WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 980

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 ^{o}C and milled to pass a 0.5 mm sieve.

This IPE sample 980 of Gerbera leaf/ Gerbera jamesonii from Netherlands is prepared for the WEPAL proficiency programs. The sample is used in 24 periods (or rounds). Only results from the last 5 periods are used. In this way the consensus values will reflect the latest 'state of the art' in the analytical techniques used in the laboratories. It will also give a better estimate of the concentrations of non-stable or volatile determinands. 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	3	3
2019	4	3
2015	1	4
2011	1	2
2007	3	2

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
B	mg/kg	31.9	2.60	8.1	400	32.0	1.78	0.16	31.68	-	32.19
Cu	mg/kg	4.22	0.540	12.8	526	4.26	0.378	0.029	4.17	-	4.27
Fe	mg/kg	169	19.2	11.3	544	170	13.0	1.0	167.4	-	170.6
Mn	mg/kg	89.9	5.96	6.6	546	90.0	4.03	0.32	89.4	-	90.4
Zn	mg/kg	54.1	4.34	8.0	554	54.0	2.98	0.23	53.75	-	54.48
Br	mg/kg	20.9	1.46	7.0	31	21.0	1.01	0.33	20.4	-	21.4
Cd	µg/kg	130	14.2	10.9	163	130	10.0	1.4	128.2	-	132.6
Co	µg/kg	150	24.1	16.1	142	149	16.7	2.5	146	-	154
Hg	µg/kg	25.8	2.38	9.2	90	25.9	1.67	0.31	25.3	-	26.3
Li	µg/kg	633	106.3	16.8	32	625	71.0	23.5	595	-	671
Mo	µg/kg	389	45.3	11.6	133	394	32.1	4.9	382	-	397
Ni	µg/kg	622	105.3	16.9	128	633	72.0	11.6	604	-	641
Pb	µg/kg	846	133.7	15.8	155	835	91.0	13.4	824	-	867
Ba	mg/kg	1.81	0.152	8.4	47	1.82	0.107	0.028	1.77	-	1.86
Ti	mg/kg	17.0	3.76	22.1	24	17.2	2.52	0.96	15.4	-	18.6
V	µg/kg	413	70.3	17.0	55	410	50.0	11.8	394	-	432
Sr	mg/kg	18.2	2.02	11.1	65	18.1	1.40	0.31	17.7	-	18.7
Rb	µg/kg	4990	468	9.4	46	5040	342	86	4852	-	5130
Ca	g/kg	16.3	1.09	6.7	575	16.2	0.76	0.06	16.16	-	16.34
Cl (as Cl)	g/kg	19.7	0.96	4.9	114	19.6	0.68	0.11	19.54	-	19.90
K	g/kg	52.6	3.73	7.1	593	52.6	2.60	0.19	52.34	-	52.95
Mg	g/kg	3.61	0.247	6.8	572	3.60	0.170	0.013	3.59	-	3.63
N - Kjeldahl (as N)	g/kg	25.9	1.74	6.7	353	25.9	1.18	0.12	25.75	-	26.11
N - NO3 (as N)	mg/kg	8240	536	6.5	46	8180	389	99	8077	-	8395
Na	mg/kg	3550	287	8.1	358	3540	200	19	3523	-	3582
P (as P)	g/kg	4.39	0.274	6.2	560	4.38	0.190	0.014	4.37	-	4.41
S (as S)	g/kg	2.30	0.160	6.9	328	2.30	0.110	0.011	2.29	-	2.32

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
C - elementary	g/kg	407	13.1	3.2	157	407	9.0	1.3	405.0	-	409.2
Al	mg/kg	126	23.3	18.5	69	125	16.3	3.5	120	-	132
N - elementary	g/kg	30.6	1.28	4.2	250	30.6	0.90	0.10	30.46	-	30.78

Consensus Values   IPE 980

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	111	13.3	12.0	118	112	9.2	1.5	108.6	-	113.4

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Crude fibre	g/kg	227	13.0	5.7	31	227	9.0	2.9	222	-	232
ADF-ash-free	g/kg	275	17.1	6.2	19	275	11.1	4.9	266	-	283
NDF-ash-free	g/kg	322	41.7	13.0	18	326	29.2	12.3	301	-	343
Total ash	g/kg	161	7.8	4.8	62	162	5.5	1.2	159.4	-	163.3

Indicative Values   IPE 980

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
As	µg/kg	46.9	12.00	25.6	80	48.4	8.42	1.68	44.2	-	49.6
Cr	µg/kg	461	168.6	36.5	140	483	119.3	17.8	433	-	490
I	µg/kg	136	58.7	43.2	17	150	42.0	17.8	106	-	166
Se	µg/kg	17.4	6.10	35.1	45	18.7	4.27	1.14	15.5	-	19.2
Sb	µg/kg	27.8	6.98	25.1	45	28.6	5.10	1.30	25.7	-	29.9
Sn	µg/kg	166	58.1	34.9	23	164	38.0	15.1	141	-	192
Be	µg/kg	5.15	1.006	19.5	15	5.50	0.780	0.325	4.59	-	5.70
Cs	µg/kg	13.7	5.44	39.8	17	13.9	3.70	1.65	10.9	-	16.4

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Si	mg/kg	482	199.0	41.3	10	555	136.4	78.6	342	-	622

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
delta 13C	‰ V-PDB	-34.3	0.25	0.7	14	-34.3	0.17	0.08	-34.41	-	-34.13
delta 15N	‰ Air	1.59	0.349	22.0	12	1.55	0.235	0.126	1.37	-	1.81

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Total fat	g/kg	19.0	5.94	31.3	25	20.7	4.30	1.49	16.5	-	21.4

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
Ga	µg/kg	-	-	0	600	5
Bi	µg/kg	3.20	1.260	5	7.50	12
Ag	µg/kg	10.1	5.75	4	11.0	12
N - NH4 (as N)	mg/kg	398	135.5	14		
SO4 (as SO4)	g/kg	2.77	1.050	12		

Method: Real totals

Element	Unit	Median	MAD	N	Results smaller than (<) Median of <	N
Si	mg/kg	791	124.1	6	1000	6

Method: Nutritional values

Element	Unit	Median	MAD	N
NDF-ash-containing	g/kg	341	35.1	3