,22	78,75	75,90	74,71	4	77,90	3,34	4,29	110,97
28	F07x	PD03	DB08	82,10	85,75	82,46	86,69	4	84,25	*	2,31	120,02
29	A57	PZ02	DD02	83,20	86,70	86,50	83,00	4	84,85	*	2,02	120,88
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$   
 all labs    112    70,20    1,419    2,022

\* = non tolerable mean because more than +/-

20 % from the mean

I       $s_R$        $CV_R$   
 28    5,931    8,450

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Fe      Sample: 3

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$\bar{x}$	$s_i$		
1	F08x	PE99	DB08	50,85	53,48	51,70	48,96	4	51,25	*	1,88	79,97
2	F32x	PD01	DB08	58,40	55,00	54,30	54,20	4	55,48		1,98	86,57
3	F27	PD01	DB01	56,63	58,23	57,14	58,98	4	57,75		1,06	90,11
4	F15x	PC01	DB08	62,00	54,00	62,00	55,00	4	58,25		4,35	90,90
5	A58	PD02	DB01	59,22	59,60	55,77	63,25	4	59,46		3,06	92,79
6	F19x	PD02	DB08	61,40	60,80	56,70	59,70	4	59,65		2,09	93,09
7	A82	PD01	DB08	62,01	59,47	60,99	62,26	4	61,18		1,27	95,48
8	F12x	PC01	DB08	64,60	60,50	58,80	61,80	4	61,43		2,45	95,86
9	A60x	PD01	DB10	65,62	61,96	60,17	58,68	4	61,61		2,99	96,14
10	F13x	PD01	DB08	61,00	61,10	60,10	64,40	4	61,65		1,89	96,21
11	F06x	PD02	DB08	62,39	62,26	60,08	62,21	4	61,74		1,11	96,34
12	F18x	PD99	DB08	61,10	61,80	62,50	62,30	4	61,93		0,62	96,64
13	A47	PD01	DB08	62,50	61,70	62,30	62,50	4	62,25		0,38	97,14
14	F28x	PD02	DB08	61,87	64,74	59,85	62,70	4	62,29		2,02	97,20
15	F14x	PC01	DB08	62,60	63,50	63,00	62,00	4	62,78		0,63	97,96
16	F05x	PD02	DB08	63,00	63,20	63,60	63,80	4	63,40		0,37	98,94
17	A36	PD02	DB08	66,48	62,85	65,41	60,71	4	63,86		2,60	99,66
18	F33x	PD01	DB10	72,50	61,90	64,30	61,20	4	64,98		5,19	101,39
19	A59	PC01	DB08	71,43	63,65	60,84	64,71	4	65,16		4,49	101,68
20	A65	PD01	DB08	65,70	66,30	68,30	62,20	4	65,63		2,54	102,41
21	F16x	PC01	DB08	65,18	64,09	69,84	68,92	4	67,01		2,80	104,57
22	F25	PB06	DB08	67,97	67,20	68,22	67,55	4	67,74		0,45	105,70
23	A57	PZ02	DD02	69,80	71,50	72,90	70,60	4	71,20		1,33	111,11
24	F02x	PD02	DB08	76,00	69,00	72,00	70,00	4	71,75		3,10	111,97
25	F29x	PD02	DB01	76,54	75,59	69,64	71,12	4	73,22		3,36	114,27
26	A88	PD01	DB08	76,88	70,88	70,14	75,94	4	73,46		3,44	114,64
27	A80	PD03	DB10	76,70	71,00	68,80	79,60	4	74,03		4,99	115,52
28	A79	PD01	DB10	74,08	75,35	73,11	74,20	4	74,19		0,92	115,77
29	F07x	PD03	DB08	105,10	103,90	102,20	105,60	0	104,20	b *	1,51	162,61
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$   
 all labs    112    64,08    2,262    3,530

\* = non tolerable mean because more than +/-

20 % from the mean

I       $s_R$        $CV_R$   
 28    5,801    9,053

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Fe      Sample: 4

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		s <sub>i</sub>	V <sub>i</sub>			
1	F07x	PD03	DB08	72,28	64,98	66,69	70,93	0	68,72	b *	3,45	5,02	33,44
2	F08x	PE99	DB08	174,90	171,43	162,53	164,53	4	168,35		5,80	3,44	81,93
3	F28x	PD02	DB08	189,19	175,66	177,59	184,70	4	181,79		6,28	3,46	88,47
4	F33x	PD01	DB10	183,70	175,00	188,60	185,20	4	183,13		5,79	3,16	89,12
5	F29x	PD02	DB01	186,07	187,78	183,72	184,57	4	185,54		1,78	0,96	90,29
6	A58	PD02	DB01	188,07	195,64	190,95	190,53	4	191,30		3,16	1,65	93,10
7	F19x	PD02	DB08	192,00	192,00	193,00	193,00	4	192,50		0,58	0,30	93,68
8	F27	PD01	DB01	204,10	194,10	198,30	185,20	4	195,43		7,95	4,07	95,10
9	F32x	PD01	DB08	192,00	195,00	201,00	200,00	4	197,00		4,24	2,15	95,87
10	A60x	PD01	DB10	194,30	195,20	204,39	201,23	4	198,78		4,84	2,44	96,74
11	F05x	PD02	DB08	198,00	197,00	201,00	202,00	4	199,50		2,38	1,19	97,09
12	A36	PD02	DB08	207,08	204,94	197,42	195,28	4	201,18		5,71	2,84	97,91
13	F06x	PD02	DB08	203,90	202,50	203,10	197,10	4	201,65		3,09	1,53	98,13
14	F18x	PD99	DB08	202,00	202,00	201,00	203,00	4	202,00		0,82	0,40	98,30
15	F25	PB06	DB08	202,60	205,50	202,30	203,60	4	203,50		1,44	0,71	99,03
16	F13x	PD01	DB08	209,00	203,00	206,00	205,00	4	205,75		2,50	1,22	100,13
17	F15x	PC01	DB08	202,00	209,00	208,00	214,00	4	208,25		4,92	2,36	101,35
18	F02x	PD02	DB08	211,00	216,00	203,00	211,00	4	210,25		5,38	2,56	102,32
19	F14x	PC01	DB08	209,00	212,00	210,00	211,00	4	210,50		1,29	0,61	102,44
20	F16x	PC01	DB08	210,50	211,70	213,20	210,20	4	211,40		1,36	0,65	102,88
21	A59	PC01	DB08	213,78	215,04	212,22	205,45	4	211,62		4,27	2,02	102,99
22	A47	PD01	DB08	212,10	219,00	213,90	215,10	4	215,03		2,92	1,36	104,64
23	F12x	PC01	DB08	222,00	220,10	209,50	215,10	4	216,68		5,60	2,58	105,45
24	A88	PD01	DB08	226,54	214,54	213,67	225,02	4	219,94		6,78	3,08	107,04
25	A65	PD01	DB08	220,70	222,90	219,10	221,90	4	221,15		1,64	0,74	107,62
26	A80	PD03	DB10	223,00	228,00	226,00	232,00	4	227,25		3,77	1,66	110,59
27	A57	PZ02	DD02	227,20	230,00	231,60	230,00	4	229,70		1,83	0,80	111,79
28	A79	PD01	DB10	231,50	227,80	230,70	232,20	4	230,55		1,93	0,84	112,20
29	A82	PD01	DB08	235,10	234,00	232,30	234,00	4	233,85		1,16	0,49	113,80
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n	Mean	s <sub>r</sub>	CV <sub>r</sub>
all labs	112	205,48	3,544
20	% from the mean		1,725

I	s <sub>R</sub>	CV <sub>R</sub>
28	15,874	7,725

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cu      Sample: 1

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$\bar{x}$	$s_i$		
1	F08x	PE99	DB08	5,82	5,04	5,48	5,36	4	5,43	0,32	5,98	87,47
2	F14x	PC01	DB10	5,54	5,50	5,55	5,58	4	5,54	0,03	0,60	89,35
3	F07x	PD03	DB08	5,64	5,74	5,53	5,88	4	5,70	0,15	2,61	91,86
4	A57	PZ01	DD02	5,70	5,80	5,90	5,90	4	5,83	0,10	1,64	93,90
5	F27	PD01	DB05	6,04	5,81	5,74	5,71	4	5,83	0,15	2,56	93,90
6	F06x	PD02	DB08	5,82	5,71	5,88	5,95	4	5,84	0,10	1,74	94,14
7	A82	PD01	DB10	5,90	5,93	5,88	5,96	4	5,92	0,03	0,56	95,40
8	F12x	PC01	DB10	5,83	6,51	5,84	5,76	4	5,99	0,35	5,89	96,50
9	A47	PD01	DB08	6,15	6,18	5,87	5,89	4	6,02	0,17	2,74	97,08
10	A59	PC01	DB08	6,14	5,97	6,02	6,16	4	6,07	0,09	1,52	97,89
11	A36	PD02	DB08	6,12	5,99	6,57	6,00	4	6,17	0,27	4,43	99,46
12	A79	PD01	DB10	6,25	6,20	6,17	6,14	4	6,19	0,05	0,73	99,78
13	F33x	PD01	DB10	6,36	6,24	6,47	6,15	4	6,31	0,14	2,21	101,64
14	F29x	PD02	DB10	6,09	6,17	6,34	6,70	4	6,32	0,27	4,33	101,95
15	A60x	PD01	DB10	6,04	6,13	7,1367a	6,08	3	6,08	0,05	0,76	98,01
16	F19x	PD02	DB08	7,24a	5,95	6,14	6,06	3	6,05	0,10	1,58	97,53
17	F05	PD02	DB08	6,35	6,32	6,38	6,38	4	6,36	0,03	0,45	102,48
18	F18x	PD99	DB10	6,47	6,35	6,52	6,26	4	6,40	0,12	1,84	103,17
19	F02x	PD02	DB08	6,46	6,30	6,53	6,42	4	6,43	0,10	1,50	103,61
20	F25	PB06	DB08	6,59	6,44	6,29	6,60	4	6,48	0,15	2,24	104,48
21	A58	PD02	DB05	6,93	6,25	6,47	6,57	4	6,56	0,28	4,32	105,67
22	A88	PD01	DB08	6,55	7,10	6,45	6,16	4	6,57	0,39	5,99	105,83
23	A65	PD01	DB08	6,60	6,60	6,60	6,50	4	6,58	0,05	0,76	105,99
24	F16x	PC01	DB08	6,59	6,56	6,60	6,57	4	6,58	0,02	0,25	106,08
25	F13x	PD01	DB08	6,52	6,56	6,63	6,75	4	6,62	0,10	1,52	106,63
26	A80	PD03	DB10	6,54	6,63	6,92	6,70	4	6,70	0,16	2,42	107,96
27	F15	PC01	DB09	6,83	7,41	6,58	6,75	4	6,89	0,36	5,23	111,11
28	F28x	PD02	DB08	7,27	7,65	7,99	7,44	0	7,59	b *	4,11	122,34
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$       CV<sub>r</sub>  
 all labs    106    6,20    0,153    2,462  
 20      % from the mean

\* = non tolerable mean because more than +/-

I       $s_R$       CV<sub>R</sub>  
 27      0,371    5,976

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cu      Sample: 2

Unit: µg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3		$b^*$	$V_i$		
1	F07x	PD03	DB08	3,03	2,98	3,25	3,07	0	3,08	0,12	72,69
2	F14x	PC01	DB10	3,87	3,91	3,95	3,94	4	3,92	0,04	92,34
3	A82	PD01	DB10	3,94	3,91	3,93	3,96	4	3,93	0,02	92,70
4	F08x	PE99	DB08	3,74	3,63	4,15	4,26	4	3,94	0,31	92,98
5	F06x	PD02	DB08	4,03	3,94	4,00	3,85	4	3,96	0,08	93,22
6	F12x	PC01	DB10	3,87	4,35	3,82	3,99	4	4,01	0,24	94,41
7	A60x	PD01	DB10	4,08	4,07	4,11	4,13	4	4,10	0,02	96,55
8	A58	PD02	DB05	4,16	4,00	4,18	4,08	4	4,11	0,08	96,76
9	F27	PD01	DB05	4,14	4,12	4,10	4,09	4	4,11	0,02	96,94
10	F28x	PD02	DB08	4,39	4,05	4,22	3,93	4	4,15	0,20	97,77
11	F19x	PD02	DB08	4,06	4,07	4,31	4,17	4	4,15	0,12	97,88
12	A36	PD02	DB08	4,07	4,24	4,33	3,97	4	4,15	0,16	97,88
13	A47	PD01	DB08	4,13	4,44	4,11	3,95	4	4,16	0,20	98,00
14	A79	PD01	DB10	4,17	4,22	4,14	4,15	4	4,17	0,03	98,34
15	A59	PC01	DB08	4,10	4,09	4,29	4,23	4	4,18	0,10	98,47
16	F16x	PC01	DB08	4,18	4,25	4,16	4,25	4	4,21	0,05	99,18
17	F33x	PD01	DB10	4,26	4,23	4,10	4,30	4	4,22	0,09	99,53
18	F29x	PD02	DB10	4,01	4,38	4,13	4,54	4	4,26	0,24	100,52
19	F18x	PD99	DB10	4,34	4,23	4,27	4,33	4	4,29	0,05	101,18
20	A57	PZ01	DD02	4,40	4,30	4,40	4,30	4	4,35	0,06	102,53
21	A88	PD01	DB08	4,26	4,82	4,45	3,93	4	4,37	0,37	102,89
22	F13x	PD01	DB08	4,32	4,46	4,49	4,58	4	4,46	0,11	105,19
23	A80	PD03	DB10	4,48	4,56	4,43	4,46	4	4,48	0,06	105,66
24	F05	PD02	DB08	4,20	4,80	4,20	4,80	4	4,50	0,35	106,07
25	F02x	PD02	DB08	4,35	4,45	4,53	4,73	4	4,52	0,16	106,42
26	A65	PD01	DB08	4,60	4,50	4,50	4,50	4	4,53	0,05	106,66
27	F25	PB06	DB08	4,47	4,80	4,60	4,67	4	4,63	0,14	109,20
28	F15	PC01	DB09	4,62	4,44	4,65	5,08	4	4,70	0,27	110,72
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											

n      Mean       $s_r$        $CV_r$   
 all labs    108    4,24    0,134    3,159

\* = non tolerable mean because more than +/-

20 % from the mean

I       $s_R$        $CV_R$   
 27    0,219    5,157

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cu      Sample: 3

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$s_i$	$V_i$		
1	F06x	PD02	DB08	2,25	2,23	2,16	2,34	4	2,25		0,07	91,41
2	F08x	PE99	DB08	2,174a	2,27	2,28	2,28	3	2,28		0,00	92,71
3	F27	PD01	DB05	2,31	2,22	2,25	2,28	4	2,27		0,04	92,22
4	F25	PB06	DB08	2,19	2,36	2,29	2,26	4	2,27		0,07	92,59
5	A57	PZ01	DD02	2,30	2,10	2,40	2,30	4	2,28		0,13	92,63
6	A82	PD01	DB10	2,31	2,28	2,29	2,31	4	2,30		0,01	93,49
7	F12x	PC01	DB10	2,30	2,35	2,27	2,28	4	2,30		0,04	93,68
8	F14x	PC01	DB10	2,31	2,31	2,38	2,21	4	2,30		0,07	93,75
9	A47	PD01	DB08	2,57	2,32	2,23	2,10	4	2,31		0,20	93,85
10	A60x	PD01	DB10	2,39	2,39	2,35	2,35	4	2,37		0,02	96,59
11	A36	PD02	DB08	2,42	2,37	2,42	2,29	4	2,38		0,06	96,70
12	F19x	PD02	DB08	2,44	2,37	2,34	2,37	4	2,38		0,04	96,90
13	F16x	PC01	DB08	2,42	2,43	2,43	2,37	4	2,41		0,03	98,16
14	F29x	PD02	DB10	2,51	2,39	2,39	2,63	4	2,48		0,11	101,06
15	F13x	PD01	DB08	2,43	2,39	2,53	2,58	4	2,48		0,09	101,07
16	A58	PD02	DB05	2,51	2,43	2,47	2,60	4	2,50		0,07	101,89
17	A59	PC01	DB08	2,45	2,80	2,57	2,33	4	2,54		0,20	103,31
18	F33x	PD01	DB10	2,63	2,57	2,48	2,53	4	2,55		0,06	103,93
19	A65	PD01	DB08	2,60	2,60	2,60	2,60	4	2,60		0,00	105,86
20	A80	PD03	DB10	2,64	2,66	2,65	2,70	4	2,66		0,03	108,40
21	F18x	PD99	DB10	2,67	2,70	2,71	2,83	4	2,73		0,07	111,05
22	A79	PD01	DB10	2,74	2,76	2,72	2,70	4	2,73		0,03	111,17
23	F05	PD02	DB08	2,81	2,54	2,78	2,90	4	2,76		0,15	112,27
24	F02x	PD02	DB08	2,81	2,85	2,76	2,73	4	2,79		0,05	113,49
25	A88	PD01	DB08	3,17	3,24	2,60	2,43	0	2,86	c	0,41	116,44
26	F15	PC01	DB09	3,15	3,07	2,94	3,49	0	3,16	b *	0,23	128,76
27	F28x	PD02	DB08	3,70	4,02	3,81	3,92	0	3,86	b *	0,14	157,23
28	F07x	PD03	DB08	5,84	5,83	5,74	5,70	0	5,78	b *	0,07	235,16
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

