WAGENINGEN EVALUATING PROGRAMS

FOR ANALYTICAL LABORATORIES

Certificate of Analysis

International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 202

WAGENINGEN
UNIVERSITY & RESEARCH

Certificate of Analysis IPE 202

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 202 of Hop / Humulus lupulus from Netherlands is prepared for the WEPAL proficiency programs. The sample is used in 1 period (or round). The results on which the values in this report are based were taken from the period given in the following table.

Year	Round	Number
2011	2	2

Consensus Values IPE 202

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
As	µg/kg	218	34.0	15.6	20	214	26.0	9.5	202 - 233
B	mg/kg	33.0	3.16	9.6	74	33.0	2.20	0.46	32.3 - 33.7
Ca	g/kg	18.1	1.11	6.1	105	18.1	0.75	0.14	17.89 - 18.32
Cl (as Cl)	g/kg	1.63	0.166	10.2	24	1.63	0.120	0.042	1.56 - 1.70
Co	µg/kg	70.1	11.13	15.9	24	70.0	8.15	2.84	65.4 - 74.8
Cu	mg/kg	5.13	0.662	12.9	94	5.10	0.445	0.085	5.00 - 5.27
Fe	mg/kg	101	12.7	12.6	95	101	8.6	1.6	98.5 - 103.6
K	g/kg	19.3	1.17	6.1	107	19.2	0.80	0.14	19.03 - 19.48
Mg	g/kg	5.00	0.327	6.5	105	5.00	0.225	0.040	4.94 - 5.06
Mn	mg/kg	125	8.0	6.3	97	125	5.5	1.0	123.8 - 127.0
Mo	µg/kg	461	47.4	10.3	29	471	31.6	11.0	443 - 479
N - Kjeldahl (as N)	g/kg	14.6	0.62	4.2	73	14.6	0.42	0.09	14.48 - 14.76
Na	mg/kg	224	31.4	14.0	63	230	21.5	4.9	216 - 232
P (as P)	g/kg	4.83	0.300	6.2	106	4.84	0.210	0.036	4.78 - 4.89
Pb	µg/kg	462	55.8	12.1	25	451	42.0	14.0	439 - 485
S (as S)	g/kg	1.45	0.116	8.0	64	1.44	0.080	0.018	1.42 - 1.48
Zn	mg/kg	50.4	3.16	6.3	94	50.2	2.16	0.41	49.8 - 51.1

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
C - elementary	g/kg	452	9.3	2.1	41	452	6.0	1.8	449.5 - 455.4
N - elementary	g/kg	15.7	0.63	4.0	62	15.7	0.43	0.10	15.57 - 15.89

Indicative Values IPE 202

Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Ba	mg/kg	9.31	0.747	8.0	10	9.28	0.495	0.295	8.78 - 9.84
Cd	µg/kg	32.3	8.35	25.9	18	34.1	5.90	2.46	28.2 - 36.4
Cr	µg/kg	1080	323	30.0	22	1110	217	86	934 - 1220
Hg	µg/kg	9.29	1.168	12.6	12	9.38	0.840	0.421	8.55 - 10.0
N - NO3 (as N)	mg/kg	198	14.4	7.2	10	201	9.5	5.7	188 - 208
Ni	µg/kg	397	107.2	27.0	20	409	70.4	30.0	347 - 447
Se	µg/kg	16.7	5.99	35.8	11	16.2	4.00	2.26	12.7 - 20.7
Sr	mg/kg	36.8	1.72	4.7	12	37.0	1.21	0.62	35.7 - 37.9
V	µg/kg	121	25.7	21.2	8	124	19.0	11.3	99.9 - 142

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	112	12.5	11.2	11	109	9.0	4.7	103 - 120

Method: Acid extractable (So-called totals)

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Al	mg/kg	72.4	21.12	29.2	22	75.7	14.93	5.63	63.1 - 81.7

Method: Other determinations

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
delta 13C	‰ V-PDB	-27.7	0.53	1.9	14	-27.6	0.38	0.18	-27.99 - -27.38

Method: Nutritional values

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits
Total ash	g/kg	91.6	6.04	6.6	13	91.0	4.58	2.09	88.0 - 95.2

Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N
Be	µg/kg	4.80	2.770	3
I	µg/kg	125	34.1	3
Li	µg/kg	611	136.5	4
N - NH4 (as N)	mg/kg	114	0.3	3
Rb	µg/kg	3190	211	3
Sb	µg/kg	30.3	0.30	5
Sn	µg/kg	35900	22540	5
SO4 (as SO4)	g/kg	1.40	0.415	4
Ti	mg/kg	5.69	1.400	5

Method: Other determinations

Element	Unit	Median	MAD	N
delta 15N	‰ Air	0.759	0.4780	13

Method: Nutritional values

Element	Unit	Median	MAD	N
ADF-ash-free	g/kg	406	3.3	3
Crude fibre	g/kg	261	20.4	6
NDF-ash-free	g/kg	444	12.9	3
Total fat	g/kg	10.2	8.20	5