

Plausible ranges for foliage and litterfall samples

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Austrian Federal Research and Training Centre for Forests

Plausible Ranges

- **1997:** 4th EP-Foliage - based on experience
(used for data check of the level I survey)



4th EP-Foliage/Vienna (1997)

Data submission form	Parameter	Unit	Plausible range ¹	
XX199?.FOM	Sample number	(-)	Tree number followed by 0 or 1 ²	
XX199?.FOM	Mass of 100 leaves	g	1-100	
XX199?.FOM	Mass of 1000 needles	g	1-100	
XX199?.FOM	Shootmass	g	1-500	
XX199?.FOM	N	mg.g ⁻¹	5 - 40 ³	
XX199?.FOM	S	mg.g ⁻¹	0.3 - 10	0.5 - 5
XX199?.FOM	P	mg.g ⁻¹	0.3 - 10	0.5 - 5
XX199?.FOM	Ca	mg.g ⁻¹	1- 40	1 - 20
XX199?.FOM	Mg	mg.g ⁻¹	0.1 - 10	0.5 - 5
XX199?.FOM	K	mg.g ⁻¹	1 - 35	1 - 20
XX199?.FOO	Na	µg.g ⁻¹	50 - 7500	
XX199?.FOO	Zn	µg.g ⁻¹	10 - 500 ⁴	10 - 250
XX199?.FOO	Mn	µg.g ⁻¹	10 - 5000	
XX199?.FOO	Fe	µg.g ⁻¹	10 - 1000	20 - 800
XX199?.FOO	Cu	µg.g ⁻¹	1 - 100 ⁴	1 - 25
XX199?.FOO	Pb	µg.g ⁻¹	1 - 100 ⁴	0.5 - 30
XX199?.FOO	Al	µg.g ⁻¹	10 - 1000	20 - 500
XX199?.FOO	B	µg.g ⁻¹	5 - 150	5 - 50



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- **2007:** 10th EP-Foliage and Litterfall – based on the Level I results from 1987-1995 for „main tree genera“ Spruce, Pine, Beech, Oak



Plausible Range example for the mandatory elements

Main Tree Species	Plausible limit	S mg/g	N mg/g	P mg/g	K mg/g	Ca mg/g	Mg mg/g
Spruce	lower	0,79	10,00	0,80	3,24	2,27	0,59
	upper	1,62	16,41	2,11	8,47	10,05	1,83
Pine	lower	0,80	8,79	0,85	3,78	1,62	0,69
	upper	1,86	18,30	2,14	7,70	6,33	2,31
Beech	lower	1,30	13,90	0,84	5,70	5,12	0,86
	upper	3,97	31,52	3,16	15,95	18,50	3,28
Oak	lower	0,89	11,76	0,68	5,50	3,90	1,05
	upper	2,66	29,54	2,70	12,23	14,36	2,99

Plausible range for foliage element concentrations based on the **level I** results of the FFCC database - **5% of the lowest and 5% of the highest results were removed.**

Results outside of these limits should be **checked** once more and-if necessary-**reanalyzed**.

www.ffcc.at



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- **1997:** 4th EP-Foliage - based on experience
- **2007:** 10th EP-Foliage and Litterfall – based on the Level I results from 1987-1995 for „main tree genera“ Spruce, Pine, Beech, Oak
- **2008:** QA/QC Firenze – for Foliage based on the JRC - Level II database, for different tree species



Plausible ranges – Foliage (Level II)

- *Fagus sylvatica*
- *Quercus cerris*
- *Quercus ilex*
- *Quercus petraea*
- *Quercus pyrenaica*
- *Quercus robur*
- *Quercus suber*
- *Abies alba*
- *Picea abies*
- *Picea sitchensis*
- *Pinus contorta*
- *Pinus halepensis*
- *Pinus nigra*
- *Pinus pinaster*
- *Pinus pinea*
- *Pinus sylvestris*
- *Pseudotsuga menziesii*



Table 1: Plausible range of element concentration in foliage of different tree species calculated from the level II results (indicative values in grey)

