WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

BiMEP

International Biomass Exchange Program

REFERENCE MATERIAL

BIMEP sample 442

WAGENINGEN
UNIVERSITY & RESEARCH

BiMEP

Certificate of Analysis BIMEP 442

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 °C and milled to pass a 0.5 mm sieve.

This BIMEP sample 442 of Chinese silver grass (plant)/ Miscanthus sinensis from Netherlands is prepared for the WEPAL proficiency programs. The sample is used in 10 periods (or rounds). Only results from the last 5 periods are used. In this way the consensus values will reflect the latest 'state of the art' in the analytical techniques used in 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
2023	2	3
2020	3	4
2018	2	4
2016	4	2
2015	1	2

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Consensus Values BIMEP 442

Method: General Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Ash	% (m/m)	5.14	0.431	8.4	52	5.17	0.292	0.075	5.02 - 5.26
Moisture	% (m/m)	7.74	0.414	5.3	53	7.71	0.290	0.071	7.62 - 7.85
Calorific Value (gross)	MJ/kg	18.8	0.49	2.6	47	18.8	0.33	0.09	18.61 - 18.90
Volatile Matter	% (m/m)	78.4	0.62	0.8	33	78.6	0.47	0.13	78.15 - 78.59

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Carbon (C)	% (m/m)	47.4	0.96	2.0	43	47.4	0.63	0.18	47.09 - 47.68
Hydrogen (H)	% (m/m)	5.77	0.345	6.0	39	5.77	0.240	0.069	5.66 - 5.88
Nitrogen (N)	% (m/m)	0.756	0.1192	15.8	42	0.765	0.0810	0.0230	0.719 - 0.793
Oxygen (O)	% (m/m)	40.6	0.83	2.1	19	40.7	0.58	0.24	40.21 - 41.01

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Mn	mg/kg	69.6	7.67	11.0	17	69.2	5.49	2.33	65.7 - 73.6

Indicative Values BIMEP 442

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Cl	g/kg	0.885	0.2825	31.9	30	0.885	0.1950	0.0645	0.780 - 0.990
S	g/kg	0.636	0.2908	45.7	39	0.690	0.1900	0.0582	0.542 - 0.730

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Ca	g/kg	2.91	0.285	9.8	13	2.99	0.197	0.099	2.73 - 3.08
Fe	g/kg	0.350	0.0722	20.7	13	0.353	0.0530	0.0250	0.306 - 0.393
K	g/kg	3.67	0.372	10.2	14	3.65	0.258	0.124	3.45 - 3.88
Mg	g/kg	0.757	0.0880	11.6	13	0.760	0.0625	0.0305	0.704 - 0.809
P	g/kg	0.718	0.0461	6.4	11	0.713	0.0354	0.0174	0.688 - 0.749
Si	g/kg	13.8	4.11	29.9	8	13.0	2.89	1.82	10.4 - 17.1

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Ba	mg/kg	21.9	1.64	7.5	14	21.5	1.15	0.55	21.0 - 22.8
Cd	mg/kg	0.126	0.0131	10.4	9	0.130	0.0100	0.0055	0.116 - 0.136
Cu	mg/kg	4.22	0.925	21.9	15	4.13	0.620	0.298	3.71 - 4.73
Pb	mg/kg	2.82	0.801	28.4	13	2.57	0.532	0.278	2.34 - 3.29
Ti	mg/kg	35.7	7.79	21.8	11	34.3	5.40	2.93	30.6 - 40.9
V	mg/kg	1.02	0.251	24.8	8	1.10	0.206	0.111	0.810 - 1.22
Zn	mg/kg	27.5	4.08	14.8	15	28.0	3.00	1.32	25.2 - 29.7

Informative Values BIMEP 442

Method: Water Soluble Elements

Element	Unit	Median	MAD	N
Cl	g/kg	0.854	0.0415	4
K	g/kg	2.76	0.555	4
Na	g/kg	0.101	0.0160	4

Method: Major Elements

Element	Unit	Median	MAD	N
Al	g/kg	0.500	0.1899	13
Na	g/kg	0.169	0.0776	13

Method: Minor Elements

					Results smaller than (<)	
Element	Unit	Median	MAD	N	Median of <	N
As	mg/kg	0.693	0.4825	8		
Be	mg/kg	-	-	0	0.100	8
Co	mg/kg	0.138	0.0250	4	0.100	7
Cr	mg/kg	1.55	0.704	10		
F	mg/kg	21.3	12.00	6		
Hg	mg/kg	0.0200	0.0086	7	0.1000	5
Mo	mg/kg	1.20	0.032	7		
Ni	mg/kg	0.530	0.2230	9		
Sb	mg/kg	0.155	0.0550	6		
Se	mg/kg	0.110	0.0400	3	0.100	6
Sn	mg/kg	0.410	0.0700	5		
Tl	mg/kg	0.0200	0.0180	3	0.1000	6