

Assessment of Hungarian Consumers' Exposure to Pesticide Residues Based on the Results of Pesticide Residue Monitoring between 2017 and 2021

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Supplementary materials

Table S1. Gender and age distributions of the participants of the two surveys.

Age (year)	Gender	2009	2018-2020
0-1	Male	18	-
	Female	60	-
1-2	Male	46	134
	Female	86	134
2-3	Male	73	131
	Female	65	128
3-9	Male	420	237
	Female	396	233
9-18	Male	800	288
	Female	838	292
18-64	Male	4946	256
	Female	5001	255
64-74	Male	600	257
	Female	627	257
>74	Male	447	-
	Female	552	-

Note: The age ranges were calculated as: 0-1: babies up to one year, excluding those who had their birthdays on the survey day; the other age groups were defined similarly.

Table S2. Summary of consumption survey 2009.

Age [year]	0-1	1-2	2-3	3-9	9-18	18-64	64-74	>74 (101)
No. of subjects	78	132	138	816	1638	9947	1227	999
Ave bw [kg]	8.16	12.11	14.39	24.80	51.67	75.32	77.26	70.72
Apples								
Consum [day]	32	47	65	311	551	2859	471	384
LP [kg]	0.330	0.322	0.225	0.383	0.379	0.481	0.391	0.357
Max ¹	54.55	27.27	16.67	32.14	14.29	16.13	1.00	8.57
P97.5 ²	40.45	26.59	15.63	15.43	7.33	6.38	5.07	5.05
Average ³	15.11	10.65	8.50	6.32	3.42	2.56	2.34	2.50
Median ⁴	11.44	9.89	9.38	5.91	3.13	2.21	2.00	2.24
SD ⁵	10.06	6.01	3.79	3.78	1.76	1.56	1.20	1.20
CV ⁶	0.67	0.56	0.45	0.60	0.51	0.61	0.51	0.48
Cherries								
Consum [day]	2	4	9	71	104	670	119	77
LP [kg]	0.04	0.10	0.14	0.65	1.58	2.32	1.02	0.55
Max ¹	4.55	8.33	9.41	26.09	30.59	30.77	13.16	7.71
P97.5 ²	NA	NA	NA	17.93	9.24	7.73	8.33	5.41
Average ³	3.27	6.76	4.58	5.16	3.15	2.44	2.42	2.02
Median ⁴	3.27	6.86	4.55	3.64	2.34	1.88	1.86	1.97
SD ⁵	1.80	1.82	4.55	4.92	3.57	2.44	2.32	1.39
CV ⁶	0.55	0.27	0.99	0.95	1.13	1.00	0.96	0.69
Grapes								
Consum [day]	2	0	0	2	3	25	4	7
LP [kg]	0.05			0.07	0.28	0.30	0.47	0.22
Max ¹	6.25			2.86	5.36	3.92	6.03	3.08
P97.5 ²								
Average ³						2.00		
Median ⁴						1.85		
SD ⁵						0.87		
CV ⁶						0.44		

Peaches								
Consum [day]	7	5	1	15	24	178	18	32
LP [kg]	0.13	0.17	0.29	0.62	1.11	0.83	0.64	0.64
Max ¹	16.00	13.64	20.00	25.00	21.43	20.00	8.33	10.71
P97.5 ²	NA	NA	NA	NA	NA	11.03	NA	9.05
Average ³	11.06	11.19	20.00	9.04	5.55	4.11	4.01	4.46
Median ⁴	13.64	10.91	20.00	7.50	4.38	3.64	3.37	3.75
SD ⁵	4.04	1.52	-	5.81	4.45	2.83	2.04	2.48
CV ⁶	0.37	0.14		0.64	0.80	0.69	0.51	0.56
Peppers								
Consum [day]	3	13	20	146	302	2406	310	194
LP [kg]	0.01	0.12	0.11	0.16	0.22	0.27	0.32	0.20
Max ¹	1.5	10	7.69	11.6	7.14	6.15	5.56	3.58
P97.5 ²	NA	9.53	7.54	6.32	4.19	3.53	4.09	2.86
Average ³	0.90	2.51	2.01	1.69	1.08	0.95	0.94	0.66
Median ⁴	0.63	1.36	1.05	1.00	0.57	0.64	0.63	0.36
SD ⁵	0.52	2.82	2.23	1.90	1.22	0.91	0.97	0.67
CV ⁶	0.59	1.12	1.11	1.13	1.13	0.96	1.04	1.02
Strawberries								
Consum [day]	1	0	3	26	40	212	27	27
LP [kg]	0.04		0.06	1.08	0.50	0.54	0.35	0.22
Max ¹	5.00		3.85	43.48	9.68	10.00	4.55	3.17
P97.5 ²						7.22		
Average ³				6.17	2.82	2.08	1.68	1.49
Median ⁴				3.92	2.23	1.63	1.59	1.67
SD ⁵				8.65	2.42	1.92	1.96	0.96
CV ⁶				1.40	0.86	0.92	1.17	0.64

