



**WAGENINGEN EVALUATING PROGRAMS
FOR ANALYTICAL LABORATORIES**

Certificate of Analysis



International Plant-Analytical Exchange

REFERENCE MATERIAL

IPE sample 990



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 990 of Alfalfa Farine de Lucerne / Medicago sativa from France 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
1998	3	1
1996	6	4
1993	6	5



Consensus Values IPE 990



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
As	µg/kg	449	51.4	11.5	39	450	35.0	10.3	432	-	465
B	mg/kg	36.0	3.04	8.4	205	36.1	2.10	0.27	35.6	-	36.5
Ba	mg/kg	12.0	1.71	14.3	26	12.3	1.15	0.42	11.3	-	12.7
Ca	g/kg	21.4	1.24	5.8	352	21.4	0.84	0.08	21.23	-	21.49
Cd	µg/kg	67.6	15.21	22.5	66	67.5	10.80	2.34	63.8	-	71.3
Cl (as Cl)	g/kg	2.77	0.253	9.1	69	2.80	0.177	0.038	2.71	-	2.83
Co	µg/kg	238	48.6	20.4	55	244	34.0	8.2	225	-	251
Cr	µg/kg	821	159.8	19.5	62	827	105.5	25.4	780	-	861
Cu	mg/kg	5.09	0.744	14.6	325	5.09	0.510	0.052	5.01	-	5.17
Fe	mg/kg	204	25.1	12.3	319	204	17.0	1.8	201.1	-	206.7
K	g/kg	27.0	1.51	5.6	367	27.1	1.02	0.10	26.87	-	27.18
Mg	g/kg	1.66	0.096	5.7	352	1.66	0.063	0.006	1.65	-	1.67
Mn	mg/kg	42.6	3.30	7.7	340	42.7	2.30	0.22	42.25	-	42.95
Mo	µg/kg	278	51.9	18.7	36	283	36.9	10.8	260	-	296
N - Kjeldahl (as N)	g/kg	25.5	1.13	4.4	259	25.5	0.78	0.09	25.37	-	25.65
N - NO3 (as N)	mg/kg	272	34.1	12.6	48	270	23.8	6.2	262	-	282
P (as P)	g/kg	2.56	0.132	5.1	355	2.57	0.090	0.009	2.55	-	2.58
Pb	µg/kg	1560	287	18.3	81	1580	202	40	1499	-	1626
S (as S)	g/kg	2.83	0.239	8.4	145	2.83	0.164	0.025	2.79	-	2.87
Sr	mg/kg	50.8	3.20	6.3	25	51.6	2.00	0.80	49.5	-	52.1
V	µg/kg	615	97.7	15.9	22	601	69.0	26.0	572	-	658
Zn	mg/kg	17.9	2.17	12.1	339	18.0	1.50	0.15	17.70	-	18.17

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
N - elementary	g/kg	26.4	1.29	4.9	106	26.5	0.90	0.16	26.19	-	26.69



Indicative Values IPE 990



Method: Inorganic Chemical Composition

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
Be	µg/kg	28.6	4.21	14.7	9	29.0	3.00	1.75	25.4	-	31.8
Hg	µg/kg	9.64	2.919	30.3	36	10.00	2.000	0.608	8.65	-	10.6
Li	µg/kg	871	99.0	11.4	9	914	69.0	41.2	796	-	945
Na	mg/kg	117	53.8	45.9	229	120	37.9	4.4	110	-	124
Ni	µg/kg	1040	265	25.5	64	1050	184	41	972	-	1104
Sb	µg/kg	41.2	5.89	14.3	13	41.0	4.00	2.04	37.7	-	44.7
Se	µg/kg	128	21.3	16.7	15	129	14.0	6.9	116	-	139
SO4 (as SO4)	g/kg	3.21	0.717	22.4	14	3.41	0.562	0.240	2.79	-	3.62

Method: Real totals

Element	Unit	Mean	Std.Dev.	CV %	N	Median	MAD	Uncertainty	95 % confidence limits		
C - elementary	g/kg	441	23.8	5.4	14	443	17.5	7.9	427	-	454



Informative Values IPE 990



Method: Inorganic Chemical Composition

Element	Unit	Median	MAD	N
Br	mg/kg	12.8	0.55	6
F	mg/kg	36.8	15.74	9
N - NH ₄ (as N)	mg/kg	82.5	30.54	10
Rb	µg/kg	1210	20	3
Sn	µg/kg	140	18.0	3
Ti	mg/kg	18.0	6.70	7

Method: Nutritional values

Element	Unit	Median	MAD	N
Total ash	g/kg	105	4.9	5