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, 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 442 of Chinese silver grass (plant)/ Miscanthus sinensis, from Netherlands, is prepared for the WEPAL proficiency programs. The sample has been used in 10 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
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	Rel.Uncert. %
Calorific Value (gross)	MJ/kg	18.8	0.491	2.6	47	18.8	0.330	0.090	0.478
Ash	% (m/m)	5.14	0.424	8.2	52	5.17	0.292	0.073	1.43
Moisture	% (m/m)	7.72	0.514	6.7	53	7.71	0.290	0.088	1.14
Volatile Matter	% (m/m)	78.4	0.739	0.9	33	78.6	0.470	0.161	0.205

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Carbon (C)	% (m/m)	47.5	1.33	2.8	43	47.4	0.630	0.254	0.536
Hydrogen (H)	% (m/m)	5.77	0.400	6.9	39	5.77	0.240	0.080	1.39
Nitrogen (N)	% (m/m)	0.760	0.136	17.9	42	0.765	0.081	0.026	3.45
Oxygen (O)	% (m/m)	40.6	1.39	3.4	19	40.7	0.580	0.400	0.983

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ca	g/kg	2.89	0.232	8.0	13	2.99	0.197	0.080	2.78
K	g/kg	3.64	0.460	12.6	14	3.65	0.258	0.154	4.22
Mg	g/kg	0.755	0.079	10.5	13	0.760	0.063	0.028	3.65
P	g/kg	0.717	0.052	7.2	11	0.713	0.035	0.019	2.71

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ba	mg/kg	21.8	1.85	8.5	14	21.5	1.15	0.617	2.83
Mn	mg/kg	69.6	8.41	12.1	17	69.2	5.49	2.55	3.66
Zn	mg/kg	27.4	4.58	16.7	15	28.0	3.00	1.48	5.39

Indicative Values BIMEP 442

Method: Elementary Analysis

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
S	g/kg	0.626	0.323	51.6	39	0.690	0.190	0.065	10.3
Cl	g/kg	0.878	0.396	45.1	30	0.885	0.195	0.090	10.3

Method: Water Soluble Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
K	g/kg	2.71	1.07	39.3	4	2.76	0.555	0.666	24.6
Na	g/kg	0.102	0.028	27.6	4	0.101	0.016	0.018	17.3
Cl	g/kg	0.859	0.086	10.0	4	0.854	0.042	0.054	6.25

Method: Major Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	0.431	0.199	46.2	13	0.500	0.190	0.069	16.0
Fe	g/kg	0.347	0.063	18.1	13	0.353	0.053	0.022	6.29
Na	g/kg	0.182	0.117	64.2	13	0.169	0.078	0.041	22.3
Si	g/kg	13.5	4.87	36.2	8	13.0	2.89	2.15	16.0

Method: Minor Elements

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
As	mg/kg	0.409	0.725	177.4	8	0.693	0.483	0.320	78.4
Cd	mg/kg	0.114	0.028	24.8	9	0.130	0.010	0.012	10.4
Cr	mg/kg	1.37	1.14	83.3	10	1.55	0.704	0.451	32.9
Cu	mg/kg	4.34	1.22	28.0	15	4.13	0.620	0.393	9.05
Hg	mg/kg	0.018	0.013	71.7	7	0.020	0.009	0.006	33.9
Mo	mg/kg	1.21	0.063	5.2	7	1.20	0.032	0.030	2.44
Ni	mg/kg	0.478	0.408	85.4	9	0.530	0.223	0.170	35.6
Pb	mg/kg	2.78	1.06	38.1	13	2.57	0.532	0.367	13.2
Sn	mg/kg	0.377	0.126	33.3	5	0.410	0.070	0.070	18.6
V	mg/kg	1.01	0.405	40.0	8	1.10	0.206	0.179	17.7
Ti	mg/kg	35.2	9.62	27.3	11	34.3	5.40	3.63	10.3