Notes:

¹: Maximum amount consumed [g/kgbw/day]

²: 97.5th percentile consumption [g/kgbw/day]

³: Average daily food consumption [g/kgbw/day]

⁴: Median of consumed food

⁵: Standard deviation of consumed food

⁶: Relative standard deviation of daily food consumption

Table S3. Summary of consumption survey 2018-2020.

Age [year]	1-2	2-3	3-9	9-18	18-64	64-74
No of subjects	536	516	939	1159	977	1070
Ave bw [kg]	11.07	13.62	17.57	50.50	79.55	81.50
Apples						
Consum [day]	241	244	431	395	314	457
LP [kg]	0.322	0.324	0.466	0.733	0.480	0.524
Max ¹	63.83	55.75	46.00	32.86	10.34	16.02
P97.5 ²	29.13	23.81	26.50	14.52	6.03	6.43
Average ³	9.71	8.40	7.10	3.92	2.23	2.56
Median ⁴	7.69	6.90	5.77	2.94	1.94	2.14
SD ⁵	8.72	6.66	6.34	4.01	1.52	1.64
CV ⁶	0.90	0.79	0.89	1.02	0.68	0.64
Cherries						
Consum [day]	9	1	17	20	25	19
LP [kg]	0.170	0.084	0.251	0.170	0.435	0.229
Max ¹	15.38	6.15	14.29	3.38	5.47	2.82
P97.5 ²	NA	NA	NA	NA	NA	NA
Average ³	6.64		3.37	1.38	1.45	0.98
Median ⁴	6.96		2.67	1.00	0.91	0.63
SD ⁵	4.35		3.31	1.03	1.47	0.87
CV ⁶	0.66		0.98	0.75	1.02	0.89
Grape fresh+fresh pressed						
Consum [day]	18	16	38	64	66	48
LP [kg]	0.326	0.486	0.230	0.500	0.374	0.609
Max ¹	29.41	35.71	25.00	20.80	5.56	9.26
P97.5 ²	NA	NA	13.11	9.91	4.70	7.49
Average ³	12.94	12.82	5.64	3.36	4.62	2.37

Median ⁴	11.60	10.71	4.46	2.61	1.54	1.60
SD ⁵	7.91	9.67	4.48	3.22	1.25	2.23
CV ⁶	0.61	0.75	0.79	0.96	0.27	0.94
Peaches						
Consum [day]	11	10	28	26	30	46
LP [kg]	0.18	0.21	0.38	0.42	0.58	0.87
Max ¹	16.00	15.38	21.43	9.29	7.46	14.38
P97.5 ²			17.14	8.39	7.29	10.66
Average ³	8.45	7.08	6.51	3.55	3.69	2.95
Median ⁴	9.09	6.67	5.66	3.13	2.07	2.61
SD ⁵	5.39	5.31	4.48	2.15	1.94	2.08
CV ⁶	0.64	0.75	0.69	0.61	0.53	0.71
Peppers						
Consum [day]	2	3	10	19	28	23
LP [kg]	0.02	0.03	0.09	0.12	0.12	0.18
Max ¹	1.67	2.14	3.94	2.49	1.52	2.22
P97.5 ²	NA	NA	NA	NA	NA	NA
Average ³	1.24	1.84	1.74	1.10	0.68	0.67
Median ⁴	1.24	2.00	1.58	1.00	0.59	0.60
SD ⁵	0.60	0.41	0.88	0.72	0.35	0.48
CV ⁶	0.48	0.22	0.51	0.65	0.52	0.72
Strawberry fresh and frozen						
Consum [day]	15	14	9	26	28	33
LP [kg]	0.211	1.090	0.413	0.337	0.545	0.323
Max ¹	19.09	80.00	23.53	6.67	6.85	6.00
P97.5 ²	NA	NA	NA	NA	NA	3.98
Average ³	7.25	11.04	4.39	1.59	1.72	1.31
Median ⁴	5.80	3.07	1.15	0.84	1.34	0.87

