Supplementary Materials

Table S1. Producers and nutrition information (per 100 g) of analyzed chocolate samples

Sample*	Brand	Energy value (cal)	Fat (g)	Carbohydrate (g)	Protein (g)
S1	Lindt & Sprüngl, Switzerland	475	32	60	5
S2	Maxi Premia, Serbia	528	31.8	51.1	4.9
S3	Roshen, Ukraine	547	36.2	45.1	5.8
S4	Hachez, Germany	578	47	23	8.8
S5	Soko-Štark d.o.o., Serbia	552	40	33	10
S6	Soko-Štark d.o.o., Serbia	519	34	39	8.3
S7	Soko-Štark d.o.o., Serbia	540	38	35	9.5
S8	Hachez, Germany	565	45	24	8
S9	Hachez, Germany	570	46	25	9
S10	Valor Chocolates S.A., Spain	568	49	19	11
S11	Hachez, Germany	648	58	15	10
S12	Lindt & Sprüngl, Switzerland	573	49	10	14

* **S1** (40% cocoa with the addition of dried chili pepper), **S2** (49% cocoa), **S3** (56% cocoa), **S4** (73% cocoa), **S5** (75% cocoa), **S6** (75% cocoa with addition of dried orange), **S7** (75% cocoa with addition of dried raspberry), **S8** (77% cocoa), **S9** (77% cocoa with addition of orange), **S10** (85% cocoa, gluten-free, no sugar added), **S11** (88% cocoa), **S12** (99% cocoa).

Table S2. Method parameters.

View Direction	Radial	Axial
UV Exposure time	15	15
UV RF Power	1150	1150
UV Neb Gas Flow	0.5	0.5
VIS Exposure Time	5	5
VIS RF Power	1150	1150
VIS Neb Gas Flow	0.5	0.5
Cool Gas Flow Rate	12	12
Aux Gas Flow Rate	0.5	0.5

Table S3. Method detection limits (MDL) and method quantification limits (MQL) for elements

	MQL (mg/kg)	MDL (mg/kg)
Sb	0.224	0.067
As	0.580	0.174
Cd	0.032	0.010
Co	0.420	0.126
Ni	0.126	0.038
Se	0.448	0.134
Tl	0.364	0.109
V	0.182	0.055
Al	0.559	0.168
Ba	0.014	0.004
B	0.308	0.092
Ca	0.699	0.210
Cr	0.112	0.034
Fe	0.210	0.063
Pb	1.483	0.445
Cu	0.448	0.134

Mg	0.056	0.017
Mn	0.014	0.004
Si	0.280	0.084
Sr	0.014	0.004
Ti	0.070	0.021
Zn	0.406	0.122
S	4.895	1.470
Mo	0.117	0.035
Na	3.636	1.092
K	98.643	29.623

Table S4. Parameters of descriptive statistics for elemental profile of chocolate with different cocoa content

