



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 187



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 187 of maize (grain) / Zea mays from Austria 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
2016	2	3
2013	2	1
2008	2	4



Consensus Values IPE 187



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Ba	mg/kg	0.245	0.0603	24.6	27	0.250	0.0410	0.0145	0.221	-	0.269
Cu	mg/kg	2.16	0.356	16.5	288	2.20	0.243	0.026	2.12	-	2.20
Fe	mg/kg	25.0	4.56	18.2	295	25.2	3.20	0.33	24.5	-	25.5
K	g/kg	3.73	0.291	7.8	320	3.74	0.203	0.020	3.70	-	3.76
Mg	g/kg	1.27	0.098	7.7	322	1.27	0.069	0.007	1.26	-	1.28
Mn	mg/kg	6.05	0.862	14.3	290	6.01	0.595	0.063	5.95	-	6.15
Mo	µg/kg	334	32.9	9.8	81	332	22.0	4.6	327	-	341
N - Kjeldahl (as N)	g/kg	13.3	0.86	6.5	224	13.3	0.60	0.07	13.16	-	13.39
Ni	µg/kg	213	42.5	20.0	50	218	31.0	7.5	201	-	225
P (as P)	g/kg	3.28	0.190	5.8	325	3.28	0.130	0.013	3.26	-	3.31
S (as S)	g/kg	1.03	0.100	9.6	180	1.02	0.070	0.009	1.02	-	1.05
Se	µg/kg	49.0	7.59	15.5	38	49.6	5.08	1.54	46.5	-	51.5
Zn	mg/kg	23.1	2.00	8.7	301	23.1	1.38	0.14	22.88	-	23.34

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
C - elementary	g/kg	449	16.1	3.6	113	448	10.9	1.9	446.2	-	452.2
N - elementary	g/kg	13.7	0.57	4.2	159	13.7	0.40	0.06	13.61	-	13.79

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
delta 13C	‰ V-PDB	-11.3	0.33	3.0	35	-11.3	0.23	0.07	-11.43	-	-11.20
delta 15N	‰ Air	1050	23	2.2	45	1040	15	4	1038	-	1052

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Total ash	g/kg	14.7	0.73	4.9	28	14.8	0.50	0.17	14.39	-	14.95



Indicative Values IPE 187



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
B	mg/kg	2.49	0.793	31.9	188	2.55	0.550	0.072	2.37	-	2.60
Cd	µg/kg	5.68	2.025	35.6	42	6.38	1.565	0.391	5.05	-	6.31
Cl (as Cl)	g/kg	0.393	0.1159	29.5	54	0.413	0.0815	0.0197	0.362	-	0.425
Rb	µg/kg	471	45.3	9.6	13	465	33.0	15.7	443	-	498

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
ADF-ash-free	g/kg	18.1	2.17	12.0	9	18.1	1.49	0.90	16.5	-	19.8
Crude fibre	g/kg	12.3	5.92	48.1	16	12.8	4.09	1.85	9.15	-	15.4
NDF-ash-free	g/kg	66.7	12.47	18.7	9	67.0	8.60	5.20	57.3	-	76.1
Total fat	g/kg	46.5	9.01	19.4	10	44.3	6.70	3.56	40.1	-	52.8



Informative Values IPE 187



Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
Ag	µg/kg	4.91	3.200	5	5.00	5
As	µg/kg	16.0	6.00	33	50.0	38
Be	µg/kg	3.00	2.680	5	20.00	21
Bi	µg/kg	1.58	1.160	5	51.50	6
Ca	g/kg	0.0800	0.0300	253	0.2000	50
Co	µg/kg	6.94	3.505	34	50.00	41
Cr	µg/kg	136	89.0	41	460	36
Cs	µg/kg	0.440	0.2600	5		
Ga	µg/kg	5.52	0.950	3		
Hg	µg/kg	1.300	0.8150	24	5.000	35
I	µg/kg	130	74.8	3	50.0	6
Li	µg/kg	7.17	4.370	11	200.00	11
N - NH4 (as N)	mg/kg	53.5	16.50	10		
N - NO3 (as N)	mg/kg	8.10	6.031	10	11.50	18
Na	mg/kg	17.0	12.31	114	53.8	66
Pb	µg/kg	47.5	35.51	39	200.0	53
Sb	µg/kg	4.49	2.590	15	30.00	14
Sn	µg/kg	57.5	49.54	12	125.0	8
SO4 (as SO4)	g/kg	0.181	0.0786	12		
Sr	mg/kg	0.140	0.0480	31	1.000	9
Ti	mg/kg	1.41	1.048	13	1.00	7
V	µg/kg	66.6	58.59	17	100.0	19

Method: Real totals

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
Al	mg/kg	3.91	2.406	22	15.00	12

Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
Al	mg/kg	2.42	1.100	42	10.50	18
Si	mg/kg	23.9	19.91	6		