WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 154

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis IPE 154

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 154 of Raye grass / Lolium perenne from Netherlands is prepared for the WEPAL proficiency programs. The sample is used in 4 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	1	2
2012	4	2
2008	4	4
2005	3	3

Consensus Values IPE 154

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
As	µg/kg	152	28.0	18.5	81	156	19.9	3.9	145 - 158
Ba	mg/kg	15.0	1.13	7.5	48	15.0	0.75	0.20	14.67 - 15.32
Ca	g/kg	4.69	0.323	6.9	456	4.70	0.223	0.019	4.66 - 4.72
Cd	µg/kg	63.2	8.14	12.9	138	64.0	5.77	0.87	61.9 - 64.6
Cl (as Cl)	g/kg	19.0	1.20	6.3	91	18.9	0.83	0.16	18.78 - 19.28
Co	µg/kg	85.3	15.53	18.2	91	88.0	11.00	2.04	82.1 - 88.5
Cr	µg/kg	738	182.0	24.7	119	756	124.0	20.9	705 - 771
Cu	mg/kg	7.16	0.586	8.2	423	7.13	0.400	0.036	7.10 - 7.21
Fe	mg/kg	331	27.4	8.3	425	330	18.7	1.7	328.6 - 333.8
Hg	µg/kg	15.2	1.14	7.5	81	15.2	0.80	0.16	14.90 - 15.40
K	g/kg	38.8	2.83	7.3	469	38.8	1.96	0.16	38.52 - 39.04
Li	µg/kg	192	20.4	10.6	23	195	14.2	5.3	183 - 201
Mg	g/kg	1.80	0.128	7.1	464	1.80	0.090	0.007	1.79 - 1.81
Mn	mg/kg	81.1	5.85	7.2	440	81.0	4.02	0.35	80.5 - 81.6
Mo	µg/kg	977	107.0	11.0	131	986	74.0	11.7	959 - 996
N - Kjeldahl (as N)	g/kg	33.5	2.01	6.0	296	33.5	1.37	0.15	33.28 - 33.74
Na	mg/kg	2790	206	7.4	292	2780	142	15	2762 - 2809
Ni	µg/kg	823	101.0	12.3	119	830	68.5	11.6	804 - 841
P (as P)	g/kg	5.14	0.346	6.7	467	5.13	0.237	0.020	5.11 - 5.17
Pb	µg/kg	1040	121	11.6	146	1040	83	12	1020 - 1060
Rb	µg/kg	4630	603	13.0	18	4770	455	178	4328 - 4926
S (as S)	g/kg	3.48	0.296	8.5	276	3.46	0.207	0.022	3.44 - 3.51
Sb	µg/kg	47.9	9.80	20.5	25	50.2	7.20	2.45	43.8 - 51.9
Se	µg/kg	32.6	7.87	24.1	47	34.5	5.90	1.43	30.3 - 34.9
Sr	mg/kg	12.2	1.27	10.4	53	12.3	0.90	0.22	11.86 - 12.56
V	µg/kg	519	44.4	8.6	46	520	30.5	8.2	506 - 532
Zn	mg/kg	39.4	3.17	8.0	436	39.2	2.19	0.19	39.07 - 39.66

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
C - elementary	g/kg	452	18.2	4.0	119	452	12.1	2.1	448.5 - 455.1
N - elementary	g/kg	35.6	1.73	4.8	194	35.4	1.17	0.15	35.39 - 35.88

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	147	22.2	15.1	107	148	15.2	2.7	143 - 152

Consensus Values IPE 154

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Crude fibre	g/kg	217	16.1	7.4	23	219	11.9	4.2	210 - 224
Total ash	g/kg	115	7.1	6.2	44	115	5.0	1.3	113.0 - 117.3

Indicative Values IPE 154

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
B	mg/kg	4.47	1.127	25.2	314	4.52	0.780	0.080	4.34 - 4.59
Be	µg/kg	6.93	3.306	47.7	17	7.10	2.350	1.002	5.24 - 8.63
Bi	µg/kg	7.27	1.803	24.8	13	7.90	1.330	0.625	6.19 - 8.35
I	µg/kg	87.1	8.27	9.5	10	88.1	6.30	3.27	81.3 - 92.9
Sn	µg/kg	89.4	26.03	29.1	16	93.1	18.10	8.14	75.6 - 103

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	236	103.0	43.7	35	271	74.0	21.8	200 - 271

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
delta 13C	‰ V-PDB	-31.6	0.31	1.0	10	-31.6	0.22	0.12	-31.80 - -31.37
delta 15N	‰ Air	6.67	0.249	3.7	9	6.72	0.160	0.104	6.48 - 6.85

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
ADF-ash-free	g/kg	242	9.1	3.8	13	244	6.3	3.2	237 - 248
NDF-ash-free	g/kg	390	17.8	4.6	12	393	12.2	6.4	378 - 401
Total fat	g/kg	52.7	16.09	30.5	11	54.5	10.50	6.06	42.1 - 63.4

Informative Values IPE 154

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
Ag	µg/kg	8.99	3.570	9		
Br	mg/kg	5.30	0.300	3		
Cs	µg/kg	19.4	1.20	7		
F	mg/kg	5.21	2.875	6		
Ga	µg/kg	59.4	26.60	5		
N - NH4 (as N)	mg/kg	1130	716	12		
N - NO3 (as N)	mg/kg	19.6	11.21	23	30.0	23
SO4 (as SO4)	g/kg	3.66	1.316	15		
Ti	mg/kg	8.14	3.760	19		

Method: Real totals

Element	Unit	Median	MAD	N
Si	mg/kg	5140	663	5

Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N
Si	mg/kg	1006	795.2	9