



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Manure and Refuse Sample Exchange Program

REFERENCE MATERIAL

MARSEP sample 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 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 240 of Organic Fertilizer from Belgium is prepared for the WEPAL proficiency programs. The sample is used in 10 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
2020	1	3
2017	2	2
2014	2	3
2011	2	3
2008	3	4

Consensus Values MARSEP 240

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
Al	g/kg	1.65	0.254	15.4	46	1.69	0.169	0.047	1.58	- 1.73
As	mg/kg	4.32	0.516	11.9	52	4.34	0.356	0.089	4.18	- 4.47
B	mg/kg	33.9	4.25	12.6	35	34.0	2.85	0.90	32.4	- 35.3
Ba	mg/kg	167	16.3	9.8	26	164	11.0	4.0	160	- 173
TC =totalC (org+inorg)	g/kg	377	24.1	6.4	20	373	17.0	6.7	366	- 388
Ca	g/kg	26.8	1.03	3.8	126	26.7	0.70	0.11	26.58	- 26.94
Cd	mg/kg	0.229	0.0285	12.5	119	0.230	0.0200	0.0033	0.224	- 0.234
Co	mg/kg	2.15	0.161	7.5	103	2.12	0.110	0.020	2.11	- 2.18
Cr	mg/kg	16.0	1.72	10.8	134	16.0	1.13	0.19	15.73	- 16.32
Cu	mg/kg	64.1	3.91	6.1	141	64.0	2.70	0.41	63.4	- 64.7
Fe	g/kg	2.70	0.231	8.5	86	2.70	0.163	0.031	2.65	- 2.75
Hg	µg/kg	25.3	3.87	15.3	79	25.2	2.62	0.54	24.5	- 26.2
K	g/kg	23.1	1.15	5.0	135	23.0	0.80	0.12	22.87	- 23.26
Mg	g/kg	9.38	0.432	4.6	131	9.38	0.290	0.047	9.30	- 9.45
Mn	mg/kg	249	11.9	4.8	80	249	8.2	1.7	246.7	- 252.0
Mo	mg/kg	3.41	0.276	8.1	95	3.39	0.190	0.035	3.36	- 3.47
N	g/kg	53.8	1.27	2.4	130	53.7	0.87	0.14	53.53	- 53.97
Na	g/kg	2.88	0.222	7.7	54	2.91	0.151	0.038	2.82	- 2.95
Ni	mg/kg	18.9	0.96	5.1	131	19.0	0.63	0.10	18.70	- 19.03
P	g/kg	17.4	0.70	4.0	135	17.3	0.47	0.08	17.26	- 17.50
Pb	mg/kg	6.64	0.885	13.3	116	6.73	0.613	0.103	6.47	- 6.80
S	mg/kg	5420	370	6.8	34	5370	258	79	5291	- 5549
V	mg/kg	8.98	1.442	16.1	37	8.82	0.980	0.296	8.50	- 9.46
Zn	mg/kg	181	10.9	6.0	143	181	7.4	1.1	179.2	- 182.8

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
AOX	mg/kg	83.0	9.45	11.4	34	84.7	6.10	2.03	79.7	- 86.3
loss-on-ignition	%	77.2	0.34	0.4	108	77.1	0.24	0.04	77.11	- 77.24

Indicative Values MARSEP 240

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Be	µg/kg	85.5	26.98	31.6	13	84.6	18.60	9.35	69.3	-	102
Li	mg/kg	2.39	0.528	22.0	8	2.43	0.400	0.233	1.96	-	2.82
Sb	µg/kg	406	105.1	25.9	17	419	75.0	31.9	352	-	460
Se	µg/kg	654	174.3	26.7	17	666	126.0	52.8	564	-	743
Sn	mg/kg	0.444	0.1396	31.4	11	0.470	0.1060	0.0526	0.351	-	0.537
Sr	mg/kg	57.9	4.14	7.2	15	59.0	2.80	1.34	55.6	-	60.1
Tl	µg/kg	40.4	4.56	11.3	10	41.3	3.50	1.80	37.2	-	43.6



Informative Values MARSEP 240

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N
Ag	µg/kg	24.4	4.36	5
Bi	µg/kg	62.3	6.45	4
N - NO3 (as N)	mg/kg	117	38.5	4
S - SO4 (as S)	mg/kg	5500	296	5
Ti	mg/kg	79.6	48.41	11

Results smaller than (<)

Median of <	N
300.0	6

Method: Other determinations

Element	Unit	Median	MAD	N
dry weight	%	93.6	0.40	5