SD ⁵	5.15	20.68	7.50	1.83	1.33	1.25
CV ⁶	0.71	1.87	1.71	1.15	0.78	0.96

Notes:

¹: Maximum amount consumed [g/kgbw/day]

²: 97.5th percentile consumption [g/kgbw/day]

³: Average of daily food consumption [g/kgbw/day]

⁴: Median of consumed food

⁵: Standard deviation of consumed food

⁶: Relative standard deviation of daily food consumption

Table S4. Summary of residues, their MRLs and ARfD values detected in the selected samples during 2017-2021.

Active substance	ARfD	Apples				Cherries				Grapes				Peaches				Peppers				Strawberries			
		No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}
Abamectin (sum)	0.0012																					4	0.15	0.075	
Acetamiprid	0.025	162	0.4	0.16	0.14	27	1.5	0.13		36	0.5	0.39		40	0.2	0.14		39	0.3	0.3		3	0.5	0.076	
Ametoctradin	NA									4	6.0	0.13													
Azoxystrobin	NA									27	3.0	0.44		1	2.0	0.9		65	3.0	0.31	0.29	50	10	0.33	0.32
Bifenazate	0.1																					3	3	0.38	
Boscalid	NA	162	0.31	2.00	0.23	19	5.0	0.2		87	5.0	0.75	0.70	29	5.0	0.15		35	3.0	0.32		70	6	1.2	0.82
Bupirimate	NA	3	0.3	0.02						2	1.5	0.041		2	0.3	0.041						14	1.5	0.92	
Buprofezin	0.5									8	0.01	0.066						2	0.01	0.236					
Captan	0.3	118	-	2.68	1.57																				
Captan and THPI		160	10	88.61	40.2	6	6.0	0.22						12	6.0	0.7		1	0.03	0.061		7	1.5	0.16	
Carbendazim	0.02	27	3	0.10		25	0.5	0.22		12	0.3	0.21		10	0.2	0.2						6	0.1	0.1	
Chlorantraniliprole	NA	100	0.4	0.10	0.07					12	1.0	0.21		1	1.0	0.016		17	1.0	0.068					
Chlorothalonil	0.05	3	0.01	0.04						1	0.01	0.017													
Chlorpyrifos	0.1	8	0.01	0.05		1	0.01	0.014		2	0.01	0.057		3	0.01	0.91									
Chlorpyrifos-methyl	0.005	13	0.01	0.06						5	0.01	0.073		2	0.01	0.023		5	0.01	0.058					
Clofentezine	NA																					1	2	0.098	
Clothianidin	0.1	1	0.4	0.01						4	0.7	0.03						4	0.04	0.032		1	0.02	0.009	
Cyantraniliprole	NA	1	0.8	0.02																					
Cyazofamid	NA									22	2.0	0.2													
Cyflufenamid (sum)	0.05																	5	0.06	0.019		2	0.04	0.013	
Cypermethrin (sum)	0.005	6	0.7	0.05						5	0.5	0.084		1	2.0	0.48		5	0.5	0.125					
Cyproconazole	0.02									2	0.2	0.014		2	0.1	0.01									
Cyprodinil	NA	19	2	0.13						59	3.0	1.5	1.13	14	2.0	0.19		3	1.5	0.048		39	5	1.8	
Deltamethrin	0.01	1	0.2	0.01		4	0.1	0.079		1	0.2	0.16		4	0.15	0.038		2	0.2	0.029		2	0.2	0.092	
Difenoconazole	0.16	42	0.8	0.73		1	0.3			19	3.0	1.38		13	0.5	0.042		62	0.9	0.38	0.29	49	2	0.25	0.24
Diflubenzuron	NA									1	0.01	0.054		5	0.01	0.24									

