



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis

BIMEP

International Biomass Exchange Program

REFERENCE MATERIAL

BIMEP sample 455

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 455 of Compost, from Switzerland, is prepared for the WEPAL proficiency programs. The sample has been used in 3 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	4	2
2019	4	3
2013	1	3

Consensus Values BIMEP 455

Method: General Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Calorific Value (gross)	MJ/kg	3.74	0.183	4.9	27	3.74	0.134	0.044	1.18
Ash	% (m/m)	90.7	1.11	1.2	28	90.5	0.780	0.262	0.289
Moisture	% (m/m)	5.03	0.470	9.3	33	5.01	0.302	0.102	2.03
Volatile Matter	% (m/m)	30.8	6.59	21.4	24	31.0	4.25	1.68	5.47

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Carbon (C)	% (m/m)	12.7	0.432	3.4	26	12.8	0.228	0.106	0.830
Hydrogen (H)	% (m/m)	2.34	0.295	12.6	23	2.35	0.180	0.077	3.29
Nitrogen (N)	% (m/m)	1.000	0.134	13.4	24	1.01	0.075	0.034	3.41

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ca	g/kg	333	51.9	15.6	11	327	27.4	19.5	5.87
P	g/kg	6.70	0.740	11.0	10	6.78	0.450	0.292	4.36

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Zn	mg/kg	271	43.9	16.2	14	271	27.0	14.7	5.42

Indicative Values BIMEP 455

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
S	g/kg	0.685	0.818	119.5	22	0.715	0.565	0.218	31.8
Cl	g/kg	0.118	0.106	90.0	15	0.117	0.077	0.034	29.0
Oxygen (O)	% (m/m)	25.4	1.79	7.0	5	25.9	1.20	1.000	3.94

Method: Water Soluble Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
K	g/kg	0.241	0.135	56.2	5	0.229	0.061	0.076	31.4
Na	g/kg	0.146	0.086	59.0	5	0.150	0.039	0.048	33.0

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	13.3	2.83	21.3	9	14.7	1.60	1.18	8.89
Fe	g/kg	10.8	2.98	27.6	12	11.3	1.60	1.08	9.96
K	g/kg	1.47	0.720	49.1	12	1.60	0.375	0.260	17.7
Mg	g/kg	2.90	0.624	21.5	11	2.85	0.274	0.235	8.12
Na	g/kg	0.629	0.284	45.2	10	0.660	0.251	0.112	17.9
Si	g/kg	20.5	12.6	61.4	8	22.7	6.89	5.56	27.1

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
As	mg/kg	3.07	1.97	64.3	7	3.10	1.14	0.932	30.4
Ba	mg/kg	126	29.1	23.0	10	126	19.2	11.5	9.09
Cd	mg/kg	0.571	0.358	62.8	10	0.688	0.180	0.142	24.8
Co	mg/kg	2.47	0.858	34.7	8	2.57	0.489	0.379	15.3
Cr	mg/kg	23.0	6.34	27.6	13	24.9	3.41	2.20	9.55
Cu	mg/kg	91.4	25.1	27.4	13	100	13.4	8.69	9.50
Hg	mg/kg	0.340	0.057	16.7	5	0.330	0.033	0.032	9.36
Mn	mg/kg	132	44.2	33.6	13	125	20.3	15.3	11.6
Mo	mg/kg	1.57	0.474	30.2	5	1.72	0.310	0.265	16.9
Ni	mg/kg	8.23	3.22	39.1	12	9.02	2.12	1.16	14.1
Pb	mg/kg	32.0	8.36	26.2	13	30.8	6.40	2.90	9.07
Sb	mg/kg	1.33	0.236	17.8	6	1.30	0.161	0.121	9.09
Sn	mg/kg	5.18	3.57	69.0	9	5.70	2.40	1.49	28.7
V	mg/kg	9.94	3.02	30.4	10	9.31	1.55	1.20	12.0
Ti	mg/kg	125	196	156.6	10	172	121	77.5	61.9