



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis

BIMEP

International Biomass Exchange Program

REFERENCE MATERIAL

BIMEP sample 431

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 431 of Compost, from Switzerland, is prepared for the WEPAL proficiency programs. The sample has been 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
2021	4	1
2018	4	4
2015	1	4
2013	3	3
2010	1	4

Consensus Values BIMEP 431

Method: General Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Calorific Value (gross)	MJ/kg	4.50	0.196	4.4	42	4.52	0.139	0.038	0.840
Ash	% (m/m)	75.9	0.765	1.0	50	75.8	0.500	0.135	0.178
Moisture	% (m/m)	3.75	0.411	11.0	51	3.72	0.250	0.072	1.92
Volatile Matter	% (m/m)	24.0	0.810	3.4	35	24.0	0.500	0.171	0.713

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Carbon (C)	% (m/m)	14.0	0.535	3.8	42	13.9	0.330	0.103	0.736
Hydrogen (H)	% (m/m)	1.48	0.199	13.4	37	1.52	0.112	0.041	2.76
Nitrogen (N)	% (m/m)	1.05	0.081	7.7	43	1.04	0.050	0.015	1.46

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ca	g/kg	50.3	9.07	18.0	17	51.2	4.93	2.75	5.47
Fe	g/kg	18.8	3.63	19.3	19	20.0	1.21	1.04	5.53
Mg	g/kg	9.57	1.19	12.4	17	9.47	0.630	0.360	3.77

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Hg	mg/kg	0.091	0.012	13.3	13	0.093	0.007	0.004	4.60
Mn	mg/kg	669	134	20.0	22	673	85.0	35.7	5.33
Ni	mg/kg	30.7	6.04	19.7	19	31.2	3.00	1.73	5.65

Indicative Values BIMEP 431

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
S	g/kg	1.06	0.580	54.8	36	1.08	0.417	0.121	11.4
Cl	g/kg	0.616	0.457	74.2	30	0.600	0.336	0.104	16.9
Oxygen (O)	% (m/m)	11.2	4.55	40.8	7	10.5	4.64	2.15	19.3

Method: Water Soluble Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
K	g/kg	3.28	1.70	51.8	6	3.85	0.798	0.866	26.4
Na	g/kg	0.410	0.101	24.5	6	0.426	0.055	0.051	12.5

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	31.8	7.03	22.1	15	32.3	3.01	2.27	7.12
K	g/kg	13.1	5.40	41.3	18	14.8	4.04	1.59	12.2
Na	g/kg	3.64	2.36	64.8	18	4.74	1.61	0.695	19.1
P	g/kg	2.42	0.499	20.6	16	2.53	0.319	0.156	6.43
Si	g/kg	195	98.7	50.6	16	224	37.6	30.9	15.8

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
As	mg/kg	8.69	2.32	26.7	14	9.26	1.33	0.774	8.91
Ba	mg/kg	136	65.1	47.7	16	136	58.9	20.3	14.9
Be	mg/kg	0.858	0.419	48.9	9	0.980	0.280	0.175	20.4
Cd	mg/kg	0.269	0.259	96.2	15	0.390	0.181	0.083	31.1
Co	mg/kg	7.48	2.24	29.9	15	7.70	1.12	0.722	9.64
Cr	mg/kg	81.0	41.9	51.8	19	78.0	22.9	12.0	14.8
Cu	mg/kg	44.7	12.6	28.1	21	45.0	7.30	3.43	7.66
Mo	mg/kg	3.56	1.19	33.3	10	3.55	0.850	0.468	13.2
Pb	mg/kg	36.6	10.9	29.8	18	37.0	6.00	3.21	8.77
Sb	mg/kg	1.19	0.372	31.3	7	1.14	0.250	0.176	14.8
Sn	mg/kg	3.43	1.34	39.0	11	3.23	0.715	0.503	14.7
Tl	mg/kg	0.351	0.166	47.2	7	0.380	0.080	0.078	22.3
V	mg/kg	47.8	13.7	28.7	13	51.1	9.57	4.75	9.95
Zn	mg/kg	128	33.3	25.9	21	133	19.8	9.07	7.06
F	mg/kg	15.9	40.0	251.0	8	25.5	19.4	17.7	111
Ti	mg/kg	1636	780	47.6	12	1686	472	281	17.2