

WAGENINGEN EVALUATING PROGRAMS FOR ANALYTICAL LABORATORIES

Certificate of Analysis



International Biomass Exchange Program

REFERENCE MATERIAL
BIMEP sample 439



Certificate of Analysis BIMEP 439

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 $^{\circ}$ C and milled to pass a 0.5 mm sieve.

This BIMEP sample 439 of Compost from Switzerland is prepared for the WEPAL proficiency programs. The sample is 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	3	1
2018	2	1
2016	1	1
2011	3	1

Ві́МЕР



Consensus Values BIMEP 439

	Odiscisus values Biller 400								-	
Method: General Analysis Element Ash	Unit % (m/m)	Mean 68.1	Std.Dev. 1.16	CV %	N 41	Median 68.2	MAD 0.80	Uncertainty 0.23	95 % confidence 67.75 -	e limits 68.48
Moisture	% (m/m)	3.96	0.505	12.7	44	3.95	0.340	0.095	3.81 -	4.11
Calorific Value (gross)	MJ/kg	6.29	0.280	4.4	42	6.34	0.188	0.054	6.20 -	6.38
Volatile Matter	% (m/m)	32.1	0.73	2.3	31	32.2	0.52	0.16	31.79 -	32.32
Method: Elementary Analysis										
Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence	limits
Carbon (C)	% (m/m)	19.4	1.38	7.1	37	19.7	0.98	0.28	19.0 -	19.9
Hydrogen (H)	% (m/m)	1.95	0.200	10.3	35	1.97	0.140	0.042	1.88 -	2.02
Nitrogen (N)	% (m/m)	1.38	0.086	6.3	37	1.39	0.060	0.018	1.35 -	1.41







Method: Elementary Analysis										
Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confid	ence limits
S	g/kg	1.07	0.513	48.0	33	1.05	0.320	0.112	0.886	1.25
Method: Major Elements										
Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confid	ence limits
Al	g/kg	18.9	3.31	17.5	9	19.0	2.30	1.38	16.4	21.4
Ca	g/kg	72.3	5.78	8.0	10	72.2	4.24	2.29	68.2	76.3
Fe	g/kg	11.1	1.32	11.9	10	11.4	0.90	0.52	10.2	12.0
K	g/kg	15.8	1.90	12.0	10	15.6	1.28	0.75	14.4	17.1
Mg	g/kg	11.1	1.00	9.0	10	11.1	0.70	0.40	10.4	11.8
Na	g/kg	4.38	0.734	16.8	10	4.25	0.515	0.290	3.86	4.90
Р	g/kg	2.73	0.267	9.8	11	2.72	0.190	0.101	2.55	2.91
Method: Minor Elements										
Element	11!6		0.15	OV 0/		Madian		11	05.0/	
	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confid	ence limits
As	Unit ma/ka	Mean 5.80	Std.Dev. 1,455	CV % 25.1	N 8		MAD 0.935	Uncertainty 0.643	95 % confid 4.62	
	mg/kg	5.80	1.455			медіап 5.71 127		0.643		6.99
As Ba	mg/kg mg/kg	5.80 124	1.455 40.3	25.1 32.5	8	5.71 127	0.935 29.2	0.643 15.9	4.62 · 95.4 ·	6.99 152
As	mg/kg mg/kg mg/kg	5.80	1.455	25.1	8 10	5.71	0.935	0.643 15.9	4.62	6.99 152 0.403
As Ba Cd	mg/kg mg/kg mg/kg mg/kg	5.80 124 0.325	1.455 40.3 0.0955	25.1 32.5 29.4	8 10 8	5.71 127 0.349	0.935 29.2 0.0700	0.643 15.9 0.0422	4.62 · 95.4 · 0.247 ·	6.99 152 0.403 5.96
As Ba Cd Co	mg/kg mg/kg mg/kg	5.80 124 0.325 5.51	1.455 40.3 0.0955 0.678	25.1 32.5 29.4 12.3	8 10 8 11	5.71 127 0.349 5.49	0.935 29.2 0.0700 0.457	0.643 15.9 0.0422 0.255	4.62 · 95.4 · 0.247 · 5.06 ·	6.99 152 0.403 5.96 89.6
As Ba Cd Co Cr	mg/kg mg/kg mg/kg mg/kg mg/kg	5.80 124 0.325 5.51 78.6	1.455 40.3 0.0955 0.678 17.39	25.1 32.5 29.4 12.3 22.1	8 10 8 11 12	5.71 127 0.349 5.49 78.0	0.935 29.2 0.0700 0.457 12.00	0.643 15.9 0.0422 0.255 6.28	4.62 · 95.4 · 0.247 · 5.06 · 67.7 · ·	6.99 152 0.403 5.96 89.6 43.9
As Ba Cd Co Cr Cu	mg/kg mg/kg mg/kg mg/kg mg/kg	5.80 124 0.325 5.51 78.6 39.8	1.455 40.3 0.0955 0.678 17.39 7.17	25.1 32.5 29.4 12.3 22.1 18.0	8 10 8 11 12 14	5.71 127 0.349 5.49 78.0 41.5	0.935 29.2 0.0700 0.457 12.00 5.15	0.643 15.9 0.0422 0.255 6.28 2.40	4.62 · 95.4 · 0.247 · 5.06 · 67.7 · 35.7 · ·	6.99 152 0.403 5.96 89.6 43.9
As Ba Cd Co Cr Cu Mn	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	5.80 124 0.325 5.51 78.6 39.8 454	1.455 40.3 0.0955 0.678 17.39 7.17 58.0	25.1 32.5 29.4 12.3 22.1 18.0 12.8	8 10 8 11 12 14	5.71 127 0.349 5.49 78.0 41.5	0.935 29.2 0.0700 0.457 12.00 5.15 42.7	0.643 15.9 0.0422 0.255 6.28 2.40 19.4	4.62 · · · · · · · · · · · · · · · · · · ·	6.99 152 0.403 5.96 89.6 43.9 487 3.42
As Ba Cd Co Cr Cu Mn	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	5.80 124 0.325 5.51 78.6 39.8 454 3.13	1.455 40.3 0.0955 0.678 17.39 7.17 58.0 0.358	25.1 32.5 29.4 12.3 22.1 18.0 12.8 11.5	8 10 8 11 12 14 14	5.71 127 0.349 5.49 78.0 41.5 453 3.21	0.935 29.2 0.0700 0.457 12.00 5.15 42.7 0.250	0.643 15.9 0.0422 0.255 6.28 2.40 19.4 0.158	4.62 · · · · · · · · · · · · · · · · · · ·	6.99 152 0.403 5.96 89.6 43.9 487 3.42 25.5
As Ba Cd Co Cr Cu Mn Mo Ni	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	5.80 124 0.325 5.51 78.6 39.8 454 3.13 22.3	1.455 40.3 0.0955 0.678 17.39 7.17 58.0 0.358 5.36	25.1 32.5 29.4 12.3 22.1 18.0 12.8 11.5 24.1	8 10 8 11 12 14 14 8 13	5.71 127 0.349 5.49 78.0 41.5 453 3.21 22.6	0.935 29.2 0.0700 0.457 12.00 5.15 42.7 0.250 3.90	0.643 15.9 0.0422 0.255 6.28 2.40 19.4 0.158 1.86	4.62 · 95.4 · 0.247 · 5.06 · 67.7 · 35.7 · 420 · 2.83 · 19.0 · ·	6.99 152 0.403 5.96 89.6 43.9 487 3.42 25.5 37.7
As Ba Cd Co Cr Cu Mn Mo Ni Pb	mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg mg/kg	5.80 124 0.325 5.51 78.6 39.8 454 3.13 22.3 34.6	1.455 40.3 0.0955 0.678 17.39 7.17 58.0 0.358 5.36 4.77	25.1 32.5 29.4 12.3 22.1 18.0 12.8 11.5 24.1 13.8	8 10 8 11 12 14 14 8 13	5.71 127 0.349 5.49 78.0 41.5 453 3.21 22.6 34.9	0.935 29.2 0.0700 0.457 12.00 5.15 42.7 0.250 3.90 3.10	0.643 15.9 0.0422 0.255 6.28 2.40 19.4 0.158 1.86 1.80	4.62 · · · · · · · · · · · · · · · · · · ·	6.99 152 0.403 5.96 89.6 43.9 487 3.42 25.5 37.7 3.72

