WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 221

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis IPE 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 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 ºC 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 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
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	95 % confidence limits
B	mg/kg	10.8	1.32	12.2	211	10.8	0.92	0.11	10.60 - 10.96
Cu	mg/kg	10.3	0.88	8.5	277	10.3	0.60	0.07	10.23 - 10.44
Fe	mg/kg	77.6	6.84	8.8	272	77.5	4.75	0.52	76.7 - 78.4
Mn	mg/kg	9.60	0.802	8.4	269	9.58	0.550	0.061	9.50 - 9.69
Zn	mg/kg	49.7	3.51	7.1	278	49.6	2.38	0.26	49.3 - 50.1
As	µg/kg	58.5	11.44	19.5	48	60.0	8.15	2.06	55.2 - 61.9
Co	µg/kg	228	23.8	10.4	60	229	16.9	3.8	222 - 234
Mo	µg/kg	14500	1170	8.1	98	14400	830	150	14234 - 14702
Ni	µg/kg	2540	249	9.8	64	2550	169	39	2481 - 2605
Se	µg/kg	152	33.2	21.9	43	154	24.0	6.3	141 - 162
Sr	mg/kg	1.90	0.133	7.0	23	1.91	0.099	0.035	1.84 - 1.96
Ca	g/kg	0.798	0.1003	12.6	281	0.800	0.0700	0.0075	0.787 - 0.810
Cl (as Cl)	g/kg	0.876	0.2116	24.1	45	0.900	0.1500	0.0394	0.813 - 0.940
K	g/kg	12.5	0.82	6.5	298	12.5	0.55	0.06	12.40 - 12.58
Mg	g/kg	1.29	0.086	6.7	288	1.29	0.060	0.006	1.28 - 1.30
N - Kjeldahl (as N)	g/kg	44.2	2.79	6.3	183	43.8	1.95	0.26	43.8 - 44.6
Na	mg/kg	168	18.2	10.9	171	168	12.7	1.7	165.1 - 170.6
P (as P)	g/kg	5.71	0.417	7.3	293	5.67	0.290	0.030	5.66 - 5.75
S (as S)	g/kg	1.77	0.150	8.5	174	1.77	0.105	0.014	1.75 - 1.79

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
C - elementary	g/kg	446	15.0	3.4	108	444	10.1	1.8	442.8 - 448.6
N - elementary	g/kg	46.8	1.97	4.2	152	46.9	1.35	0.20	46.47 - 47.10

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
delta 13C	‰ V-PDB	-27.1	0.39	1.4	29	-27.1	0.27	0.09	-27.22 - -26.93
delta 15N	‰ Air	2.33	0.223	9.6	29	2.28	0.170	0.052	2.24 - 2.41

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Crude fibre	g/kg	83.4	5.94	7.1	21	82.6	4.10	1.62	80.7 - 86.1
Total ash	g/kg	36.9	2.12	5.8	38	36.8	1.51	0.43	36.2 - 37.6

Indicative Values IPE 221

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Cr	µg/kg	154	73.4	47.5	43	160	52.9	14.0	132 - 177
Ba	mg/kg	0.169	0.0734	43.3	18	0.199	0.0573	0.0216	0.133 - 0.206
Sb	µg/kg	3.89	1.112	28.6	11	3.92	0.730	0.419	3.15 - 4.63
V	µg/kg	25.5	7.37	29.0	19	27.8	5.77	2.11	21.9 - 29.0
Rb	µg/kg	5500	524	9.5	8	5510	351	232	5071 - 5926

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	8.68	2.195	25.3	45	8.70	1.523	0.409	8.02 - 9.34

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
ADF-ash-free	g/kg	119	6.8	5.8	11	119	4.6	2.6	114 - 123
NDF-ash-free	g/kg	141	27.0	19.2	10	143	18.3	10.7	122 - 160
Total fat	g/kg	19.2	4.20	21.9	14	18.8	2.91	1.40	16.7 - 21.6

Informative Values IPE 221

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
Cd	µg/kg	20.0	7.10	57	100.0	30
Hg	µg/kg	1.54	1.086	22	5.00	27
I	µg/kg	80.0	60.00	3	77.5	6
Li	µg/kg	23.7	8.64	9	200.0	7
Pb	µg/kg	41.5	16.72	38	200.0	41
Bi	µg/kg	1.04	0.680	3		
Sn	µg/kg	30.3	21.44	5	100.0	9
Ti	mg/kg	1.111	0.8020	12	2.000	10
Ag	µg/kg	-	-	0	10.0	5
Be	µg/kg	2.10	1.689	5	50.00	11
N - NH4 (as N)	mg/kg	834	384.0	3		
N - NO3 (as N)	mg/kg	16.1	9.46	7	50.0	11
SO4 (as SO4)	g/kg	0.610	0.2800	4		

Method: Real totals

Element	Unit	Median	MAD	N
Al	mg/kg	15.8	6.18	28
Si	mg/kg	84.0	71.60	5

Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N
Si	mg/kg	135	102.4	6