\* = non tolerable mean because more than +/-

n      Mean       $s_r$        $CV_r$   
 all labs    95    2,46    0,069    2,816

20      % from the mean

I       $s_R$        $CV_R$   
 24      0,178    7,254

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cu      Sample: 4

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.	Recovery	
		P	D	1	2	3	4		s <sub>i</sub>	v <sub>i</sub>			
1	F07x	PD03	DB08	3,283a	3,14	3,10	3,10	0	3,12	b *	0,02	0,70	50,49
2	F08x	PE99	DB08	3,97	3,92	3,79	3,1862a	0	3,89	b *	0,09	2,44	63,13
3	F14x	PC01	DB10	5,44	5,44	5,50	5,43	4	5,45		0,03	0,59	88,38
4	F27	PD01	DB05	5,50	5,49	5,56	5,43	4	5,50		0,05	0,97	89,06
5	F06x	PD02	DB08	5,81	5,69	5,58	5,53	4	5,65		0,12	2,20	91,62
6	F12x	PC01	DB10	5,61	5,56	5,95	5,72	4	5,71		0,17	2,97	92,54
7	A82	PD01	DB10	5,71	5,66	5,74	5,74	4	5,71		0,03	0,60	92,59
8	A36	PD02	DB08	6,04	6,15	5,83	5,83	4	5,96		0,16	2,67	96,64
9	A59	PC01	DB08	5,89	6,25	5,91	5,85	4	5,98		0,19	3,10	96,84
10	A60x	PD01	DB10	5,90	6,03	6,06	5,96	4	5,99		0,07	1,23	97,07
11	A47	PD01	DB08	6,12	6,25	5,61	5,98	4	5,99		0,28	4,61	97,09
12	F19x	PD02	DB08	5,99	6,03	5,98	6,03	4	6,01		0,03	0,44	97,37
13	F16x	PC01	DB08	6,12	6,06	6,04	6,04	4	6,07		0,04	0,62	98,31
14	A57	PZ01	DD02	6,00	6,00	6,20	6,10	4	6,08		0,10	1,58	98,47
15	A79	PD01	DB10	6,03	6,12	6,12	6,18	4	6,11		0,06	1,06	99,06
16	A58	PD02	DB05	6,04	6,22	6,19	6,10	4	6,14		0,08	1,35	99,48
17	F33x	PD01	DB10	6,27	6,16	6,13	6,12	4	6,17		0,07	1,12	100,01
18	A88	PD01	DB08	6,42	6,54	5,92	5,91	4	6,20		0,33	5,32	100,45
19	F29x	PD02	DB10	6,18	6,00	6,59	6,30	4	6,27		0,25	3,99	101,56
20	F18x	PD99	DB10	6,40	6,26	6,26	6,38	4	6,33		0,08	1,19	102,52
21	F02x	PD02	DB08	6,27	6,43	6,32	6,36	4	6,35		0,07	1,07	102,84
22	F13x	PD01	DB08	6,22	6,37	6,46	6,49	4	6,39		0,12	1,90	103,49
23	A80	PD03	DB10	6,41	6,50	6,47	6,54	4	6,48		0,05	0,85	105,03
24	A65	PD01	DB08	6,60	6,60	6,60	6,60	4	6,60		0,00	0,00	106,98
25	F25	PB06	DB08	6,92	6,99	6,76	6,84	4	6,88		0,10	1,45	111,49
26	F28x	PD02	DB08	6,50	7,11	7,28	6,84	4	6,93		0,34	4,92	112,36
27	F15	PC01	DB09	7,02	7,60	7,29	7,40	4	7,33		0,24	3,30	118,77
28	F05	PD02	DB08	10,90	11,10	10,60	9,50	0	10,53	b *	0,71	6,78	170,59
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

\* = non tolerable mean because more than +/-

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    100    6,17    0,123    1,988  
 20      % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
 25      0,441    7,151

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Pb      Sample: 1

Unit: µg/g

No.	Lab. Code	Method code P      D		Replications 1      2      3      4				n	Lab.mean		Lab.standard dev.	Recovery
		P	D	1	2	3	4		s <sub>i</sub>	v <sub>i</sub>	%	
1	F27	PD01	DB05	0,12	0,15	0,18	0,17	4	0,16		0,03	17,20
2	F16x	PC01	DB10	0,16	0,16	0,17	0,16	4	0,16		0,00	2,31
3	F13x	PD01	DB10	0,18	0,17	0,17	0,17	4	0,17		0,00	1,79
4	A36	PD02	DB10	0,18	0,17	0,17	0,17	4	0,17		0,00	0,98
5	A47	PD01	DB10	0,20	0,17	0,20	0,17	4	0,19		0,02	9,36
6	A79	PD01	DB10	0,19	0,19	0,19	0,19	4	0,19		0,00	1,69
7	F08x	PD01	DB10	0,18	0,22	0,19	0,19	4	0,20		0,01	6,77
8	A82	PD01	DB10	0,20	0,20	0,19	0,19	4	0,20		0,01	3,11
9	F29x	PD02	DB10	0,20	0,20	0,22	0,21	4	0,21		0,01	3,71
10	F18x	PD99	DB10	0,21	0,20	0,23	0,23	4	0,22		0,01	6,89
11	F32x	PD01	DB10	0,22	0,23	0,20	0,22	4	0,22		0,01	4,91
12	F12x	PC01	DB10	0,20	0,23	0,23	0,22	4	0,22		0,02	6,95
13	F14x	PC01	DB10	0,25	0,26	0,23	0,24	4	0,24		0,01	5,14
14	F05	PD02	DB05	0,25	0,31	0,22	0,25	4	0,26		0,04	13,75
15	F33x	PD01	DB10	0,28	0,28	0,30	0,26	4	0,28		0,02	5,93
16												
17												
18	F19x	PD02	DB08	<1,05	<1,05	<1,06	<1,06				**	
19	F15	PC01	DB09	<,5	<,5	<,5	<,5					
20	F06x	PD02	DB08	<,5	<,5	<,5	<,5					
21	F25	PB99	DB08	<,5	<,5	<,5	<,5					
22	F07x	PD03	DB08	<,2	<,2	<,2	<,2					
23	A80	PD03	DB10	<,2	<,2	<,2	<,2					
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs      60      0,205      0,013      6,124  
 40 % from the mean

\* = non tolerable mean because more than +/-

\*\* = higher than maximum acceptable LOQ

Limit for the lower concentration range

I      S<sub>R</sub>      CV<sub>R</sub>  
 21      0,099      67,849

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Pb      Sample: 2

Unit: µg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3		s <sub>i</sub>	v <sub>i</sub>			
1	F08x	PD01	DB10	0,10	0,11	0,10	0,10	4	0,10	0,00	2,61	76,25
2	A47	PD01	DB10	0,10	0,11	0,10	0,11	4	0,11	0,01	5,50	76,60
3	F16x	PC01	DB10	0,10	0,11	0,10	0,11	4	0,11	0,01	5,69	78,58
4	F13x	PD01	DB10	0,12	0,12	0,12	0,12	4	0,12	0,00	1,09	86,44
5	A36	PD02	DB10	0,12	0,13	0,12	0,12	4	0,12	0,01	5,05	87,72
6	A82	PD01	DB10	0,12	0,13	0,12	0,12	4	0,12	0,00	1,24	89,98
7	F05	PD02	DB05	0,12	0,13	0,13	0,12	4	0,12	0,00	3,27	90,09
8	A79	PD01	DB10	0,13	0,13	0,13	0,13	4	0,13	0,00	2,33	93,99
9	F32x	PD01	DB10	0,13	0,13	0,13	0,13	4	0,13	0,00	2,56	94,29
10	F12x	PC01	DB10	0,13	0,15	0,12	0,13	4	0,13	0,01	7,13	96,44
11	F18x	PD99	DB10	0,13	0,13	0,13	0,13	4	0,13	0,00	0,72	96,48
12	F27	PD01	DB05	0,12	0,15	0,20	0,09	0	0,14	c	0,05	32,86
13	F33x	PD01	DB10	0,18	0,17	0,16	0,17	4	0,17	0,01	5,14	123,83
14	F29x	PD02	DB10	0,20	0,21	0,20	0,21	4	0,21	*	0,00	2,19
15	F14x	PC01	DB10	0,22	0,22	0,23	0,21	4	0,22	*	0,01	3,77
16	F07x	PD03	DB08	0,38	0,37	0,36	0,36	0	0,37	b *	0,01	1,89
17												269,00
18												
19	F19x	PD02	DB08	<1,05	<1,05	<1,06	<1,05			**		
20	F06x	PD02	DB08	<,5	<,5	<,5	<,5					
21	F15	PC01	DB09	<,5	<,5	<,5	<,5					
22	F25	PB99	DB08	<,5	<,5	<,5	<,5					
23	A80	PD03	DB10	<,2	<,2	<,2	<,2					
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    56    0,14    0,005    3,425

40 % from the mean

\* = non tolerable mean because more than +/-

\*\* = higher than maximum acceptable LOQ

Lower than the lowest evaluated result

|      S<sub>R</sub>      CV<sub>R</sub>  
 19    0,069    68,333

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Pb      Sample: 3

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. S <sub>i</sub>	Recovery %
		P	D	1	2	3	4		S <sub>i</sub>	V <sub>i</sub>		
1	A47	PD01	DB10	0,15	0,14	0,14	0,15	4	0,15		0,01	77,32
2	F16x	PC01	DB10	0,15	0,15	0,14	0,15	4	0,15		0,00	80,02
3	F27	PD01	DB05	0,18	0,20	0,08	0,15	0	0,16	c	0,05	83,18
4	A36	PD02	DB10	0,16	0,16	0,16	0,16	4	0,16		0,00	83,71
5	F13x	PD01	DB10	0,16	0,16	0,16	0,16	4	0,16		0,00	84,51
6	A82	PD01	DB10	0,16	0,17	0,16	0,17	4	0,16		0,00	87,21
7	F08x	PD01	DB10	0,16	0,17	0,17	0,17	4	0,17		0,01	89,86
8	F32x	PD01	DB10	0,19	0,17	0,17	0,18	4	0,18		0,01	93,58
9	F12x	PC01	DB10	0,17	0,18	0,18	0,18	4	0,18		0,00	93,77
10	F18x	PD99	DB10	0,18	0,18	0,19	0,18	4	0,18		0,00	95,58
11	F05	PD02	DB05	0,24	0,22	0,21	0,23	4	0,22		0,01	118,64
12	F14x	PC01	DB10	0,25	0,23	0,21	0,23	4	0,23		0,01	121,97
13	F33x	PD01	DB10	0,27	0,25	0,24	0,24	4	0,25		0,01	133,04
14	F29x	PD02	DB10	0,26	0,25	0,28	0,27	4	0,27	*	0,01	141,80
15	F07x	PD03	DB08	0,37	0,39	0,39	0,41	0	0,39	b *	0,02	207,09
16	A79	PD01	DB10	0,18	1,1943a	0,19	0,19	3	0,19		0,00	98,66
17												
18												
19	F19x	PD02	DB08	<1,05	<1,05	<1,05	<1,05			**		
20	F06x	PD02	DB08	<,5	<,5	<,5	<,5					
21	F25	PB99	DB08	<,5	<,5	<,5	<,5					
22	F15	PC01	DB09	<,5	<,5	<,5	<,5					
23	A80	PD03	DB10	<,2	<,2	<,2	<,2					
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    55    0,19    0,007    3,732

\* = non tolerable mean because more than +/-

\*\* = higher than maximum acceptable LOQ

Lower than the lowest evaluated result

40 % from the mean

|      S<sub>R</sub>      CV<sub>R</sub>  
 19    0,091    65,790

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Pb      Sample: 4

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery	
		P	D	1	2	3	4			b	*	S <sub>i</sub>	V <sub>i</sub>	%
1	F07x	PD03	DB08	0,25	0,23	0,24	0,23	0	0,23		0,01	4,48	8,73	
2	F27	PD01	DB05	2,29	2,12	1,97	2,06	4	2,11		0,13	6,40	78,42	
3	F08x	PD01	DB10	2,21	2,22	2,34	2,28	4	2,26		0,06	2,59	84,18	
4	F16x	PC01	DB10	2,46	2,46	2,39	2,39	4	2,42		0,04	1,67	90,12	
5	F05	PD02	DB05	2,49	2,52	2,50	2,58	4	2,52		0,04	1,60	93,82	
6	F13x	PD01	DB10	2,65	2,66	2,52	2,45	4	2,57		0,10	3,98	95,59	
7	A80	PD03	DB10	2,65	2,66	2,66	2,67	4	2,66		0,01	0,31	98,94	
8	A47	PD01	DB10	2,65	2,67	2,64	2,69	4	2,66		0,02	0,83	99,03	
9	A36	PD02	DB10	2,67	2,74	2,65	2,66	4	2,68		0,04	1,42	99,72	
10	A82	PD01	DB10	2,69	2,67	2,72	2,67	4	2,69		0,02	0,83	99,99	
11	F18x	PD99	DB10	2,72	2,74	2,67	2,69	4	2,71		0,03	1,15	100,61	
12	F19x	PD02	DB08	2,78	2,80	2,81	2,59	4	2,75		0,10	3,79	102,10	
13	F15	PC01	DB09	2,89	2,74	2,76	2,68	4	2,77		0,09	3,20	102,94	
14	F29x	PD02	DB10	2,76	2,78	2,82	2,78	4	2,79		0,03	0,92	103,64	
15	F14x	PC01	DB10	2,87	2,85	2,83	2,80	4	2,84		0,03	1,05	105,54	
16	A79	PD01	DB10	2,74	2,92	2,86	2,88	4	2,85		0,08	2,81	105,96	
17	F06x	PD02	DB08	2,80	3,01	2,92	2,77	4	2,88		0,11	3,86	106,93	
18	F12x	PC01	DB10	2,81	2,84	3,05	2,81	4	2,88		0,11	3,99	106,99	
19	F32x	PD01	DB10	2,90	2,90	2,90	2,94	4	2,91		0,02	0,69	108,24	
20	F25	PB99	DB08	3,17	3,17	3,15	3,13	4	3,15		0,02	0,55	117,25	
21	F33x	PD01	DB10	4,03	4,00	3,91	4,04	0	3,99	b *	0,06	1,49	148,52	
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														
51														
52														
53														
54														
55														

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    76    2,69    0,057    2,133

\* = non tolerable mean because more than +/-

30 % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
 19    0,239    8,908

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cd      Sample: 1

Unit: ng/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3		s <sub>i</sub>	V <sub>i</sub>			
1	F07x	PD03	DB08	50,88	50,51	49,89	51,48	0	50,69	b	*	69,14
2	F05	PD02	DB05	53,30	49,80	59,10	51,10	0	53,33	b		72,74
3	F16x	PC01	DB10	60,67	61,94	60,96	61,55	4	61,28			83,59
4	F08x	PD01	DB10	77,33	60,38	67,00	64,42	4	67,29			91,78
5	F33x	PD01	DB10	67,20	71,80	66,80	67,70	4	68,38			93,27
6	A58	PD02	DB05	69,21	68,19	68,69	68,01	4	68,53			93,47
7	F27	PD01	DB05	70,20	70,90	68,80	68,80	4	69,68			95,04
8	F14x	PC01	DB10	72,10	71,10	72,10	66,70	4	70,50			96,17
9	F25	PZ99	DB08	75,20	69,30	69,20	69,90	4	70,90			96,71
10	A36	PD02	DB10	70,62	71,47	71,58	72,33	4	71,50			97,53
11	A88	PD01	DB05	72,03	72,03	70,42	72,03	4	71,63			97,70
12	F29x	PD02	DB10	71,34	71,09	76,11	73,31	4	72,96			99,52
13	A79	PD01	DB10	73,90	74,30	74,00	73,50	4	73,93			100,84
14	A82	PD01	DB10	74,19	73,63	74,81	73,34	4	73,99			100,93
15	F18x	PD99	DB10	73,30	70,80	81,10	77,10	4	75,58			103,09
16	A80	PD03	DB10	75,20	75,70	76,90	75,60	4	75,85			103,46
17	F13x	PD01	DB10	76,20	77,80	75,40	75,50	4	76,23			103,97
18	F15	PC01	DB09	83,00	78,00	68,00	76,00	4	76,25			104,01
19	F32x	PD01	DB10	78,10	74,90	78,10	78,10	4	77,30			105,44
20	F12x	PC01	DB10	73,20	82,40	80,00	73,80	4	77,35			105,51
21	F06x	PD02	DB08	86,00	76,00	72,00	79,00	4	78,25			106,74
22	A47	PD01	DB10	99a	76,00	71,00	70,00	3	72,33			98,67
23	A60x	PD01	DB10	83,51	76,34	82,01	82,66	4	81,13			110,66
24	F19x	PD02	DB08	84,40	84,10	74,10	84,60	4	81,80			111,58
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    87    73,31    2,647    3,610

