WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 209

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis IPE 209

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 209 of Barly (grain) / Hordeum vulgare, from Netherlands, is prepared for the WEPAL proficiency programs. The sample has been 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
2022	1	1
2017	4	1
2012	4	1

Consensus Values IPE 209

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Cu	mg/kg	4.79	0.725	15.1	280	4.79	0.440	0.054	1.13
Fe	mg/kg	42.0	5.85	13.9	278	42.2	3.58	0.438	1.04
Mn	mg/kg	66.5	5.76	8.7	288	66.0	3.60	0.424	0.638
Zn	mg/kg	47.9	4.52	9.4	289	47.9	2.79	0.332	0.695
Cd	µg/kg	80.0	9.33	11.7	74	79.6	5.72	1.36	1.69
Mo	µg/kg	231	29.0	12.6	76	234	16.1	4.16	1.80
Ni	µg/kg	705	114	16.1	53	707	65.0	19.5	2.76
Ba	mg/kg	3.35	0.330	9.9	24	3.36	0.235	0.084	2.51
Sr	mg/kg	1.37	0.177	12.9	24	1.38	0.090	0.045	3.30
Rb	µg/kg	1239	90.0	7.3	12	1232	59.5	32.5	2.62
Ca	g/kg	0.375	0.078	20.8	274	0.380	0.046	0.006	1.57
K	g/kg	4.00	0.332	8.3	307	4.01	0.207	0.024	0.592
Mg	g/kg	1.33	0.105	7.9	302	1.34	0.068	0.008	0.565
N - Kjeldahl (as N)	g/kg	18.9	1.16	6.1	191	19.0	0.780	0.105	0.554
P (as P)	g/kg	4.21	0.333	7.9	310	4.20	0.210	0.024	0.561
S (as S)	g/kg	1.36	0.156	11.5	182	1.36	0.096	0.014	1.07

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
C - elementary	g/kg	448	15.5	3.5	104	448	11.2	1.90	0.424
N - elementary	g/kg	19.8	0.803	4.1	149	19.8	0.520	0.082	0.415

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
delta 13C	‰ V-PDB	-26.2	0.295	1.1	11	-26.2	0.260	0.111	0.424
delta 15N	‰ Air	3.60	0.328	9.1	11	3.63	0.174	0.124	3.43

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
ADF-ash-free	g/kg	32.3	4.71	14.6	14	32.3	2.99	1.57	4.87
Total ash	g/kg	18.7	2.38	12.8	38	18.6	1.41	0.483	2.59

Indicative Values IPE 209

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
B	mg/kg	1.34	1.09	81.1	171	1.49	0.844	0.104	7.75
As	µg/kg	7.08	3.92	55.3	26	7.35	2.55	0.961	13.6
Co	µg/kg	6.88	3.73	54.1	37	7.45	2.45	0.766	11.1
Cr	µg/kg	55.4	51.5	92.9	34	69.9	36.0	11.0	19.9
Hg	µg/kg	1.44	2.02	140.5	23	2.00	1.37	0.527	36.6
Li	µg/kg	9.41	10.5	111.4	12	11.0	6.73	3.78	40.2
Pb	µg/kg	18.5	22.2	119.9	43	21.2	13.5	4.24	22.9
Se	µg/kg	17.1	8.16	47.7	27	16.9	3.92	1.96	11.5
Sb	µg/kg	2.73	4.26	155.9	10	3.26	2.50	1.68	61.6
Sn	µg/kg	25.8	32.6	126.5	9	43.7	35.7	13.6	52.7
V	µg/kg	6.42	5.74	89.5	13	7.85	3.69	1.99	31.0
Ag	µg/kg	5.29	2.95	55.8	6	5.77	1.22	1.50	28.5
Cs	µg/kg	1.15	0.125	10.8	5	1.16	0.080	0.070	6.05
Cl (as Cl)	g/kg	0.487	0.175	36.0	49	0.490	0.110	0.031	6.43
N - NO3 (as N)	mg/kg	12.0	11.5	95.9	12	14.6	6.40	4.16	34.6
Na	mg/kg	22.9	15.1	66.2	134	24.2	9.86	1.63	7.15

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	4.75	4.79	100.8	27	6.00	3.40	1.15	24.3

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	2.44	1.96	80.2	37	2.80	1.50	0.402	16.5

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Crude fibre	g/kg	24.0	5.52	23.0	21	25.0	3.42	1.51	6.28
NDF-ash-free	g/kg	115	34.5	30.0	13	116	22.7	12.0	10.4
Total fat	g/kg	26.0	5.06	19.5	15	26.5	3.00	1.63	6.29