

1 Supplementary materials

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5 **Accumulation of trace metals in vegetables from allotment gardens in the city of Wrocław,**

6 **SW Poland**

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8 Sup Table 1

9 Description of the location of the sampling sites in allotment gardens

Number and name of allotment garden complex in Wrocław	GPS Coordinates
1-Lepsze jutro	N 51°07.531' , E 017°03.584'
	N 51°07.547' , E 017°03.560'
	N 51°07.516' , E 017°03.622'
	N 51°07.500' , E 017°03.643'
2-Złocień	N 51°04.141' , E 017°04.239'
	N 51°04.149' , E 017°04.223'
	N 51°04.147' , E 017°04.265'
	N 51°04.075' , E 017°04.168'
3-Spółdzielca	N 51°08.018' , E 017°05.797'
	N 51°08.005' , E 017°05.817'

N 51°08.035' , E 017°05.736'

N 51°08.044' , E 017°05.695'

N 51°08.105' , E 017°05.813'

4-Jarzębina

N 51°06.040' , E 016°58.987'

5-Radość

N 51°06.183' , E 016°58.270'

N 51°06.367' , E 016°58.719'

N 51°06.345' , E 016°58.757'

6-Malina

N 51°06.339' , E 016°58.771'

N 51°06.221' , E 016°58.586'

7-Oświata

N 51°05.959' , E 016°58.217'

10 Note: The specified GPS coordinates refer to the allotment plots. A larger quantity of vegetables and soil was taken from
11 each plot. Soil and vegetables were taken depending on whether there was at least one vegetable in the allotment garden, such
12 as lettuce, beetroot, or carrots.
13 1 – Lepsze Jutro: soils contaminated by various substances such as contaminated lime and compost; 2 – Złocień:
14 contamination possibly caused by old rubble and materials used to fill holes and depressions; 3 – Spółdzielca: contamination
15 may be linked to past industrial activities in the area; 4 – Jarzębina: soils mainly polluted by emissions from the Hutmen
16 plant; 5 – Radość: soils polluted by emissions from the Hutmen plant; 6 – Malina: soils polluted by emissions from the
17 Hutmen plant; 7 – Oświata: soils polluted by emissions from the Hutmen plant.

19 Sup Table 2

20 Geochemical background values for selected heavy metals in garden soils in Wrocław
21 (Państwowy Instytut Geologiczny, 1998).

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Zn [min/max/mean] [mg kg ⁻¹]	Cu [min/max/mean] [mg kg ⁻¹]	Pb [min/max/mean] [mg kg ⁻¹]	Cd [min/max/mean] [mg kg ⁻¹]
24/950/172	5/101/26	13/251/54	<0.5/4.6/0.7

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42 Sup Table 3

43 Heavy metal content in vegetables samples from the examined allotment gardens complex

Number of allotment garden complex in Wrocław	Vegetable	Part of vegetable	Zn [mg/kg d.m.]	Cu [mg/kg d.m.]	Pb [mg/kg d.m.]	Cd [mg/kg d.m.]
1	Lettuce	Root	92.7	20.2	n/a	n/a
	Lettuce	Shoots	69.0	7.1	n/a	n/a
	Beetroot	Root	91.7	11.3	1.7	n/a
	Beetroot	Shoots	238.6	9.6	3.0	n/a
	Lettuce	Root	72.8	16.7	n/a	n/a
	Lettuce	Shoots	79.4	14.3	n/a	n/a
	Beetroot	Root	79.9	16.2	n/a	n/a
	Beetroot	Shoots	209.3	18.8	n/a	n/a
	Carrot	Root	37.0	13.3	n/a	n/a
	Carrot	Shoots	31.5	9.5	n/a	n/a
	Carrot	Root	18.1	8.5	n/a	n/a
	Carrot	Shoots	70.9	15.1	n/a	n/a
	Lettuce	Root	97.0	19.5	n/a	n/a
	Lettuce	Shoots	63.4	12.9	n/a	n/a
2	Carrot	Root	36.7	12.5	n/a	n/a
	Carrot	Shoots	42.3	16.2	n/a	n/a
	Beetroot	Root	69.4	16.1	n/a	n/a
	Beetroot	Shoots	357.8	22.3	n/a	n/a
	Lettuce	Root	55.7	15.4	n/a	n/a
	Lettuce	Shoots	87.7	14.8	n/a	n/a
	Beetroot	Root	46.6	18.4	n/a	n/a
	Beetroot	Shoots	237.0	22.8	n/a	n/a
	Carrot	Root	21.1	12.8	n/a	n/a
	Carrot	Shoots	25.5	20.4	n/a	n/a
	Carrot	Root	17.0	11.7	n/a	n/a
	Carrot	Shoots	22.9	21.6	4.0	n/a
	Carrot	Root	26.8	10.2	n/a	n/a
	Carrot	Shoots	57.7	10.4	1.8	n/a
	Beetroot	Root	74.4	14.8	n/a	n/a
	Beetroot	Shoots	257.8	17.1	n/a	n/a
	Lettuce	Root	101.4	13.8	2.0	n/a
	Lettuce	Shoots	95.3	11.8	n/a	n/a
3	Carrot	Root	27.0	14.3	n/a	n/a
	Carrot	Shoots	34.2	22.7	4.2	n/a
	Beetroot	Root	27.5	11.9	4.2	n/a
	Beetroot	Shoots	127.1	22.5	4.4	n/a
	Carrot	Root	23.5	19.0	4.1	n/a
	Carrot	Shoots	32.3	22.0	4.5	n/a
	Beetroot	Root	42.3	21.8	4.2	n/a