ВîМЕР



Informative Values	BIMEP 439
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		mormati	ve values	BINEP 439		
y Analysis						
Unit	Median	MAD	N			
% (m/m)	9.99	3.41	11			
g/kg	0.900	0.4200	29			
uble Elements						
Unit	Median	MAD	N			
g/kg	0.566	0.3540	5			
g/kg	5.96	1.755	4			
g/kg	0.574	0.1370	4			
nents						
Unit	Median	MAD	N			
g/kg	128	53.4	8			
ments				Results smaller t	than (<)	
Unit	Median	MAD	N	Median of <	N	
mg/kg	0.660	0.1600	7			
mg/kg	49.0	36.00	7			
mg/kg	0.250	0.0400	7			
mg/kg	1.72	0.381	7			
mg/kg	0.345	0.0950	4	0.750	6	
mg/kg	-	-	0	1.00	5	
mg/kg	1016	391.0	11			
mg/kg	0.240	0.0400	3	1.000	5	
	Unit % (m/m) g/kg uble Elements Unit g/kg g/kg g/kg ments Unit g/kg mg/kg	Unit % (m/m) 9.99 g/kg 0.900 uble Elements Unit Median g/kg 0.566 g/kg 5.96 g/kg 0.574 ments Unit Median g/kg 128 ments Unit Median g/kg 128 ments Unit Median g/kg 128 ments Unit Median g/kg 1.72 mg/kg 0.345 mg/kg 0.345 mg/kg 1016	y Analysis	Unit Median MAD N % (m/m) 9.99 3.41 11 g/kg 0.900 0.4200 29 uble Elements Unit Median MAD N g/kg 0.566 0.3540 5 g/kg 5.96 1.755 4 g/kg 0.574 0.1370 4 ments Unit Median MAD N g/kg 128 53.4 8 ments Median MAD N mg/kg 0.660 0.1600 7 mg/kg 0.660 0.1600 7 mg/kg 0.250 0.0400 7 mg/kg 1.72 0.381 7 mg/kg 0.345 0.0950 4 mg/kg - 0 mg/kg 1016 391.0 11	y Analysis Unit Median MAD N % (m/m) 9.99 3.41 11 g/kg 0.900 0.4200 29 uble Elements Unit Median MAD N g/kg 0.566 0.3540 5 g/kg 5.96 1.755 4 g/kg 0.574 0.1370 4 ments Unit Median MAD N g/kg 128 53.4 8 ments Unit Median MAD N g/kg 128 53.4 8 ments Unit Median MAD N mg/kg 0.660 0.1600 7 mg/kg 0.660 0.1600 7 mg/kg 49.0 36.00 7 mg/kg 0.250 0.0400 7 mg/kg 0.345 0.0950 4 0.750 mg/kg 0.345 0.0950 4 0.750 mg/kg 1016 391.0 11	