



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 235



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 235 of Raye grass / Lolium perenne from Austria 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
2021	4	3
2020	2	4
2017	2	2



Consensus Values IPE 235



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
As	µg/kg	412	61.1	14.8	53	413	43.0	10.5	395	-	429
B	mg/kg	7.82	1.549	19.8	209	7.93	1.070	0.134	7.61	-	8.03
Ba	mg/kg	33.1	2.42	7.3	26	33.1	1.67	0.59	32.2	-	34.1
Ca	g/kg	8.66	0.486	5.6	275	8.67	0.330	0.037	8.61	-	8.72
Cd	µg/kg	48.0	8.67	18.0	62	49.6	6.28	1.38	45.8	-	50.2
Cl (as Cl)	g/kg	16.0	0.72	4.5	45	15.9	0.50	0.13	15.77	-	16.20
Co	µg/kg	252	30.1	11.9	55	250	20.3	5.1	244	-	260
Cr	µg/kg	1690	305	18.1	49	1730	217	54	1599	-	1774
Cu	mg/kg	6.99	0.757	10.8	262	6.97	0.531	0.058	6.90	-	7.08
Fe	mg/kg	671	71.1	10.6	256	664	48.8	5.6	662	-	680
Hg	µg/kg	15.3	1.83	11.9	41	15.5	1.28	0.36	14.8	-	15.9
K	g/kg	36.6	2.19	6.0	288	36.3	1.52	0.16	36.34	-	36.85
Mg	g/kg	3.06	0.155	5.1	278	3.05	0.107	0.012	3.04	-	3.08
Mn	mg/kg	55.8	3.57	6.4	261	56.0	2.50	0.28	55.4	-	56.2
Mo	µg/kg	720	82.3	11.4	74	726	55.4	12.0	701	-	739
N - Kjeldahl (as N)	g/kg	19.0	0.85	4.5	171	19.0	0.60	0.08	18.86	-	19.12
Na	mg/kg	775	75.3	9.7	159	771	50.4	7.5	764	-	787
Ni	µg/kg	1890	209	11.0	47	1910	144	38	1833	-	1956
P (as P)	g/kg	2.98	0.172	5.8	286	2.97	0.120	0.013	2.96	-	3.00
Pb	µg/kg	818	110.8	13.5	66	824	76.1	17.0	791	-	845
S (as S)	g/kg	4.27	0.284	6.7	157	4.25	0.200	0.028	4.23	-	4.32
Sn	µg/kg	107	10.7	10.0	16	108	8.1	3.3	102	-	113
Sr	mg/kg	29.6	2.40	8.1	20	29.3	1.65	0.67	28.4	-	30.7
V	µg/kg	1460	293	20.0	22	1500	203	78	1334	-	1593
Zn	mg/kg	31.9	2.63	8.2	266	32.0	1.81	0.20	31.63	-	32.26

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
C - elementary	g/kg	427	11.3	2.6	119	427	7.8	1.3	424.9	-	429.0
N - elementary	g/kg	19.8	0.76	3.9	164	19.8	0.52	0.07	19.70	-	19.94

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	693	152.8	22.1	55	680	104.0	25.8	652	-	734



Consensus Values IPE 235

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
delta 13C	‰ V-PDB	-29.3	0.13	0.4	30	-29.3	0.08	0.03	-29.30	-	-29.21
delta 15N	‰ Air	984	16.9	1.7	30	985	11.6	3.9	978	-	990

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Crude fibre	g/kg	272	11.6	4.3	20	273	7.8	3.2	266	-	277
Total ash	g/kg	132	4.1	3.1	35	131	2.7	0.9	130.4	-	133.2



Indicative Values IPE 235



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Be	µg/kg	34.5	6.24	18.1	9	34.6	4.60	2.60	29.8	-	39.2
I	µg/kg	127	12.9	10.1	8	128	9.0	5.7	117	-	138
Li	µg/kg	866	182.1	21.0	12	842	131.0	65.7	752	-	981
N - NO3 (as N)	mg/kg	158	22.7	14.4	15	162	18.0	7.3	145	-	170
Rb	µg/kg	6400	824	12.9	8	6500	549	364	5730	-	7070
Sb	µg/kg	31.5	13.79	43.8	16	32.2	9.44	4.31	24.2	-	38.8
Se	µg/kg	135	42.0	31.1	39	130	30.0	8.4	121	-	149
Ti	mg/kg	17.9	6.93	38.8	19	18.8	4.60	1.99	14.5	-	21.2

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Al	mg/kg	1040	265	25.4	29	1070	175	61	943	-	1144
Si	mg/kg	10600	830	7.9	8	10700	620	370	9890	-	11250

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
ADF-ash-free	g/kg	309	12.6	4.1	10	309	8.0	5.0	300	-	318
NDF-ash-free	g/kg	541	27.1	5.0	10	544	18.8	10.7	522	-	560
Total fat	g/kg	38.7	12.93	33.4	13	43.4	9.45	4.48	30.9	-	46.4



Informative Values IPE 235



Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N
Ag	µg/kg	5.42	1.485	6
Bi	µg/kg	14.8	6.50	4
Cs	µg/kg	119	14.0	3
Ga	µg/kg	417	123.2	4
N - NH4 (as N)	mg/kg	989	488.0	4
SO4 (as SO4)	g/kg	8.84	2.520	6

Method: Acid extractable (So-called totals)

Element	Unit	Median	MAD	N
Si	mg/kg	840	728.5	10

Method: Nutritional values

Element	Unit	Median	MAD	N
NDF-ash-containing	g/kg	531	8.0	3
Total monosaccharides	g/kg	53.5	28.50	4