	Beetroot	Shoots	118.9	23.8	4.4	n/a
	Lettuce	Root	40.8	32.0	4.5	n/a
	Lettuce	Shoots	77.9	25.8	4.5	n/a
	Carrot	Root	13.5	19.6	4.5	n/a
	Carrot	Shoots	23.4	25.3	4.6	n/a
	Beetroot	Root	27.9	27.2	4.5	n/a
	Beetroot	Shoots	48.2	29.6	4.7	n/a
	Lettuce	Root	22.8	23.4	4.6	n/a
	Lettuce	Shoots	24.3	25.5	4.6	n/a
	Carrot	Root	29.8	19.4	4.1	n/a
	Carrot	Shoots	34.0	25.1	4.3	n/a
	Lettuce	Root	52.3	27.4	4.2	n/a
	Lettuce	Shoots	37.1	23.1	4.4	n/a
	Beetroot	Root	38.5	30.3	4.6	n/a
	Beetroot	Shoots	111.2	34.8	4.3	n/a
	Carrot	Root	28.8	18.2	4.1	n/a
	Carrot	Shoots	36.4	23.8	4.7	n/a
	Beetroot	Root	90.8	24.9	4.6	n/a
	Beetroot	Shoots	132.7	23.7	4.2	n/a
	Lettuce	Root	196.0	43.6	7.6	2.3
	Lettuce	Shoots	80.2	18.6	3.3	n/a
4	Beetroot	Root	107.9	20.3	1.8	n/a
	Beetroot	Shoots	156.8	19.3	5.9	1.3
	Carrot	Root	50.1	18.7	3.7	n/a
	Carrot	Shoots	108.4	26.3	7.8	1.3
	Carrot	Root	35.1	10.3	n/a	n/a
	Carrot	Shoots	61.1	15.6	2.5	n/a
5	Beetroot	Root	59.4	14.2	n/a	n/a
	Beetroot	Shoots	144.2	14.9	3.1	n/a
	Beetroot	Root	81.8	28.8	4.9	n/a
	Beetroot	Shoots	43.2	30.2	4.9	n/a
	Carrot	Root	29.6	26.7	5.0	n/a
	Carrot	Shoots	45.2	27.1	5.0	n/a
	Beetroot	Root	63.8	21.9	4.8	n/a
	Beetroot	Shoots	147.6	26.9	5.2	n/a
	Carrot	Root	45.6	28.3	5.0	n/a
	Carrot	Shoots	66.8	26.1	5.0	n/a
6	Beetroot	Root	38.4	27.2	5.1	n/a
	Beetroot	Shoots	25.1	19.6	4.8	n/a
	Lettuce	Root	53.8	34.6	5.0	n/a
	Lettuce	Shoots	48.5	24.5	4.8	n/a
	Carrot	Root	83.7	21.8	4.8	n/a
	Carrot	Shoots	146.7	22.5	4.7	n/a
	Beetroot	Root	83.7	21.8	4.8	n/a
	Beetroot	Shoots	146.7	22.5	4.7	n/a
	Carrot	Root	36.8	23.3	5.1	n/a
	Carrot	Shoots	41.1	24.8	5.1	n/a

7	Carrot	Root	35.2	21.5	5.2	n/a
	Carrot	Shoots	41.4	25.4	4.8	n/a
	Beetroot	Root	133.1	33.9	5.2	n/a
	Beetroot	Shoots	56.6	29.9	5.2	n/a

