



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 222



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 222 of Maize (grain) / Zea mays from France 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
2022	2	2
2019	3	3
2014	4	2



Consensus Values IPE 222



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Cu	mg/kg	1.46	0.362	24.8	262	1.50	0.255	0.028	1.42	-	1.50
Fe	mg/kg	23.9	4.31	18.0	278	24.0	3.00	0.32	23.4	-	24.4
K	g/kg	3.70	0.274	7.4	313	3.70	0.190	0.019	3.67	-	3.73
Mg	g/kg	1.07	0.079	7.4	309	1.07	0.053	0.006	1.06	-	1.07
Mn	mg/kg	5.41	0.670	12.4	278	5.44	0.470	0.050	5.33	-	5.49
Mo	µg/kg	189	25.3	13.4	78	194	18.3	3.6	183	-	195
N - Kjeldahl (as N)	g/kg	13.3	0.71	5.3	198	13.3	0.51	0.06	13.19	-	13.39
P (as P)	g/kg	2.53	0.154	6.1	313	2.53	0.106	0.011	2.52	-	2.55
S (as S)	g/kg	1.06	0.088	8.3	178	1.06	0.060	0.008	1.05	-	1.07
Zn	mg/kg	20.0	1.84	9.2	291	20.0	1.24	0.13	19.81	-	20.23

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
C - elementary	g/kg	455	14.8	3.2	96	455	10.0	1.9	452.3	-	458.3
N - elementary	g/kg	13.6	0.42	3.1	146	13.6	0.29	0.04	13.55	-	13.69

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Crude fibre	g/kg	19.0	2.93	15.5	17	18.7	2.00	0.89	17.5	-	20.5
Total ash	g/kg	13.3	1.32	9.9	42	13.0	0.95	0.26	12.9	-	13.7



Indicative Values IPE 222



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
As	µg/kg	5.83	1.722	29.6	23	6.46	1.309	0.449	5.08	- 6.57
B	mg/kg	1.86	0.726	39.0	179	1.89	0.500	0.068	1.75	- 1.97
Cl (as Cl)	g/kg	0.416	0.1531	36.8	39	0.430	0.1050	0.0306	0.366	- 0.466
Ni	µg/kg	170	43.7	25.7	42	177	31.2	8.4	156	- 184
Rb	µg/kg	1060	100	9.4	13	1070	74	35	1003	- 1123
Sb	µg/kg	7.90	2.804	35.5	11	8.30	2.170	1.057	6.04	- 9.76
Se	µg/kg	32.9	14.04	42.7	29	33.8	9.59	3.26	27.5	- 38.2
Sr	mg/kg	0.0931	0.0394	42.3	17	0.1080	0.0320	0.0120	0.0730	- 0.113

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
Al	mg/kg	3.61	1.545	42.8	44	3.91	1.135	0.291	3.14	- 4.08

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
delta 13C	‰ V-PDB	-11.8	0.40	3.4	13	-11.8	0.29	0.14	-12.06	- -11.58
delta 15N	‰ Air	3.89	0.340	8.7	13	3.88	0.220	0.118	3.69	- 4.10

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits	
ADF-ash-free	g/kg	27.6	6.70	24.3	10	27.3	5.02	2.65	22.9	- 32.3
NDF-ash-free	g/kg	104	24.9	23.9	9	107	18.2	10.4	85.5	- 123
Total fat	g/kg	47.7	6.83	14.3	15	47.1	5.08	2.21	44.0	- 51.5



Informative Values IPE 222



Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
Ag	µg/kg	2.00	1.330	5		
Ba	mg/kg	0.0800	0.0336	17	0.3000	11
Be	µg/kg	1.08	0.804	3	100.00	13
Bi	µg/kg	-	-	0	53.0	7
Ca	g/kg	0.0750	0.0290	249	0.2500	45
Cd	µg/kg	4.55	3.120	31	20.00	48
Co	µg/kg	3.79	1.438	27	30.00	45
Cr	µg/kg	128	47.2	43	500	21
Hg	µg/kg	1.83	0.896	17	10.00	29
I	µg/kg	48.1	28.28	4	110.0	5
Li	µg/kg	10.5	8.60	8	156.5	8
N - NH4 (as N)	mg/kg	55.1	38.30	5		
N - NO3 (as N)	mg/kg	17.0	5.80	9	50.2	9
Na	mg/kg	15.1	10.50	114	50.0	58
Pb	µg/kg	31.0	13.97	43	100.0	34
Sn	µg/kg	23.6	22.41	7	75.0	6
SO4 (as SO4)	g/kg	0.100	0.0300	3		
Ti	mg/kg	0.850	0.7930	9	4.125	8
V	µg/kg	11.30	5.515	12	75.00	20

Method: Real totals

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
Al	mg/kg	6.61	2.870	19	10.00	11
Si	mg/kg	-	-	0	150	5

Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N
Si	mg/kg	22.0	2.80	7

Method: Nutritional values

Element	Unit	Median	MAD	N
Total monosaccharides	g/kg	17.0	4.44	3