



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 157



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, the mean and standard deviation are calculated using all reported data when at least 4 results are left after removal of reported 'lower than' (<) and 0 (= zero) values. No outliers are removed.

This report is divided into two sections: Consensus Values and Indicative Values. The division is made on the reliability of the data. Consensus Values are based on at least 8 results and a maximum relative uncertainty of 6.25%. Indicative Values are based on a maximum relative uncertainty of 35% and a minimum of 4 and maximum of 7 results, or a relative uncertainty greater than 6.25% when there are at least 8 results.

For each determinand the following parameters are given: mean, standard deviation, coefficient of variation, number of results, median, MAD (Median of Absolute Deviation), the uncertainty of the mean (consensus or indicative) value and the relative uncertainty.

Please note: Most WEPAL-QUASIMEME reference materials are found to be stable over the long term (>10 years) for most determinand/matrix combinations. There are a few exceptions known to us as being less stable over the long term. These are organotins in sediment (MS6), ASP in shellfish (BT7), some PAHs and PCBs in sediment (SETOC) and N-NH₄ (as N) in clay soils (ISE).

All values, expressed on a weight basis (kg or %), are reported as oven-dried (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 157 of Beech Leaf / *Fagus sylvatica* L., from Netherlands, is prepared for the WEPAL proficiency programs. The sample has been used in 7 periods (or rounds). Only results from the last 5 periods are used. This way, the consensus values reflect the latest 'state of the art' analytical techniques used by the laboratories. The results on which the values in this report are based were taken from the periods given in the following table:

Year	Round	Number
2025	4	4
2020	4	2
2016	1	4
2012	1	4
2008	3	2



Consensus Values IPE 157

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
B	mg/kg	27.2	2.95	10.8	393	27.2	1.90	0.186	0.683
Cu	mg/kg	8.47	1.15	13.6	502	8.50	0.700	0.064	0.759
Fe	mg/kg	458	58.1	12.7	510	455	37.0	3.22	0.702
Mn	mg/kg	625	49.4	7.9	518	620	30.9	2.72	0.435
Zn	mg/kg	87.8	7.33	8.3	516	87.9	4.75	0.403	0.459
As	µg/kg	306	49.4	16.2	111	301	28.6	5.87	1.92
Br	mg/kg	5.02	0.516	10.3	20	5.00	0.215	0.144	2.87
Cd	µg/kg	195	24.8	12.8	157	195	15.0	2.48	1.27
Co	µg/kg	280	42.3	15.1	132	280	23.8	4.60	1.64
Cr	µg/kg	2236	475	21.2	148	2218	301	48.8	2.18
Hg	µg/kg	87.4	9.80	11.2	88	87.1	5.40	1.31	1.49
Mo	µg/kg	232	49.5	21.4	126	233	28.1	5.51	2.38
Ni	µg/kg	1780	204	11.4	131	1794	119	22.2	1.25
Pb	µg/kg	5939	679	11.4	164	5863	377	66.3	1.12
Se	µg/kg	90.7	24.3	26.8	76	95.1	15.8	3.48	3.84
Ba	mg/kg	50.3	5.37	10.7	70	49.7	3.46	0.803	1.59
Bi	µg/kg	18.3	2.99	16.3	13	18.1	1.40	1.04	5.66
V	µg/kg	1065	187	17.6	63	1060	111	29.4	2.77
Sr	mg/kg	43.7	3.87	8.9	69	43.4	2.40	0.582	1.33
Be	µg/kg	50.4	7.98	15.8	30	50.7	5.05	1.82	3.61
Rb	µg/kg	5155	729	14.1	36	5163	437	152	2.94
Ca	g/kg	16.4	1.25	7.6	543	16.4	0.770	0.067	0.409
Cl (as Cl)	g/kg	1.26	0.200	15.9	96	1.25	0.140	0.025	2.03
K	g/kg	4.50	0.414	9.2	554	4.50	0.255	0.022	0.489
Mg	g/kg	1.17	0.085	7.2	539	1.18	0.060	0.005	0.389
N - Kjeldahl (as N)	g/kg	10.9	0.651	6.0	344	11.0	0.416	0.044	0.402
Na	mg/kg	324	43.8	13.5	337	323	26.0	2.98	0.920
P (as P)	g/kg	0.908	0.077	8.5	541	0.910	0.047	0.004	0.458
S (as S)	g/kg	1.07	0.105	9.8	311	1.08	0.068	0.007	0.693

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
C - elementary	g/kg	495	14.1	2.9	147	495	10.1	1.46	0.294
Al	mg/kg	503	187	37.1	65	464	186	28.9	5.75
Si	mg/kg	10245	1076	10.5	11	10199	587	406	3.96
N - elementary	g/kg	11.6	0.689	6.0	228	11.5	0.500	0.057	0.493



Consensus Values IPE 157

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	332	55.5	16.7	113	331	37.9	6.53	1.97

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
delta 13C	‰ V-PDB	-29.6	0.377	1.3	16	-29.6	0.215	0.118	0.398
delta 15N	‰ Air	-2.82	0.317	11.2	17	-2.81	0.125	0.096	3.41

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Crude fibre	g/kg	273	26.9	9.9	32	273	16.5	5.94	2.18
ADF-ash-free	g/kg	647	50.4	7.8	18	645	30.3	14.9	2.30
NDF-ash-free	g/kg	620	72.5	11.7	16	621	55.9	22.6	3.65
Total ash	g/kg	82.3	3.83	4.7	63	82.7	2.30	0.604	0.734



Indicative Values IPE 157

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
F	mg/kg	18.5	11.6	62.6	6	21.3	5.80	5.89	31.9
Ga	µg/kg	157	134	85.2	9	192	84.3	55.7	35.5
I	µg/kg	1435	368	25.7	23	1477	218	96.0	6.69
Li	µg/kg	362	111	30.7	31	368	66.6	24.9	6.89
Sb	µg/kg	308	150	48.7	50	308	105	26.6	8.61
Sn	µg/kg	278	72.6	26.1	24	289	51.2	18.5	6.67
Ti	mg/kg	9.80	4.74	48.4	31	10.8	3.00	1.07	10.9
Ag	µg/kg	25.9	9.01	34.9	16	27.6	6.65	2.82	10.9
Cs	µg/kg	67.0	17.7	26.4	21	68.9	11.2	4.82	7.19
N - NH4 (as N)	mg/kg	68.5	24.4	35.6	10	73.9	22.9	9.65	14.1
N - NO3 (as N)	mg/kg	15.7	12.0	76.3	15	19.9	7.90	3.87	24.6
SO4 (as SO4)	g/kg	0.145	0.132	90.8	13	0.150	0.090	0.046	31.5

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
NDF-ash-containing	g/kg	618	84.7	13.7	5	625	40.6	47.3	7.67
Total fat	g/kg	26.7	11.3	42.3	23	26.0	8.85	2.95	11.0