WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 208

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis IPE 208

General Information

In this report an overview is given of analytical data for this sample collected in our proficiency testing program. The consensus values are calculated using a robust statistical model. With this NDA model mean and standard deviation are calculated using all reported data when at least 8 results are left after removal of reported 'lower than' (<) and 0 (= zero) values. No outliers are removed.

This report is divided into three sections: Consensus Values, Indicative Values and Values for Information. The division is made on the reliability of the data. Consensus Values are based on at least 16 results while the coefficient of variation is smaller than 25 %. Indicative Values are based on at least 8 and less than 16 results or a coefficient of variation between 25 % and 50 %. Other values, based on more than 2 and less than 8 results or a coefficient of variation higher than 50 %, are given for information only.

In the sections with Consensus Values and Indicative Values the following parameters are given: mean, standard deviation, coefficient of variation, number of results, median and MAD (Median of Absolute Deviation) and the uncertainty in the consensus values. The confidence limits (at 95 % probability) are calculated for these determinands.
In the section with Information Values the following parameters are given: median, MAD and number of results. For determinands which have at least 5 results reported as smaller than (<) the median of these 'smaller than results' is calculated. In some cases this median of '<' values is much smaller than median and mean of the indicative values. This may be caused by a too optimistic (too low) value for the detection limit reported by a (small) majority of participating laboratories who report '<'-values.

All values, expressed on a weight basis (kg or %), are reported in oven dry (105 °C) material. Moisture is reported in the material as received.

Sample information

WEPAL reference materials are from natural sources only. There is no spiking, mixing or other alterations of the samples. For sample preparation the IPE samples are dried at 70 °C and milled to pass a 0.5 mm sieve.

This IPE sample 208 of Lucerne / Medicago sativa from Austria is prepared for the WEPAL proficiency programs. The sample is used in 1 period (or round). The results on which the values in this report are based were taken from the period given in the following table.

Year	Round	Number
2012	2	2

Consensus Values IPE 208

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
As	µg/kg	338	62.0	18.3	19	341	42.0	17.8	308 - 368
B	mg/kg	39.4	3.69	9.4	77	39.2	2.46	0.53	38.6 - 40.2
Ca	g/kg	19.8	1.16	5.9	107	19.8	0.81	0.14	19.59 - 20.03
Cd	µg/kg	75.8	10.95	14.4	28	76.0	7.75	2.59	71.6 - 80.1
Cl (as Cl)	g/kg	7.76	0.220	2.8	19	7.75	0.150	0.063	7.66 - 7.87
Co	µg/kg	254	31.5	12.4	24	255	22.2	8.0	241 - 267
Cr	µg/kg	1280	287	22.4	25	1330	207	72	1162 - 1398
Cu	mg/kg	8.21	0.768	9.4	97	8.23	0.530	0.097	8.05 - 8.36
Fe	mg/kg	528	62.7	11.9	97	526	44.0	8.0	516 - 541
K	g/kg	20.5	1.28	6.3	108	20.6	0.90	0.15	20.26 - 20.75
Mg	g/kg	3.23	0.218	6.8	108	3.21	0.155	0.026	3.19 - 3.27
Mn	mg/kg	43.7	3.42	7.8	99	43.7	2.33	0.43	43.1 - 44.4
Mo	µg/kg	1330	124	9.3	29	1320	83	29	1282 - 1376
N - Kjeldahl (as N)	g/kg	31.2	1.80	5.8	72	31.4	1.26	0.26	30.8 - 31.7
Na	mg/kg	752	61.2	8.1	56	757	42.9	10.2	736 - 769
Ni	µg/kg	1050	248	23.6	21	1040	165	68	940 - 1165
P (as P)	g/kg	2.58	0.187	7.2	106	2.57	0.131	0.023	2.54 - 2.62
Pb	µg/kg	554	84.9	15.3	27	550	61.0	20.4	520 - 587
S (as S)	g/kg	3.07	0.221	7.2	58	3.05	0.155	0.036	3.02 - 3.13
Zn	mg/kg	19.9	1.88	9.4	99	20.1	1.31	0.24	19.56 - 20.31

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
C - elementary	g/kg	446	11.6	2.6	40	446	7.9	2.3	442.1 - 449.5
N - elementary	g/kg	32.9	1.14	3.5	59	32.9	0.80	0.19	32.65 - 33.24

Indicative Values IPE 208

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Ba	mg/kg	13.0	1.65	12.7	8	12.7	1.19	0.73	11.6 - 14.3
Be	µg/kg	24.0	4.38	18.2	8	24.8	3.01	1.93	20.4 - 27.6
Hg	µg/kg	10.0	0.89	8.9	14	10.2	0.65	0.30	9.50 - 10.5
N - NO3 (as N)	mg/kg	209	10.4	5.0	9	209	8.0	4.3	202 - 217
Se	µg/kg	89.3	20.52	23.0	13	92.0	14.00	7.11	77.0 - 102
Sr	mg/kg	49.6	2.94	5.9	11	49.8	2.06	1.11	47.6 - 51.5
V	µg/kg	1060	220	20.7	13	1060	160	76	933 - 1196

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	764	265.2	34.7	12	814	177.0	95.7	597 - 931

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	581	158.9	27.3	18	591	109.3	46.8	503 - 660

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
delta 13C	‰ V-PDB	-30.2	0.38	1.3	11	-30.1	0.27	0.14	-30.46 - -29.96
delta 15N	‰ Air	774	11.4	1.5	14	773	8.5	3.8	767 - 780

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Total ash	g/kg	106	5.0	4.7	10	106	3.5	2.0	102.1 - 109.2

Informative Values IPE 208

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N
Ag	µg/kg	8.73	3.950	4
Bi	µg/kg	22.1	14.34	4
F	mg/kg	8.29	2.905	4
I	µg/kg	143	25.0	3
Li	µg/kg	713	114.8	5
N - NH4 (as N)	mg/kg	102	18.7	5
Rb	µg/kg	5800	430	5
Sb	µg/kg	32.8	7.20	7
Sn	µg/kg	66.8	7.15	6
SO4 (as SO4)	g/kg	1.28	0.060	3
Ti	mg/kg	14.2	2.71	4

Method: Nutritional values

Element	Unit	Median	MAD	N
ADF-ash-free	g/kg	295	1.7	3
Crude fibre	g/kg	241	11.3	5
Total fat	g/kg	22.5	5.19	4