



**WAGENINGEN EVALUATING PROGRAMS  
FOR ANALYTICAL LABORATORIES**

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**Certificate of Analysis**



**International Plant-Analytical Exchange**

**REFERENCE MATERIAL**

**IPE sample 225**

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## 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 225 of Spruce / Picea sp. 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
2023	2	4
2019	1	1



## Consensus Values IPE 225



### Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
As	µg/kg	61.6	10.48	17.0	33	64.0	7.40	2.28	57.9	-	65.3
B	mg/kg	20.2	2.07	10.2	167	20.2	1.45	0.20	19.91	-	20.54
Ba	mg/kg	17.1	0.71	4.1	20	17.1	0.45	0.20	16.75	-	17.41
Ca	g/kg	7.27	0.506	7.0	206	7.28	0.350	0.044	7.20	-	7.34
Cd	µg/kg	72.5	4.60	6.3	49	72.1	3.21	0.82	71.2	-	73.8
Cl (as Cl)	g/kg	1.01	0.134	13.2	35	1.02	0.100	0.028	0.965	-	1.06
Co	µg/kg	101	11.5	11.4	45	100	8.0	2.1	97.7	-	104.6
Cr	µg/kg	681	139.5	20.5	47	693	97.0	25.4	640	-	721
Cu	mg/kg	3.89	0.609	15.7	188	3.94	0.418	0.056	3.80	-	3.98
Fe	mg/kg	135	15.4	11.4	191	136	10.8	1.4	132.8	-	137.2
Hg	µg/kg	33.5	4.08	12.2	32	34.3	2.77	0.90	32.0	-	34.9
K	g/kg	8.92	0.657	7.4	218	8.99	0.465	0.056	8.83	-	9.01
Mg	g/kg	1.03	0.067	6.5	209	1.03	0.046	0.006	1.02	-	1.04
Mn	mg/kg	481	36.9	7.7	196	483	25.4	3.3	476	-	487
Mo	µg/kg	138	20.7	15.0	51	140	15.0	3.6	132	-	143
N - Kjeldahl (as N)	g/kg	15.4	0.82	5.3	133	15.5	0.57	0.09	15.29	-	15.57
Ni	µg/kg	875	137.8	15.8	44	884	95.7	26.0	833	-	917
P (as P)	g/kg	2.07	0.115	5.5	217	2.08	0.080	0.010	2.06	-	2.09
Pb	µg/kg	458	55.5	12.1	51	472	39.1	9.7	443	-	474
S (as S)	g/kg	1.25	0.097	7.8	126	1.25	0.066	0.011	1.23	-	1.26
Sr	mg/kg	29.9	1.81	6.0	18	30.1	1.25	0.53	29.0	-	30.8
V	µg/kg	276	42.5	15.4	21	274	30.0	11.6	257	-	296
Zn	mg/kg	49.4	4.09	8.3	196	49.2	2.83	0.37	48.8	-	49.9

### Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	187	43.3	23.2	21	192	28.9	11.8	167	-	206
C - elementary	g/kg	520	13.8	2.7	68	518	9.5	2.1	516.5	-	523.1
N - elementary	g/kg	15.9	0.55	3.5	97	15.9	0.37	0.07	15.74	-	15.96

### Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	148	22.0	14.8	43	148	15.1	4.2	142	-	155



### Consensus Values IPE 225

Method: Nutritional values

Element

Total ash

Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
g/kg	41.1	2.35	5.7	28	41.3	1.66	0.55	40.2	-	42.0



## Indicative Values IPE 225

### Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Li	µg/kg	104	8.4	8.0	11	104	6.0	3.2	98.7	-	110
Na	mg/kg	75.3	20.10	26.7	107	77.2	14.10	2.43	71.4	-	79.1
Rb	µg/kg	2450	278	11.3	8	2470	182	123	2221	-	2674
Sb	µg/kg	39.5	4.92	12.5	14	40.6	3.65	1.64	36.6	-	42.3
Se	µg/kg	29.6	11.04	37.3	22	29.6	7.60	2.94	24.7	-	34.5
Sn	µg/kg	104	23.9	22.9	12	108	17.3	8.6	89.2	-	119
Ti	mg/kg	3.92	1.723	44.0	9	4.10	1.200	0.718	2.62	-	5.21

### Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Crude fibre	g/kg	264	27.0	10.3	14	260	18.7	9.0	248	-	279
Total fat	g/kg	48.0	9.87	20.6	14	51.8	6.80	3.30	42.4	-	53.7



## Informative Values IPE 225

### Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
Ag	µg/kg	13.6	2.70	5		
Be	µg/kg	6.84	3.795	6	50.00	7
Bi	µg/kg	6.14	0.060	3		
Cs	µg/kg	23.5	0.40	3		
I	µg/kg	240	10.0	5		
N - NO3 (as N)	mg/kg	20.9	6.87	10	47.8	5

### Method: Real totals

Element	Unit	Median	MAD	N
Si	mg/kg	715	423.4	5

### Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N
Si	mg/kg	413	352.4	5

### Method: Other determinations

Element	Unit	Median	MAD	N
delta 13C	‰ V-PDB	-29.9	0.09	6
delta 15N	‰ Air	0.367	0.1450	6

### Method: Nutritional values

Element	Unit	Median	MAD	N
ADF-ash-free	g/kg	310	13.2	6
NDF-ash-free	g/kg	457	23.5	6