\* = non tolerable mean because more than +/- 30 % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
 22    4,790    6,534

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cd      Sample: 2

Unit: ng/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$s_i$	$V_i$		
1	F27	PD01	DB05	192,40	197,10	189,70	194,80	4	193,50		3,18	79,76
2	F07x	PD03	DB08	195,80	186,30	187,80	204,80	4	193,68		8,51	79,83
3	F16x	PC01	DB10	221,70	208,70	219,10	222,00	4	217,88		6,25	89,81
4	F08x	PD01	DB10	237,11	217,00	223,60	223,89	4	225,40		8,43	92,91
5	A58	PD02	DB05	227,30	226,86	226,16	223,75	4	226,02		1,58	93,16
6	A82	PD01	DB10	236,00	231,80	234,10	243,10	4	236,25		4,88	97,38
7	F15	PC01	DB09	239,00	232,00	246,00	237,00	4	238,50		5,80	98,31
8	F06x	PD02	DB08	236,00	236,00	247,00	240,00	4	239,75		5,19	98,82
9	F05	PD02	DB05	236,00	243,00	249,00	241,00	4	242,25		5,38	99,85
10	F29x	PD02	DB10	239,42	241,05	241,38	249,11	4	242,74		4,33	100,06
11	F33x	PD01	DB10	245,00	238,50	242,70	245,00	4	242,80		3,06	100,08
12	F14x	PC01	DB10	240,00	241,00	244,00	248,00	4	243,25		3,59	100,27
13	F18x	PD99	DB10	246,00	249,00	242,00	246,00	4	245,75		2,87	101,30
14	A36	PD02	DB10	249,49	248,75	243,00	242,15	4	245,85		3,81	101,34
15	F19x	PD02	DB08	243,00	253,00	254,00	263,00	4	253,25		8,18	104,39
16	F25	PZ99	DB08	255,70	255,50	253,00	254,20	4	254,60		1,26	104,95
17	F32x	PD01	DB10	256,00	254,00	256,00	256,00	4	255,50		1,00	105,32
18	A47	PD01	DB10	243,00	253,00	249,00	278,00	4	255,75		15,39	105,42
19	A88	PD01	DB05	250,61	250,61	269,30	263,96	4	258,62		9,50	106,60
20	A80	PD03	DB10	262,00	257,00	258,00	260,00	4	259,25		2,22	106,86
21	A60x	PD01	DB10	273,44	259,80	254,76	251,81	4	259,95		9,58	107,15
22	A79	PD01	DB10	260,50	263,60	260,10	261,80	4	261,50		1,58	107,79
23	F12x	PC01	DB10	246,70	282,20	252,90	267,90	4	262,43		15,91	108,17
24	F13x	PD01	DB10	263,00	273,00	268,00	268,00	4	268,00		4,08	110,47
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$   
 all labs    96    242,60    5,649    2,328

\* = non tolerable mean because more than +/-

30 % from the mean

I       $s_R$        $CV_R$   
 24    19,671    8,108

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cd      Sample: 3

Unit: ng/g

No.	Lab. Code	Method code P	Method code D	Replications				n	Lab.mean		Lab.standard dev.	Recovery
				1	2	3	4		S <sub>i</sub>	V <sub>i</sub>	%	
1	F08x	PD01	DB10	36,14	37,21	41,24	39,05	4	38,41		2,23	84,13
2	F27	PD01	DB05	37,40	40,20	37,20	39,00	4	38,45		1,42	84,22
3	F16x	PC01	DB10	41,42	39,03	39,65	39,23	4	39,83		1,09	87,25
4	F29x	PD02	DB10	40,44	40,25	45,06	42,81	4	42,14		2,27	92,30
5	F33x	PD01	DB10	45,60	42,50	38,60	43,60	4	42,58		2,94	93,26
6	A82	PD01	DB10	44,00	43,62	45,44	43,81	4	44,22		0,83	96,85
7	A36	PD02	DB10	46,60	43,93	43,07	45,21	4	44,70		1,54	97,92
8	F18x	PD99	DB10	44,60	45,90	43,90	46,10	4	45,13		1,05	98,84
9	A47	PD01	DB10	47,00	43,00	47,00	44,00	4	45,25		2,06	99,12
10	A88	PD01	DB05	45,09	44,55	46,15	46,15	4	45,49		0,80	99,63
11	A60x	PD01	DB10	53,11	38,97	42,42	48,23	0	45,68	c	6,25	13,69
12	F12x	PC01	DB10	45,60	46,40	46,40	46,80	4	46,30		0,50	101,42
13	F13x	PD01	DB10	46,90	47,40	46,80	46,80	4	46,98		0,29	102,89
14	F14x	PC01	DB10	48,53	46,40	45,30	48,50	4	47,18		1,60	103,35
15	A80	PD03	DB10	46,80	46,80	48,30	47,30	4	47,30		0,71	103,61
16	A58	PD02	DB05	48,33	49,60	46,99	44,88	4	47,45		2,02	103,93
17	F32x	PD01	DB10	49,00	46,90	47,90	46,90	4	47,68		1,00	104,43
18	F05	PD02	DB05	46,80	49,60	49,70	48,90	4	48,75		1,35	106,78
19	F15	PC01	DB09	57,00	50,00	53,00	48,00	4	52,00		3,92	113,90
20	A79	PD01	DB10	53,60	52,40	54,10	52,30	4	53,10		0,89	116,31
21	F07x	PD03	DB08	105,5a	100,70	100,20	100,90	0	100,60	b *	0,36	220,35
22												
23												
24	F19x	PD02	DB08	<70	<70	<70	<70			**		
25	F25	PZ99	DB08	<50	<50	<50	<50					
26	F06x	PD02	DB08	47	59	<40	49					
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    76    45,65    1,501    3,304

\* = non tolerable mean because more than +/-

\*\* = higher than maximum acceptable LOQ

30 % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
 22    16,369    41,731

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cd      Sample: 4

Unit: ng/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		b	*	S <sub>i</sub>	V <sub>i</sub>	
1	F07x	PD03	DB08	67,03	65,99	66,54	67,47	0	66,76	b *	0,64	0,95	28,15
2	F27	PD01	DB05	188,90	190,60	186,90	190,70	4	189,28		1,79	0,94	79,80
3	F16x	PC01	DB10	202,30	212,20	201,50	209,60	4	206,40		5,31	2,57	87,02
4	F15	PC01	DB09	213,00	216,00	217,00	211,00	4	214,25		2,75	1,29	90,33
5	F08x	PD01	DB10	214,20	205,68	217,11	223,14	4	215,03		7,26	3,38	90,66
6	F05	PD02	DB05	214,00	216,00	218,00	223,00	4	217,75		3,86	1,77	91,81
7	F29x	PD02	DB10	220,91	226,70	224,36	229,64	4	225,40		3,69	1,64	95,04
8	A58	PD02	DB05	231,88	229,56	222,82	224,08	4	227,09		4,33	1,91	95,75
9	F33x	PD01	DB10	228,60	230,80	226,40	223,90	4	227,43		2,96	1,30	95,89
10	A82	PD01	DB10	233,00	233,30	229,20	229,80	4	231,33		2,13	0,92	97,53
11	F18x	PD99	DB10	233,00	232,00	234,00	238,00	4	234,25		2,63	1,12	98,77
12	F14x	PC01	DB10	230,00	240,00	236,00	241,00	4	236,75		4,99	2,11	99,82
13	A36	PD02	DB10	238,96	241,52	241,52	237,34	4	239,84		2,06	0,86	101,12
14	F06x	PD02	DB08	243,00	247,00	231,00	249,00	4	242,50		8,06	3,32	102,24
15	A80	PD03	DB10	248,00	249,00	250,00	247,00	4	248,50		1,29	0,52	104,77
16	F12x	PC01	DB10	244,80	247,50	264,10	243,10	4	249,88		9,65	3,86	105,35
17	A47	PD01	DB10	267,00	238,00	242,00	259,00	4	251,50		13,77	5,48	106,04
18	F32x	PD01	DB10	251,00	250,00	249,00	256,00	4	251,50		3,11	1,24	106,04
19	A88	PD01	DB05	255,80	250,40	245,01	261,19	4	253,10		6,96	2,75	106,71
20	F13x	PD01	DB10	259,00	255,00	255,00	252,00	4	255,25		2,87	1,13	107,62
21	A79	PD01	DB10	254,80	254,40	255,50	257,00	4	255,43		1,14	0,45	107,69
22	F19x	PD02	DB08	255,00	255,00	266,00	254,00	4	257,50		5,69	2,21	108,57
23	A60x	PD01	DB10	263,29	257,07	248,48	265,19	4	258,51		7,53	2,91	108,99
24	F25	PZ99	DB08	266,10	266,90	265,90	267,50	4	266,60		0,74	0,28	112,41
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
all labs    92    237,18    4,547    1,917

\* = non tolerable mean because more than +/-

30 % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
23      19,535    8,237

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: B      Sample: 1

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
		P	D	1	2	3	4		b *	$V_i$			
1	F07x	PD03	DB08	9,21	10,93a	9,12	9,09	0	9,14	b *	0,06	0,65	22,01
2	F16x	PC01	DB10	36,14	36,25	36,30	36,24	4	36,23		0,07	0,18	87,26
3	F08x	PZ99	DB08	37,24	36,67	36,93	37,44	4	37,07		0,34	0,91	89,27
4	F18x	PD99	DB08	37,80	37,20	37,10	36,80	4	37,23		0,42	1,13	89,65
5	F28x	PD02	DB08	39,12	40,40	38,29	36,92	4	38,68		1,46	3,77	93,15
6	A65	PD01	DB08	40,10	40,00	40,40	41,20	4	40,43		0,54	1,35	97,35
7	F02x	PD02	DB08	41,70	39,70	39,60	40,90	4	40,48		1,01	2,49	97,47
8	A59	PC01	DB08	40,08	40,77	40,08	41,64	4	40,64		0,74	1,82	97,88
9	F32x	PD01	DB08	41,20	41,80	41,30	41,30	4	41,40		0,27	0,65	99,70
10	F19x	PD02	DB08	40,90	41,60	42,30	41,80	4	41,65		0,58	1,39	100,30
11	F33x	PD01	DB10	44,40	41,76	40,29	41,05	4	41,88		1,79	4,27	100,85
12	A88	PD01	DB08	42,82	41,83	41,58	41,74	4	41,99		0,56	1,34	101,13
13	F05	PD02	DB08	42,50	42,30	42,60	42,40	4	42,45		0,13	0,30	102,23
14	F15	PC01	DB08	42,30	42,10	42,80	42,90	4	42,53		0,39	0,91	102,41
15	A60x	PD01	DB10	43,92	43,14	42,11	41,84	4	42,75		0,96	2,25	102,96
16	A80	PD03	DB10	42,00	43,40	43,90	42,90	4	43,05		0,81	1,88	103,68
17	F14x	PC01	DB08	43,20	42,80	43,10	43,40	4	43,13		0,25	0,58	103,86
18	A36	PD02	DB08	43,78	43,03	46,76	42,18	4	43,94		1,99	4,53	105,81
19	A47	PD01	DB08	45,14	45,37	49,38	46,48	4	46,59		1,95	4,18	112,21
20	A79	PD02	DB10	48,89	47,05	46,42	45,05	4	46,85		1,59	3,40	112,83
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean       $s_r$        $CV_r$   
 all labs    76    41,52    0,834    2,009

\* = non tolerable mean because more than +/-

20 % from the mean

I       $s_R$        $CV_R$   
 19    2,848    6,859

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: B      Sample: 2

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		b	*	S <sub>i</sub>	V <sub>i</sub>	
1	F07x	PD03	DB08	14,92	15,44	15,38	14,75	0	15,12	b *	0,34	2,25	72,90
2	F16x	PC01	DB10	17,64	18,40	17,91	17,86	4	17,95		0,32	1,79	86,54
3	F18x	PD99	DB08	18,30	18,20	18,30	17,90	4	18,18		0,19	1,04	87,61
4	F08x	PZ99	DB08	18,81	18,77	19,51	19,79	4	19,22		0,51	2,65	92,64
5	A59	PC01	DB08	20,28	20,47	20,28	19,81	4	20,21		0,28	1,39	97,42
6	A79	PD02	DB10	21,30	20,78	19,52	19,27	4	20,22		0,98	4,84	97,46
7	F33x	PD01	DB10	19,94	20,82	19,87	20,42	4	20,26		0,44	2,20	97,68
8	A88	PD01	DB08	20,68	21,03	20,54	19,54	4	20,45		0,64	3,13	98,57
9	F05	PD02	DB08	20,60	20,60	20,60	20,60	4	20,60		0,00	0,00	99,30
10	F28x	PD02	DB08	20,71	21,60	20,10	21,01	4	20,86		0,63	3,00	100,54
11	F19x	PD02	DB08	20,70	20,70	21,00	21,20	4	20,90		0,24	1,17	100,75
12	F32x	PD01	DB08	20,90	21,10	20,80	21,10	4	20,98		0,15	0,72	101,11
13	A65	PD01	DB08	21,40	21,00	20,60	21,00	4	21,00		0,33	1,56	101,23
14	F15	PC01	DB08	21,00	20,40	21,20	21,40	4	21,00		0,43	2,06	101,23
15	F02x	PD02	DB08	20,60	21,30	21,90	21,60	4	21,35		0,56	2,61	102,92
16	F14x	PC01	DB08	21,80	21,70	21,70	21,60	4	21,70		0,08	0,38	104,61
17	A60x	PD01	DB10	21,55	22,94	21,44	20,99	4	21,73		0,84	3,88	104,75
18	A36	PD02	DB08	21,93	22,35	22,46	21,18	4	21,98		0,58	2,64	105,96
19	A80	PD03	DB10	22,60	22,40	22,20	22,00	4	22,30		0,26	1,16	107,50
20	A47	PD01	DB08	22,68	22,90	23,89	23,62	4	23,27		0,57	2,47	112,19
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    76    20,74    0,423    2,039

\* = non tolerable mean because more than +/-

20 % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
 19    1,300    6,269

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: B      Sample: 3

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		s <sub>i</sub>	v <sub>i</sub>			
1	F07x	PD03	DB08	12,07	12,52	12,14	12,22	0	12,24	b *	0,20	1,62	75,02
2	F16x	PC01	DB10	13,63	13,89	13,42	13,69	4	13,66		0,19	1,42	83,73
3	F18x	PD99	DB08	13,90	14,20	14,20	13,80	4	14,03		0,21	1,47	85,98
4	F08x	PZ99	DB08	14,09	13,92	14,64	14,62	4	14,32		0,37	2,58	87,78
5	F28x	PD02	DB08	15,77	16,68	14,84	16,15	4	15,86		0,78	4,90	97,23
6	A59	PC01	DB08	15,92	16,05	16,31	15,65	4	15,98		0,27	1,72	97,98
7	F05	PD02	DB08	16,10	16,10	15,80	16,10	4	16,03		0,15	0,94	98,24
8	F19x	PD02	DB08	16,60	16,40	16,30	16,60	4	16,48		0,15	0,91	101,00
9	F33x	PD01	DB10	17,86	16,36	15,83	15,99	0	16,51	c	0,93	5,61	101,22
10	A65	PD01	DB08	16,70	16,40	16,60	16,40	4	16,53		0,15	0,91	101,31
11	F15	PC01	DB08	16,60	16,60	16,40	16,50	4	16,53		0,10	0,58	101,31
12	A79	PD02	DB10	16,25	17,15	16,80	16,73	4	16,73		0,37	2,21	102,58
13	A60x	PD01	DB10	16,27	16,29	17,49	17,03	4	16,77		0,60	3,57	102,82
14	A36	PD02	DB08	17,21	16,99	16,57	16,46	4	16,81		0,35	2,10	103,04
15	A88	PD01	DB08	17,00	16,68	16,82	16,89	4	16,85		0,13	0,80	103,29
16	F14x	PC01	DB08	16,90	16,90	16,80	16,90	4	16,88		0,05	0,30	103,45
17	F32x	PD01	DB08	17,00	17,00	17,00	17,30	4	17,08		0,15	0,88	104,68
18	F02x	PD02	DB08	17,80	17,70	16,80	17,00	4	17,33		0,50	2,88	106,21
19	A80	PD03	DB10	17,10	17,30	17,50	17,40	4	17,33		0,17	0,99	106,21
20	A47	PD01	DB08	18,33	17,82	19,02	18,66	4	18,46		0,51	2,76	113,16
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      s<sub>r</sub>      CV<sub>r</sub>  
 all labs    72    16,31    0,289    1,771  
 \* = non tolerable mean because more than +/- 20 % from the mean

