



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 221



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 221 of Bean / *Phaseolus vulgaris* L., from Netherlands, 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
2023	4	2
2020	1	3
2016	2	2



Consensus Values IPE 221

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
B	mg/kg	10.8	1.49	13.8	211	10.8	0.920	0.128	1.19
Cu	mg/kg	10.3	0.975	9.4	277	10.3	0.600	0.073	0.708
Fe	mg/kg	77.6	7.60	9.8	272	77.5	4.75	0.576	0.742
Mn	mg/kg	9.56	1.01	10.5	269	9.58	0.550	0.077	0.802
Zn	mg/kg	49.7	3.84	7.7	278	49.6	2.38	0.288	0.578
As	µg/kg	58.8	13.1	22.3	48	60.0	8.15	2.36	4.02
Co	µg/kg	228	25.5	11.2	60	229	16.9	4.11	1.80
Mo	µg/kg	14457	1292	8.9	98	14405	830	163	1.13
Ni	µg/kg	2538	277	10.9	64	2549	169	43.2	1.70
Se	µg/kg	152	35.5	23.4	43	154	24.0	6.76	4.46
Sr	mg/kg	1.90	0.165	8.7	23	1.91	0.099	0.043	2.26
Rb	µg/kg	5497	528	9.6	8	5506	351	233	4.25
Ca	g/kg	0.799	0.116	14.5	281	0.800	0.070	0.009	1.08
Cl (as Cl)	g/kg	0.877	0.214	24.4	45	0.900	0.150	0.040	4.54
K	g/kg	12.5	0.899	7.2	298	12.5	0.547	0.065	0.522
Mg	g/kg	1.29	0.096	7.4	288	1.29	0.060	0.007	0.548
N - Kjeldahl (as N)	g/kg	44.1	2.92	6.6	183	43.8	1.95	0.270	0.611
Na	mg/kg	168	22.3	13.2	171	168	12.7	2.13	1.26
P (as P)	g/kg	5.70	0.454	8.0	293	5.67	0.290	0.033	0.582
S (as S)	g/kg	1.77	0.165	9.3	174	1.77	0.105	0.016	0.882

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
C - elementary	g/kg	445	16.6	3.7	108	444	10.1	2.00	0.450
N - elementary	g/kg	46.8	2.05	4.4	152	46.9	1.35	0.208	0.444

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	8.73	2.70	31.0	45	8.70	1.52	0.504	5.77

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
delta 13C	‰ V-PDB	-27.1	0.442	1.6	29	-27.1	0.270	0.103	0.379
delta 15N	‰ Air	2.32	0.291	12.5	29	2.28	0.170	0.067	2.90



Consensus Values IPE 221

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Crude fibre	g/kg	84.1	7.75	9.2	21	82.6	4.10	2.11	2.52
ADF-ash-free	g/kg	119	8.50	7.2	11	119	4.60	3.20	2.70
Total ash	g/kg	37.0	2.70	7.3	38	36.8	1.51	0.547	1.48



Indicative Values IPE 221

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Cd	µg/kg	18.7	9.44	50.6	57	20.0	7.10	1.56	8.37
Cr	µg/kg	148	71.3	48.1	43	160	52.9	13.6	9.16
Hg	µg/kg	1.20	1.59	132.2	22	1.54	1.09	0.424	35.2
Li	µg/kg	20.3	17.7	87.3	9	23.7	8.64	7.39	36.4
Pb	µg/kg	34.3	22.0	64.0	38	41.5	16.7	4.46	13.0
Ba	mg/kg	0.170	0.092	53.9	18	0.199	0.057	0.027	15.9
Sb	µg/kg	3.50	1.73	49.5	11	3.92	0.730	0.653	18.7
Ti	mg/kg	0.888	1.21	136.5	12	1.11	0.802	0.437	49.2
V	µg/kg	25.8	9.14	35.5	19	27.8	5.77	2.62	10.2

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	13.6	9.13	66.9	28	15.8	6.18	2.16	15.8

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
NDF-ash-free	g/kg	144	32.6	22.6	10	143	18.3	12.9	8.93
Total fat	g/kg	18.9	5.10	27.0	14	18.8	2.91	1.70	9.04