WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 225

WAGENINGEN
UNIVERSITY & RESEARCH

marsep

Certificate of Analysis MARSEP 225

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 MARSEP samples are dried at 40 ^{o}C and milled to pass a 0.5 mm sieve.

This MARSEP sample 225 of Compost from Switzerland is prepared for the WEPAL proficiency programs. The sample is used in 6 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
2019	4	2
2016	4	1
2015	4	3
2012	3	1
2010	1	2

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Consensus Values MARSEP 225

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Ag	µg/kg	3890	583	15.0	17	4000	410	177	3590 - 4186
Al	g/kg	8.88	1.474	16.6	47	8.79	1.030	0.269	8.44 - 9.31
As	mg/kg	2.72	0.455	16.7	54	2.80	0.308	0.077	2.60 - 2.84
Ba	mg/kg	139	17.3	12.5	24	140	12.0	4.4	132 - 146
Be	µg/kg	187	30.3	16.2	16	195	21.0	9.5	171 - 203
TC =totalC (org+inorg)	g/kg	115	16.4	14.2	25	115	10.7	4.1	109 - 122
Ca	g/kg	315	14.6	4.6	128	316	10.2	1.6	312.8 - 318.0
Cd	mg/kg	0.755	0.0729	9.7	126	0.756	0.0505	0.0081	0.742 - 0.768
Co	mg/kg	2.32	0.180	7.8	109	2.30	0.120	0.022	2.29 - 2.36
Cr	mg/kg	24.2	2.99	12.4	131	24.1	2.05	0.33	23.6 - 24.7
Cu	mg/kg	102	6.9	6.8	139	102	4.6	0.7	100.6 - 102.9
Fe	g/kg	10.6	0.65	6.1	81	10.6	0.43	0.09	10.46 - 10.75
Hg	µg/kg	304	39.1	12.8	111	304	26.2	4.6	297 - 312
K	g/kg	0.748	0.1865	24.9	132	0.753	0.1269	0.0203	0.716 - 0.780
Mg	g/kg	2.65	0.221	8.3	135	2.65	0.154	0.024	2.62 - 2.69
Mn	mg/kg	136	13.0	9.6	76	137	8.7	1.9	133.1 - 139.0
Mo	mg/kg	1.74	0.251	14.4	94	1.78	0.175	0.032	1.69 - 1.79
N	g/kg	9.59	0.309	3.2	130	9.59	0.209	0.034	9.54 - 9.65
Na	g/kg	0.309	0.0415	13.4	54	0.306	0.0280	0.0071	0.298 - 0.321
Ni	mg/kg	8.50	0.951	11.2	124	8.50	0.625	0.107	8.33 - 8.67
P	g/kg	6.93	0.401	5.8	138	6.92	0.271	0.043	6.86 - 7.00
Pb	mg/kg	35.6	4.38	12.3	131	35.4	3.04	0.48	34.8 - 36.4
S	mg/kg	5140	482	9.4	33	5130	344	105	4964 - 5306
Sb	µg/kg	1180	155	13.1	17	1160	111	47	1097 - 1255
Se	µg/kg	478	111.0	23.2	20	477	83.0	31.0	426 - 530
Sn	mg/kg	6.20	1.125	18.2	19	6.16	0.766	0.323	5.66 - 6.74
V	mg/kg	10.1	1.21	12.1	35	10.0	0.80	0.26	9.66 - 10.5
Zn	mg/kg	293	21.0	7.2	138	293	14.3	2.2	289.9 - 297.0

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
loss-on-ignition	%	9.37	0.931	9.9	111	9.46	0.650	0.111	9.20 - 9.55

Indicative Values MARSEP 225

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
B	mg/kg	7.39	2.291	31.0	27	7.76	1.490	0.551	6.49 - 8.30
Li	mg/kg	4.15	1.923	46.3	11	4.70	1.390	0.725	2.87 - 5.43
Sr	mg/kg	161	22.9	14.3	12	161	16.4	8.3	146 - 175
Ti	mg/kg	78.2	38.38	49.1	8	92.3	27.54	16.96	46.9 - 110

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
AOX	mg/kg	85.2	25.85	30.3	33	84.8	18.20	5.63	76.1 - 94.4

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Informative Values MARSEP 225

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
Bi	µg/kg	571	26.0	4		
Cl	mg/kg	238	177.3	4		
N - NH4 (as N)	mg/kg	128	118.3	5		
N - NO3 (as N)	mg/kg	25.0	17.34	5		
S - SO4 (as S)	mg/kg	4710	1059	9		
Si	g/kg	1.72	0.767	3		
Tl	µg/kg	67.3	15.30	7	500.0	11

Method: Other determinations

Element	Unit	Median	MAD	N
residu-on-ignition	%	89.5	0.50	3
dry weight	%	95.2	0.22	6