I      s<sub>R</sub>      CV<sub>R</sub>  
 18    1,218    7,470

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: B      Sample: 4

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %		
		P	D	1	2	3	4		b	*				
1	F07x	PD03	DB08	1,94	1,85	1,91	1,94	0	1,91	b	*	0,04	2,14	3,00
2	F18x	PD99	DB08	55,50	56,00	55,70	54,70	4	55,48			0,56	1,00	87,26
3	A79	PD02	DB10	54,27	56,40	56,60	55,24	4	55,63			1,09	1,95	87,50
4	F16x	PC01	DB10	55,96	57,03	55,05	56,66	4	56,18			0,87	1,55	88,36
5	F08x	PZ99	DB08	55,16	54,77	58,50	57,72	4	56,54			1,85	3,27	88,94
6	F28x	PD02	DB08	58,85	58,18	56,56	57,52	4	57,78			0,98	1,69	90,88
7	F33x	PD01	DB10	63,21	61,91	61,96	61,41	4	62,12			0,77	1,23	97,72
8	A59	PC01	DB08	62,64	63,54	63,14	62,20	4	62,88			0,58	0,93	98,91
9	A65	PD01	DB08	64,60	63,70	64,20	64,30	4	64,20			0,37	0,58	100,99
10	F05	PD02	DB08	64,60	64,80	64,70	64,70	4	64,70			0,08	0,13	101,77
11	A88	PD01	DB08	64,68	66,45	65,63	64,47	4	65,31			0,91	1,40	102,73
12	A80	PD03	DB10	65,20	66,00	65,60	65,70	4	65,63			0,33	0,50	103,23
13	A36	PD02	DB08	67,17	67,38	64,27	65,88	4	66,18			1,43	2,17	104,09
14	F19x	PD02	DB08	66,50	66,30	66,10	66,20	4	66,28			0,17	0,26	104,25
15	A60x	PD01	DB10	66,84	65,92	67,11	66,38	4	66,56			0,52	0,79	104,70
16	F32x	PD01	DB08	65,60	66,10	67,90	67,70	4	66,83			1,15	1,72	105,12
17	F02x	PD02	DB08	66,20	67,90	66,90	66,70	4	66,93			0,71	1,07	105,27
18	F15	PC01	DB08	67,30	68,30	68,90	66,60	4	67,78			1,02	1,51	106,61
19	F14x	PC01	DB08	67,50	68,10	68,00	67,90	4	67,88			0,26	0,39	106,77
20	A47	PD01	DB08	73,06	73,96	72,40	72,68	4	73,03			0,68	0,93	114,87
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														
51														
52														
53														
54														
55														

n      Mean       $s_r$        $CV_r$   
 all labs    76    63,57    0,755    1,187

20 % from the mean

\* = non tolerable mean because more than +/-

I       $s_R$        $CV_R$   
 19    4,990    7,850

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: As      Sample: 1

Unit: ng/g

No.	Lab. Code	Method code P      D		Replications 1      2      3      4				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
1	A82	PC01	DB10	23,12	22,83	22,05	22,60	4	22,65		0,45	75,05
2	F14x	PC01	DB10	26,91	23,70	27,90	24,80	4	25,83		1,92	85,58
3	F16x	PC01	DB10	25,72	27,48	25,21	26,31	4	26,18		0,98	86,75
4	A36	PD02	DB10	27,69	27,06	27,38	26,84	4	27,24		0,37	90,27
5	F08x	PD01	DB10	24,80	28,51	33,51	22,60	4	27,36		4,78	90,64
6	A60x	PD01	DB10	26,37	26,93	28,29	28,39	4	27,50		1,00	91,11
7	F32x	PD01	DB10	32,10	26,70	32,10	33,20	4	31,03		2,93	102,80
8	A79	PD01	DB10	33,70	30,40	30,00	30,80	4	31,23		1,68	103,46
9	F33	PD01	DB10	39,00	35,00	31,00	35,00	4	35,00		3,27	115,97
10	F12x	PC01	DB10	33,50	37,30	32,00	38,80	4	35,40		3,18	117,30
11	F13x	PD01	DB10	42,00	42,50	42,60	43,20	4	42,58	*	0,49	141,07
12												
13												
14	A80	PD03	DB10	<100	<100	<100	<100			**		
15	A47	PD01	DB10	<,07	<,07	<,07	<,07			*		
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$   
 all labs      44      30,18      1,914      6,341

30 % from the mean

\* = non tolerable mean because more than +/-

\*\* = higher than maximum acceptable LOQ

Limit for the lower concentration range

|       $s_R$        $CV_R$   
 55      12,425      205,850

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: As      Sample: 2

Unit: ng/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$\bar{x}$	$V_i$		
1	A60x	PD01	DB10	12,16	11,22	13,95	14,59	4	12,98		1,56	12,01
2	F16x	PC01	DB10	12,34	15,20	12,20	12,97	4	13,18		1,39	10,54
3	F14x	PC01	DB10	15,00	15,00	15,02	17,00	4	15,51		1,00	6,43
4	A82	PC01	DB10	15,53	15,46	15,85	16,10	4	15,74		0,30	1,89
5	F32x	PD01	DB10	18,10	17,10	17,10	13,90	4	16,55		1,83	11,05
6	F12x	PC01	DB10	14,10	17,70	18,40	16,70	4	16,73		1,88	11,26
7	F33	PD01	DB10	17,00	18,00	17,00	16,00	4	17,00		0,82	4,80
8	A79	PD01	DB10	17,70	18,30	17,40	19,00	4	18,10		0,71	3,91
9	F13x	PD01	DB10	22,40	22,70	23,30	23,40	0	22,95	b *	0,48	2,09
10												
11												
12	A80	PD03	DB10	<100	<100	<100	<100			**		
13	F08x	PD01	DB10	<20	<20	<20	<20			*		
14	A36	PD02	DB10	<20	<20	<20	<20					
15	A47	PD01	DB10	<,07	<,07	<,07	<,07					
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$   
 all labs    32    15,72    1,185    7,536

\* = non tolerable mean because more than +/-

30 % from the mean

\*\* = higher than maximum acceptable LOQ

Lower than the lowest evaluated result

I       $s_R$        $CV_R$   
 12    7,875    75,134

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: As      Sample: 3

Unit: ng/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		Lab.mean	$s_i$	$V_i$	
1	A60x	PD01	DB10	19,52	16,81	20,59	18,77	4	18,92	1,60	8,43	81,52
2	A82	PC01	DB10	20,56	21,18	20,99	21,28	4	21,00	0,32	1,52	90,48
3	A36	PD02	DB10	21,59	21,59	21,38	22,12	4	21,67	0,32	1,46	93,35
4	F14x	PC01	DB10	21,60	22,60	21,60	21,60	4	21,85	0,50	2,29	94,13
5	F12x	PC01	DB10	21,90	20,50	21,90	23,70	4	22,00	1,31	5,96	94,77
6	F16x	PC01	DB10	23,30	24,17	20,50	23,68	4	22,91	1,65	7,19	98,70
7	F33	PD01	DB10	27,00	25,00	26,00	25,00	4	25,75	0,96	3,72	110,93
8	F32x	PD01	DB10	24,50	25,60	24,50	28,80	4	25,85	2,03	7,87	111,36
9	F13x	PD01	DB10	25,20	26,40	25,90	26,10	4	25,90	0,51	1,97	111,57
10	A79	PD01	DB10	26,30	26,80	25,60	26,40	4	26,28	0,50	1,90	113,19
11	F08x	PD01	DB10	25,95	20,20	42,71	28,69	0	29,39	c	9,56	32,54
12												
13												
14	A80	PD03	DB10	<100	<100	<100	<100			**		
15	A47	PD01	DB10	<,07	<,07	<,07	<,07			*		
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$   
 all labs    40    23,21    0,969    4,174

\* = non tolerable mean because more than +/-

\*\* = higher than maximum acceptable LOQ

Limit for the lower concentration range

I       $s_R$        $CV_R$   
 12    9,328    48,222

30 % from the mean

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: As      Sample: 4

Unit: ng/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
		P	D	1	2	3	4		b	$V_i$			
1	F08x	PD01	DB10	557,36	573,34	524,91	547,61	0	550,81	b	20,26	3,68	80,45
2	F16x	PC01	DB10	638,80	649,30	618,30	643,90	4	637,58		13,55	2,12	93,13
3	F12x	PC01	DB10	619,90	616,60	690,20	624,60	4	637,83		35,07	5,50	93,16
4	F14x	PC01	DB10	625,00	656,00	657,00	681,00	4	654,75		22,95	3,51	95,64
5	F33	PD01	DB10	664,00	667,00	658,00	682,00	4	667,75		10,21	1,53	97,54
6	A60x	PD01	DB10	674,27	668,74	667,12	664,07	4	668,55		4,28	0,64	97,65
7	A36	PD02	DB10	666,95	669,64	687,02	686,27	4	677,47		10,66	1,57	98,96
8	F32x	PD01	DB10	680,00	673,00	677,00	680,00	4	677,50		3,32	0,49	98,96
9	F13x	PD01	DB10	682,00	681,00	676,00	697,00	4	684,00		9,06	1,32	99,91
10	A47	PD01	DB10	716,00	686,00	645,00	700,00	4	686,75		30,41	4,43	100,31
11	A80	PD03	DB10	716,00	744,00	722,00	726,00	4	727,00		12,06	1,66	106,19
12	A82	PC01	DB10	730,00	736,80	738,20	732,80	4	734,45		3,75	0,51	107,28
13	A79	PD01	DB10	760,90	768,40	757,70	760,30	4	761,83		4,60	0,60	111,28
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean       $s_r$        $CV_r$   
 all labs    48    684,62    13,325    1,946

\* = non tolerable mean because more than +/- 20 % from the mean

I       $s_R$        $CV_R$   
 12    38,358    5,603

## 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cr      Sample: 1

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$b$	*	$V_i$	
1	F07x	PD03	DB08	0,54	0,53	0,53	0,54	0	0,53	b *	0,01	48,85
2	F14x	PC01	DB10	0,83	0,80	0,83	0,81	4	0,82	*	0,02	74,62
3	A88	PD01	DB08	0,80	0,84	0,77	0,96	4	0,84		0,08	77,09
4	F16x	PC01	DB10	0,90	1,00	0,87	0,93	4	0,92		0,05	84,36
5	F06	PD02	DB08	0,97	0,90	0,99	0,98	4	0,96		0,04	87,98
6	A60x	PD01	DB10	0,93	0,99	0,99	0,99	4	0,98		0,03	89,44
7	F08x	PD01	DB10	0,93	0,93	1,11	0,95	4	0,98		0,09	89,50
8	A36	PD02	DB10	1,03	0,96	1,00	0,97	4	0,99		0,03	90,55
9	F33	PD01	DB10	1,09	0,99	1,07	0,97	4	1,03		0,06	94,25
10	A47	PD01	DB08	1,10	0,93	1,03	1,20	4	1,07		0,11	10,69
11	A80	PD03	DB10	0,97	1,07	1,15	1,08	4	1,07		0,07	97,75
12	A79	PD01	DB10	1,12	1,08	1,10	1,10	4	1,10		0,02	100,70
13	F18x	PD99	DB10	1,19	1,06	1,11	1,19	4	1,14		0,06	5,62
14	F27	PD01	DB05	1,06	1,16	1,32	1,29	4	1,21		0,12	110,68
15	F12x	PC01	DB10	1,24	1,31	1,25	1,14	4	1,23		0,07	112,87
16	F02x	PD02	DB08	1,22	1,27	1,31	1,17	4	1,24		0,06	4,89
17	F19x	PD02	DB08	1,21	1,18	1,29	1,35	4	1,26		0,08	115,07
18	A82	PD01	DB10	1,26	1,32	1,24	1,24	4	1,27		0,04	115,78
19	F13x	PD01	DB10	1,36	1,25	1,26	1,25	4	1,28		0,05	4,18
20	F32x	PD01	DB10	1,45	1,36	1,47	1,27	4	1,39	*	0,09	117,13
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

\* = non tolerable mean because more than +/-

n      Mean       $s_r$        $CV_r$   
 all labs    76    1,09    0,062    5,693  
 25      % from the mean

I       $s_R$        $CV_R$   
 19      0,161    14,709

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cr

Sample: 2

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$s_i$	$V_i$		
1	F27	PD01	DB05	0,97	1,00	0,78	0,80	4	0,89	*	0,12	68,89
2	F14x	PC01	DB10	1,08	1,06	1,04	1,08	4	1,06		0,02	82,70
3	A88	PD01	DB08	1,07	1,12	1,06	1,03	4	1,07		0,04	83,24
4	F06	PD02	DB08	1,16	1,18	1,23	1,12	4	1,17		0,05	91,21
5	A47	PD01	DB08	1,08	1,10	1,19	1,39	4	1,19		0,14	92,58
6	F33	PD01	DB10	1,18	1,26	1,16	1,16	4	1,19		0,05	92,58
7	F08x	PD01	DB10	1,23	1,14	1,16	1,26	4	1,20		0,05	93,20
8	F16x	PC01	DB10	1,27	1,11	1,36	1,19	4	1,23		0,10	95,78
9	A82	PD01	DB10	1,27	1,22	1,34	1,26	4	1,27		0,05	98,90
10	A80	PD03	DB10	1,34	1,35	1,24	1,31	4	1,31		0,05	101,91
11	A60x	PD01	DB10	1,42	1,11	1,54	1,26	4	1,33		0,19	103,81
12	A36	PD02	DB10	1,29	1,29	1,34	1,46	4	1,34		0,08	104,56
13	A79	PD01	DB10	1,26	1,31	1,46	1,38	4	1,35		0,09	105,24
14	F18x	PD99	DB10	1,24	1,49	1,50	1,28	4	1,38		0,14	107,16
15	F12x	PC01	DB10	1,30	1,58	1,31	1,39	4	1,39		0,13	108,46
16	F13x	PD01	DB10	1,46	1,43	1,40	1,41	4	1,43		0,03	110,86
17	F19x	PD02	DB08	1,49	1,37	1,47	1,44	4	1,44		0,05	112,22
18	F02x	PD02	DB08	1,43	1,56	1,47	1,51	4	1,49		0,06	116,11
19	F07x	PD03	DB08	1,62	1,54	1,48	1,48	4	1,53		0,06	118,87
20	F32x	PD01	DB10	1,48	1,49	1,69a	1,49	3	1,49		0,01	115,65
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

\* = non tolerable mean because more than +/-

n      Mean       $s_r$        $CV_r$   
 all labs    79    1,29    0,075    5,815  
 25      % from the mean

I       $s_R$        $CV_R$   
 20      0,165    12,784

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cr

Sample: 3

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		s <sub>i</sub>	v <sub>i</sub>			
1	F07x	PD03	DB08	0,77	0,62	0,66	0,76	0	0,70	b *	0,07	10,60	16,66
2	F27	PD01	DB05	3,38	3,14	3,25	3,39	4	3,29		0,12	3,58	78,03
3	F14x	PC01	DB10	3,34	3,61	3,64	3,21	4	3,45		0,21	6,06	81,82
4	F08x	PD01	DB10	4,06	4,31	3,19	2,67	0	3,56	c	0,76	21,46	84,40
5	A88	PD01	DB08	3,49	3,36	3,71	4,15	4	3,68		0,35	9,42	87,20
6	A47	PD01	DB08	3,67	3,99	3,72	3,69	4	3,77		0,15	3,97	89,34
7	F06	PD02	DB08	3,87	3,82	3,58	3,82	4	3,77		0,13	3,46	89,46
8	F19x	PD02	DB08	4,17	4,19	3,62	3,86	4	3,96		0,27	6,88	93,90
9	F16x	PC01	DB10	4,33	3,84	4,31	3,97	4	4,12		0,24	5,95	97,59
10	A60x	PD01	DB10	4,63	4,22	4,02	3,74	4	4,15		0,37	8,98	98,44
11	F18x	PD99	DB10	4,75	3,75	4,33	4,22	4	4,26		0,41	9,64	101,08
12	F12x	PC01	DB10	4,70	4,21	4,07	4,20	4	4,29		0,28	6,45	101,84
13	F33	PD01	DB10	4,78	4,51	3,99	4,37	4	4,41		0,33	7,46	104,63
14	A36	PD02	DB10	4,44	4,43	4,31	4,57	4	4,43		0,11	2,40	105,15
15	F32x	PD01	DB10	4,57	4,35	4,35	4,95	4	4,56		0,28	6,21	108,01
16	F13x	PD01	DB10	4,70	4,77	4,32	4,90	4	4,67		0,25	5,33	110,80
17	A79	PD01	DB10	4,67	4,81	4,60	4,62	4	4,68		0,09	1,98	110,87
18	F02x	PD02	DB08	4,94	4,80	4,65	4,39	4	4,70		0,24	5,01	111,33
19	A82	PD01	DB10	5,00	4,45	4,79	4,93	4	4,79		0,25	5,12	113,66
20	A80	PD03	DB10	4,98	4,68	4,54	5,51	4	4,93		0,43	8,72	116,85
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    72    4,22    0,250    5,931  
 25      % from the mean

