WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 227

WAGENINGEN
UNIVERSITY & RESEARCH

marsep

Certificate of Analysis MARSEP 227

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 °C and milled to pass a 0.5 mm sieve.

This MARSEP sample 227 of Compost from Switzerland is prepared for the WEPAL proficiency programs. The sample is used in 11 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. It will also give a better estimate of the concentrations of non-stable or volatile determinands. The results on which the values in this report are based were taken from the periods given in the following table.

Year	Round	Number
2020	3	4
2017	4	1
2014	3	4
2011	4	1
2008	2	3

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Consensus Values MARSEP 227

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	g/kg	25.8	1.71	6.6	45	26.0	1.19	0.32	25.3 - 26.3
As	mg/kg	5.34	0.716	13.4	59	5.30	0.510	0.117	5.16 - 5.53
Ba	mg/kg	672	66.0	9.8	27	660	46.0	15.9	645 - 698
Be	µg/kg	571	40.3	7.1	23	573	27.0	10.5	553 - 588
TC =totalC (org+inorg)	g/kg	209	11.2	5.4	23	207	8.0	2.9	204 - 213
Ca	g/kg	76.0	2.12	2.8	130	75.9	1.45	0.23	75.61 - 76.34
Cd	mg/kg	2.09	0.146	7.0	137	2.10	0.100	0.016	2.07 - 2.12
Co	mg/kg	9.11	0.764	8.4	111	9.11	0.530	0.091	8.97 - 9.25
Cr	mg/kg	113	9.6	8.5	134	112	6.5	1.0	111.2 - 114.5
Cu	mg/kg	637	35.8	5.6	143	634	24.0	3.7	631 - 643
Fe	g/kg	34.0	1.64	4.8	87	33.9	1.10	0.22	33.68 - 34.37
Hg	µg/kg	1390	125	9.0	115	1400	89	15	1370 - 1416
K	g/kg	3.16	0.729	23.1	137	3.15	0.484	0.078	3.03 - 3.28
Mg	g/kg	4.95	0.347	7.0	134	4.94	0.235	0.037	4.90 - 5.01
Mn	mg/kg	313	18.9	6.0	81	314	13.0	2.6	309 - 317
Mo	mg/kg	8.36	0.707	8.5	104	8.30	0.467	0.087	8.23 - 8.50
N	g/kg	23.0	0.60	2.6	126	23.0	0.40	0.07	22.92 - 23.13
Na	g/kg	1.10	0.092	8.3	58	1.11	0.065	0.015	1.08 - 1.12
Ni	mg/kg	80.0	4.76	6.0	135	79.8	3.20	0.51	79.2 - 80.8
P	g/kg	22.4	0.86	3.9	137	22.4	0.60	0.09	22.22 - 22.51
Pb	mg/kg	184	10.3	5.6	136	183	7.0	1.1	181.9 - 185.4
S	mg/kg	6460	718	11.1	31	6590	490	161	6199 - 6725
Sb	µg/kg	3950	471	11.9	19	3900	320	135	3721 - 4173
Se	µg/kg	3090	556	18.0	22	2950	385	148	2841 - 3332
Sn	mg/kg	81.2	12.97	16.0	20	79.1	8.98	3.63	75.1 - 87.2
V	mg/kg	23.8	4.72	19.9	38	23.9	3.29	0.96	22.2 - 25.3
Zn	mg/kg	1330	55	4.2	143	1330	38	6	1324 - 1342

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
AOX	mg/kg	461	42.1	9.1	32	461	27.0	9.3	446 - 476
loss-on-ignition	%	37.7	0.66	1.7	110	37.7	0.46	0.08	37.60 - 37.85

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Indicative Values MARSEP 227

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Ag	µg/kg	14100	990	7.0	14	14000	720	330	13550 - 14690
B	mg/kg	29.9	8.14	27.2	35	31.2	5.76	1.72	27.1 - 32.7
Li	mg/kg	10.7	2.35	22.0	11	10.9	1.70	0.89	9.12 - 12.2
Sr	mg/kg	271	28.4	10.5	14	271	20.5	9.5	255 - 287
Tl	µg/kg	129	37.5	29.2	12	130	26.1	13.5	105 - 152

Informative Values MARSEP 227

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N
Bi	µg/kg	3200	122	5
Ga	µg/kg	5330	55	3
N - NH4 (as N)	mg/kg	2540	140	3
N - NO3 (as N)	mg/kg	22.0	18.00	3
S - SO4 (as S)	mg/kg	6300	2486	7
Ti	mg/kg	166	96.9	10

Method: Other determinations

Element	Unit	Median	MAD	N
dry weight	%	94.7	1.17	5