WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 174

WAGENINGEN
UNIVERSITY & RESEARCH

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 174 of Tulip (tuber) / Tulipa l. from Netherlands is prepared for the WEPAL proficiency programs. The sample is used in 2 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
2009	4	2
2006	2	1

Consensus Values   IPE 174

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
As	µg/kg	55.8	10.05	18.0	31	56.0	6.97	2.26	52.1	-	59.4
B	mg/kg	7.45	1.257	16.9	160	7.39	0.855	0.124	7.25	-	7.64
Ca	g/kg	0.700	0.0837	12.0	216	0.704	0.0595	0.0071	0.688	-	0.711
Cl (as Cl)	g/kg	0.617	0.1533	24.9	52	0.644	0.1141	0.0266	0.574	-	0.659
Cu	mg/kg	2.73	0.393	14.4	216	2.73	0.270	0.033	2.67	-	2.78
Fe	mg/kg	47.2	6.27	13.3	209	47.5	4.41	0.54	46.4	-	48.1
Hg	µg/kg	5.60	0.634	11.3	31	5.70	0.440	0.142	5.36	-	5.83
K	g/kg	7.47	0.485	6.5	231	7.47	0.330	0.040	7.40	-	7.53
Mg	g/kg	0.596	0.0341	5.7	225	0.600	0.0230	0.0028	0.591	-	0.600
Mn	mg/kg	4.13	0.534	12.9	214	4.12	0.380	0.046	4.05	-	4.20
Mo	µg/kg	216	38.2	17.7	49	222	28.0	6.8	205	-	227
N - Kjeldahl (as N)	g/kg	11.0	0.53	4.8	148	11.0	0.36	0.05	10.88	-	11.05
P (as P)	g/kg	1.88	0.126	6.7	235	1.90	0.090	0.010	1.87	-	1.90
S (as S)	g/kg	0.907	0.0863	9.5	146	0.900	0.0600	0.0089	0.893	-	0.921
Sr	mg/kg	2.62	0.247	9.4	25	2.67	0.160	0.062	2.52	-	2.72
Zn	mg/kg	9.97	1.141	11.4	216	10.00	0.800	0.097	9.81	-	10.12

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
C - elementary	g/kg	436	9.6	2.2	58	437	6.5	1.6	433.7	-	438.7
N - elementary	g/kg	11.3	0.45	4.0	101	11.3	0.30	0.06	11.25	-	11.43

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	30.6	5.36	17.5	45	31.2	3.70	1.00	29.0	-	32.2

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Cd	µg/kg	32.8	8.71	26.6	54	32.8	6.00	1.48	30.4	-	35.2
Co	µg/kg	17.6	4.69	26.6	35	18.6	3.60	0.99	16.0	-	19.2
Cr	µg/kg	204	84.6	41.5	45	210	60.0	15.8	178	-	229
N - NH4 (as N)	mg/kg	278	73.1	26.3	12	291	50.5	26.4	232	-	324
Na	mg/kg	88.3	25.20	28.6	132	87.1	17.21	2.74	83.9	-	92.6
Ni	µg/kg	158	61.3	38.9	40	170	43.5	12.1	138	-	177
Sb	µg/kg	9.14	1.075	11.8	9	9.10	0.800	0.448	8.33	-	9.95
Se	µg/kg	15.3	6.58	42.9	15	15.0	5.00	2.12	11.7	-	19.0
V	µg/kg	85.7	15.77	18.4	12	88.3	10.98	5.69	75.8	-	95.6

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	41.2	12.31	29.9	18	40.2	8.70	3.63	35.1	-	47.3

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Crude fibre	g/kg	22.5	4.33	19.2	11	22.9	3.10	1.63	19.6	-	25.4
Total ash	g/kg	19.6	1.61	8.2	14	19.9	1.14	0.54	18.6	-	20.5

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
Ba	mg/kg	0.386	0.1750	16	1.000	12
Be	µg/kg	22.4	18.50	5	20.0	9
I	µg/kg	103	53.4	3		
Li	µg/kg	69.5	14.20	4		
N - NO3 (as N)	mg/kg	20.7	18.38	18	47.8	7
Pb	µg/kg	81.2	28.45	46	300.0	35
Rb	µg/kg	1700	65	6		
Sn	µg/kg	12.1	5.80	5		
SO4 (as SO4)	g/kg	0.971	0.1610	7		

Method: Real totals

Element	Unit	Median	MAD	N
Si	mg/kg	325	2.0	3

Method: Other determinations

Element	Unit	Median	MAD	N
delta 13C	‰ V-PDB	-27.5	0.06	3
delta 15N	‰ Air	4.40	0.090	3

Method: Nutritional values

Element	Unit	Median	MAD	N
ADF-ash-free	g/kg	40.7	9.30	3
NDF-ash-free	g/kg	410	351.4	4
Polysaccharides (starch)	g/kg	640	13.0	3
Total fat	g/kg	5.20	1.900	7