Code	Tree species	Leaf_type	Limit	N g/kg	S g/kg	P g/kg	Ca g/kg	Mg g/kg	K g/kg	C g/100g	Zn µg/g	Mn µg/g	Fe µg/g	Cu µg/g	Pb µg/g	Cd ng/g	B µg/g
20	Fagus sylvatica	0	low	20,41	1,26	0,89	3,44	0,65	4,81	45	17,0	127	62	5,67	-	50	9,1
		0	high	29,22	2,12	1,86	14,77	2,50	11,14	55	54,2	2902	178	12,18	6,8	462	40,0
41	Quercus cerris	0	low	12,86	0,91	0,63	4,81	0,98	1,19	45	13,0	509	83	6,89	-	63	15,9
		0	high	30,79	3,24	2,29	16,49	3,24	15,64	55	-	-	-	-	-	-	-
46	Quercus ilex	0	low	11,95	0,81	0,69	4,00	0,76	3,42	45	12,7	278	73	4,00	-	-	21,7
		0	high	17,24	1,41	1,22	10,32	2,62	8,46	55	41,0	5385	717	7,00	-	-	-
48	Quercus petraea	0	low	19,75	1,24	0,90	4,12	1,06	5,86	45	11,0	905	60	5,39	-	24	5,5
		0	high	29,84	2,01	1,85	10,46	2,26	11,16	55	25,0	4209	149	11,64	-	-	-
50	Quercus pyrenaica (Q. toza)	0	low	17,85	1,18	1,48	4,60	1,40	3,52	45	18,0	434	81	8,07	-	-	-
		0	high	25,50	2,33	3,12	12,03	3,00	11,81	55	-	-	-	-	-	-	-
51	Quercus robur (Q. pedunculata)	0	low	20,31	1,36	0,97	3,33	1,09	5,80	45	14,0	219	64	5,50	0,1	40	23,4
		0	high	30,69	2,21	2,55	12,26	2,85	12,64	55	50,0	2820	233	14,10	18,0	183	54,8
54	Quercus suber	0	low	11,39	0,85	0,47	4,29	1,22	4,37	45	17,0	291	62	6,11	-	-	17,5
		0	high	23,09	1,61	1,53	11,02	2,55	9,85	55	47,0	2887	621	20,00	-	-	-
100	Abies alba	0	low	11,55	0,79	0,95	3,50	0,68	4,29	47	22,0	185	21	2,31	-	48	15,5
		0	high	16,16	1,69	2,23	11,71	1,90	8,48	57	45,0	2510	85	5,89	-	-	-
		1	low	11,67	0,95	0,86	4,19	0,37	3,97	47	20,0	250	32	2,00	-	56	14,4
		1	high	16,46	1,79	2,21	16,39	1,70	7,57	57	47,5	5241	121	6,45	-	-	-
118	Picea abies (P. excelsa)	0	low	10,39	0,70	1,01	1,83	0,66	3,65	47	16,0	165	22	1,41	-	-	7,2
		0	high	16,68	1,31	2,10	7,01	1,56	8,36	57	47,0	1739	91	5,94	2,9	226	29,4
		1	low	9,47	0,69	0,81	2,26	0,44	3,41	47	12,0	198	27	0,94	-	-	6,2
		1	high	15,97	1,34	1,82	9,77	1,51	7,05	57	51,8	2376	118	7,07	5,2	169	32,9
120	Picea sitchensis	0	low	12,67	0,98	1,04	1,21	0,78	5,56	47	8,4	147	31	0,70	-	-	6,0
		0	high	17,61	1,75	2,56	8,02	1,41	10,89	57	33,8	1489	232	5,91	-	-	42,0
		1	low	11,87	0,92	0,84	1,41	0,50	4,62	47	9,5	160	33	0,70	-	-	5,0
		1	high	18,19	1,94	2,43	8,23	1,18	10,05	57	29,3	1734	133	4,67	-	-	52,0
124	Pinus contorta	0	low	11,31	0,75	0,98	1,02	0,79	3,56	47	-	-	-	-	-	-	-
		0	high	21,51	1,66	1,73	2,70	1,31	6,06	57	-	-	-	-	-	-	-
		1	low	13,12	0,87	0,88	1,96	0,75	1,21	47	-	-	-	-	-	-	-
1	high	20,22	1,70	1,55	4,41	1,50	6,02	57	-	-	-	-	-	-	-	-	
125	Pinus halepensis	0	low	9,22	0,92	0,80	2,12	1,84	3,20	47	23,0	32	230	-	-	-	-
		0	high	14,28	1,68	1,79	8,04	2,89	8,67	57	-	-	-	-	-	-	-
129	Pinus nigra	0	low	8,42	0,51	0,81	0,97	0,56	3,88	47	18,8	60	29	1,81	0,6	399	8,9
		0	high	21,18	1,44	1,57	4,42	2,08	8,30	57	67,7	1072	131	18,08	-	-	-
		1	low	7,97	0,44	0,75	1,17	0,35	3,89	47	19,0	109	69	1,80	0,9	380	8,7
		1	high	23,49	1,93	1,71	6,90	2,06	7,34	57	70,0	1000	-	-	-	-	-
130	Pinus pinaster	0	low	6,85	0,61	0,55	0,80	1,01	3,26	47	15,6	41	23	1,70	-	-	15,0
		0	high	13,71	1,29	1,24	3,80	2,47	7,14	57	39,0	825	579	5,03	-	-	-
		1	low	6,25	0,55	0,40	1,09	0,94	2,40	47	12,3	35	23	1,13	-	-	20,0
1	high	13,27	1,44	1,38	6,02	2,88	6,86	57	36,8	794	111	4,68	-	-	-		
131	Pinus pinea	0	low	7,51	0,65	0,58	1,53	1,80	3,25	47	6,0	89	44	4,30	-	-	28,5
		0	high	11,30	1,65	1,20	4,40	3,00	6,70	57	-	-	-	-	-	-	-
134	Pinus sylvestris	0	low	11,40	0,75	1,11	1,61	0,64	3,77	47	32,0	172	18	2,28	-	50	9,2
		0	high	20,41	1,56	2,06	4,61	1,31	7,27	57	77,6	912	139	7,70	3,9	447	30,5
		1	low	10,94	0,77	1,00	2,57	0,50	3,51	47	31,5	222	28	1,96	0,1	60	7,4
		1	high	19,38	1,61	1,88	6,71	1,18	6,52	57	96,0	1332	171	6,88	5,6	507	33,9
136	Pseudotsuga menziesii	0	low	13,54	1,00	1,00	1,98	1,02	5,17	47	15,0	159	43	2,72	-	141	30,9
		0	high	22,71	1,80	1,70	5,91	2,10	8,96	57	45,3	1661	129	5,95	-	-	-
		1	low	13,55	0,99	0,71	3,09	1,14	2,97	47	14,0	444	58	2,91	-	-	-
		1	high	29,23	2,18	1,45	9,64	2,73	7,30	57	-	155	279	-	-	-	-