Active substance	ARfD	Apples				Cherries				Grapes				Peaches				Peppers				Strawberries			
		No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}
Dimethoate						1	0.01	0.052		1	0.01	0.017													
Dimethomorph	0.6									54	3.0	1.7	1.48									2	0.7	0.045	
Dithianon	0.12	23	3	0.2																					
Dithiocarbamates						23	2.0	0.94		71	5.0	2.9	1.59	31	2.0	0.73		18	5.0	2.9		10	10	0.47	
Dodine	0.1					2	3.0	0.029																	
Emamectin	0.01													1	0.15	0.018						1	0.05	0.012	
Ethirimol										1	0.4	0.034										8	0.3	0.058	
Etofenprox	1.0	28	0.7	0.19	0.17					2	4.0	0.293		13	0.6	0.14									
Etoxazole	NA	1	0.07	0.02																		3	0.2	0.044	
Famoxadone	0.1									7	2.0	0.15													
Fenbuconazole	0.3													9	0.6	0.107									
Fenhexamid	NA	1	0.01	0.01		12	7.0	0.43		56	15.0	4.2	3.04					6	3.0	0.31		30	10	1.1	
Fenoxycarb	2.0	5	0.7	0.03										2	1.5	0.028									
Fenpyrazamine	0.3									2	3.0	0.242		2	5.0	0.028		4	3.0	0.038					
Fenpyroximate	0.02	13	0.3	0.03										1	0.3	0.01									
Fenvalerate (Sum)		2	0.1	0.03						1	0.3	0.01		6	0.2	0.074									
Flonicamid	0.025	29	0.3	0.03																					
Flonicamid (Sum)		56	0.3	81.2	74.3									11	0.4	0.17		25	0.3	0.3		1	0.7	0.32	
Fluazinam	0.07	2	0.3	0.03																					
Fludioxonil	NA	58	5	0.41	0.29	2	5.0	0.066		51	5.0	1.6	1.23	56	10.0	2.7	2.10	9	1.0	0.063		28	4	0.68	
Fluopicolide	0.18									8	2.0	0.079						1	1.0	0.024					
Fluopyram	0.5	88	0.8	0.27	0.20	15	2.0	0.19		44	2.0	0.4	0.39	54	1.5	0.25	0.19	39	2.0	0.198		34	2	0.266	
Flupyradifurone	0.15	4	0.6	0.03																					
Flutriafol	0.05																	18	1.0	0.226		1	1.5	0.01	
Fluvalinate		1	0.3	0.02																					
Fluxapyroxad	0.25	26	0.9	0.08						22	3.0	0.78						1	0.6	0.012					
Folpet	0.2	8	0.3	0.1																					
Folpet ²	0.2									3	6.0	0.8										1	5	0.026	
Formetanate (sum)	0.005																					1	0.4	0.019	
Fosetyl-Al	NA									3	100.0	4.2													
Glyphosate	0.5																	1	0.1	0.096					

Active substance	ARfD	Apples				Cherries				Grapes				Peaches				Peppers				Strawberries			
		No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}	No	MRL	Max	P _{0.975}
Glufosinate (sum)	0.021																	1	0.03	0.05					
Hexythiazox	NA	2	0.4	0.01						1	1.0	0.02						3	0.09	0.019		7	6	0.04	
Imazalil	0.05													1	0.01	0.011									
Imidacloprid	0.08	1	0.01	0.01						16	0.7	0.2		9	0.01	0.041		23	0.9	0.8		2	0.01	0.023	
Indoxacarb	0.005	61	0.5	0.10	0.09	1	1.0	0.014		6	2.0	0.087		16	1.0	0.064		13	0.3	0.118					
Iprodione	0.06									6	0.01	1.3						2	0.01	1.84		2	0.01	0.51	
Iprovalicarb	NA									4	2.0	0.044													
Kresoxim-methyl	NA																	2	0.8	0.04		1	1.5	0.014	
Lambda-Cyhalothrin	0.0025	21	0.08	0.05		35	0.3	0.15		16	0.08	0.053		39	0.15	0.089		21	0.1	0.1		4	0.2	0.013	
Lufenuron	NA																	1	0.8	0.015					
Mandipropamid	NA									16	2.0	0.24													
Mepanipyrim	0.3																					1	3	0.063	
Metalaxyl +M	0.5									20	2.0	0.1						1	0.5	0.014					
Metaflumizone	0.13																	2	1.5	0.15					
Methomyl	0.0025																	3	0.04	0.11					
Methoxyfenozide	0.1	83	0.01	0.16	0.14					30	1.0	0.27						7	2.0	0.082					
Metrafenone	NA	1	1	0.05						34	7.0	1.187						12	2.0	0.28		1	0.6	0.032	
Myclobutanil	0.31	8	0.6	0.03		1	3.0	0.023		16	1.5	0.066		2	3.0	0.03		2	3.0	0.17		19	1.5	0.41	
Napropamide	NA																	20	0.01	0.17					
Omethoate						1	0.01	0.101																	
Penconazole	0.5	3	0.15	0.01		2	0.15	0.014		37	0.5	0.14		6	0.15	0.061		3	0.2	0.053		23	0.5	0.16	
Phosmet	0.001	1	10	0.02										5	1.0	0.212									
Phthalimide		4	-	0.1																					
Pirimicarb	0.1	107	0.5	0.28	0.11	7	5.0	0.48		1	0.01	0.01		13	1.5	0.17									
Prochloraz	0.025					2	0.03	0.036																	
Propamocarb (sum)	1.0													1	0.01	0.01		6	3.0	0.24		3	0.01	0.064	
Proquinazid	0.2									2	0.5	0.074													
Pymetrozine	0.1																	6	0.02	0.054		1	0.02	0.073	
Pyraclostrobin	0.03	117	0.6	0.10	0.84	5	3.0	0.031		18	0.3	0.303		14	0.3	0.033		15	0.5	0.066		43	1.5	0.14	0.14
Pyridaben	0.05																	6	0.3	0.019					

