WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

BiMEP

International Biomass Exchange Program

REFERENCE MATERIAL

BIMEP sample 453

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis   BIMEP 453

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

This BIMEP sample 453 of Poplar (leaf) / populus l., from Netherlands, is prepared for the WEPAL proficiency programs. The sample has been 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
2021	2	4
2019	3	3
2017	2	4
2012	4	3

Consensus Values   BIMEP 453

Method: General Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Calorific Value (gross)	MJ/kg	18.2	0.255	1.4	38	18.1	0.170	0.052	0.285
Ash	% (m/m)	13.6	0.354	2.6	41	13.6	0.220	0.069	0.507
Moisture	% (m/m)	7.34	0.912	12.4	43	7.33	0.580	0.174	2.37
Volatile Matter	% (m/m)	72.3	1.39	1.9	27	72.5	0.760	0.336	0.464

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Cl	g/kg	3.57	0.861	24.1	30	3.49	0.532	0.196	5.50
Carbon (C)	% (m/m)	45.8	1.28	2.8	36	45.7	0.765	0.267	0.582
Hydrogen (H)	% (m/m)	5.55	0.232	4.2	30	5.58	0.115	0.053	0.955
Nitrogen (N)	% (m/m)	1.60	0.129	8.1	35	1.59	0.090	0.027	1.70
Oxygen (O)	% (m/m)	32.7	1.06	3.2	13	32.7	0.500	0.368	1.13

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ca	g/kg	35.9	3.21	8.9	15	35.9	1.70	1.04	2.88
Fe	g/kg	0.254	0.030	11.7	15	0.260	0.012	0.010	3.78
K	g/kg	8.74	1.00	11.5	15	8.80	0.564	0.323	3.70
Mg	g/kg	4.53	0.441	9.7	15	4.69	0.237	0.142	3.14
Na	g/kg	1.20	0.039	3.2	14	1.20	0.022	0.013	1.08
P	g/kg	1.53	0.223	14.5	14	1.56	0.110	0.074	4.86

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ba	mg/kg	24.6	4.08	16.6	16	25.4	2.63	1.28	5.18
Cd	mg/kg	3.03	0.405	13.4	16	3.07	0.290	0.127	4.18
Co	mg/kg	4.39	0.758	17.3	14	4.45	0.486	0.253	5.77
Mn	mg/kg	130	18.8	14.5	19	136	14.7	5.39	4.15
Zn	mg/kg	225	38.3	17.0	19	222	23.3	11.0	4.87

Indicative Values   BIMEP 453

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
S	g/kg	3.28	1.38	41.9	34	3.30	0.792	0.295	8.98

Method: Water Soluble Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
K	g/kg	8.64	0.879	10.2	7	8.67	0.617	0.415	4.81
Na	g/kg	1.07	0.610	57.1	6	1.00	0.291	0.311	29.1

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	0.177	0.139	78.7	13	0.200	0.104	0.048	27.3
Si	g/kg	9.65	3.05	31.6	11	9.90	1.73	1.15	11.9

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
As	mg/kg	0.490	0.405	82.6	11	0.490	0.258	0.153	31.1
Cr	mg/kg	0.732	0.786	107.4	8	0.823	0.362	0.348	47.5
Cu	mg/kg	10.3	2.25	21.8	18	10.5	1.14	0.662	6.43
Hg	mg/kg	0.038	0.016	41.3	7	0.042	0.012	0.007	19.5
Mo	mg/kg	0.233	0.098	42.1	8	0.260	0.062	0.043	18.6
Ni	mg/kg	2.91	0.616	21.1	13	2.98	0.330	0.214	7.33
Pb	mg/kg	1.51	0.757	50.1	12	1.49	0.443	0.273	18.1
V	mg/kg	0.503	0.196	38.9	9	0.490	0.116	0.081	16.2
F	mg/kg	15.3	7.61	49.6	10	15.5	5.00	3.01	19.6
Ti	mg/kg	9.99	4.25	42.5	11	11.9	2.61	1.60	16.0