



**WAGENINGEN EVALUATING PROGRAMS  
FOR ANALYTICAL LABORATORIES**

---

**Certificate of Analysis**



**International Plant-Analytical Exchange**

**REFERENCE MATERIAL**

**IPE sample 193**

---



## 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 °C and milled to pass a 0.5 mm sieve.

This IPE sample 193 of Oil palm leaves / *Elaeis guineensis* from Colombia is prepared for the WEPAL proficiency programs. The sample is used in 3 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
2017	2	3
2013	3	4
2009	3	1



## Consensus Values IPE 193



### Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
B	mg/kg	17.9	1.87	10.5	231	17.8	1.28	0.15	17.62	-	18.10
Ba	mg/kg	2.86	0.237	8.3	39	2.88	0.170	0.048	2.79	-	2.94
Ca	g/kg	6.70	0.396	5.9	328	6.70	0.271	0.027	6.66	-	6.75
Cd	µg/kg	51.9	6.25	12.0	77	52.0	4.30	0.89	50.5	-	53.3
Cl (as Cl)	g/kg	6.43	0.348	5.4	62	6.50	0.241	0.055	6.35	-	6.52
Cu	mg/kg	6.66	1.305	19.6	300	6.71	0.880	0.094	6.51	-	6.81
Fe	mg/kg	81.9	7.73	9.4	300	82.3	5.33	0.56	81.0	-	82.7
Hg	µg/kg	27.1	2.79	10.3	45	26.9	1.81	0.52	26.2	-	27.9
K	g/kg	10.7	0.74	6.9	334	10.7	0.50	0.05	10.61	-	10.77
Mg	g/kg	2.95	0.181	6.1	331	2.95	0.123	0.012	2.93	-	2.97
Mn	mg/kg	413	32.6	7.9	312	412	22.4	2.3	409.3	-	416.6
Mo	µg/kg	136	28.9	21.3	68	136	20.5	4.4	129	-	143
N - Kjeldahl (as N)	g/kg	25.4	1.23	4.8	220	25.4	0.83	0.10	25.20	-	25.53
Ni	µg/kg	1040	136	13.0	67	1040	91	21	1010	-	1076
P (as P)	g/kg	1.66	0.089	5.4	331	1.66	0.060	0.006	1.65	-	1.67
Pb	µg/kg	252	45.8	18.2	74	256	32.5	6.6	241	-	262
S (as S)	g/kg	1.80	0.130	7.2	178	1.79	0.090	0.012	1.78	-	1.82
Se	µg/kg	522	65.2	12.5	43	523	46.4	12.4	502	-	542
Sr	mg/kg	16.4	1.00	6.1	37	16.5	0.66	0.21	16.07	-	16.74
V	µg/kg	123	20.7	16.9	23	125	15.0	5.4	114	-	132
Zn	mg/kg	16.3	1.85	11.3	305	16.3	1.29	0.13	16.07	-	16.49

### Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	59.7	13.78	23.1	36	59.6	9.16	2.87	55.0	-	64.4
C - elementary	g/kg	477	12.5	2.6	102	476	8.2	1.5	474.5	-	479.4
N - elementary	g/kg	26.5	0.94	3.5	147	26.5	0.64	0.10	26.39	-	26.69

### Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	50.8	10.42	20.5	60	51.1	7.00	1.68	48.1	-	53.5

### Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
delta 13C	‰ V-PDB	-29.7	0.20	0.7	19	-29.7	0.14	0.06	-29.78	-	-29.59
delta 15N	‰ Air	3.33	0.272	8.2	18	3.33	0.189	0.080	3.20	-	3.47



### Consensus Values IPE 193

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Crude fibre	g/kg	212	15.9	7.5	20	212	11.1	4.5	204	-	219
Total ash	g/kg	81.8	2.66	3.3	38	81.8	1.84	0.54	81.0	-	82.7



## Indicative Values IPE 193



### Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Be	µg/kg	18.0	2.24	12.5	13	18.2	1.58	0.78	16.7	-	19.4
Co	µg/kg	29.0	8.18	28.2	40	29.9	5.85	1.62	26.4	-	31.6
Cr	µg/kg	252	72.2	28.7	56	252	49.6	12.1	232	-	271
I	µg/kg	197	48.6	24.7	10	188	32.0	19.2	162	-	231
Li	µg/kg	50.9	14.19	27.8	11	54.1	10.09	5.35	41.5	-	60.4
Na	mg/kg	62.6	16.73	26.7	164	61.7	11.50	1.63	60.0	-	65.1
Rb	µg/kg	11900	1310	11.0	9	11800	910	550	10870	-	12840
Ti	mg/kg	1.98	0.987	49.8	14	2.02	0.675	0.330	1.42	-	2.55

### Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
ADF-ash-free	g/kg	316	38.9	12.3	11	321	27.7	14.6	291	-	342
NDF-ash-free	g/kg	524	68.3	13.0	12	527	47.4	24.7	481	-	567
Total fat	g/kg	24.3	9.78	40.3	10	25.6	6.75	3.87	17.4	-	31.2



## Informative Values IPE 193

### Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
Ag	µg/kg	24.4	14.40	7		
As	µg/kg	26.6	9.80	33	100.0	41
Bi	µg/kg	2.01	0.190	3	20.00	7
Cs	µg/kg	98.2	7.00	6		
F	mg/kg	5.93	0.370	4		
Ga	µg/kg	76.7	40.26	5		
N - NH4 (as N)	mg/kg	204	86.9	8		
N - NO3 (as N)	mg/kg	24.8	16.65	16	48.3	10
Sb	µg/kg	4.50	1.560	9	37.50	18
Sn	µg/kg	40.5	22.53	14	500.0	8
SO4 (as SO4)	g/kg	0.156	0.0509	9		

### Method: Real totals

Element	Unit	Median	MAD	N
Si	mg/kg	19500	280	5

### Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N
Si	mg/kg	1720	1569	7