Active substance	ARfD	Apples				Cherries				Grapes				Peaches				Peppers				Strawberries			
		No	MRL	Max	P ^{0.975}	No	MRL	Max	P ^{0.975}	No	MRL	Max	P ^{0.975}	No	MRL	Max	P ^{0.975}	No	MRL	Max	P ^{0.975}	No	MRL	Max	P ^{0.975}
Pyridalyl	NA																	1	0.9	0.13					
Pyrimethanil	NA	57	15	1.35	1.20					26	5.0	1.294		3	10.0	0.739		1	2.0	0.012		7	5	1.3	
Pyriofenone	NA									2	0.9	0.17													
Pyriproxyfen	1.0	3	0.2	0.03														8	1.0	0.105					
Quinoxifen	NA									10	1.0	0.091													
Spinetoram (sum)	0.1																					2	0.2	0.041	
Spinosad (sum)	NA									10	0.5	0.091		3	0.6	0.12		6	0.6	0.24		11	0.3	0.12	
Spirodiclofen	NA	48	0.8	0.80	0.55									1	2.0	0.014		1	0.2	0.12					
Spiromesifen	2.0																	20	0.5	0.37		8	1.0	0.18	
Spirotetramat	1.0	5	0.7	14.85						10	2.0	0.11						21	1.0	0.69					
Spiroxamine	0.1									16	0.6	0.17													
Sulfoxaflor	0.25									1	2.0	0.048													
Tau-fluvalinate		9	0.3	0.17						6	-	0.075													
Tebuconazole	0.03	131	0.3	0.25	0.16	24	1.0	0.2		28	0.5	0.3		72	0.6	0.276	0.22	4	0.6	0.47		6	0.02	0.2	
Tebufenpyrad	0.02	11	0.3	0.06																		8	1	0.18	
Tetrahidrophthalimide		116	-	0.84	0.75																				
Tetraconazole	0.05	30	0.3	0.07						4	0.5	0.15													
TFNA		94	-	0.08	0.06																				
Thiacloprid	0.02	54	0.3	0.23	0.17	3	0.5	0.014						6	0.5	0.08		3	1.0	0.057		19	1	0.44	
Thiamethoxam	0.5	18	0.3	0.05		6	0.6	0.34		10	0.4	0.051						17	0.7	0.13		6	0.3	0.11	
Thiophanate-methyl	0.02	3	0.5	0.04		5	0.3	0.121		5	0.1	0.071		4	2.0	0.029		1	0.1	0.023		2	0.1	0.1	
Triadimefon	0.08																	2	0.01	0.09					
Triadimenol	0.05																	10	0.5	0.093		1	0.5	0.013	
Trifloxystrobin	0.5	11	0.7	0.02		5	3.0	0.058		5	3.0	0.034		1	3.0	0.011		20	0.4	0.17		36	1	0.31	
Triflumuron	NA	59	0.5	0.16	0.12																				
Zoxamide	NA									10	5.0	1.8													

Notes:

No: number of samples analysed; NA: ARfD: mg/kgbw/day; Not applicable; NAP: not approved; Empty cell: value is not included in the EC list.

²: Sum of folpet and phthalimide, expressed as folpet.