



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 245



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 245 of Willow wood / Salix alba. 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
2022	3	4
2019	2	4



Consensus Values IPE 245



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
As	µg/kg	62.0	9.76	15.7	35	63.3	6.70	2.06	58.7	-	65.4
B	mg/kg	10.7	1.37	12.8	152	10.8	0.97	0.14	10.46	-	10.90
Ba	mg/kg	10.0	0.99	9.9	20	10.0	0.69	0.28	9.55	-	10.5
Ca	g/kg	6.60	0.485	7.4	205	6.56	0.340	0.042	6.53	-	6.66
Cd	µg/kg	211	22.0	10.4	58	212	15.0	3.6	205	-	217
Co	µg/kg	46.4	5.06	10.9	35	46.8	3.20	1.07	44.7	-	48.2
Cr	µg/kg	369	81.6	22.1	39	360	55.1	16.3	343	-	396
Cu	mg/kg	3.60	0.477	13.3	185	3.63	0.331	0.044	3.53	-	3.67
Fe	mg/kg	91.3	10.87	11.9	185	92.0	7.51	1.00	89.8	-	92.9
Hg	µg/kg	6.94	1.112	16.0	27	6.99	0.775	0.268	6.50	-	7.38
K	g/kg	2.41	0.220	9.1	211	2.43	0.155	0.019	2.38	-	2.44
Mg	g/kg	0.493	0.0420	8.5	202	0.500	0.0299	0.0037	0.488	-	0.499
Mn	mg/kg	54.5	3.89	7.1	197	54.2	2.68	0.35	54.0	-	55.0
Mo	µg/kg	105	18.8	17.9	42	107	13.2	3.6	99.1	-	111
N - Kjeldahl (as N)	g/kg	5.23	0.527	10.1	123	5.22	0.379	0.059	5.14	-	5.33
Na	mg/kg	188	25.5	13.6	121	190	17.6	2.9	183	-	193
Ni	µg/kg	275	50.4	18.3	33	279	35.7	11.0	257	-	293
P (as P)	g/kg	0.536	0.0535	10.0	210	0.542	0.0385	0.0046	0.528	-	0.543
Pb	µg/kg	1270	137	10.7	56	1270	96	23	1238	-	1311
S (as S)	g/kg	0.472	0.0498	10.5	121	0.480	0.0350	0.0057	0.463	-	0.481
Sr	mg/kg	22.0	1.44	6.6	16	22.2	0.95	0.45	21.2	-	22.8
Zn	mg/kg	20.7	1.55	7.5	194	20.7	1.05	0.14	20.45	-	20.89

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
C - elementary	g/kg	490	13.1	2.7	76	489	8.7	1.9	486.6	-	492.6
N - elementary	g/kg	5.39	0.602	11.2	109	5.42	0.420	0.072	5.28	-	5.51

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	53.3	11.00	20.7	46	53.5	7.45	2.03	50.0	-	56.5

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
delta 13C	‰ V-PDB	-26.7	0.33	1.2	16	-26.7	0.23	0.10	-26.92	-	-26.57



Method: Nutritional values

Element

Total ash

Consensus Values IPE 245



Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
g/kg	25.5	2.52	9.9	28	25.2	1.80	0.60	24.5	-	26.4



Indicative Values IPE 245



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Cl (as Cl)	g/kg	0.504	0.1694	33.6	28	0.500	0.1200	0.0400	0.438	-	0.569
Li	µg/kg	86.8	22.92	26.4	8	82.9	14.66	10.13	68.1	-	105
Sb	µg/kg	52.5	17.54	33.4	10	55.9	11.90	6.93	40.2	-	64.9
Se	µg/kg	47.2	14.04	29.8	21	47.0	10.04	3.83	40.8	-	53.5
Sn	µg/kg	91.3	9.43	10.3	11	91.8	6.69	3.56	85.0	-	97.5
V	µg/kg	180	35.2	19.5	13	182	25.0	12.2	159	-	202

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	78.8	26.27	33.3	20	83.7	17.76	7.34	66.6	-	91.1

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
delta 15N	‰ Air	-1.33	0.170	12.8	15	-1.34	0.120	0.055	-1.42	-	-1.24

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
ADF-ash-free	g/kg	656	58.9	9.0	8	648	41.6	26.0	608	-	704
Crude fibre	g/kg	525	36.8	7.0	14	519	26.6	12.3	503	-	546



Informative Values IPE 245

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<)	Median of <	N
Be	µg/kg	-	-	0	275		6
I	µg/kg	537	77.0	7			
N - NH4 (as N)	mg/kg	51.9	27.71	4			
N - NO3 (as N)	mg/kg	18.4	13.46	6	74.5		6
Rb	µg/kg	2140	292	7			
SO4 (as SO4)	g/kg	1.77	0.660	4			
Ti	mg/kg	1.68	0.395	6			

Method: Real totals

Element	Unit	Median	MAD	N
Si	mg/kg	876	256.0	4

Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N
Si	mg/kg	488	221.5	5

Method: Nutritional values

Element	Unit	Median	MAD	N
NDF-ash-free	g/kg	817	13.2	7
Total fat	g/kg	7.00	4.860	11