\* = non tolerable mean because more than +/-

I      S<sub>R</sub>      CV<sub>R</sub>  
 18      0,479    11,369

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Cr      Sample: 4

Unit: µg/g

No.	Lab. Code	Method code P      D		Replications 1      2      3      4				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
1	F27	PD01	DB05	0,68	0,65	0,61	0,62	4	0,64		0,03	5,03	71,78
2	F08x	PD01	DB10	0,60	0,64	0,67	0,68	4	0,65		0,04	5,46	73,21
3	F33	PD01	DB10	0,71	0,68	0,71	0,70	4	0,70		0,01	2,02	78,85
4	F14x	PC01	DB10	0,74	0,76	0,72	0,73	4	0,74		0,02	2,32	83,07
5	A36	PD02	DB10	0,75	0,79	0,79	0,77	4	0,77		0,02	2,32	87,18
6	A47	PD01	DB08	0,91	0,80	0,77	0,74	4	0,81		0,07	9,21	90,68
7	A60x	PD01	DB10	0,74	0,76	0,79	0,95	0	0,81	c	0,10	12,06	90,89
8	A80	PD03	DB10	0,80	0,82	0,81	0,83	4	0,81		0,01	1,51	91,61
9	F18x	PD99	DB10	0,92	0,89	0,91	0,90	4	0,90		0,02	1,67	101,74
10	A82	PD01	DB10	0,89	0,91	0,94	0,93	4	0,92		0,02	2,51	103,18
11	F06	PD02	DB08	0,90	0,98	0,90	0,90	4	0,92		0,04	4,49	103,55
12	F16x	PC01	DB10	0,92	0,93	0,92	0,92	4	0,92		0,01	0,66	103,97
13	A79	PD01	DB10	0,99	0,99	1,01	1,01	4	1,00		0,01	0,89	112,58
14	F32x	PD01	DB10	1,04	1,02	1,01	1,05	4	1,03		0,02	1,77	116,02
15	F13x	PD01	DB10	1,02	1,06	1,04	1,05	4	1,04		0,02	1,64	117,43
16	F19x	PD02	DB08	1,07	1,04	1,09	1,03	4	1,06		0,03	2,60	119,12
17	A88	PD01	DB08	1,01	1,08	1,07	1,13	4	1,07		0,05	4,59	120,81
18	F12x	PC01	DB10	1,09	1,09	1,12	1,15	4	1,11		0,03	2,54	125,23
19	F07x	PD03	DB08	2,43	2,20	2,23	2,26	0	2,28	b *	0,10	4,45	256,74
20													
21													
22	F02x	PD02	DB08	<1	<1	<1	<1						
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean       $s_r$        $CV_r$   
 all labs    68    0,89    0,026    2,901

\* = non tolerable mean because more than +/-

Limit for the lower concentration range

I       $s_R$        $CV_R$   
 35 % from the mean    18    0,257    30,612

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Co      Sample: 1

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		$b$	$V_i$		
1	F08x	PD01	DB10	0,03	0,02	0,02	0,02	0	0,02	<b>b</b>	0,00	5,95
2	F16x	PC01	DB10	0,03	0,03	0,03	0,03	4	0,03		0,00	1,66
3	A60x	PD01	DB10	0,03	0,04	0,03	0,03	4	0,03		0,00	7,50
4	A47	PD01	DB08	0,04	0,03	0,03	0,04	4	0,03		0,00	11,71
5	F33x	PD01	DB10	0,03	0,04	0,03	0,03	4	0,03		0,00	3,67
6	F13x	PD01	DB10	0,03	0,04	0,04	0,03	4	0,04		0,00	3,17
7	F12x	PC01	DB10	0,03	0,04	0,04	0,04	4	0,04		0,00	5,85
8	A82	PD01	DB10	0,04	0,03	0,03	0,04	4	0,04		0,00	3,49
9	F32x	PD01	DB10	0,04	0,04	0,04	0,04	4	0,04		0,00	5,84
10	A79	PD01	DB10	0,04	0,04	0,04	0,04	4	0,04		0,00	2,64
11	F14x	PC01	DB10	0,04	0,04	0,04	0,04	4	0,04		0,00	2,09
12	A80	PD03	DB10	0,04	0,04	0,05	0,04	4	0,04		0,00	11,36
13	F07x	PD03	DB08	0,41	0,41	0,39	0,40	0	0,40	<b>b</b> *	0,01	2,20
14												1143,46
15												
16	A36	PD02	DB10	<,1	<,1	<,1	<,1			**		
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$   
 all labs    44    0,04    0,002    5,391

\* = non tolerable mean because more than +/-

\*\* = higher than maximum acceptable LOQ

Lower than the lowest evaluated result

|       $s_R$        $CV_R$   
 12    0,011    32,759

35 % from the mean

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Co      Sample: 2

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		b	*	$v_i$	
1	F07x	PD03	DB08	0,07	0,07	0,07	0,06	0	0,07	b *	0,00	5,48
2	F08x	PD01	DB10	0,11	0,11	0,11	0,11	4	0,11		0,00	1,72
3	F16x	PC01	DB10	0,12	0,12	0,12	0,12	4	0,12		0,00	2,25
4	A60x	PD01	DB10	0,12	0,12	0,12	0,13	4	0,12		0,01	4,34
5	A82	PD01	DB10	0,13	0,12	0,12	0,13	4	0,13		0,00	1,50
6	F33x	PD01	DB10	0,13	0,13	0,12	0,13	4	0,13		0,00	1,86
7	A47	PD01	DB08	0,13	0,13	0,13	0,13	4	0,13		0,00	2,14
8	F14x	PC01	DB10	0,13	0,13	0,13	0,13	4	0,13		0,00	1,42
9	F12x	PC01	DB10	0,13	0,14	0,13	0,13	4	0,13		0,01	5,61
10	A36	PD02	DB10	0,13	0,13	0,13	0,13	4	0,13		0,00	1,43
11	F32x	PD01	DB10	0,13	0,13	0,14	0,14	4	0,13		0,00	2,66
12	F13x	PD01	DB10	0,13	0,13	0,14	0,14	4	0,13		0,00	2,80
13	A79	PD01	DB10	0,14	0,14	0,14	0,14	4	0,14		0,00	0,53
14	A80	PD03	DB10	0,14	0,14	0,14	0,14	4	0,14		0,00	0,36
15												
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$   
 all labs    52    0,13    0,003    2,183  
 25 % from the mean

\* = non tolerable mean because more than +/-

I       $s_R$        $CV_R$   
 13    0,008    6,536

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Co      Sample: 3

Unit: µg/g

No.	Lab. Code	Method code P      D		Replications 1      2      3      4			n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
1	F08x	PD01	DB10	0,31	0,31	0,34	0,34	4	0,32	0,02	84,91
2	F16x	PC01	DB10	0,36	0,34	0,34	0,35	4	0,35	0,01	91,66
3	F14x	PC01	DB10	0,36	0,36	0,36	0,34	4	0,35	0,01	93,15
4	A60x	PD01	DB10	0,38	0,35	0,37	0,35	4	0,36	0,01	95,48
5	A82	PD01	DB10	0,37	0,37	0,36	0,36	4	0,36	0,00	96,14
6	F13x	PD01	DB10	0,37	0,37	0,37	0,38	4	0,37	0,00	98,16
7	F12x	PC01	DB10	0,38	0,39	0,37	0,37	4	0,38	0,01	98,89
8	F33x	PD01	DB10	0,39	0,38	0,37	0,37	4	0,38	0,01	99,68
9	A36	PD02	DB10	0,39	0,39	0,39	0,39	4	0,39	0,00	102,64
10	F32x	PD01	DB10	0,40	0,39	0,41	0,39	4	0,40	0,01	104,62
11	A47	PD01	DB08	0,40	0,41	0,38	0,40	4	0,40	0,01	104,62
12	A80	PD03	DB10	0,42	0,42	0,42	0,43	4	0,42	0,01	110,61
13	A79	PD01	DB10	0,45	0,46	0,45	0,45	4	0,45	0,00	119,44
14											
15											
16	F07x	PD03	DB08	<0,05	<0,05	<0,05	<0,05			*	
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											

n      Mean       $s_r$        $CV_r$   
 all labs      52      0,38      0,008      2,006

\* = non tolerable mean because more than +/- 25 % from the mean

|       $s_R$        $CV_R$   
 14      0,106      30,180

## 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Co      Sample: 4

Unit: µg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3		$s_i$	$V_i$		
1	F08x	PD01	DB10	0,18	0,18	0,19	0,18	0,01	3,84	80,81	
2	F16x	PC01	DB10	0,21	0,21	0,21	0,20	0,00	2,15	92,05	
3	F14x	PC01	DB10	0,21	0,20	0,22	0,22	0,01	4,37	94,26	
4	F33x	PD01	DB10	0,21	0,21	0,22	0,22	0,00	1,58	95,03	
5	A60x	PD01	DB10	0,23	0,21	0,22	0,22	0,00	2,23	97,68	
6	A82	PD01	DB10	0,22	0,22	0,23	0,23	0,00	2,05	99,19	
7	A47	PD01	DB08	0,23	0,23	0,22	0,22	0,01	2,60	100,68	
8	F12x	PC01	DB10	0,22	0,22	0,24	0,24	0,01	3,42	102,11	
9	A36	PD02	DB10	0,24	0,24	0,23	0,23	0,00	1,98	104,22	
10	F13x	PD01	DB10	0,24	0,23	0,24	0,25	0,01	2,15	105,21	
11	A80	PD03	DB10	0,24	0,25	0,24	0,25	0,00	1,84	108,20	
12	F32x	PD01	DB10	0,25	0,26	0,25	0,24	0,00	1,99	110,19	
13	A79	PD01	DB10	0,25	0,25	0,25	0,25	0,00	0,60	110,38	
14	F07x	PD03	DB08	0,46	0,47	0,46	0,48	0,01	2,17	208,00	
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											

n      Mean       $s_r$       CV<sub>r</sub>  
 all labs    52    0,23    0,005    2,324

\* = non tolerable mean because more than +/-

25 % from the mean

I       $s_R$       CV<sub>R</sub>  
 13    0,019    8,286

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Hg      Sample: 1

Unit: ng/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %
		P	D	1	2	3	4		Lab.mean	$V_i$		
1	A36	PD02	DB03	13,95	12,57	11,93	12,57	4	12,76		0,85	77,94
2	F16x	PC01	DB10	14,73	14,10	14,90	14,59	4	14,58		0,34	89,09
3	F28x	PZ98	DA05	15,09	15,70	15,48	14,70	4	15,25		0,44	93,15
4	F12x	PC01	DB10	15,65	17,29	15,10	16,01	4	16,01		0,93	97,85
5	F18x	PD99	DA05	16,40	16,40	16,30	16,30	4	16,35		0,06	99,90
6	A80	PZ98	DA05	17,20	16,90	17,00	16,30	4	16,85		0,39	102,96
7	F03	PZ98	DA05	17,20	17,20	16,12	17,20	4	16,93		0,54	103,45
8	F13x	PZ98	DA05	17,20	17,50	17,10	17,30	4	17,28		0,17	105,56
9	F02x	PZ98	DA05	17,80	17,80	17,30	17,90	4	17,70		0,27	108,15
10	A60x	PD01	DB10	18,09	18,71	18,80	18,33	4	18,48		0,33	112,93
11	A79	PD01	DB10	19,6a	18,40	18,30	18,30	3	18,33		0,06	112,02
12	A82	PZ98	DA05	24,20	24,87	24,43	24,35	0	24,46	b *	0,29	149,47
13												
14										*		
15	F08x	PD01	DB03	<10	<10	<10	<10					
16												
17												
18												
19												
20												
21												
22												
23												
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean       $s_r$        $CV_r$   
 all labs    43    16,37    0,399    2,436

\* = non tolerable mean because more than +/-

Limit for the lower concentration range

30 % from the mean

I       $s_R$        $CV_R$   
 13    6,356    45,776

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Hg      Sample: 2

Unit: ng/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		s <sub>i</sub>	V <sub>i</sub>			
1	A36	PD02	DB03	17,35	17,03	15,97	15,75	0	16,53	b	0,78	4,74	81,10
2	F16x	PC01	DB10	18,78	17,83	19,25	17,95	4	18,45		0,68	3,68	90,55
3	F28x	PZ98	DA05	19,56	19,49	19,81	20,04	4	19,73		0,25	1,27	96,80
4	F18x	PD99	DA05	20,20	19,30	19,60	20,20	4	19,83		0,45	2,27	97,29
5	F13x	PZ98	DA05	20,30	20,10	19,90	20,10	4	20,10		0,16	0,81	98,64
6	F03	PZ98	DA05	20,30	20,30	20,30	20,30	4	20,30		0,00	0,00	99,62
7	F02x	PZ98	DA05	20,30	20,20	20,30	20,50	4	20,33		0,13	0,62	99,74
8	A82	PZ98	DA05	20,18	20,63	20,61	20,18	4	20,40		0,25	1,25	100,11
9	A80	PZ98	DA05	21,20	20,60	20,30	20,50	4	20,65		0,39	1,88	101,34
10	A60x	PD01	DB10	21,24	21,68	21,45	21,61	4	21,49		0,20	0,91	105,48
11	F12x	PC01	DB10	21,35	20,33	24,89	22,19	0	22,19	c	1,96	8,82	108,90
12	A79	PD01	DB10	22,40	22,60	22,20	22,80	4	22,50		0,26	1,15	110,42
13													
14										*			
15	F08x	PD01	DB03	<10	<10	<10	<10						
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    40    20,38    0,276    1,356

\* = non tolerable mean because more than +/-

Limit for the lower concentration range

I      S<sub>R</sub>      CV<sub>R</sub>  
 30    % from the mean    6,228    33,618

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Hg      Sample: 3

Unit: ng/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %		
		P	D	1	2	3	4		b	*				
1	A36	PD02	DB03	9,09	9,09	8,23	8,12	0	8,63	b	*	0,53	6,14	66,42
2	F28x	PZ98	DA05	11,58	11,80	11,25	11,96	4	11,65			0,31	2,64	89,62
3	F16x	PC01	DB10	11,78	11,97	11,98	11,98	4	11,93			0,10	0,83	91,77
4	F18x	PD99	DA05	12,60	11,90	12,90	12,00	4	12,35			0,48	3,88	95,02
5	A80	PZ98	DA05	12,70	12,50	12,40	11,90	4	12,38			0,34	2,75	95,22
6	F12x	PC01	DB10	12,37	12,10	12,34	13,01	4	12,46			0,39	3,13	95,84
7	F03	PZ98	DA05	12,81	12,81	12,81	12,81	4	12,81			0,00	0,00	98,56
8	F02x	PZ98	DA05	13,30	13,20	13,40	13,50	4	13,35			0,13	0,97	102,72
9	A60x	PD01	DB10	14,09	13,51	13,93	13,77	4	13,82			0,25	1,78	106,37
10	F13x	PZ98	DA05	14,00	13,90	14,00	14,00	4	13,98			0,05	0,36	107,53
11	A79	PD01	DB10	15,00	15,70	15,00	15,30	4	15,25			0,33	2,17	117,34
12	A82	PZ98	DA05	35,09	34,58	34,91	35,12	0	34,93	b	*	0,25	0,71	268,72
13														
14														
15	F08x	PD01	DB03	<10	<10	<10	<10							
16														
17														
18														
19														
20														
21														
22														
23														
24														
25														
26														
27														
28														
29														
30														
31														
32														
33														
34														
35														
36														
37														
38														
39														
40														
41														
42														
43														
44														
45														
46														
47														
48														
49														
50														
51														
52														
53														
54														
55														

n      Mean       $s_r$        $CV_r$   
 all labs    40    13,00    0,237    1,826

30 % from the mean

\* = non tolerable mean because more than +/-

Limit for the lower concentration range

I	$s_R$	$CV_R$
11	4,056	34,327

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Hg      Sample: 4

Unit: ng/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev. $s_i$	Recovery %	
		P	D	1	2	3	4		b	c			
1	A82	PZ98	DA05	9,41	9,09	9,16	9,42	0	9,27	*	0,17	1,85	23,07
2	F08x	PD01	DB03	34,10	38,37	36,95	30,54	0	34,99	c	3,46	9,88	87,08
3	F16x	PC01	DB10	36,22	36,10	35,80	36,02	4	36,04		0,18	0,49	89,68
4	A36	PD02	DB03	37,02	36,05	36,16	35,84	4	36,27		0,52	1,43	90,26
5	F18x	PD99	DA05	38,00	38,00	37,30	39,00	4	38,08		0,70	1,84	94,76
6	F28x	PZ98	DA05	38,79	37,02	38,36	39,17	4	38,33		0,94	2,45	95,40
7	F12x	PC01	DB10	38,43	38,82	39,15	38,80	4	38,80		0,29	0,76	96,56
8	F02x	PZ98	DA05	40,60	40,40	40,40	40,00	4	40,35		0,25	0,62	100,42
9	A80	PZ98	DA05	41,80	41,40	41,80	41,80	4	41,70		0,20	0,48	103,78
10	F03	PZ98	DA05	42,05	42,05	42,05	42,05	4	42,05		0,00	0,00	104,65
11	A60x	PD01	DB10	43,70	41,78	41,79	41,46	4	42,18		1,02	2,42	104,98
12	A79	PD01	DB10	42,70	43,90	44,10	43,90	4	43,65		0,64	1,47	108,63
13	F13x	PZ98	DA05	44,20	44,50	44,80	44,70	4	44,55		0,26	0,59	110,87
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean       $s_r$        $CV_r$   
 all labs    44    40,18    0,455    1,132