44 Note: the gray field with n/a means that the ICP-AES results were below detection.

45 **Note:** 1 – Lepsze Jutro: soils contaminated by various substances such as contaminated lime and compost; 2 – Złocien:
46 contamination possibly caused by old rubble and materials used to fill holes and depressions; 3 – Spółdzielca: contamination
47 may be linked to past industrial activities in the area; 4 – Jarzębina: soils mainly polluted by emissions from the Hutmen
48 plant; 5 – Radość: soils polluted by emissions from the Hutmen plant; 6 – Malina: soils polluted by emissions from the
49 Hutmen plant; 7 – Oświata: soils polluted by emissions from the Hutmen plant.

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70 Content of selected trace elements in vegetables in comparison to the literature data

Selected trace element	Vegetable	Part of vegetable	Result {[mg kg ⁻¹ d.m.]}	Ranges from articles [mg kg ⁻¹ d.m.]	Bibliography
Pb	Beetroot	Root	1.7 – 5.2	0.1 – 4.2	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Beetroot	Shoot	3 – 6	0.1 – 3.0	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Carrot	Root	4 – 5	0.1 – 8.0	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Carrot	Shoot	2 – 8	0.1 – 3.2	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Lettuce	Root	2 – 8	n/a	
	Lettuce	Shoot	4 – 5	0.1 – 4.5	(Bielicka et al., 2009)
Zn	Beetroot	Root	28 – 133	46.2 – 132.0	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Beetroot	Shoot	25 – 358	15.4 – 97.6	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Carrot	Root	14 – 84	19.8 – 57.2	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Carrot	Shoot	23 – 147	25.6 – 80.0	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Lettuce	Root	23 – 196	n/a	
	Lettuce	Shoot	24 – 95	52.4 – 80.0	(Bielicka et al., 2009)

Cu	Beetroot	Root	11 – 34	8.3 – 17.1	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Beetroot	Shoot	10 – 35	3.7 – 14.8	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Carrot	Root	9 – 28	0.9 – 6.6	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Carrot	Shoot	9 – 27	2.8 – 4.3	(Kawałko and Chodak, 1996; Chodak et al., 1995; Gontarz and Dmowski., 2000)
	Lettuce	Root	14 – 44		n/a
	Lettuce	Shoot	7 – 29	9.4 – 13.8	(Bielicka et al., 2009)

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86 Sup Table 5

87 Heavy metal content in soil in 7 complexes of allotment gardens.

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No. of allotment garden complex	NO. OF SAMPLE	Zn [mg kg ⁻¹ , soil dry mass]	Cu [mg kg ⁻¹ , soil dry mass]	Pb [mg kg ⁻¹ , soil dry mass]	Cd [mg kg ⁻¹ , soil dry mass]
1	1	395	64	114	1
	2	483	80	156	2
	3	377	62	132	1
	4	276	58	94	1
	5	244	47	86	1
	6	531	69	138	3
	7	599	77	141	3
2	20	350	49	46	2
	21	159	37	30	1
	22	199	32	40	1
	23	143	30	29	1
	24	218	42	36	1
	25	101	28	24	1
	26	647	39	54	1
	27	483	36	50	1
	28	1138	72	78	2
	29	195	40	32	1
	30	190	41	35	1
3	31	236	55	46	1
	32	208	44	35	1
	33	229	58	35	1
	34	182	30	20	1
	35	138	33	20	1
	36	136	30	20	1
	37	117	25	23	1
	38	144	30	32	1
	39	137	29	26	1
	40	269	60	69	1
	41	235	58	63	1
4	42	1283	215	231	3
	43	1290	219	222	6
	44	1384	232	237	6
5	45	350	76	90	2
	46	321	61	69	1
6	48	563	105	90	2
	49	400	106	78	2

	50	216	57	58	1
	51	246	64	65	1
	52	388	91	95	2
	53	384	88	102	2
	54	338	81	75	2
	55	472	76	104	2
	56	345	65	73	2
7	57	263	57	71	1
	58	283	56	86	1

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90 **Note:** 1 – Lepsze Jutro: soils contaminated by various substances such as contaminated lime and compost; 2 – Złocień:
91 contamination possibly caused by old rubble and materials used to fill holes and depressions; 3 – Spółdzielca: contamination
92 may be linked to past industrial activities in the area; 4 – Jarzębina: soils mainly polluted by emissions from the Hutmen
93 plant; 5 – Radość: soils polluted by emissions from the Hutmen plant; 6 – Malina: soils polluted by emissions from the
94 Hutmen plant; 7 – Oświata: soils polluted by emissions from the Hutmen plant.

