



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 907



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 907 of Spinach / Spinacia oleracea from unknown 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
1998	3	5
1996	6	3
1992	6	1



Consensus Values IPE 907



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
As	µg/kg	338	59.8	17.7	34	341	40.0	12.8	318	-	359
B	mg/kg	27.4	3.08	11.3	204	27.7	2.17	0.27	27.0	-	27.8
Ba	mg/kg	4.93	1.032	21.0	26	5.05	0.780	0.253	4.51	-	5.34
Ca	g/kg	15.4	1.35	8.7	371	15.4	0.93	0.09	15.30	-	15.58
Cd	µg/kg	1210	156	13.0	84	1200	109	21	1174	-	1242
Cl (as Cl)	g/kg	7.43	0.560	7.5	64	7.51	0.378	0.087	7.29	-	7.57
Co	µg/kg	217	42.3	19.5	45	219	30.0	7.9	204	-	229
Cr	µg/kg	2100	518	24.7	63	2050	364	82	1969	-	2230
Cu	mg/kg	10.2	1.45	14.2	320	10.2	1.00	0.10	10.05	-	10.37
Fe	mg/kg	506	70.0	13.8	317	506	48.0	4.9	498	-	514
Hg	µg/kg	34.4	4.38	12.7	37	35.1	3.10	0.90	32.9	-	35.8
K	g/kg	77.8	6.36	8.2	376	77.8	4.42	0.41	77.1	-	78.4
Mg	g/kg	5.79	0.389	6.7	368	5.79	0.267	0.025	5.75	-	5.83
Mn	mg/kg	61.3	4.60	7.5	337	61.0	3.10	0.31	60.8	-	61.8
Mo	µg/kg	404	61.4	15.2	41	408	42.8	12.0	384	-	423
N - Kjeldahl (as N)	g/kg	43.7	2.29	5.3	263	43.6	1.57	0.18	43.41	-	43.97
N - NO3 (as N)	mg/kg	6120	330	5.4	55	6080	231	56	6034	-	6212
Na	mg/kg	2390	228	9.6	239	2380	159	18	2357	-	2415
Ni	µg/kg	925	164.1	17.7	61	942	112.0	26.3	883	-	967
P (as P)	g/kg	6.07	0.361	6.0	367	6.07	0.248	0.024	6.03	-	6.11
Pb	µg/kg	2040	374	18.3	77	2040	265	53	1957	-	2126
S (as S)	g/kg	4.12	0.283	6.9	145	4.08	0.196	0.029	4.07	-	4.16
Sr	mg/kg	35.2	3.58	10.2	24	35.7	2.49	0.91	33.7	-	36.7
V	µg/kg	1630	240	14.8	22	1660	169	64	1519	-	1731
Zn	mg/kg	158	13.3	8.4	330	158	9.3	0.9	157.0	-	159.9

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
N - elementary	g/kg	47.4	2.71	5.7	112	46.9	1.91	0.32	46.8	-	47.9



Indicative Values IPE 907

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Be	µg/kg	23.3	6.11	26.2	9	24.8	4.80	2.54	18.7	-	27.9
Li	µg/kg	895	116.6	13.0	8	895	76.0	51.5	800	-	990
Sb	µg/kg	53.6	15.28	28.5	11	57.0	11.00	5.76	43.4	-	63.7
Se	µg/kg	36.5	8.74	24.0	11	37.0	6.40	3.30	30.7	-	42.3
SO4 (as SO4)	g/kg	5.10	1.576	30.9	16	5.43	1.148	0.492	4.26	-	5.93

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
C - elementary	g/kg	368	10.6	2.9	14	368	6.7	3.6	362	-	374



Informative Values IPE 907



Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N
Br	mg/kg	24.4	0.20	4
F	mg/kg	8.25	4.650	7
N - NH4 (as N)	mg/kg	133	62.4	10
Rb	µg/kg	23400	1100	4
Sn	µg/kg	183	23.5	4
Ti	mg/kg	18.0	12.15	6

Method: Nutritional values

Element	Unit	Median	MAD	N
Total ash	g/kg	227	9.0	5