\* = non tolerable mean because more than +/-

Limit for the lower concentration range

30 % from the mean

|       $s_R$        $CV_R$   
 11    2,885    7,179

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Ni      Sample: 1

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		s <sub>i</sub>	V <sub>i</sub>			
1	F07x	PD03	DB09	2,15	2,34	2,21	2,08	0	2,19	b *	0,11	4,98	28,98
2	A88	PD01	DB08	6,40	6,10	5,93	6,06	4	6,12		0,20	3,25	80,93
3	F16x	PC01	DB10	6,58	6,63	6,66	6,65	4	6,63		0,04	0,56	87,64
4	F27	PD01	DB05	6,74	6,59	6,71	6,78	4	6,71		0,08	1,22	88,63
5	F14x	PC01	DB10	6,84	6,77	6,90	6,98	4	6,87		0,09	1,30	90,85
6	F06	PD02	DB08	7,31	7,06	7,08	6,95	4	7,10		0,15	2,13	93,86
7	F13x	PD01	DB10	7,22	7,41	7,44	7,41	4	7,37		0,10	1,37	97,43
8	F12x	PC01	DB10	7,21	8,37	7,50	7,05	0	7,53	c	0,59	7,77	99,57
9	A60x	PD01	DB10	7,44	7,65	7,50	7,67	4	7,57		0,11	1,50	100,02
10	A82	PD01	DB10	7,61	7,58	7,58	7,60	4	7,59		0,02	0,20	100,37
11	F33x	PD01	DB10	7,76	7,56	7,95	7,40	4	7,67		0,24	3,12	101,36
12	A36	PD02	DB10	7,68	7,63	7,71	7,69	4	7,68		0,04	0,46	101,50
13	A47	PD01	DB08	7,50	8,09	7,29	7,84	4	7,68		0,36	4,62	101,52
14	F02x	PD02	DB08	8,01	7,09	8,00	7,85	4	7,74		0,44	5,66	102,28
15	F19x	PD02	DB08	8,29a	7,57	7,53	7,60	3	7,57		0,04	0,46	100,03
16	A79	PD01	DB10	7,93a	7,78	7,81	7,77	3	7,79		0,02	0,25	102,92
17	F05	PD02	DB08	7,84	7,80	7,85	7,80	4	7,82		0,03	0,34	103,41
18	F18x	PD99	DB10	8,04	7,95	8,26	7,98	4	8,06		0,14	1,74	106,51
19	F25	PB06	DB08	8,15	8,15	8,19	8,12	4	8,15		0,03	0,31	107,75
20	F32x	PD01	DB10	8,27	8,18	8,18	8,43	4	8,27		0,12	1,43	109,26
21	A80	PD03	DB10	8,25	8,22	8,55	8,40	4	8,36		0,15	1,82	110,45
22	A65	PD01	DB08	8,50	8,30	8,40	8,40	4	8,40		0,08	0,97	111,04
23	F08x	PD01	DB10	12,612a	8,28	7,65	7,67	3	7,87		0,36	4,58	103,98
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    81    7,56    0,134    1,771

\* = non tolerable mean because more than +/-

20 % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
 21    0,596    7,869

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Ni      Sample: 2

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		s <sub>i</sub>	v <sub>i</sub>			
1	F07x	PD03	DB09	0,73	0,74	0,79	0,80	0	0,76	b *	0,03	4,48	6,08
2	A88	PD01	DB08	10,15	10,42	9,91	9,82	4	10,08		0,27	2,67	80,41
3	F16x	PC01	DB10	11,04	11,47	11,01	11,16	4	11,17		0,21	1,88	89,15
4	F27	PD01	DB05	11,62	11,30	11,42	11,52	4	11,47		0,14	1,19	91,50
5	F06	PD02	DB08	11,70	11,60	11,50	11,40	4	11,55		0,13	1,12	92,18
6	F14x	PC01	DB10	11,74	11,60	11,40	11,70	4	11,61		0,15	1,31	92,66
7	F08x	PD01	DB10	11,64	11,33	12,24	12,27	4	11,87		0,46	3,89	94,72
8	A82	PD01	DB10	11,99	12,12	12,09	12,07	4	12,07		0,06	0,46	96,31
9	F13x	PD01	DB10	12,10	12,10	12,60	12,50	4	12,33		0,26	2,13	98,37
10	F33x	PD01	DB10	12,65	12,55	12,15	12,33	4	12,42		0,22	1,81	99,12
11	F19x	PD02	DB08	12,40	12,40	12,50	12,60	4	12,48		0,10	0,77	99,56
12	A60x	PD01	DB10	12,70	12,64	12,56	12,73	4	12,66		0,08	0,60	101,01
13	A36	PD02	DB10	12,55	12,73	12,92	12,85	4	12,76		0,16	1,27	101,85
14	F05	PD02	DB08	12,90	12,60	12,90	12,80	4	12,80		0,14	1,10	102,16
15	A47	PD01	DB08	12,92	12,73	12,61	12,97	4	12,81		0,17	1,31	102,22
16	F12x	PC01	DB10	12,17	13,90	12,84	12,73	0	12,91	c	0,72	5,58	103,04
17	A79	PD01	DB10	13,00	13,13	12,90	12,95	4	13,00		0,10	0,76	103,71
18	F18x	PD99	DB10	13,10	13,20	13,20	13,20	4	13,18		0,05	0,38	105,15
19	A80	PD03	DB10	13,50	13,70	13,50	13,60	4	13,58		0,10	0,71	108,34
20	F32x	PD01	DB10	13,70	13,80	13,70	13,60	4	13,70		0,08	0,60	109,34
21	F02x	PD02	DB08	13,90	13,60	13,40	14,00	4	13,73		0,28	2,01	109,54
22	F25	PB06	DB08	13,67	13,80	13,76	13,69	4	13,73		0,06	0,44	109,58
23	A65	PD01	DB08	14,30	14,10	14,10	14,20	4	14,18		0,10	0,68	113,13
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    84    12,53    0,157    1,255

\* = non tolerable mean because more than +/- 20 % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
 21    1,010    8,063

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Ni      Sample: 3

Unit: µg/g

No.	Lab. Code	Method code		Replications				n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3	4		s <sub>i</sub>	v <sub>i</sub>	s <sub>r</sub>	v <sub>r</sub>	
1	F07x	PD03	DB09	0,68	0,68	0,67	0,68	0	0,68	b *	0,01	0,81	20,12
2	A88	PD01	DB08	2,76	2,69	2,61	2,80	4	2,72		0,08	3,07	80,41
3	F14x	PC01	DB10	3,10	3,01	2,88	2,90	4	2,97		0,10	3,39	88,00
4	F16x	PC01	DB10	3,03	2,98	3,06	3,01	4	3,02		0,04	1,17	89,43
5	F27	PD01	DB05	3,25	3,12	3,02	2,93	4	3,08		0,14	4,46	91,22
6	F06	PD02	DB08	3,18	3,08	3,10	3,16	4	3,13		0,05	1,52	92,70
7	A82	PD01	DB10	3,24	3,17	3,20	3,16	4	3,19		0,03	1,01	94,50
8	F19x	PD02	DB08	3,23	3,20	3,18	3,25	4	3,22		0,03	0,97	95,21
9	F12x	PC01	DB10	3,22	3,33	3,23	3,14	4	3,23		0,08	2,38	95,75
10	F13x	PD01	DB10	3,25	3,36	3,21	3,25	4	3,27		0,06	1,97	96,77
11	A60x	PD01	DB10	3,26	3,32	3,31	3,32	4	3,30		0,03	0,79	97,77
12	A36	PD02	DB10	3,28	3,35	3,28	3,35	4	3,31		0,04	1,29	98,10
13	F33x	PD01	DB10	3,45	3,35	3,25	3,59	4	3,41		0,15	4,26	100,99
14	F32x	PD01	DB10	3,46	3,50	3,50	3,45	4	3,48		0,03	0,76	102,99
15	F08x	PD01	DB10	3,14	3,21	3,71	3,92	0	3,50	c	0,38	10,97	103,54
16	A47	PD01	DB08	3,57	3,91	3,29	3,41	4	3,55		0,27	7,59	104,99
17	A80	PD03	DB10	3,58	3,63	3,65	3,58	4	3,61		0,04	0,99	106,91
18	F05	PD02	DB08	3,67	3,60	3,60	3,68	4	3,64		0,04	1,20	107,73
19	F25	PB06	DB08	3,67	3,71	3,79	3,70	4	3,72		0,05	1,39	110,11
20	A65	PD01	DB08	3,70	3,80	3,80	3,60	4	3,73		0,10	2,57	110,32
21	F02x	PD02	DB08	4,14a	3,59	3,64	3,61	3	3,61		0,03	0,70	107,01
22	A79	PD01	DB10	3,82	3,85	3,87	3,83	4	3,84		0,02	0,55	113,79
23	F18x	PD99	DB10	3,95	3,84	3,95	4,07	4	3,95		0,09	2,38	117,06
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													
41													
42													
43													
44													
45													
46													
47													
48													
49													
50													
51													
52													
53													
54													
55													

n      Mean      s<sub>r</sub>      CV<sub>r</sub>  
 all labs    83    3,38    0,071    2,095

\* = non tolerable mean because more than +/-

20 % from the mean

I      s<sub>R</sub>      CV<sub>R</sub>  
 21    0,315    9,323

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

Element: Ni      Sample: 4

Unit: µg/g

No.	Lab. Code	Method code		Replications			n	Lab.mean		Lab.standard dev.		Recovery %
		P	D	1	2	3		s <sub>i</sub>	V <sub>i</sub>			
1	A88	PD01	DB08	2,62	2,73	2,56	2,88	4	2,70		0,14	5,21 84,63
2	F16x	PC01	DB10	2,73	2,78	2,79	2,79	4	2,77		0,03	1,11 86,91
3	F27	PD01	DB05	2,99	2,73	2,96	2,69	4	2,84		0,15	5,43 89,18
4	F14x	PC01	DB10	3,00	2,87	2,87	2,91	4	2,91		0,06	2,10 91,38
5	A82	PD01	DB10	3,17	2,99	3,00	3,03	4	3,05		0,08	2,72 95,57
6	A47	PD01	DB08	3,18	3,03	3,02	3,13	4	3,09		0,08	2,52 96,95
7	F06	PD02	DB08	3,14	3,17	3,14	3,07	4	3,13		0,04	1,36 98,20
8	F12x	PC01	DB10	3,02	3,09	3,22	3,23	4	3,14		0,10	3,30 98,45
9	A60x	PD01	DB10	3,10	3,16	3,22	3,21	4	3,17		0,05	1,71 99,55
10	A36	PD02	DB10	3,22	3,21	3,14	3,17	4	3,18		0,04	1,15 99,81
11	F13x	PD01	DB10	3,20	3,16	3,13	3,26	4	3,19		0,06	1,76 100,01
12	F33x	PD01	DB10	3,29	3,25	3,17	3,14	4	3,21		0,07	2,16 100,79
13	F05	PD02	DB08	3,23	3,27	3,28	3,17	4	3,24		0,05	1,54 101,57
14	A79	PD01	DB10	3,23	3,26	3,27	3,31	4	3,27		0,03	1,01 102,46
15	F19x	PD02	DB08	3,20	3,31	3,27	3,34	4	3,28		0,06	1,85 102,91
16	F32x	PD01	DB10	3,33	3,42	3,28	3,43	4	3,37		0,07	2,15 105,57
17	F18x	PD99	DB10	3,36	3,53	3,34	3,53	4	3,44		0,10	3,03 107,93
18	A80	PD03	DB10	3,60	3,41	3,39	3,36	4	3,44		0,11	3,16 107,93
19	F02x	PD02	DB08	3,28	3,73	3,26	3,58	4	3,46		0,23	6,66 108,63
20	F08x	PD01	DB10	3,80	3,61	2,99	3,80	0	3,55	c	0,38	10,76 111,44
21	F25	PB06	DB08	3,55	3,57	3,58	3,56	4	3,57		0,01	0,33 111,86
22	A65	PD01	DB08	3,60	3,60	3,7a	3,60	3	3,60		0,00	0,00 112,95
23	F07x	PD03	DB09	7,94	8,04	8,02	8,10	0	8,03	b *	0,07	0,82 251,80
24												
25												
26												
27												
28												
29												
30												
31												
32												
33												
34												
35												
36												
37												
38												
39												
40												
41												
42												
43												
44												
45												
46												
47												
48												
49												
50												
51												
52												
53												
54												
55												

n      Mean      S<sub>r</sub>      CV<sub>r</sub>  
 all labs    83    3,19    0,075    2,363

\* = non tolerable mean because more than +/-

20 % from the mean

I      S<sub>R</sub>      CV<sub>R</sub>  
 21    0,246    7,702



# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code				Replicates				Mean	Si	Vi	
				P		D	1	2		3	4				
	Ag	(ng/g)	1	A80	PD03	DB10	<10	<10	<10	<10	<10	<10			
Ag	(ng/g)	2	F19X	PD02	DB08	50	48,9	50,7	49,4	49,75	0,777	1,561			
Ag	(ng/g)	3	A80	PD03	DB10	<10	<10	<10	<10	<10	<10	1,517			
Ag	(ng/g)	4	A80	PD03	DB10	11,6	13,4	13	11,9	12,48	0,862	6,907			
Al	(µg/g)	1	F19X	PD02	DB08	50	48,9	50,7	49,4	49,75	0,777	1,561			
Al	(µg/g)	1	F18X	PD99	DB08	53,7	53,3	55,1	54,6	54,18	0,822	1,517			
A36	PD02	DB08	57,2	52,62	61,14	52,19	55,79	4,228	7,578						
F28X	PD02	DB08	57,99	62,86	61,25	58,34	60,11	2,344	3,900						
F07X	PD03	DB08	63,34	61,15	60,6	58	60,77	2,195	3,611						
A60X	PC01	DB10	59,7601	62,7558	61,5307	60,8146	61,22	1,258	2,056						
A80	PD03	DB10	58,2	63,1	66,2	61,6	62,28	3,324	5,338						
F25	PB06	DB08	62,6	62,05	63,18	62,48	62,58	0,466	0,745						
F05	PD02	DB08	61,7	69,8	63,9	66	65,35	3,447	5,275						
F32X	PD01	DB08	67,6	68,7	66,3	65,7	67,08	1,343	2,002						
F12X	PC01	DB08	72,9	71,4	69,5	71,3	71,28	1,391	1,952						
F16X	PC01	DB08	74,12	74,94	73,83	74,51	74,35	0,482	0,648						
A65	PD01	DB08	74	74	75	78	75,25	1,893	2,516						
F13X	PD01	DB08	76,6	76,2	75,5	75,8	76,03	0,479	0,630						
A79	PD01	DB10	79,21	79,54	80,52	74,62	78,47	2,628	3,349						
F15	PC01	DB08	79	77	80	79	78,75	1,258	1,598						
A59	PC01	DB08	86,49	85,71	85,24	86,89	86,08	0,745	0,866						
A57	PZ02	DD02	101,7	104,9	107,2	105,2	104,75	2,275	2,172						
Al	(µg/g)	2	F07X	PD03	DB08	50,39	48,08	56,16	47,66	50,57	3,914	7,739			
			F19X	PD02	DB08	338	353	349	356	349,00	7,874	2,256			
A57	PZ02	DD02	361,5	359,9	365,5	374,7	365,40	6,632	1,815						
F32X	PD01	DB08	369	376	360	378	370,75	8,139	2,195						
F18X	PD99	DB08	377	382	380	377	379,00	2,449	0,646						
A59	PC01	DB08	389,37	373,79	380,42	372,81	379,10	7,637	2,015						
F16X	PC01	DB08	384,4	390,7	385,6	386,4	386,78	2,743	0,709						
F28X	PD02	DB08	371,84	397,16	410,52	386,61	391,53	4,182	16,373						