Plausible ranges – *Foliage Litter*

- *Betula pendula*
- *Castanea sativa*
- *Fagus sylvatica*
- *Fraxinus excelsior*
- *Quercus frainetto*
- *Quercus petraea*
- *Quercus robur*
- *Abies cephalonica*
- *Picea abies*
- *Picea sitchensis*
- *Pinus sylvestris*



Table 2: Plausible range of element concentration in foliar-litter of different tree species (indicative values in grey)

Code	Tree Species (Foliar litter)	Limit	C mg/g	S mg/g	N mg/g	P mg/g	K mg/g	Ca mg/g	Mg mg/g	Zn µg/g	Mn µg/g	Fe µg/g	Cu µg/g	B µg/g
010	Betula pendula	low	290		7,30	0,20	0,30	5,00	1,00	105,00	600	45,0	6	
		high	330		21,00	1,20	1,40	12,50	2,00	170,00	3000	300,0	19	38
015	Castanea sativa	low	390		9,00	0,20	0,20	4,50	1,40	35,00	700		5	
		high	420		13,00	0,70	0,55	10,50	2,00	45,00	2500	90,0	13	100
020	Fagus sylvatica	low	460	1	9,00	0,50	2,00	4,00	0,80	25,00	650	70,0	4	2
		high	510	2,2	19,00	1,90	8,00	17,00	2,00	35,00	1600	140,0	7	40
022	Fraxinus excelsior	low	470		12,00	0,75	0,40	20,00	2,00	15,00	110	120,0	7	
		high	470		18,00	1,50	1,40	25,00	3,50	20,00	200	200,0	9	50
044	Quercus frainetto (Q. conferta)	low		1,1	8,00	1,10	4,50	14,00	1,20					
		high		1,1	11,70	1,30	5,20	18,30	1,40					
048	Quercus petraea	low	460		8,00	0,30	2,00	7,00	1,30	14,00	700	50,0	5	
		high	510		12,00	0,60	4,00	10,00	2,00	25,00	1700	200,0	8	35
051	Quercus robur (Q. pedunculata)	low	460	0,85	10,00	0,82	4,00	5,00	1,00	15,00	1000	90,0	6	7
		high	510	1,7	19,00	2,00	8,00	13,00	2,00	25,00	1200	150,0	7	35
102	Abies cephalonica	low			8,00		2,70	11,00	1,00					
		high			13,00		8,30	24,00	1,50					
118	Picea abies (P. excelsa)	low		1	6,50	0,60	1,00	2,50	0,70					
		high	520	1,5	12,60	1,20	4,20	16,00	2,20					
120	Picea sitchensis	low	440	1	6,00	0,60	1,50	4,00	0,60	15,00	250	40,0	2	
		high	530	1,1	13,00	1,10	3,00	11,00	1,00	35,00	1400	120,0	4	35
134	Pinus sylvestris	low	490	0,62	5,00	0,40	1,00	2,00	0,50	20,00	180	35,0	2	
		high	530	0,62	10,00	0,80	3,00	11,00	0,80	45,00	800	150,0	5	45

Plausible Ranges Future improvements

- Plausible ranges for Foliage Litter - based on real level II data → EP-Foliage and Litterfall
- „Country related“ – plausible ranges for each country (should be discussed in Hamburg)

