



**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, the mean and standard deviation are calculated using all reported data when at least 4 results are left after removal of reported 'lower than' (<) and 0 (= zero) values. No outliers are removed.

This report is divided into two sections: Consensus Values and Indicative Values. The division is made on the reliability of the data. Consensus Values are based on at least 8 results and a maximum relative uncertainty of 6.25%. Indicative Values are based on a maximum relative uncertainty of 35% and a minimum of 4 and maximum of 7 results, or a relative uncertainty greater than 6.25% when there are at least 8 results.

For each determinand the following parameters are given: mean, standard deviation, coefficient of variation, number of results, median, MAD (Median of Absolute Deviation), the uncertainty of the mean (consensus or indicative) value and the relative uncertainty.

All values, expressed on a weight basis (kg or %), are reported as oven-dried (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 has been 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	Rel.Uncert. %
B	mg/kg	1.88	0.827	44.0	179	1.89	0.500	0.077	4.11
Cu	mg/kg	1.46	0.406	27.8	262	1.50	0.255	0.031	2.15
Fe	mg/kg	23.9	4.47	18.7	278	24.0	3.00	0.335	1.40
Mn	mg/kg	5.40	0.816	15.1	278	5.44	0.470	0.061	1.13
Zn	mg/kg	20.0	1.95	9.7	290	20.0	1.23	0.143	0.714
Mo	µg/kg	190	31.9	16.8	78	194	18.3	4.51	2.37
Ni	µg/kg	170	50.6	29.8	42	177	31.2	9.77	5.75
Rb	µg/kg	1064	127	11.9	13	1074	74.0	44.0	4.14
Ca	g/kg	0.069	0.049	70.9	249	0.075	0.029	0.004	5.62
K	g/kg	3.70	0.307	8.3	313	3.70	0.190	0.022	0.587
Mg	g/kg	1.07	0.086	8.1	309	1.07	0.053	0.006	0.574
N - Kjeldahl (as N)	g/kg	13.3	0.753	5.7	198	13.3	0.506	0.067	0.503
P (as P)	g/kg	2.53	0.169	6.7	313	2.53	0.106	0.012	0.470
S (as S)	g/kg	1.06	0.103	9.7	178	1.06	0.060	0.010	0.913

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
C - elementary	g/kg	455	15.5	3.4	96	455	10.0	1.98	0.434
N - elementary	g/kg	13.6	0.478	3.5	146	13.6	0.290	0.049	0.363

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
delta 13C	‰ V-PDB	-11.8	0.338	2.9	13	-11.8	0.290	0.117	0.992
delta 15N	‰ Air	3.89	0.501	12.9	13	3.88	0.220	0.174	4.47

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Crude fibre	g/kg	18.9	3.87	20.5	17	18.7	2.00	1.17	6.22
Total ash	g/kg	13.3	1.44	10.8	42	13.0	0.948	0.278	2.09
Total fat	g/kg	47.7	6.95	14.6	15	47.1	5.08	2.24	4.70



Indicative Values IPE 222

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
As	µg/kg	5.87	2.36	40.2	23	6.46	1.31	0.616	10.5
Cd	µg/kg	3.63	4.69	129.2	31	4.55	3.12	1.05	29.0
Co	µg/kg	2.93	2.27	77.6	27	3.79	1.44	0.547	18.7
Cr	µg/kg	132	65.8	50.0	43	128	47.2	12.5	9.54
Hg	µg/kg	1.38	1.05	76.4	17	1.83	0.896	0.319	23.2
Li	µg/kg	11.4	11.5	100.6	8	10.5	8.60	5.06	44.5
Pb	µg/kg	27.2	25.3	92.7	43	31.0	14.0	4.81	17.7
Se	µg/kg	32.6	16.7	51.1	29	33.8	9.59	3.87	11.9
Ba	mg/kg	0.073	0.057	77.4	17	0.080	0.034	0.017	23.5
Sb	µg/kg	7.77	3.29	42.4	11	8.30	2.17	1.24	16.0
Ti	mg/kg	1.000	1.39	139.1	9	0.850	0.793	0.579	58.0
V	µg/kg	8.42	7.02	83.4	12	11.3	5.52	2.53	30.1
Sr	mg/kg	0.093	0.041	43.6	17	0.108	0.032	0.012	13.2
Cl (as Cl)	g/kg	0.415	0.152	36.5	39	0.430	0.105	0.030	7.31
N - NO ₃ (as N)	mg/kg	15.3	12.9	84.4	9	17.0	5.80	5.37	35.2
Na	mg/kg	12.6	13.5	106.6	114	15.1	10.5	1.58	12.5

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	5.60	3.88	69.4	19	6.61	2.87	1.11	19.9

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	3.67	1.86	50.8	44	3.91	1.14	0.351	9.57
Si	mg/kg	20.5	6.42	31.4	7	22.0	2.80	3.03	14.8

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
ADF-ash-free	g/kg	27.5	7.51	27.3	10	27.3	5.02	2.97	10.8
NDF-ash-free	g/kg	103	32.6	31.7	9	107	18.2	13.6	13.2