WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 290

WAGENINGEN
UNIVERSITY & RESEARCH

marsep

Certificate of Analysis MARSEP 290

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.

Please note: Most WEPAL-QUASIMEME reference materials are found to be stable over the long term (>10 years) for most determinand/matrix combinations. There are a few exceptions known to us as being less stable over the long term. These are organotins in sediment (MS6), ASP in shellfish (BT7), some PAHs and PCBs in sediment (SETOC) and N-NH_4 (as N) in clay soils (ISE).

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 MARSEP samples are dried at 40°C and milled to pass a 0.5 mm sieve.

This MARSEP sample 290 of Sewage sludge, from Switzerland, is prepared for the WEPAL proficiency programs. The sample has been used in 1 period (or round). The results on which the values in this report are based were taken from the period given in the following table:

Year	Round	Number
2025	3	2

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Consensus Values MARSEP 290

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
As	mg/kg	26.0	3.09	11.9	11	25.7	1.77	1.17	4.49
Ca	g/kg	37.3	1.97	5.3	24	37.1	1.42	0.502	1.35
Cd	mg/kg	0.759	0.127	16.7	20	0.760	0.083	0.035	4.67
Co	mg/kg	6.71	0.579	8.6	18	6.77	0.342	0.171	2.54
Cr	mg/kg	56.3	4.51	8.0	23	56.3	1.92	1.18	2.09
Cu	mg/kg	360	20.1	5.6	27	358	14.5	4.82	1.34
Fe	g/kg	71.3	4.44	6.2	18	70.5	2.50	1.31	1.84
Hg	µg/kg	353	67.6	19.2	22	341	43.5	18.0	5.11
K	g/kg	3.27	0.802	24.5	26	3.34	0.576	0.197	6.01
Mg	g/kg	5.26	0.520	9.9	25	5.22	0.338	0.130	2.47
Mn	mg/kg	403	33.0	8.2	18	395	27.6	9.73	2.41
Mo	mg/kg	7.22	0.991	13.7	17	7.20	0.780	0.301	4.16
Na	g/kg	0.923	0.157	17.1	14	0.948	0.087	0.053	5.70
Ni	mg/kg	25.9	3.12	12.1	23	25.8	2.15	0.814	3.15
N	g/kg	44.3	1.91	4.3	28	44.4	1.01	0.452	1.02
P	g/kg	29.0	2.71	9.3	31	29.0	1.40	0.608	2.09
Pb	mg/kg	40.4	4.37	10.8	24	40.1	2.70	1.12	2.76
Zn	mg/kg	738	56.8	7.7	27	736	31.4	13.7	1.85
TC =totalC (org+inorg)	g/kg	310	20.7	6.7	11	313	13.0	7.79	2.51

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
loss-on-ignition	%	57.9	0.817	1.4	24	57.8	0.450	0.208	0.360
dry weight	%	93.0	1.01	1.1	16	92.9	0.492	0.314	0.338

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Indicative Values MARSEP 290

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	6.14	1.57	25.6	10	6.24	1.14	0.621	10.1
B	mg/kg	19.5	6.52	33.5	9	18.4	4.23	2.72	14.0
Ba	mg/kg	358	76.6	21.4	4	361	36.5	47.9	13.4
Be	µg/kg	214	93.5	43.7	4	214	42.3	58.5	27.3
Se	µg/kg	2198	608	27.7	4	2095	295	380	17.3
Sn	mg/kg	2851	188	6.6	4	2860	115	118	4.12
V	mg/kg	16.9	4.13	24.4	8	17.2	2.90	1.83	10.8
S	mg/kg	8514	2271	26.7	14	8403	1318	759	8.91
TOC =total org.C	g/kg	287	44.0	15.3	4	290	26.5	27.5	9.56
OC = org.C	g/kg	305	41.4	13.6	4	300	20.9	25.9	8.49

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
AOX	mg/kg	196	32.9	16.8	4	197	17.0	20.5	10.5
residue-on-ignition	%	41.1	3.13	7.6	4	42.1	1.65	1.96	4.77