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112 Sup Table 6

113 Results of Kruskal-Wallis analysis on comparison of heavy-metal content in shoots and roots

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Heavy metals	Chi-Square	DF	Prob>Chi-Square
Zn	37.82398	5	<0.0001
Cu	9.35332	5	0.09577
Pb	0.42124	5	0.99472

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135 Bioaccumulation factor (BAF) in the roots and shoots parts of selected plants

Lettuce						
No. Of allotment garden complex	Shoots			Roots		
	Zn	Cu	Pb	Zn	Cu	Pb
1	0.23	0.32	n/a	0.23	0.32	n/a
	0.21	0.23	n/a	0.19	0.27	n/a
	0.11	0.17	n/a	0.16	0.25	n/a
2	0.44	0.46	n/a	0.28	0.48	n/a
	0.08	0.16	n/a	0.09	0.19	0.03
3	0.34	0.44	0.13	0.18	0.55	0.13
	0.18	0.85	0.23	0.17	0.78	0.23
	0.26	0.77	0.14	0.36	0.91	0.13
4	0.06	0.09	0.01	0.15	0.2	0.03
6	0.13	0.28	0.05	0.14	0.39	0.05
Mean	0.2	0.38	0.11	0.2	0.43	0.1
Min	0.06	0.09	0.01	0.09	0.19	0.03
Max	0.44	0.85	0.23	0.36	0.91	0.23
SD	0.12	0.26	0.09	0.08	0.25	0.08
Beetroot						
No. Of allotment garden complex	Shoots			Roots		
	Zn	Cu	Pb	Zn	Cu	Pb
1	0.49	0.12	0.02	0.19	0.14	0.01
	0.76	0.32	n/a	0.29	0.28	n/a
	2.25	0.6	n/a	0.44	0.43	n/a
2	1.66	0.76	n/a	0.33	0.61	n/a
	0.53	0.48	n/a	0.15	0.41	n/a
3	0.67	0.55	0.13	0.14	0.29	0.12
	0.57	0.54	0.13	0.2	0.5	0.12
	0.35	0.9	0.23	0.2	0.82	0.23
4	0.81	1.2	0.16	0.28	1.04	0.18
	0.12	0.09	0.03	0.08	0.09	0.01
	0.45	0.24	0.04	0.18	0.23	n/a
5	0.08	0.29	0.05	0.15	0.27	0.05
	0.68	0.47	0.09	0.3	0.38	0.08
	0.06	0.22	0.05	0.1	0.3	0.05
6	0.31	0.3	0.05	0.18	0.29	0.05
	0.2	0.53	0.06	0.47	0.61	0.06
	0.62	0.48	0.09	0.23	0.42	0.09
Mean	0.62	0.48	0.09	0.23	0.42	0.09
Min	0.06	0.09	0.02	0.08	0.09	0.01
Max	2.25	1.2	0.23	0.47	1.04	0.23

	SD	0.58	0.29	0.06	0.11	0.25	0.07
Carrot							
No. Of allotment garden complex	Shoots			Roots			
	Zn	Cu	Pb	Zn	Cu	Pb	
1	0.13	0.2	n/a	0.15	0.28	n/a	
	0.13	0.22	n/a	0.03	0.12	n/a	
2	0.12	0.33	n/a	0.1	0.26	n/a	
	0.12	0.49	n/a	0.1	0.31	n/a	
	0.23	0.77	0.17	0.17	0.42	n/a	
	0.09	0.27	0.03	0.04	0.26	n/a	
	0.18	0.57	0.13	0.14	0.36	n/a	
3	0.14	0.4	0.1	0.1	0.34	0.09	
	0.13	0.84	0.23	0.07	0.65	0.23	
	0.29	1	0.19	0.25	0.78	0.18	
	0.14	0.4	0.07	0.11	0.3	0.06	
	0.08	0.11	0.03	0.04	0.08	0.02	
4	0.17	0.21	0.03	0.1	0.14	n/a	
5	0.11	0.26	0.06	0.07	0.25	0.06	
6	0.27	0.41	0.08	0.19	0.44	0.08	
	0.43	0.28	0.06	0.25	0.27	0.06	
	0.12	0.38	0.07	0.11	0.36	0.07	
7	0.16	0.44	0.07	0.13	0.38	0.07	
Mean	0.17	0.42	0.09	0.12	0.33	0.09	
Min	0.08	0.11	0.03	0.03	0.08	0.02	
Max	0.43	1	0.23	0.25	0.78	0.23	
SD	0.09	0.24	0.06	0.06	0.17	0.06	

