WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 212

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis IPE 212

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 IPE samples are dried at 70 ºC and milled to pass a 0.5 mm sieve.

This IPE sample 212 of Oil palm leaves / Elaeis guineensis from Colombia is prepared for the WEPAL proficiency programs. The sample is used in 4 periods (or rounds). The results on which the values in this report are based were taken from the periods given in the following table.

Year	Round	Number
2023	1	4
2020	1	2
2016	4	4
2012	3	4

Consensus Values IPE 212

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
B	mg/kg	18.0	1.90	10.5	309	18.0	1.30	0.13	17.81 - 18.23
Ba	mg/kg	9.23	2.271	24.6	38	9.07	1.584	0.461	8.48 - 9.97
Ca	g/kg	7.19	0.562	7.8	416	7.18	0.387	0.034	7.14 - 7.24
Cd	µg/kg	40.9	6.25	15.3	94	41.1	4.41	0.81	39.6 - 42.2
Cl (as Cl)	g/kg	6.30	0.317	5.0	74	6.30	0.216	0.046	6.23 - 6.38
Cu	mg/kg	5.98	0.831	13.9	394	5.93	0.570	0.052	5.90 - 6.06
Fe	mg/kg	87.0	9.86	11.3	391	87.4	6.86	0.62	86.0 - 87.9
Hg	µg/kg	27.4	4.17	15.2	59	28.0	2.83	0.68	26.3 - 28.5
K	g/kg	10.0	0.72	7.2	429	10.0	0.50	0.04	9.94 - 10.08
Mg	g/kg	3.01	0.218	7.2	423	3.00	0.150	0.013	2.99 - 3.03
Mn	mg/kg	457	42.4	9.3	401	454	29.1	2.6	453 - 461
Mo	µg/kg	128	26.8	20.9	88	129	18.9	3.6	123 - 134
N - Kjeldahl (as N)	g/kg	24.7	1.12	4.5	266	24.7	0.77	0.09	24.55 - 24.82
Ni	µg/kg	1050	111	10.6	80	1060	78	15	1025 - 1075
P (as P)	g/kg	1.60	0.105	6.6	426	1.60	0.073	0.006	1.59 - 1.61
Pb	µg/kg	197	45.1	22.9	87	204	33.6	6.0	187 - 206
S (as S)	g/kg	1.77	0.141	8.0	252	1.76	0.100	0.011	1.75 - 1.78
Se	µg/kg	386	63.0	16.3	60	387	44.5	10.2	370 - 402
Sr	mg/kg	18.4	1.01	5.5	37	18.5	0.71	0.21	18.09 - 18.76
V	µg/kg	181	25.9	14.3	30	181	18.0	5.9	172 - 191
Zn	mg/kg	16.2	1.81	11.1	393	16.2	1.25	0.11	16.04 - 16.40

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	79.0	12.70	16.1	41	79.1	8.51	2.48	75.0 - 83.0
C - elementary	g/kg	479	12.3	2.6	128	479	8.2	1.4	476.9 - 481.2
N - elementary	g/kg	25.8	0.84	3.2	195	25.8	0.58	0.07	25.64 - 25.88

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	63.1	11.52	18.3	85	63.2	7.84	1.56	60.6 - 65.6

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
ADF-ash-free	g/kg	332	39.7	12.0	20	325	28.0	11.1	313 - 350
Crude fibre	g/kg	213	20.9	9.8	26	217	14.7	5.1	205 - 221
NDF-ash-free	g/kg	509	34.0	6.7	16	509	22.6	10.6	491 - 527

Consensus Values IPE 212

Method: Nutritional values (cont.)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Total ash	g/kg	86.9	2.75	3.2	59	86.9	1.93	0.45	86.2 - 87.7

Indicative Values IPE 212

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
As	µg/kg	69.9	21.45	30.7	59	73.9	15.31	3.49	64.3 - 75.5
Be	µg/kg	21.0	1.58	7.5	10	21.4	1.20	0.62	19.9 - 22.1
Co	µg/kg	32.1	9.69	30.2	67	33.2	6.80	1.48	29.8 - 34.5
Cr	µg/kg	269	75.0	27.8	77	280	53.0	10.7	252 - 286
I	µg/kg	161	31.3	19.5	11	161	21.0	11.8	140 - 181
Li	µg/kg	66.1	20.12	30.4	16	65.8	14.01	6.29	55.5 - 76.8
Na	mg/kg	71.0	18.23	25.7	210	72.3	12.50	1.57	68.5 - 73.5
Rb	µg/kg	11700	1380	11.8	15	11500	960	450	10910 - 12440

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Si	mg/kg	21500	2150	10.0	10	21900	1590	850	20010 - 23030

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
delta 13C	‰ V-PDB	-29.5	0.35	1.2	15	-29.5	0.25	0.11	-29.69 - -29.31
delta 15N	‰ Air	3.30	0.147	4.4	14	3.32	0.096	0.049	3.22 - 3.39

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Total fat	g/kg	24.2	8.74	36.2	23	24.5	5.99	2.28	20.4 - 27.9

Informative Values IPE 212

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
Ag	µg/kg	19.0	7.60	9		
Bi	µg/kg	3.20	0.215	4	31.50	6
Br	mg/kg	15.0	0.10	3		
Cs	µg/kg	107	9.0	5		
F	mg/kg	8.66	0.560	7		
Ga	µg/kg	69.9	19.70	4		
N - NH4 (as N)	mg/kg	116	59.7	7		
N - NO3 (as N)	mg/kg	7.50	4.700	11	45.00	16
Sb	µg/kg	5.51	3.490	14	25.00	15
Sn	µg/kg	41.2	41.20	11	100.0	11
SO4 (as SO4)	g/kg	0.110	0.1000	3		
Ti	mg/kg	2.73	1.159	17	8.13	8

Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N
Si	mg/kg	3980	3516	7

Method: Nutritional values

Element	Unit	Median	MAD	N
NDF-ash-containing	g/kg	478	65.3	5