WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 150

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis IPE 150

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, the mean and standard deviation are calculated using all reported data when at least 4 results are left after removal of reported 'lower than' (<) and 0 (= zero) values. No outliers are removed.

This report is divided into two sections: Consensus Values and Indicative Values. The division is made on the reliability of the data. Consensus Values are based on at least 8 results and a maximum relative uncertainty of 6.25%. Indicative Values are based on a maximum relative uncertainty of 35% and a minimum of 4 and maximum of 7 results, or a relative uncertainty greater than 6.25% when there are at least 8 results.

For each determinand the following parameters are given: mean, standard deviation, coefficient of variation, number of results, median, MAD (Median of Absolute Deviation), the uncertainty of the mean (consensus or indicative) value and the relative uncertainty.

All values, expressed on a weight basis (kg or %), are reported as oven-dried (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 150 of Barley (grain) / Hordeum vulgare, from Netherlands, is prepared for the WEPAL proficiency programs. The sample has been used in 5 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
2018	4	2
2013	4	2
2009	3	4
2006	1	3
2004	2	4

Consensus Values IPE 150

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
B	mg/kg	1.96	0.999	51.1	344	2.02	0.585	0.067	3.44
Cu	mg/kg	5.06	0.609	12.0	542	5.09	0.387	0.033	0.647
Fe	mg/kg	86.7	11.3	13.1	546	86.3	7.25	0.607	0.700
Mn	mg/kg	9.54	1.19	12.5	553	9.61	0.680	0.063	0.665
Zn	mg/kg	27.5	2.27	8.3	564	27.5	1.40	0.120	0.434
As	µg/kg	65.3	11.6	17.7	91	68.0	7.00	1.52	2.33
Cd	µg/kg	21.1	5.01	23.8	125	22.0	3.00	0.561	2.66
Cr	µg/kg	222	83.9	37.8	105	236	56.0	10.2	4.61
Li	µg/kg	404	39.8	9.9	23	408	16.0	10.4	2.57
Mo	µg/kg	400	49.3	12.3	121	400	27.0	5.60	1.40
Pb	µg/kg	119	58.3	49.1	129	126	41.1	6.42	5.40
Se	µg/kg	47.3	13.2	27.9	46	51.4	9.17	2.43	5.14
Ba	mg/kg	1.47	0.175	11.9	50	1.49	0.105	0.031	2.11
V	µg/kg	97.1	20.3	20.9	33	103	14.2	4.41	4.54
Sr	mg/kg	4.73	0.416	8.8	58	4.79	0.252	0.068	1.44
Rb	µg/kg	8293	473	5.7	18	8235	297	139	1.68
Ca	g/kg	0.970	0.122	12.5	579	0.980	0.070	0.006	0.651
Cl (as Cl)	g/kg	1.60	0.217	13.6	122	1.60	0.110	0.025	1.53
K	g/kg	5.97	0.456	7.6	592	5.96	0.285	0.023	0.393
Mg	g/kg	1.23	0.095	7.8	589	1.23	0.061	0.005	0.400
N - Kjeldahl (as N)	g/kg	13.7	0.850	6.2	393	13.7	0.506	0.054	0.391
Na	mg/kg	137	21.6	15.7	345	139	13.0	1.45	1.06
P (as P)	g/kg	3.89	0.250	6.4	593	3.89	0.151	0.013	0.329
S (as S)	g/kg	1.36	0.145	10.6	339	1.37	0.090	0.010	0.720

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
C - elementary	g/kg	438	15.4	3.5	140	440	9.26	1.62	0.370
N - elementary	g/kg	14.1	0.625	4.4	238	14.1	0.400	0.051	0.360

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	40.2	9.99	24.8	118	40.5	6.50	1.15	2.86

Consensus Values IPE 150

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
delta 13C	‰ V-PDB	-27.8	0.210	0.8	9	-27.9	0.160	0.087	0.314
delta 15N	‰ Air	2.07	0.246	11.9	8	2.07	0.180	0.109	5.26

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Crude fibre	g/kg	40.4	5.23	13.0	30	39.9	2.52	1.19	2.96
ADF-ash-free	g/kg	52.9	4.86	9.2	13	54.8	4.03	1.68	3.18
NDF-ash-free	g/kg	138	16.0	11.6	9	138	11.0	6.65	4.83
Total ash	g/kg	35.9	1.90	5.3	50	36.0	1.00	0.335	0.932

Indicative Values IPE 150

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Co	µg/kg	17.7	8.39	47.5	71	19.0	5.40	1.24	7.05
Hg	µg/kg	1.55	0.802	51.8	77	1.64	0.540	0.114	7.38
I	µg/kg	84.7	61.6	72.8	8	117	33.9	27.2	32.2
Ni	µg/kg	124	70.7	56.8	92	140	48.5	9.21	7.41
Sb	µg/kg	4.05	1.77	43.7	16	4.18	1.18	0.553	13.7
Sn	µg/kg	29.1	26.3	90.3	13	34.3	20.3	9.10	31.3
Ti	mg/kg	2.61	2.21	84.8	9	2.88	1.96	0.922	35.3
Be	µg/kg	3.32	3.72	112.1	8	4.90	2.53	1.64	49.5
Cs	µg/kg	13.1	0.974	7.5	5	13.5	0.620	0.544	4.17
N - NH4 (as N)	mg/kg	48.2	25.2	52.3	18	50.5	17.6	7.44	15.4
N - NO3 (as N)	mg/kg	11.6	13.6	117.4	28	18.3	11.4	3.21	27.7
SO4 (as SO4)	g/kg	0.712	0.373	52.4	18	0.819	0.252	0.110	15.4

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	54.4	23.9	43.9	40	56.7	14.1	4.72	8.68
Si	mg/kg	5626	379	6.7	6	5590	230	194	3.44

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Si	mg/kg	2774	3536	127.5	10	2165	2139	1398	50.4

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
NDF-ash-containing	g/kg	314	164	52.3	5	274	124	91.9	29.2
Total fat	g/kg	22.6	5.56	24.6	15	21.9	3.79	1.80	7.94