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi
				P	D	1	2	3	4			
A36	PD02	DB08	389,57	395,96	405,53	378,92	392,50	11,177	2,848			
F05	PD02	DB08	394	393	393	394	393,50	0,577	0,147			
F25	PB06	DB08	397,9	398,1	394,6	392,9	395,88	2,551	0,644			
A60x	PC01	DB10	405,0597	397,8131	392,7869	399,0966	398,69	5,045	1,265			
F15	PC01	DB08	401	397	403	410	402,75	5,439	1,350			
F12x	PC01	DB08	409,4	403,6	400,2	404,4	404,40	3,798	0,939			
A80	PD03	DB10	407	413	396	403	404,75	7,136	1,763			
A65	PD01	DB08	416	413	408	406	410,75	4,573	1,113			
F13x	PD01	DB08	419	421	416	426	420,50	4,203	1,000			
A79	PD01	DB10	432,2	436,7	469,4	434	443,08	17,647	3,983			
Al	(µg/g)	3	A36	PD02	DB08	51,84	51,41	47,99	50,66	1,793	3,539	
			F19x	PD02	DB08	53,1	51,8	52,5	52,4	0,532	1,015	
			F18x	PD99	DB08	53	52,3	53,3	54,4	0,874	1,641	
			A57	PZ02	DD02	52,6	55,7	55,9	55,9	1,619	2,943	
			F28x	PD02	DB08	56,345	54,495	58,939	55,08	1,973	3,511	
			F32x	PD01	DB08	58,4	57,8	57,4	58,4	0,490	0,845	
			F12x	PC01	DB08	59,2	57	58,3	57,6	0,946	1,631	
			F16x	PC01	DB08	60,09	60,55	58,74	60,14	0,787	1,315	
			A60x	PC01	DB10	59,7381	59,4955	60,61	60,1036	59,99	0,485	0,808
			A80	PD03	DB10	58,2	61,5	62,4	61,9	61,00	1,903	3,119
			A59	PC01	DB08	62,45	63,28	60,47	60,91	61,78	1,313	2,125
			F25	PB06	DB08	61,45	62,22	62,7	62,71	62,27	0,593	0,952
			F13x	PD01	DB08	64,2	64,1	62,9	64	63,80	0,606	0,949
			A65	PD01	DB08	66	63	64	63	64,00	1,414	2,210
			F05	PD02	DB08	65,1	64	65,1	65,2	64,85	0,569	0,877
			F15	PC01	DB08	67	66	64	66	65,75	1,258	1,914
			A79	PD01	DB10	74,56	74,37	73,35	74,16	74,11	0,532	0,718
			F07x	PD03	DB08	94,81	96,12	96,66	94,45	95,51	1,050	1,099
Al	(µg/g)	4	F07x	PD03	DB08	59,33	56,59	60,82	62,95	59,92	2,673	4,460
			F19x	PD02	DB08	268	267	268	270	268,25	1,258	0,469

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi	
				P	D	1	2	3	4				
A36		PD02	DB08	290,77	282,19	263,95	263,95	275,22	13,471	4,895			
F25		PB06	DB08	275,1	275,1	278,9	278,9	277,00	2,194	0,792			
F18x		PD99	DB08	291	300	271	281	285,75	12,527	4,384			
F28x		PD02	DB08	305,3	294,5	273,5	286,9	290,05	13,369	4,609			
A80		PD03	DB10	277	298	287	300	290,50	10,661	3,670			
F05		PD02	DB08	293	293	295	294	293,75	0,957	0,326			
A60x		PC01	DB10	287,1993	299,82	298,5649	298,8955	296,12	5,971	2,016			
A59		PC01	DB08	378,17	383,49	377,13	374,92	378,43	3,637	0,961			
F16x		PC01	DB08	407,3	412,5	405,2	412,3	409,33	3,654	0,893			
F32x		PD01	DB08	403	420	425	428	419,00	11,165	2,665			
A57		PZ02	DD02	414,4	422,3	427,7	417,2	420,40	5,863	1,395			
A65		PD01	DB08	439	432	434	438	435,75	3,304	0,758			
F12x		PC01	DB08	442,4	443,6	424	434,4	436,10	9,041	2,073			
F15		PC01	DB08	409	452	450	444	438,75	20,123	4,586			
F13x		PD01	DB08	456	453	458	456	455,75	2,062	0,452			
A79		PD01	DB10	466,8	471,6	471,1	470,1	469,90	2,159	0,459			
Ba	(µg/g)	1	F16x	PC01	DB10	81,49	81,27	81,42	81,51	0,255	0,313		
		A82	PD01	DB08	84,23	84,25	84,95	84,29	84,43	0,348	0,412		
		A65	PD01	DB08	92,6	91,2	92,3	90,5	91,65	0,975	1,063		
		A80	PD03	DB10	100,5	101,7	102,1	102,6	101,73	0,896	0,881		
Ba	(µg/g)	2	F16x	PC01	DB10	38,26	40,25	37,8	38,71	38,76	1,064	2,745	
		A82	PD01	DB08	39,44	39,61	39,59	39,36	39,50	0,120	0,304		
		A65	PD01	DB08	43,4	42,9	42,9	42,7	42,98	0,299	0,695		
		A80	PD03	DB10	46,6	46,2	45,5	45,6	45,98	0,519	1,128		
Ba	(µg/g)	3	F16x	PC01	DB10	10,11	9,65	9,634	9,479	9,72	0,272	2,802	
		A82	PD01	DB08	9,977	10,02	9,994	10,03	10,01	0,024	0,242		
		A65	PD01	DB08	10,7	10,4	10,6	10,2	10,48	0,222	2,117		
		A80	PD03	DB10	11	11,1	11,5	11,3	11,23	0,222	1,975		
Ba	(µg/g)	4	F16x	PC01	DB10	29,38	29,43	29,41	29,42	29,41	0,022	0,073	
		A82	PD01	DB08	30,43	30,6	30,42	30,3	30,44	0,123	0,405		

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi
				P	D	1	2	3	4			
A65		A65	PD01	DB08	32,7	32,2	31,9	32,4	32,30	0,337	1,042	
		A80	PD03	DB10	34,3	34,4	34,3	34,3	34,33	0,050	0,146	
Be (ng/g)	1	F16x	PC01	DB10	11,38	11,11	11,67	11,56	11,43	0,245	2,139	
		F16x	PC01	DB10	23,99	25,66	24,7	25,65	25,00	0,810	3,240	
Be (ng/g)	3	F16x	PC01	DB10	3,796	3,902	3,798	3,767	3,82	0,059	1,552	
		F16x	PC01	DB10	28,08	26,41	28,72	26,87	27,52	1,066	3,873	
Bi (ng/g)	1	F16x	PC01	DB10	5,72	5,417	6,011	5,439	5,65	0,279	4,946	
		A80	PD03	DB10	6,93	7,01	7,32	6,62	6,97	0,288	4,127	
Bi (ng/g)	2	F16x	PC01	DB10	5,281	5,398	5,253	5,395	5,33	0,076	1,419	
		A80	PD03	DB10	5,88	6,09	6,28	6,31	6,14	0,199	3,238	
Bi (ng/g)	3	A80	PD03	DB10	<2	<2	<2	<2	<2			
		F16x	PC01	DB10	1,173	1,327	1,132	1,233	1,22	0,085	6,963	
Bi (ng/g)	4	F16x	PC01	DB10	12,13	12,43	12,07	12,18	12,20	0,158	1,296	
		A80	PD03	DB10	13,1	13	13,8	14,2	13,53	0,574	4,242	
Ce (ng/g)	1	A80	PD03	DB10	320	335	337	323	328,75	8,500	2,586	
		A80	PD03	DB10	49,5	51,2	47,9	60,1	52,18	5,452	10,450	
Ce (ng/g)	2	A80	PD03	DB10	20,7	18,9	19,5	18,1	19,30	1,095	5,676	
		A80	PD03	DB10	307	306	308	320	310,25	6,551	2,112	
Ce (ng/g)	3	A80	PD03	DB10	307	306	308	320	310,25	6,551	2,112	
		A80	PD03	DB10	307	306	308	320	310,25	6,551	2,112	
Cl ( $\mu\text{g/g}$ )	1	F02	PA06	DF03	120	120	120	<100	<100			
		A57	PZ02	DD02	110	110	120	110	112,50	5,000	4,444	
Cl ( $\mu\text{g/g}$ )	2	F02	PA06	DF03	230	220	240	230	230,00	8,165	3,550	
		A57	PZ02	DD02	290	300	300	290	295,00	5,774	1,957	
Cl ( $\mu\text{g/g}$ )	3	F02	PA06	DF03	620	610	600	610	610,00	8,165	1,339	
		A57	PZ02	DD02	710	700	710	710	707,50	5,000	0,707	
Cl ( $\mu\text{g/g}$ )	4	F02	PA06	DF03	920	910	910	910	915,00	5,774	0,631	
		A57	PZ02	DD02	950	940	950	950	947,50	5,000	0,528	
Cs (ng/g)	1	A80	PD03	DB10	6,73	7,36	7,47	6,93	7,12	0,350	4,919	
		A80	PD03	DB10	123	122	121	121	121,75	0,957	0,786	
Cs (ng/g)	2	A80	PD03	DB10	70	70,1	72	72,1	71,05	1,156	1,627	
		A80	PD03	DB10	562	563	562	562	562,50	0,577	0,103	

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi
				P	D	1	2	3	4			
F	(µg/g)	1	F32x	PB99	DF03	<5	<5	<5	<5	<5	<5	
			F02	PE01	DF03	<3	<3	<3	<3	<3	<3	
F	(µg/g)	2	F32x	PB99	DF03	<5	<5	<5	<5	<5	<5	
			F02	PE01	DF03	<3	<3	<3	<3	<3	<3	
F	(µg/g)	3	F32x	PB99	DF03	<5	<5	<5	<5	<5	<5	
			F02	PE01	DF03	<3	<3	<3	<3	<3	<3	
F	(µg/g)	4	F02	PE01	DF03	11,5	11,6	10,2	9,4	10,68	1,063	9,954
			F32x	PB99	DF03	12,1	12,3	12	12,3	12,18	0,150	1,232
La	(ng/g)	1	A80	PD03	DB10	238	245	248	240	242,75	4,573	1,884
			A80	PD03	DB10	30,5	32	29,7	36,1	32,08	2,848	8,878
La	(ng/g)	3	A80	PD03	DB10	16,3	15,5	16,5	15,7	16,00	0,476	2,976
			A80	PD03	DB10	151	150	151	158	152,50	3,697	2,424
Li	(µg/g)	1	A80	PD03	DB10	0,0567	0,0546	0,0563	0,0529	0,06	0,002	3,157
			A80	PD03	DB10	0,0317	0,0324	0,0325	0,0309	0,03	0,001	2,325
Li	(µg/g)	3	A80	PD03	DB10	0,136	0,133	0,137	0,135	0,14	0,002	1,263
			A80	PD03	DB10	0,152	0,164	0,155	0,161	0,16	0,005	3,467
Mo	(ng/g)	1	F13x	PD01	DB10	130	128	135	124	129,25	4,573	3,538
			F16x	PC01	DB10	130,5	136,9	130,5	136,1	133,50	3,479	2,606
A36		A36	PD02	DB10	137,8	136,8	136,5	132,3	135,85	2,431	1,790	
			F32	PD01	DB10	140	135	153	135	140,75	8,500	6,039
A80		A80	PD03	DB10	156	153	157	160	156,50	2,887	1,845	
			F07x	PD03	DB08	482	491,9	472,1	430,9	469,23	26,798	5,711
Mo	(ng/g)	2	F32	PD01	DB10	56,6	55,5	59,8	58,7	57,65	1,954	3,389
			F13x	PD01	DB10	61,9	61,3	62,4	61,5	61,78	0,486	0,786
F16x		F16x	PC01	DB10	65,57	65,17	61,5	59,89	63,03	2,783	4,415	
			A36	PD02	DB10	66,7	63,8	62,5	60,2	63,30	2,712	4,284
A80		A80	PD03	DB10	79,2	79,7	87,3	81,7	81,98	3,711	4,527	
			F07x	PD03	DB08	364,7	361,7	338	355,8	355,05	11,953	3,367
Mo	(ng/g)	3	F07x	PD03	DB08	58,04	60,57	62,44	55,6	59,16	2,982	5,040
			A36	PD02	DB10	103,04	99,4	98,87	100,04	100,34	1,864	1,858

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi
				P	D	1	2	3	4			
F13x	PD01	DB10	106	108	104	108	106,50	1,915	1,798			
F16x	PC01	DB10	105,7	108,7	106,9	113,3	108,65	3,336	3,071			
F32	PD01	DB10	112	117	104	107	110,00	5,715	5,196			
A80	PD03	DB10	129	123	124	128	126,00	2,944	2,336			
Mo (ng/g)	4	F32	PD01	DB10	81,6	80,6	77,3	79,5	79,75	1,845	2,313	
F16x	PC01	DB10	78,81	84,65	77,1	81,2	80,44	3,272	4,067			
F13x	PD01	DB10	83,2	82,9	83,1	80,4	82,40	1,339	1,625			
A36	PD02	DB10	81,4	89,5	86,9	90,5	87,08	4,076	4,681			
A80	PD03	DB10	103,1	109	107,1	106,9	106,53	2,472	2,320			
F07x	PD03	DB08	433,5	414,6	422,4	416,2	421,68	8,571	2,033			
Na (µg/g)	1	F19x	PD02	DB08	8,48	7,32	6,64	6,79	7,31	0,834	11,417	
A60x	PD01	DB10	9,5345	6,6641	7,3783	7,3933	7,74	1,242	16,043			
F32x	PD01	DB08	9,49	9,63	9,45	9,29	9,47	0,140	1,478			
F16x	PC01	DB10	10,19	10,32	9,824	10,3	10,16	0,230	2,266			
F18x	PD99	DB08	11,3	10,6	10,8	11,3	11,00	0,356	3,235			
F05	PD02	DB08	13,4	11,7	15,9	15,3	14,08	1,909	13,560			
F07x	PD03	DB08	16,41	16,58	16,77	16,67	16,61	0,153	0,920			
A36	PD02	DB08	16,51	16,4	17,58	16,94	16,86	0,535	3,174			
A65	PD01	DB08	19,8	19,9	18,8	20,3	19,70	0,638	3,237			
F14x	PC01	DB08	21,4	20,7	21,3	21,1	21,13	0,310	1,465			
A79	PD01	DB08	23,56	22,6	22,48	22,59	22,81	0,505	2,212			
F25	PB06	DB08	40,88	39,68	37,37	43,48	40,35	2,543	6,303			
F28x	PD02	DB08	57,268	55,274	58,982	53,838	56,34	2,254	4,000			
Na (µg/g)	2	F18x	PD99	DB08	<10	<10	<10					
F19x	PD02	DB08	<6,33	<6,32	<6,34	<6,31						
A60x	PD01	DB10	3,5982	3,6548	3,7956	4,3004	3,84	0,320	8,332			
F32x	PD01	DB08	6,18	6,01	5,82	6,22	6,06	0,183	3,015			
F16x	PC01	DB10	6,22	6,529	5,655	6,316	6,18	0,373	6,037			
A36	PD02	DB08	7,77	7,51	8,64	8,14	8,02	0,490	6,118			
F07x	PD03	DB08	9,586	10,28	9,869	9,468	9,80	0,361	3,684			

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi
				P	D	1	2	3	4			
F28x	PD02	DB08	11,8	10,87	12,22	11,45	11,59	0,571	4,931			
F14x	PC01	DB08	11,9	12,1	12,1	11,8	11,98	0,150	1,253			
F05	PD02	DB08	12,8	12	12,1	13,4	12,58	0,655	5,210			
A65	PD01	DB08	14,9	14,7	16,1	13	14,68	1,276	8,698			
A79	PD01	DB08	16,15	17,01	16,61	16,7	16,62	0,356	2,140			
F25	PB06	DB08	36,42	35,36	34,37	34,71	35,22	0,902	2,562			
Na	(µg/g)	3	F18x	PD99	DB08	<10	<10	<10	<10			
			F19x	PD02	DB08	<6,3	<6,3	<6,3	<6,3			
			A60x	PD01	DB10	0,7558	0,4594	0,8244	1,7692	0,95	0,567	59,570
			F32x	PD01	DB08	2,24	1,83	2,11	1,97	2,04	0,177	8,682
			A36	PD02	DB08	1,91	1,67	3,12	2,55	2,31	0,654	28,282
			F16x	PC01	DB10	3,058	2,575	3,068	2,646	2,84	0,263	9,267
			F14x	PC01	DB08	3,3	3,5	3,5	3,3	3,40	0,115	3,396
			F28x	PD02	DB08	7,664	7,07	7,463	7,342	7,38	0,248	3,363
			F05	PD02	DB08	6,94	7,31	7,55	7,78	7,40	0,359	4,854
			A79	PD01	DB08	9,51	10,28	9,78	9,38	9,74	0,398	4,089
			A65	PD01	DB08	11,1	11,1	11,1	11,1	11,10	0,000	0,000
			F07x	PD03	DB08	24,37	23,26	22,52	23,38	23,38	0,760	3,251
			F25	PB06	DB08	28,83	27,61	30,95	25,52	28,23	2,272	8,049
Na	(µg/g)	4	A60x	PD01	DB10	16,0478	16,1112	15,9528	15,7136	15,96	0,174	1,093
			F19x	PD02	DB08	17,7	17,5	16,3	18	17,38	0,746	4,291
			F07x	PD03	DB08	17,37	17,76	17,49	17,59	17,55	0,165	0,940
			F18x	PD99	DB08	18,1	22	20,7	18,3	19,78	1,896	9,589
			F28x	PD02	DB08	20,893	20,444	19,724	19,066	20,03	0,804	4,013
			A36	PD02	DB08	21,03	20,39	20,17	20,6	20,55	0,366	1,783
			F16x	PC01	DB10	20,98	21,27	20,65	21,14	21,01	0,268	1,274
			F32x	PD01	DB08	21,3	22	22,8	22,7	22,20	0,698	3,142
			F05	PD02	DB08	24	21,8	24,1	24,3	23,55	1,173	4,982
			F14x	PC01	DB08	24	23,9	23,7	23,6	23,80	0,183	0,767
			A65	PD01	DB08	30,5	30	31,4	30,3	30,55	0,603	1,973

