WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 240

WAGENINGEN
UNIVERSITY & RESEARCH

marsep

Certificate of Analysis MARSEP 240

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

This MARSEP sample 240 of Organic Fertilizer, from Belgium, is prepared for the WEPAL proficiency programs. The sample has been used in 11 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.It also gives 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
2022	4	2
2020	1	3
2017	2	2
2014	2	3
2011	2	3

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Consensus Values MARSEP 240

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	g/kg	1.63	0.310	19.1	51	1.67	0.170	0.054	3.34
As	mg/kg	4.31	0.501	11.6	56	4.32	0.315	0.084	1.94
B	mg/kg	33.4	5.54	16.6	39	33.4	3.39	1.11	3.31
Ba	mg/kg	170	17.3	10.1	28	171	13.0	4.08	2.39
Ca	g/kg	26.7	1.21	4.5	120	26.7	0.700	0.138	0.517
Cd	mg/kg	0.229	0.029	12.6	116	0.230	0.020	0.003	1.46
Co	mg/kg	2.13	0.209	9.8	101	2.12	0.120	0.026	1.22
Cr	mg/kg	16.1	2.19	13.6	126	16.2	1.30	0.244	1.52
Cu	mg/kg	64.4	4.09	6.4	134	64.5	2.71	0.442	0.686
Fe	g/kg	2.72	0.280	10.3	88	2.71	0.185	0.037	1.37
Hg	µg/kg	25.8	4.50	17.4	74	25.5	2.62	0.654	2.54
K	g/kg	23.2	1.38	6.0	131	23.2	0.900	0.151	0.651
Mg	g/kg	9.33	0.524	5.6	125	9.33	0.330	0.059	0.628
Mn	mg/kg	249	13.4	5.4	82	249	9.00	1.85	0.742
Mo	mg/kg	3.40	0.275	8.1	95	3.38	0.180	0.035	1.04
Na	g/kg	2.93	0.244	8.3	61	2.93	0.180	0.039	1.33
Ni	mg/kg	18.9	1.33	7.0	121	19.0	1.00	0.151	0.797
N	g/kg	53.6	1.49	2.8	126	53.7	0.900	0.165	0.309
P	g/kg	17.4	0.841	4.8	131	17.3	0.500	0.092	0.530
Pb	mg/kg	6.66	0.967	14.5	113	6.77	0.575	0.114	1.71
Sr	mg/kg	57.5	4.98	8.7	15	58.8	2.60	1.61	2.80
V	mg/kg	8.94	1.42	15.8	40	8.82	0.940	0.280	3.13
Zn	mg/kg	182	10.7	5.9	136	182	7.01	1.15	0.630
S	mg/kg	5449	398	7.3	38	5372	224	80.7	1.48
TC =totalC (org+inorg)	g/kg	380	16.1	4.2	22	381	13.0	4.29	1.13

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
AOX	mg/kg	83.4	9.62	11.5	30	83.2	5.50	2.20	2.63
loss-on-ignition	%	77.1	0.343	0.4	103	77.1	0.200	0.042	0.055
dry weight	%	93.3	0.636	0.7	17	93.4	0.370	0.193	0.207

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Indicative Values MARSEP 240

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Ag	µg/kg	24.6	10.8	44.0	7	24.4	5.54	5.12	20.8
Be	µg/kg	91.0	30.9	34.0	16	90.0	17.2	9.66	10.6
Bi	µg/kg	59.4	9.71	16.4	5	62.3	3.63	5.43	9.14
Li	mg/kg	2.31	0.635	27.5	9	2.46	0.440	0.265	11.5
S - SO4 (as S)	mg/kg	5481	368	6.7	6	5486	163	188	3.43
Sb	µg/kg	399	97.4	24.4	19	409	57.0	27.9	7.00
Se	µg/kg	701	184	26.2	18	716	113	54.1	7.71
Sn	mg/kg	0.444	0.129	29.0	12	0.460	0.098	0.047	10.5
Ti	mg/kg	80.6	51.3	63.7	12	71.1	33.3	18.5	23.0
Tl	µg/kg	40.0	8.07	20.2	11	40.5	3.50	3.04	7.60

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
residu-on-ignition	%	22.6	0.776	3.4	6	22.9	0.350	0.396	1.75