WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

BIMEP

International Biomass Exchange Program

REFERENCE MATERIAL

BIMEP sample 438

WAGENINGEN
UNIVERSITY & RESEARCH

BiMEP

Certificate of Analysis BIMEP 438

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 BIMEP samples are dried at 40 °C and milled to pass a 0.5 mm sieve.

This BIMEP sample 438 of Conifers / Coniferae from Netherlands is prepared for the WEPAL proficiency programs. The sample is 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
2022	2	3
2020	1	1
2017	2	2
2015	4	3
2011	2	4

BiMEP

Consensus Values BIMEP 438

Method: General Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Ash	% (m/m)	4.88	0.260	5.3	52	4.88	0.180	0.045	4.80 - 4.95
Moisture	% (m/m)	9.13	1.441	15.8	52	9.13	1.015	0.250	8.73 - 9.53
Calorific Value (gross)	MJ/kg	21.7	0.61	2.8	50	21.8	0.42	0.11	21.57 - 21.92
Volatile Matter	% (m/m)	75.4	1.56	2.1	39	75.7	1.15	0.31	74.9 - 75.9

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Carbon (C)	% (m/m)	52.8	1.75	3.3	49	52.7	1.25	0.31	52.3 - 53.3
Hydrogen (H)	% (m/m)	6.41	0.224	3.5	46	6.45	0.155	0.041	6.35 - 6.48
Nitrogen (N)	% (m/m)	1.54	0.097	6.3	47	1.53	0.070	0.018	1.51 - 1.57
Cl	g/kg	4.00	0.864	21.6	41	4.00	0.600	0.169	3.73 - 4.27
S	g/kg	1.34	0.256	19.2	43	1.32	0.180	0.049	1.26 - 1.41

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	g/kg	0.196	0.0346	17.7	16	0.201	0.0240	0.0108	0.177 - 0.214
Ca	g/kg	9.94	1.274	12.8	18	9.92	0.935	0.375	9.31 - 10.6
Fe	g/kg	0.207	0.0196	9.5	18	0.210	0.0150	0.0058	0.197 - 0.216
K	g/kg	10.0	1.02	10.2	18	10.1	0.68	0.30	9.54 - 10.5
Mg	g/kg	1.29	0.136	10.6	17	1.30	0.095	0.041	1.22 - 1.36
P	g/kg	1.44	0.170	11.8	16	1.45	0.123	0.053	1.35 - 1.53

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Ba	mg/kg	17.1	3.05	17.9	19	18.0	2.20	0.88	15.6 - 18.6
Cd	mg/kg	0.598	0.0858	14.3	19	0.602	0.0660	0.0246	0.557 - 0.639
Mn	mg/kg	385	49.8	12.9	23	379	36.1	13.0	364 - 407
Ni	mg/kg	4.15	1.002	24.1	19	4.20	0.690	0.287	3.67 - 4.63
Pb	mg/kg	11.6	2.03	17.5	19	11.3	1.39	0.58	10.6 - 12.6
Zn	mg/kg	309	50.6	16.3	22	313	36.6	13.5	287 - 332

BiMEP

Indicative Values BIMEP 438

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Oxygen (O)	% (m/m)	36.1	2.72	7.5	12	34.9	1.82	0.98	34.4 - 37.8

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Na	g/kg	0.169	0.0536	31.7	16	0.168	0.0325	0.0168	0.141 - 0.198
Si	g/kg	1.09	0.365	33.3	12	1.16	0.240	0.132	0.866 - 1.32

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Co	mg/kg	1.28	0.141	10.9	15	1.27	0.100	0.045	1.21 - 1.36
Cr	mg/kg	1.04	0.507	48.6	15	1.19	0.380	0.164	0.763 - 1.32
Cu	mg/kg	4.42	1.320	29.9	17	4.69	0.971	0.400	3.74 - 5.09
Sn	mg/kg	0.445	0.1614	36.3	11	0.483	0.1170	0.0608	0.338 - 0.552

Informative Values BIMEP 438

Method: Water Soluble Elements

Element	Unit	Median	MAD	N
Cl	g/kg	4.44	0.303	6
K	g/kg	7.15	5.719	9
Na	g/kg	0.0300	0.0214	8

Method: Minor Elements

					Results smaller than (<)	
Element	Unit	Median	MAD	N	Median of <	N
As	mg/kg	0.500	0.3010	15	2.350	5
Be	mg/kg	0.100	0.0700	5	0.150	10
F	mg/kg	16.0	8.10	9	10.0	7
Hg	mg/kg	0.0300	0.0100	9	0.3000	9
Mo	mg/kg	0.170	0.0630	7	0.625	8
Sb	mg/kg	0.253	0.1400	10	2.500	8
Se	mg/kg	0.553	0.2030	5	1.000	13
Te	mg/kg	2.00	1.980	3	0.500	9
Ti	mg/kg	15.0	5.22	18		
Tl	mg/kg	0.221	0.1394	6	1.000	9
V	mg/kg	0.628	0.2250	12	1.000	6