WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

BIMEP

International Biomass Exchange Program

REFERENCE MATERIAL

BIMEP sample 456

WAGENINGEN
UNIVERSITY & RESEARCH

BiMEP

Certificate of Analysis BIMEP 456

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 456 of Champost, from Netherlands, is prepared for the WEPAL proficiency programs. The sample has been used in 9 periods (or rounds). Only results from the last 5 periods are used. This way, the consensus values reflect the latest 'state of the art' analytical techniques used by the laboratories. The results on which the values in this report are based were taken from the periods given in the following table:

Year	Round	Number
2024	4	4
2021	2	3
2018	4	2
2016	4	3
2016	3	4

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Consensus Values BIMEP 456

Method: General Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Calorific Value (gross)	MJ/kg	11.7	0.401	3.4	42	11.7	0.281	0.077	0.662
Ash	% (m/m)	42.2	1.11	2.6	49	42.2	0.700	0.198	0.469
Moisture	% (m/m)	8.82	0.763	8.7	51	8.77	0.450	0.134	1.51
Volatile Matter	% (m/m)	48.9	1.98	4.1	32	49.0	1.10	0.438	0.896

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
S	g/kg	19.5	3.66	18.8	38	20.0	2.11	0.742	3.81
Carbon (C)	% (m/m)	32.0	1.27	4.0	37	32.0	0.700	0.261	0.815
Hydrogen (H)	% (m/m)	3.40	0.355	10.4	34	3.41	0.200	0.076	2.24
Nitrogen (N)	% (m/m)	2.09	0.124	5.9	37	2.06	0.070	0.026	1.22

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Mn	mg/kg	241	36.6	15.2	15	238	19.3	11.8	4.91

Indicative Values BIMEP 456

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Cl	g/kg	5.48	2.06	37.5	30	5.80	1.38	0.469	8.56
Oxygen (O)	% (m/m)	19.0	4.89	25.8	15	19.0	3.07	1.58	8.31

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	2.50	1.96	78.5	8	2.09	1.01	0.868	34.7
Ca	g/kg	48.6	7.93	16.3	9	46.5	4.69	3.30	6.80
Fe	g/kg	2.58	0.536	20.8	11	2.48	0.240	0.202	7.84
K	g/kg	20.5	3.56	17.4	10	19.8	1.45	1.41	6.87
Mg	g/kg	3.84	0.625	16.3	9	3.69	0.290	0.260	6.78
Na	g/kg	2.61	0.761	29.2	10	2.79	0.475	0.301	11.5
P	g/kg	4.12	1.28	31.2	11	4.04	0.960	0.484	11.8
Si	g/kg	0.533	1.11	207.4	8	0.858	0.756	0.489	91.6

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
As	mg/kg	1.45	0.423	29.2	9	1.48	0.200	0.176	12.2
Ba	mg/kg	77.3	40.4	52.3	14	81.8	29.7	13.5	17.5
Cd	mg/kg	0.268	0.074	27.5	8	0.280	0.030	0.033	12.1
Co	mg/kg	1.16	0.265	22.8	6	1.26	0.205	0.135	11.6
Cr	mg/kg	10.2	4.90	48.0	10	9.60	2.25	1.94	19.0
Cu	mg/kg	19.3	11.9	61.5	12	19.8	6.50	4.29	22.2
Mo	mg/kg	2.47	0.604	24.4	6	2.55	0.370	0.308	12.5
Ni	mg/kg	3.78	1.75	46.3	11	3.89	0.590	0.659	17.4
Pb	mg/kg	5.86	4.45	75.9	10	6.74	3.69	1.76	30.0
V	mg/kg	7.11	2.00	28.1	7	6.77	1.16	0.945	13.3
Zn	mg/kg	118	28.7	24.3	13	117	19.0	9.96	8.43
F	mg/kg	33.8	15.5	45.8	7	34.0	9.00	7.32	21.6
Ti	mg/kg	356	144	40.4	9	335	96.9	59.8	16.8