WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 194

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis IPE 194

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 194 of Staghorn sumac / Rhus typhina from Netherlands is prepared for the WEPAL proficiency programs. The sample is used in 2 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
2017	4	4
2013	2	2

Consensus Values IPE 194

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
As	µg/kg	80.0	11.92	14.9	30	80.8	8.30	2.72	75.5 - 84.4
B	mg/kg	39.6	3.71	9.4	141	39.4	2.56	0.39	38.9 - 40.2
Ba	mg/kg	8.43	1.019	12.1	21	8.48	0.719	0.278	7.97 - 8.90
Ca	g/kg	22.4	1.72	7.7	203	22.5	1.20	0.15	22.21 - 22.69
Cd	µg/kg	36.7	5.61	15.3	41	37.3	3.93	1.09	34.9 - 38.5
Cl (as Cl)	g/kg	3.06	0.234	7.7	38	3.02	0.170	0.047	2.98 - 3.13
Co	µg/kg	73.0	10.29	14.1	34	74.3	6.85	2.21	69.4 - 76.5
Cr	µg/kg	1030	144	14.0	42	1050	99	28	986 - 1076
Cu	mg/kg	5.52	0.637	11.6	187	5.61	0.438	0.058	5.43 - 5.61
Fe	mg/kg	105	11.8	11.2	191	105	8.0	1.1	103.0 - 106.3
Hg	µg/kg	38.8	3.12	8.0	25	38.9	2.11	0.78	37.5 - 40.0
K	g/kg	13.3	0.83	6.2	209	13.3	0.56	0.07	13.16 - 13.39
Mg	g/kg	2.25	0.134	5.9	205	2.26	0.091	0.012	2.23 - 2.27
Mn	mg/kg	41.9	3.32	7.9	197	41.8	2.30	0.30	41.4 - 42.3
Mo	µg/kg	490	44.0	9.0	50	499	31.0	7.8	478 - 503
N - Kjeldahl (as N)	g/kg	15.2	0.90	5.9	138	15.2	0.62	0.10	15.07 - 15.37
Na	mg/kg	193	31.7	16.4	114	192	22.0	3.7	187 - 199
P (as P)	g/kg	2.03	0.107	5.2	208	2.03	0.073	0.009	2.02 - 2.05
Pb	µg/kg	1240	133	10.7	45	1250	90	25	1198 - 1278
S (as S)	g/kg	1.34	0.124	9.3	108	1.33	0.085	0.015	1.31 - 1.36
Se	µg/kg	360	61.5	17.1	28	351	43.7	14.5	336 - 384
Sr	mg/kg	59.4	4.09	6.9	21	59.0	2.80	1.12	57.5 - 61.2
V	µg/kg	172	20.7	12.0	16	173	15.5	6.5	161 - 183
Zn	mg/kg	26.5	2.08	7.8	195	26.5	1.43	0.19	26.23 - 26.82

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
C - elementary	g/kg	467	12.1	2.6	74	467	8.2	1.8	464.4 - 470.0
N - elementary	g/kg	16.0	0.64	4.0	101	16.0	0.44	0.08	15.92 - 16.17

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
delta 13C	‰ V-PDB	-29.4	0.27	0.9	17	-29.4	0.18	0.08	-29.51 - -29.24
delta 15N	‰ Air	13.6	0.52	3.8	18	13.5	0.36	0.15	13.33 - 13.84

Consensus Values IPE 194

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Total ash	g/kg	84.6	8.76	10.3	23	84.9	6.28	2.28	80.8 - 88.4

Indicative Values IPE 194

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Be	µg/kg	3.00	0.540	18.0	8	3.02	0.390	0.239	2.56 - 3.44
N - NO3 (as N)	mg/kg	49.0	24.25	49.5	11	50.7	17.52	9.14	32.9 - 65.1
Ni	µg/kg	424	131.0	30.9	29	422	88.0	30.4	375 - 474
Rb	µg/kg	14700	1280	8.7	11	14400	890	480	13830 - 15520
Sb	µg/kg	73.6	9.56	13.0	14	73.8	6.37	3.19	68.1 - 79.1
Sn	µg/kg	153	43.1	28.2	8	144	28.3	19.0	118 - 188

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	69.9	21.62	30.9	17	72.0	14.50	6.55	58.9 - 81.0

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	50.3	12.67	25.2	38	51.0	8.68	2.57	46.1 - 54.4

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
ADF-ash-free	g/kg	288	15.2	5.3	9	293	11.5	6.3	277 - 300
Crude fibre	g/kg	231	23.5	10.2	12	234	16.0	8.5	216 - 245
NDF-ash-free	g/kg	401	48.2	12.0	9	403	34.0	20.1	364 - 437
Total fat	g/kg	32.1	6.49	20.2	9	31.4	4.50	2.70	27.2 - 37.0

Informative Values IPE 194

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
Ag	µg/kg	4.85	1.750	5		
Bi	µg/kg	7.25	1.090	4	53.00	5
Cs	µg/kg	72.3	2.30	5		
F	mg/kg	10.8	1.20	3		
Ga	µg/kg	25.4	1.10	3		
I	µg/kg	325	45.0	7		
Li	µg/kg	110	20.2	7	315	7
N - NH4 (as N)	mg/kg	60.3	21.01	4		
SO4 (as SO4)	g/kg	0.914	0.3750	8		
Ti	mg/kg	3.31	1.922	9		

Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N
Si	mg/kg	432	298.5	5