



**WAGENINGEN EVALUATING PROGRAMS  
FOR ANALYTICAL LABORATORIES**

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**Certificate of Analysis**



**International Plant-Analytical Exchange**

**REFERENCE MATERIAL**

**IPE sample 199**

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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 199 of Saw dust / Quercus robur from Finland 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
2018	4	4
2014	1	1
2010	1	4



## Consensus Values IPE 199



### Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
B	mg/kg	3.35	0.788	23.5	201	3.40	0.550	0.069	3.24	-	3.46
Ba	mg/kg	5.25	0.446	8.5	33	5.22	0.307	0.097	5.09	-	5.41
Ca	g/kg	0.700	0.0858	12.2	314	0.700	0.0600	0.0061	0.691	-	0.710
Cd	µg/kg	82.9	7.08	8.5	77	83.2	4.98	1.01	81.3	-	84.5
Co	µg/kg	31.3	7.13	22.8	50	30.5	5.05	1.26	29.3	-	33.3
Fe	mg/kg	41.7	7.96	19.1	294	42.0	5.46	0.58	40.7	-	42.6
K	g/kg	0.413	0.0720	17.4	304	0.420	0.0500	0.0052	0.405	-	0.422
Mg	g/kg	0.171	0.0181	10.6	309	0.170	0.0120	0.0013	0.169	-	0.173
Mn	mg/kg	70.7	6.01	8.5	308	70.6	4.10	0.43	70.0	-	71.3
Na	mg/kg	95.7	17.66	18.5	176	97.4	12.56	1.66	93.1	-	98.4
P (as P)	g/kg	0.0533	0.0126	23.6	274	0.0566	0.0091	0.0010	0.0518	-	0.0548
Sr	mg/kg	3.40	0.361	10.6	37	3.42	0.250	0.074	3.28	-	3.52
V	µg/kg	40.9	9.80	24.0	20	43.5	7.55	2.74	36.3	-	45.4
Zn	mg/kg	8.71	1.078	12.4	293	8.82	0.737	0.079	8.59	-	8.84

### Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	37.4	8.42	22.5	26	36.4	5.66	2.06	34.0	-	40.8
C - elementary	g/kg	503	13.1	2.6	87	503	8.8	1.8	500.3	-	505.9

### Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Crude fibre	g/kg	691	36.5	5.3	18	686	24.8	10.8	673	-	709



## Indicative Values IPE 199



### Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Bi	µg/kg	56.3	5.27	9.4	10	55.7	3.55	2.08	52.6	-	60.0
Cr	µg/kg	313	129.8	41.4	57	329	93.0	21.5	279	-	348
Cu	mg/kg	0.904	0.3830	42.4	243	0.956	0.2660	0.0307	0.855	-	0.952
Hg	µg/kg	2.09	0.852	40.8	23	2.06	0.601	0.222	1.72	-	2.46
Li	µg/kg	56.7	16.82	29.6	11	58.0	12.00	6.34	45.6	-	67.9
N - NO3 (as N)	mg/kg	4.47	2.068	46.2	10	5.02	1.582	0.817	3.02	-	5.93
Ni	µg/kg	168	68.8	41.0	43	183	47.9	13.1	147	-	189
Rb	µg/kg	1760	54	3.1	10	1770	38	21	1720	-	1795
S (as S)	g/kg	0.0593	0.0151	25.5	157	0.0610	0.0110	0.0015	0.0569	-	0.0617
Sb	µg/kg	5.82	1.451	24.9	10	5.82	1.010	0.574	4.80	-	6.85

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

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	22.6	5.90	26.1	62	22.2	4.11	0.94	21.1	-	24.1

### Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
delta 13C	‰ V-PDB	-26.0	0.14	0.5	10	-26.0	0.09	0.06	-26.08	-	-25.88

### Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
ADF-ash-free	g/kg	736	29.1	4.0	10	729	18.9	11.5	715	-	756
NDF-ash-free	g/kg	902	25.5	2.8	8	903	17.6	11.3	882	-	923
Total ash	g/kg	3.12	0.844	27.1	35	3.20	0.575	0.178	2.83	-	3.41



## Informative Values IPE 199

### Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
Ag	µg/kg	34.6	2.30	7		
As	µg/kg	18.0	8.94	21	100.0	43
Be	µg/kg	1.82	1.405	6	20.00	17
Cl (as Cl)	g/kg	0.210	0.1460	37	0.400	18
Cs	µg/kg	18.4	1.55	4		
I	µg/kg	115	13.4	4		
Mo	µg/kg	27.0	12.61	40	161.0	49
N - Kjeldahl (as N)	g/kg	0.830	0.2740	181	1.400	20
N - NH4 (as N)	mg/kg	10.9	2.49	4		
Pb	µg/kg	107.1	36.21	65	1000.0	30
Se	µg/kg	6.98	4.180	16	51.50	30
Sn	µg/kg	28.8	11.35	14	100.0	6
SO4 (as SO4)	g/kg	0.100	0.0350	7		
Ti	mg/kg	1.21	0.636	7	8.13	6

### Method: Real totals

Element	Unit	Median	MAD	N	Results smaller than (<)	
					Median of <	N
N - elementary	g/kg	1.00	0.398	119	1.04	12

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

Element	Unit	Median	MAD	N
Si	mg/kg	95.6	39.55	4

### Method: Other determinations

Element	Unit	Median	MAD	N
delta 15N	‰ Air	-1.28	1.750	5

### Method: Nutritional values

Element	Unit	Median	MAD	N
NDF-ash-containing	g/kg	886	32.5	4
Total fat	g/kg	14.3	7.64	12