



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 225



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.

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 225 of Spruce / Picea sp., from Netherlands, is prepared for the WEPAL proficiency programs. The sample has been 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
2023	2	4
2019	1	1



Consensus Values IPE 225

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
B	mg/kg	20.2	2.26	11.2	167	20.2	1.45	0.219	1.08
Cu	mg/kg	3.90	0.652	16.7	188	3.94	0.418	0.059	1.52
Fe	mg/kg	135	15.3	11.3	191	136	10.8	1.38	1.02
Mn	mg/kg	481	37.5	7.8	196	483	25.4	3.35	0.695
Zn	mg/kg	49.4	4.21	8.5	196	49.2	2.83	0.376	0.761
As	µg/kg	61.3	12.8	20.9	33	64.0	7.40	2.79	4.56
Cd	µg/kg	72.5	5.99	8.3	49	72.1	3.21	1.07	1.48
Co	µg/kg	101	14.7	14.6	45	100	8.00	2.74	2.71
Cr	µg/kg	679	175	25.8	47	693	97.0	31.9	4.70
Hg	µg/kg	33.4	4.61	13.8	32	34.3	2.77	1.02	3.05
Li	µg/kg	104	13.0	12.4	11	104	6.00	4.89	4.69
Mo	µg/kg	136	30.3	22.2	51	140	15.0	5.30	3.89
Ni	µg/kg	878	169	19.2	44	884	95.7	31.8	3.62
Pb	µg/kg	459	66.9	14.6	51	472	39.1	11.7	2.55
Ba	mg/kg	17.1	0.926	5.4	20	17.1	0.450	0.259	1.52
Sb	µg/kg	39.7	5.66	14.3	14	40.6	3.65	1.89	4.76
V	µg/kg	277	46.1	16.6	21	274	30.0	12.6	4.54
Sr	mg/kg	29.9	1.91	6.4	18	30.1	1.25	0.561	1.88
Rb	µg/kg	2464	301	12.2	8	2467	182	133	5.40
Ca	g/kg	7.28	0.568	7.8	206	7.28	0.350	0.049	0.679
Cl (as Cl)	g/kg	1.01	0.151	14.9	35	1.02	0.100	0.032	3.14
K	g/kg	8.92	0.660	7.4	218	8.99	0.465	0.056	0.626
Mg	g/kg	1.03	0.079	7.7	209	1.03	0.046	0.007	0.662
N - Kjeldahl (as N)	g/kg	15.4	0.903	5.9	133	15.5	0.567	0.098	0.635
Na	mg/kg	74.7	25.9	34.7	107	77.2	14.1	3.13	4.19
P (as P)	g/kg	2.07	0.125	6.0	217	2.08	0.080	0.011	0.512
S (as S)	g/kg	1.24	0.120	9.6	126	1.25	0.066	0.013	1.07

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
C - elementary	g/kg	520	16.0	3.1	68	518	9.49	2.42	0.466
N - elementary	g/kg	15.9	0.684	4.3	97	15.9	0.370	0.087	0.548

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	148	23.1	15.6	43	148	15.1	4.40	2.97



Consensus Values IPE 225

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Crude fibre	g/kg	263	23.9	9.1	14	260	18.7	8.00	3.04
Total ash	g/kg	41.1	2.49	6.0	28	41.3	1.66	0.587	1.43



Indicative Values IPE 225

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
I	µg/kg	240	18.5	7.7	5	240	10.0	10.4	4.32
Se	µg/kg	28.5	12.1	42.6	22	29.6	7.60	3.23	11.3
Sn	µg/kg	103	27.4	26.7	12	108	17.3	9.87	9.62
Ti	mg/kg	4.32	2.80	64.8	9	4.10	1.20	1.17	27.0
Ag	µg/kg	12.3	4.29	34.8	5	13.6	2.70	2.40	19.5
N - NO3 (as N)	mg/kg	15.6	9.81	62.9	10	20.9	6.87	3.88	24.9

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
Al	mg/kg	185	51.1	27.6	21	192	28.9	13.9	7.53

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
delta 13C	‰ V-PDB	-29.9	0.185	0.6	6	-29.9	0.085	0.094	0.316
delta 15N	‰ Air	0.374	0.209	55.9	6	0.367	0.145	0.107	28.5

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	Rel.Uncert. %
ADF-ash-free	g/kg	313	25.8	8.3	6	310	13.2	13.2	4.21
NDF-ash-free	g/kg	455	59.2	13.0	6	457	23.5	30.2	6.65
Total fat	g/kg	49.0	13.6	27.7	14	51.8	6.80	4.54	9.26