136 Note: n/a means that the heavy metal content in the prepared solutions was below detection in the ICP-AES.

137 **Note:** 1 – Lepsze Jutro: soils contaminated by various substances such as contaminated lime and compost; 2 – Złocięń:
138 contamination possibly caused by old rubble and materials used to fill holes and depressions; 3 – Spółdzielca: contamination
139 may be linked to past industrial activities in the area; 4 – Jarzębina: soils mainly polluted by emissions from the Hutmen
140 plant; 5 – Radość: soils polluted by emissions from the Hutmen plant; 6 – Malina: soils polluted by emissions from the
141 Hutmen plant; 7 – Oświata: soils polluted by emissions from the Hutmen plant.

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148 Sup Table 8

149 Results of Kruskal-Wallis analysis on comparison of heavy-metal bioaccumulation in shoots
150 and roots

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Vegetables	Chi-Square	DF	Prob>Chi-Square
Lettuce	20.03724	5	0.00123
Beetroot	48.87525	5	<0.0001
Carrot	59.5425	5	<0.0001

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171 Sup Table 9

172 Translocation coefficient in individual vegetables

Lettuce				Beetroot				Carrot			
No. Of allotment garden complex	Zn	Cu	Pb	No. Of allotment garden complex	Zn	Cu	Pb	No. Of allotment garden complex	Zn	Cu	Pb
1	1	1		1	2.6	0.9	1.8	1	0.9	0.7	
	1.1	0.9			2.6	1.2			3.9	1.8	
2	0.7	0.7		2	5.2	1.4		2	1.2	1.3	
	1.6	1			5.1	1.2			1.2	1.6	
3	0.9	0.9		3	3.5	1.2		3	1.4	1.9	
	1.9	0.8	1		4.6	1.9	1.1		2.2	1.0	
4	1.1	1.1	1	4	2.8	1.1	1.1	4	1.3	1.6	
	0.7	0.8	1		1.7	1.1	1.0		1.4	1.2	1.1
6	0.4	0.4	0.4	5	2.9	1.2	0.9	5	1.7	1.3	1.0
	0.9	0.7	1		1.5	1.0	3.2		1.1	1.3	1.0
				6	2.4	1.1		6	1.3	1.3	1.1
					0.5	1.1	1		2.2	1.4	2.1
				7	2.3	1.2	1.1	7	1.7	1.5	
					0.7	0.7	0.9		1.5	1.0	1.0
					1.8	1.0	1.0		1.5	0.9	1.0
					0.4	0.9	1		1.8	1.0	1.0
									1.1	1.1	1.0
								7	1.2	1.2	0.9
Mean	1.0	0.8	0.9	Mean	2.5	1.1	1.3	Mean	1.6	1.3	1.1
Min	0.4	0.4	0.4	Min	0.4	0.7	0.9	Min	0.9	0.7	0.9
Max	1.9	1.1	1.0	Max	5.2	1.9	3.2	Max	3.9	1.9	2.1
SD	0.4	0.2	0.3	SD	1.5	0.3	0.7	SD	0.7	0.3	0.4

173 Note: the gray field without a value means that for one bioaccumulation factor, the index could not be calculated by obtaining the results of
 174 heavy metal content in individual vegetables in ICP-AES below detection.

175 1 – Lepsze Jutro: soils contaminated by various substances such as contaminated lime and compost; 2 – Złocień: contamination possibly caused
 176 by old rubble and materials used to fill holes and depressions; 3 – Spółdzielca: contamination may be linked to past industrial activities in the
 177 area; 4 – Jarzębina: soils mainly polluted by emissions from the Hutmen plant; 5 – Radość: soils polluted by emissions from the Hutmen plant;
 178 6 – Malina: soils polluted by emissions from the Hutmen plant; 7 – Oświęta: soils polluted by emissions from the Hutmen plant.

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185 Sup Table 10

186 Results of Kruskal-Wallis analysis on comparison of heavy-metal translocation in shoots and

187 roots of vegetables

Vegetable	Chi-Square	DF	Prob>Chi-Square
Lettuce	11.36264	2	0.00341
Beetroot	10.45577	2	0.00536
Carrot	9.74239	2	0.00766

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