WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 182

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis IPE 182

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 ºC and milled to pass a 0.5 mm sieve.

This IPE sample 182 of wheat (grain) / Triticum vulgare from Netherlands is prepared for the WEPAL proficiency programs. The sample is used in 3 periods (or rounds). The results on which the values in this report are based were taken from the periods given in the following table.

Year	Round	Number
2016	2	4
2011	3	1
2007	3	4

Consensus Values IPE 182

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
As	µg/kg	72.9	12.56	17.2	52	73.5	8.95	2.18	69.4 - 76.4
Ba	mg/kg	2.02	0.289	14.3	35	2.06	0.200	0.061	1.92 - 2.12
Ca	g/kg	0.727	0.0931	12.8	328	0.730	0.0665	0.0064	0.717 - 0.737
Cl (as Cl)	g/kg	0.991	0.1422	14.4	60	0.988	0.0990	0.0230	0.954 - 1.03
Co	µg/kg	42.3	7.21	17.1	61	42.0	5.04	1.15	40.4 - 44.1
Cu	mg/kg	4.16	0.426	10.2	318	4.18	0.295	0.030	4.12 - 4.21
Fe	mg/kg	166	20.7	12.4	316	165	14.5	1.5	164.1 - 168.7
K	g/kg	4.45	0.331	7.4	343	4.46	0.230	0.022	4.41 - 4.48
Li	µg/kg	155	19.5	12.6	18	155	14.0	5.8	145 - 165
Mg	g/kg	1.20	0.086	7.1	339	1.20	0.060	0.006	1.19 - 1.21
Mn	mg/kg	12.4	1.30	10.5	317	12.4	0.90	0.09	12.26 - 12.55
Mo	µg/kg	794	78.8	9.9	90	793	53.0	10.4	778 - 811
N - Kjeldahl (as N)	g/kg	14.5	0.78	5.4	230	14.5	0.54	0.06	14.44 - 14.64
P (as P)	g/kg	3.46	0.214	6.2	342	3.45	0.150	0.014	3.43 - 3.48
Pb	µg/kg	181	39.4	21.8	85	189	29.0	5.3	172 - 189
S (as S)	g/kg	1.13	0.101	8.9	188	1.13	0.070	0.009	1.12 - 1.15
Se	µg/kg	30.5	6.86	22.5	34	31.0	4.89	1.47	28.1 - 32.9
Sr	mg/kg	4.83	0.314	6.5	37	4.83	0.214	0.065	4.72 - 4.93
V	µg/kg	249	44.0	17.6	31	257	31.0	9.9	233 - 265
Zn	mg/kg	27.4	2.00	7.3	318	27.4	1.39	0.14	27.13 - 27.57

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
C - elementary	g/kg	439	13.0	3.0	99	439	8.7	1.6	436.6 - 441.8
N - elementary	g/kg	15.0	0.60	4.0	155	15.1	0.40	0.06	14.95 - 15.14

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	119	20.9	17.5	68	121	14.0	3.2	114 - 125

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
delta 13C	‰ V-PDB	-27.9	0.30	1.1	17	-27.9	0.21	0.09	-28.09 - -27.77
delta 15N	‰ Air	4.46	0.554	12.4	18	4.46	0.395	0.163	4.19 - 4.74

Consensus Values IPE 182

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Crude fibre	g/kg	34.8	4.23	12.2	18	33.8	2.75	1.25	32.7	-	36.9
Total ash	g/kg	29.8	1.40	4.7	33	30.0	1.00	0.31	29.3	-	30.3

Indicative Values IPE 182

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Bi	µg/kg	18.3	5.53	30.1	8	18.8	3.89	2.44	13.8 - 22.9
Cd	µg/kg	16.5	5.83	35.2	72	17.7	4.30	0.86	15.2 - 17.9
Cr	µg/kg	330	89.0	27.0	71	338	63.0	13.2	309 - 351
I	µg/kg	113	56.4	49.7	11	118	41.3	21.2	76.0 - 151
N - NH4 (as N)	mg/kg	29.3	11.45	39.1	9	29.4	8.60	4.77	20.7 - 38.0
Na	mg/kg	48.8	15.37	31.5	170	50.4	10.80	1.47	46.5 - 51.2
Ni	µg/kg	200	61.8	30.8	67	201	42.7	9.4	185 - 216
Rb	µg/kg	3820	297	7.8	12	3810	200	107	3638 - 4011
Sb	µg/kg	7.41	1.952	26.3	12	7.30	1.335	0.704	6.18 - 8.64
Sn	µg/kg	21.2	6.07	28.6	11	21.7	4.40	2.29	17.2 - 25.3

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	157	65.2	41.4	35	162	45.1	13.8	135 - 180

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
ADF-ash-free	g/kg	48.9	7.60	15.5	11	47.1	5.00	2.86	43.9 - 53.9
NDF-ash-free	g/kg	135	19.9	14.8	10	139	14.0	7.9	121 - 149
Total fat	g/kg	17.0	6.45	38.0	12	16.3	4.24	2.33	12.9 - 21.0

Informative Values IPE 182

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
Ag	µg/kg	2.63	1.960	4	5.00	5
B	mg/kg	1.50	0.600	195	3.00	34
Be	µg/kg	5.02	1.875	14	45.00	8
Br	mg/kg	22.0	2.55	4		
Cs	µg/kg	26.7	1.10	5		
Ga	µg/kg	70.3	44.46	3		
Hg	µg/kg	2.13	0.870	43	10.00	26
N - NO3 (as N)	mg/kg	15.6	13.51	16	25.0	15
SO4 (as SO4)	g/kg	0.180	0.0900	9		
Ti	mg/kg	3.60	1.837	13		

Method: Real totals

Element	Unit	Median	MAD	N
Si	mg/kg	4850	287	3

Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N
Si	mg/kg	1650	790	5