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi	
				P	D	1	2	3	4				
Nb	(ng/g)	A79	PD01	DB08	31,68	32,86	32,48	32,5	32,38	0,498	1,539		
		F25	PB06	DB08	51,89	50,7	46,65	48,72	49,49	2,301	4,649		
Nb	(ng/g)	1	A80	PD03	DB10	7,11	7,88	8,3	7,32	7,65	0,540	7,061	
		2	A80	PD03	DB10	5,72	6,3	5,09	5,47	5,65	0,508	8,994	
Nb	(ng/g)	3	A80	PD03	DB10	1,35	1,77	2,06	1,52	1,68	0,309	18,462	
		Nb	(ng/g)	4	A80	PD03	DB10	42,7	43,4	43	44,9	43,50	0,976
Rb	( $\mu$ g/g)	1	F16x	PC01	DB10	1,033	1,013	1,034	1,032	1,03	0,010	0,976	
		A80	PD03	DB10	1,18	1,19	1,2	1,18	1,19	0,010	0,806		
Rb	( $\mu$ g/g)	2	F16x	PC01	DB10	6,971	6,833	7,013	6,929	6,94	0,077	1,111	
		A80	PD03	DB10	8,32	8,37	8,28	8,28	8,31	0,043	0,514		
Rb	( $\mu$ g/g)	3	F16x	PC01	DB10	16,61	17,13	16,71	16,73	16,80	0,229	1,366	
		A80	PD03	DB10	20,3	20,4	20,8	20,7	20,7	0,238	1,158		
Rb	( $\mu$ g/g)	4	F16x	PC01	DB10	40,24	40,85	39,1	39,6	39,95	0,761	1,906	
		A80	PD03	DB10	49,5	49,4	48,7	49	49,15	0,370	0,752		
Sb	(ng/g)	1	A80	PD03	DB10	<50	<50	<50	<50	<50			
		A79	PC01	DB10	11	10,3	10,5	10,5	10,5	10,58	0,299	2,824	
Sb	(ng/g)	F16x	PC01	DB10	10,96	11,72	10,81	10,81	11,08	0,436	3,935		
		F32	PD01	DB10	14,1	15,7	15,7	16,7	15,55	1,075	6,916		
Sb	(ng/g)	2	A80	PD03	DB10	<50	<50	<50	<50	<50			
		F16x	PC01	DB10	22,48	22,39	20,7	21,74	21,83	0,821	3,760		
Sb	(ng/g)	F32	PD01	DB10	26,3	26,3	26,3	27,2	26,53	0,450	1,697		
		A79	PC01	DB10	26,5	28,1	26,6	28,1	27,33	0,896	3,278		
Sb	(ng/g)	3	A80	PD03	DB10	<50	<50	<50	<50	<50			
		A79	PC01	DB10	<10	<10	<10	<10	<10				
Sb	(ng/g)	4	A79	PC01	DB10	37	32,6	39,2	38,5	36,83	0,295	4,669	
		F16x	PC01	DB10	42,37	45,97	42,96	45,6	44,23	0,603	5,713		
Sb	(ng/g)	F32	PD01	DB10	62,5	62,2	62,8	62,5	62,50	0,245	4,124		
		A80	PD03	DB10	72,5	90,6	69,3	89,7	80,53	11,197	13,904		

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi
				P	D	1	2	3	4			
Se (ng/g)	1	A80	PD03	DB10	<100	<100	<100	<100	<100	9,93	0,155	1,558
		F32	PD01	DB04	<30	<30	<30	<30	<30			
		A36	PD02	DB10	<25	<25	<25	<25	<25			
		A82	PD01	DB10	10,03	9,786	10,1	9,819	9,819			
		A60x	PC01	DB10	27,6186	41,0436	42,3294	27,2676	34,56			
		F16x	PC01	DB10	93,54	73,97	89,92	81,36	84,70			
		A80	PD03	DB10	<100	<100	<100	<100	<100			
Se (ng/g)	2	F32	PD01	DB04	<30	<30	<30	<30	<30	8,82	0,273	3,091
		A36	PD02	DB10	<25	<25	<25	<25	<25			
		A82	PD01	DB10	8,463	8,847	8,844	9,127	8,82			
		A60x	PC01	DB10	10,4384	19,4446	4,2352	27,2376	15,34			
		F16x	PC01	DB10	86,91	80,61	77,17	64,06	77,19			
		A80	PD03	DB10	<100	<100	<100	<100	<100			
		F32	PD01	DB04	<30	<30	<30	<30	<30			
Se (ng/g)	3	A36	PD02	DB10	<25	<25	<25	<25	<25	9,636	10,095	65,815
		A60x	PC01	DB10	<20	<20	<20	<20	<20			
		A82	PD01	DB10	<2	<2	<2	<2	<2			
		F16x	PC01	DB10	61,43	93,7	88,48	73,64	79,31			
		A82	PD01	DB10	263,2	265	266,3	266,3	265,20			
		F32	PD01	DB04	278	252	271	261	265,50			
		A80	PD03	DB10	282	279	331	272	291,00			
Se (ng/g)	4	A60x	PC01	DB10	305,125	268,0482	305,0115	292,3189	292,63	321,11	12,142	3,781
		A36	PD02	DB10	309,87	332,3	330,9	311,37	321,11			
		F16x	PC01	DB10	371,5	377,5	403,8	436,2	397,25			
		A80	PC01	DB10	36,38	38,1	36,24	37,46	37,05			
		F16x	PD03	DB10	49,2	51,5	50,6	50,2	50,38			
		A80	PD03	DB10	60,15	61,57	57,76	60,25	59,93			
		F16x	PC01	DB10	93,8	74	71,6	69,4	77,20			
Sn (ng/g)	2	A80	PD03	DB10	10,31	11,4	10,53	12,67	11,23	1,071	9,536	2,647
		A80	PD03	DB10	14,7	13,6	15,1	14	14,35			
Sn (ng/g)	3	F16x	PC01	DB10	10,31	11,4	10,53	12,67	11,23	0,676	4,709	14,540
		A80	PD03	DB10	14,7	13,6	15,1	14	14,35			

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi	
				P	D	1	2	3	4				
Sn (ng/g)	4	F16x A80	PC01 PD03	DB10 DB10	88,4 120	95,97 116	86,97 110	91,64 123	90,75 117,25	3,994 5,620	4,401 4,793		
			PC01 PD01 PD03	DB10 DB08 DB10	9,693 10,8 11,3	9,594 10,8 11,3	9,811 10,8 11,5	9,65 10,8 11,40	9,69 10,80 11,40	0,092 0,000 0,115	0,950 0,000 1,013		
Sr (μg/g)	2	F16x A65 A80	PC01 PD01 PD03	DB10 DB08 DB10	14,8 17,5 18	16,42 17,3 17,8	15,27 17,4 17,7	15,46 17,5 17,8	15,49 17,43 17,83	0,681 0,096 0,126	4,396 0,549 0,706		
			PC01 PD01 PD03	DB10 DB08 DB10	9,172 9,7 9,56	8,346 9,6 9,72	8,549 9,7 9,94	8,497 9,5 9,81	8,64 9,63 9,76	0,364 0,096 0,160	4,216 0,995 1,636		
Sr (μg/g)	3	F16x A65 A80	PC01 PD01 PD03	DB10 DB08 DB10	8,5 8,54 8,54	8,4 8,53 8,46	8,4 8,53 8,46	8,497 9,5 9,81	8,64 9,63 9,76	0,364 0,096 0,160	4,396 0,549 0,706		
			PC01 PD01 PD03	DB10 DB08 DB10	7,222 8,5 8,54	7,501 8,4 8,53	7,245 8,4 8,46	7,466 8,5 8,55	7,36 8,45 8,52	0,145 0,058 0,041	1,975 0,683 0,479		
Ti (μg/g)	1	A80 A65	PD03 PD01	DB10 DB08	1,84 3,5	2,12 4	2,12 3,8	2,12 3,7	2 3,7	2,02 3,75	0,133 0,208	6,568 5,551	
			PD03 PD01	DB10 DB08	0,984 1,9	1,09 2,4	0,802 1,8	0,98 1,9	0,96 2,00	0,119 0,271	12,387 13,540		
Ti (μg/g)	2	A80 A65	PD01 PD01	DB10 DB08	<1,1 <1,1	<1,1 0,555	<1,1 0,552	<1,1 0,501	<1,1 0,50	0,96 0,50	0,119 0,067	12,387 13,320	
			PD03 PD01	DB10 DB08	34,7 37,8	37,9 38,5	36,9 37,3	38,7 39	37,05 38,15	37,05 38,15	1,731 0,751	4,672 1,967	
Ti (ng/g)	1	A36 A80 A79 A82 A60x F32 F16x F13x	PD02 PD03 PD01 PD01 PD03 PD01 PD01 PD01	DB10 DB10 DB10 DB10 DB10 DB10 DB10 DB10	<10 <5 <2 0,8542 1,56 1,18 1,161 1,3	<10 <5 <2 0,8868 1,0981 0,86 1,191 1,2	<10 <5 <2 0,8557 0,7043 1,18 1,229 1,1	<10 <5 <2 0,928 1,09 0,86 1,19 1,1	<10 <5 <2 0,88 1,09 1,10 1,19 1,23	0,88 0,035 0,355 1,160 0,030 0,096	0,035 3,932 32,562 14,545 2,483 7,816		

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi	
				P	D	1	2	3	4				
Tl	(ng/g)	2	A82	PD01	DB10	55,34	55,78	55,2	55,07	55,35	0,309	0,558	
			F16x	PC01	DB10	56,43	59,83	54,28	56,96	56,88	2,286	4,019	
		A80	PD03	DB10	58,7	58,1	58,7	57,6	58,28	0,532	0,912		
		A60x	PD01	DB10	58,237	59,2989	58,8723	56,8061	58,30	1,089	1,869		
		A36	PD02	DB10	58,33	58,44	59,29	58,86	58,73	0,438	0,745		
		F13x	PD01	DB10	59,5	62,6	58,5	59,1	59,93	1,830	3,054		
		F32	PD01	DB10	63	63	64	63	63,25	0,500	0,791		
		A79	PD01	DB10	64,1	65,2	63,8	64,7	64,45	0,624	0,969		
		A80	PD03	DB10	9,96	9,95	9,32	9,18	9,60	0,411	4,281		
		A82	PD01	DB10	10,42	10,69	10,51	10,33	10,49	0,154	1,466		
Tl	(ng/g)	3	F13x	PD01	DB10	11,2	10,8	10,4	10,1	10,63	0,479	4,506	
			A60x	PD01	DB10	10,8578	9,645	10,9688	11,1358	10,65	0,681	6,392	
		F16x	PC01	DB10	11,22	10,46	10,48	10,47	10,66	0,375	3,519		
		A36	PD02	DB10	10,69	11,33	10,8	10,8	10,91	0,288	2,641		
		F32	PD01	DB10	12	12	12,7	11,7	12,10	0,424	3,506		
		A79	PD01	DB10	12,6	13,2	12,9	13	12,93	0,250	1,934		
		F16x	PC01	DB10	182,4	190,1	183,3	189,5	186,33	4,037	2,167		
		F13x	PD01	DB10	197	195	183	178	188,25	9,215	4,895		
		A82	PD01	DB10	189,2	188,6	187,6	189	188,60	0,712	0,377		
		A60x	PD01	DB10	200,7002	196,2126	190,1552	195,9507	195,75	4,323	2,208		
U	(ng/g)	4	A36	PD02	DB10	197,75	200,32	197,1	199,89	198,77	1,580	0,795	
			A80	PD03	DB10	200	202	201	201	201,00	0,816	0,406	
		A79	PD01	DB10	205,5	211,9	211,5	210,8	209,93	2,985	1,422		
		F32	PD01	DB10	223	224	228	227	225,50	2,380	1,056		
		A36	PD02	DB10	<10	<10	<10	<10	<10				
		A80	PD03	DB10	2,43	2,78	2,54	2,41	2,54	0,170	6,689		
		F16x	PC01	DB10	2,644	2,755	2,642	2,651	2,67	0,055	2,050		
U	(ng/g)	2	A36	PD02	DB10	<10	<10	<10	<10				
			A80	PD03	DB10	1,22	1,11	1,08	1,37	1,20	0,131	10,985	
		F16x	PC01	DB10	1,204	1,265	1,226	1,247	1,24	0,026	2,134		

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi			
				P	D	1	<10	<1	<10						
U	(ng/g)	3	A36	PD02	DB10	<10	<10	<1	<1	0,6669	0,041	5,938			
		A80	PD03	DB10	<1	0,66	0,6957	<1	<10						
		F16x	PC01	DB10	0,7505										
U	(ng/g)	4	A80	PD03	DB10	15	14,8	14,9	15,7	0,6669	0,041	5,938			
		A36	PD02	DB10	15,13	15,24	15,77	14,59	15,18						
		F16x	PC01	DB10	15,53	16,2	16,26	16,44	16,11						
V	( $\mu$ g/g)	1	A60X	PD01	DB10	0,1026	0,1011	0,0959	0,1095	0,10	0,006	5,483			
		F16x	PC01	DB10	0,1117	0,1105	0,1118	0,1097	0,11						
		A80	PD03	DB10	0,112	0,116	0,118	0,113	0,11						
V	( $\mu$ g/g)	2	A79	PD01	DB10	0,1244	0,1213	0,1187	0,1153	0,12	0,004	3,223			
		F32	PD01	DB10	0,126	0,12	0,122	0,12	0,12						
		F13x	PD01	DB10	0,136	0,134	0,134	0,139	0,14						
V	( $\mu$ g/g)	2	A79	PD01	DB10	0,0504	0,0517	0,0496	0,0468	0,05	0,002	4,177			
		A60X	PD01	DB10	0,06	0,0446	0,0508	0,049	0,05						
		F32	PD01	DB10	0,052	0,05	0,053	0,053	0,05						
V	( $\mu$ g/g)	2	F16x	PC01	DB10	0,0513	0,0544	0,0542	0,0532	0,05	0,001	2,661			
		A80	PD03	DB10	0,0592	0,0627	0,0581	0,0612	0,06						
		F13x	PD01	DB10	0,0638	0,065	0,0626	0,0645	0,06						
V	( $\mu$ g/g)	3	A79	PD01	DB10	0,0296	0,0304	0,0271	0,0265	0,03	0,002	6,662			
		A60X	PD01	DB10	0,0373	0,0295	0,0278	0,0346	0,03						
		F16x	PC01	DB10	0,0415	0,0414	0,041	0,0374	0,04						
V	( $\mu$ g/g)	3	F13x	PD01	DB10	0,0415	0,0401	0,0396	0,0421	0,04	0,001	2,866			
		A80	PD03	DB10	0,0384	0,0424	0,0412	0,0467	0,04						
		F32	PD01	DB10	0,042	0,05	0,042	0,037	0,04						
V	( $\mu$ g/g)	4	A60X	PD01	DB10	0,629	0,6366	0,641	0,6549	0,64	0,011	1,699			
		A80	PD03	DB10	0,666	0,67	0,693	0,693	0,68						
		F16x	PC01	DB10	0,7064	0,7182	0,6933	0,7081	0,71						
V	( $\mu$ g/g)	4	F32	PD01	DB10	0,764	0,77	0,777	0,783	0,77	0,008	1,069			
		A79	PD01	DB10	0,8088	0,8277	0,8198	0,8237	0,82						
		F13x	PD01	DB10	0,852	0,832	0,856	0,863	0,85						

# 25<sup>th</sup> Needle/Leaf Interlaboratory Comparison Test 2022/2023

## Additional parameters

Element	Unit	Sample no.	Lab no.	Method code		Replicates				Mean	Si	Vi
				P	D	1	2	3	4			
W	(ng/g)	1	A80	PD03	DB10	8,28	7,45	6,77	7,31	7,45	0,625	8,383
W	(ng/g)	2	A80	PD03	DB10	9,19	9,93	10,41	9,69	9,81	0,508	5,177
W	(ng/g)	3	A80	PD03	DB10	9,91	9,74	10,08	10,6	10,08	0,372	3,688
W	(ng/g)	4	A80	PD03	DB10	46,2	49,7	49	48,9	48,45	1,542	3,182
Y	(ng/g)	1	A80	PD03	DB10	262	265	267	262	264,00	2,449	0,928
Y	(ng/g)	2	A80	PD03	DB10	63	64,3	61,2	63,7	63,05	1,343	2,130
Y	(ng/g)	3	A80	PD03	DB10	19,2	19,4	20,4	19,5	19,63	0,532	2,708
Y	(ng/g)	4	A80	PD03	DB10	86	88	85,3	91,1	87,60	2,599	2,967

**ISBN 978-3-903258-68-6**

Copyright 2023 by

Austrian Federal Research and Training Centre for Forests, Natural Hazards and Landscape  
Forest Foliar Co-ordinating Centre  
Seckendorff-Gudent Weg 8  
A-1131 Wien

Phone: +431-87838-1176  
Fax: +431-87838-1250

Reproduction is authorized, except for commercial purposes,  
provided the source is acknowledged.

URL: <http://www.ffcc.at>  
e-Mail: michael.tatzber@bfw.gv.at

Cover photos by Michael Tatzber