Sample		Al	Ba	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Ni	S	Si	Sr	Ti	Zn
S1	Mean	20.54	2.11	491.86	0.03	0.36	0.91	7.73	224.85	1153.80	904.54	11.28	2.43	1249.28	3.17	3.70	0.96	13.39
	St. Dev.	1.33	0.05	2.67	0.00	0.00	0.01	0.02	1.93	4.53	2.11	0.09	0.00	4.00	0.05	0.02	0.06	0.35
	Min	19.31	2.06	489.76	0.03	0.36	0.90	7.72	223.18	1149.52	902.25	11.19	2.43	1245.36	3.11	3.69	0.90	13.12
	Max	21.95	2.14	494.87	0.03	0.36	0.92	7.75	226.97	1158.54	906.41	11.37	2.43	1253.36	3.22	3.72	1.01	13.79
	Median	20.35	2.14	490.95	0.03	0.36	0.90	7.73	224.40	1153.33	904.95	11.28	2.43	1249.11	3.18	3.70	0.97	13.26
	RSD	6.45	2.19	0.54	0.00	0.05	1.56	0.20	0.86	0.39	0.23	0.80	0.00	0.32	1.64	0.52	6.14	2.63
S2	Mean	12.00	1.69	337.66	0.03	0.19	0.86	6.85	110.94	694.75	663.48	7.58	1.92	1058.68	1.62	3.74	0.23	12.15
	St. Dev.	0.65	0.06	1.26	0.00	0.01	0.01	0.02	1.00	4.65	2.07	0.10	0.01	4.50	0.03	0.03	0.04	0.25
	Min	11.35	1.62	336.46	0.03	0.18	0.86	6.83	109.95	689.87	661.21	7.51	1.92	1054.25	1.59	3.71	0.19	11.95
	Max	12.65	1.73	338.97	0.03	0.20	0.88	6.87	111.94	699.12	665.27	7.69	1.93	1063.25	1.65	3.77	0.27	12.43
	Median	12.02	1.73	337.56	0.03	0.18	0.86	6.87	110.92	695.25	663.96	7.52	1.92	1058.55	1.62	3.73	0.22	12.08
	RSD	5.41	3.80	0.37	0.00	6.13	1.14	0.36	0.90	0.67	0.31	1.34	0.32	0.43	1.89	0.84	19.20	2.02
S3	Mean	11.38	1.99	356.14	0.03	0.20	0.68	6.70	166.19	769.01	717.95	8.95	1.90	1054.35	0.68	3.82	0.18	13.25
	St. Dev.	0.79	0.04	0.70	0.00	0.00	0.01	0.02	1.07	8.16	1.99	0.03	0.00	3.46	0.07	0.07	0.02	0.26
	Min	10.75	1.94	355.50	0.03	0.20	0.67	6.68	165.16	761.25	715.99	8.91	1.90	1051.66	0.60	3.79	0.16	13.03
	Max	12.25	2.01	356.89	0.03	0.20	0.69	6.73	167.30	777.52	719.97	8.98	1.90	1058.26	0.75	3.87	0.20	13.53
	Median	11.12	2.01	356.05	0.03	0.20	0.68	6.71	166.13	768.25	717.90	8.95	1.90	1053.14	0.68	3.81	0.18	13.20
	RSD	6.90	2.03	0.20	0.00	0.17	1.67	0.32	0.64	1.06	0.28	0.36	0.13	0.33	10.61	1.88	11.81	1.95
S4	Mean	15.51	2.63	437.46	0.13	0.30	0.29	7.41	155.55	1362.00	906.90	8.48	1.97	1407.68	0.28	5.17	1.24	18.76
	St. Dev.	0.53	0.02	0.96	0.00	0.00	0.01	0.03	1.06	7.43	3.04	0.06	0.03	3.49	0.00	0.06	0.04	0.16
	Min	14.95	2.61	436.45	0.13	0.30	0.28	7.38	154.60	1355.11	903.84	8.41	1.95	1404.25	0.28	5.12	1.20	18.62
	Max	16.00	2.65	438.36	0.13	0.30	0.30	7.44	156.70	1369.88	909.92	8.52	2.00	1411.23	0.28	5.24	1.27	18.93
	Median	15.57	2.62	437.58	0.13	0.30	0.30	7.42	155.36	1361.02	906.93	8.49	1.95	1407.56	0.28	5.17	1.24	18.73
	RSD	3.39	0.66	0.22	1.57	0.08	3.44	0.34	0.68	0.55	0.34	0.68	1.32	0.25	0.00	1.15	2.85	0.84

Table S4. - Continued

Sample		Al	Ba	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Ni	S	Si	Sr	Ti	Zn
S5	Mean	36.19	3.04	673.06	0.24	0.43	1.90	11.92	371.90	1703.01	1301.12	16.15	3.76	2121.48	1.23	6.55	1.52	25.03
	St. Dev.	0.71	0.06	1.30	0.00	0.00	0.02	1.30	1.07	5.76	2.67	0.25	0.00	3.03	0.07	0.04	0.07	0.32
	Min	35.46	2.98	671.59	0.24	0.43	1.88	11.88	370.82	1698.33	1298.25	15.88	3.76	2118.15	1.17	6.51	1.45	24.71
	Max	36.88	3.11	674.07	0.24	0.43	1.92	11.94	372.95	1709.44	1303.53	16.38	3.77	2124.06	1.30	6.60	1.59	25.36
	Median	36.23	3.04	673.53	0.24	0.43	1.91	11.92	371.94	1701.25	1301.56	16.19	3.77	2122.24	1.23	6.55	1.52	25.02
	RSD	1.97	2.10	0.19	0.25	0.04	0.93	10.94	0.29	0.34	0.20	1.57	0.12	0.14	5.56	0.69	4.50	1.28
S6	Mean	25.10	3.72	908.06	0.04	0.35	1.19	10.82	157.05	1296.68	1105.20	16.16	3.37	1777.89	2.12	8.67	0.08	20.38
	St. Dev.	0.34	0.01	1.42	0.00	0.00	0.01	0.03	1.27	5.03	2.48	0.36	0.01	4.04	0.09	0.05	0.00	0.44
	Min	24.77	3.70	906.46	0.04	0.35	1.19	10.78	155.99	1291.55	1102.45	15.79	3.36	1773.55	2.02	8.62	0.07	19.95
	Max	25.46	3.72	909.17	0.04	0.35	1.20	10.85	158.46	1301.61	1107.26	16.51	3.38	1781.55	2.19	8.72	0.08	20.83
	Median	25.05	3.72	908.55	0.04	3.72	1.20	10.82	156.70	1296.88	1105.90	16.17	3.38	1778.58	2.17	8.68	0.08	20.35
	RSD	1.37	0.34	0.16	5.79	0.27	0.62	0.29	0.81	0.39	0.22	2.23	0.37	0.23	4.44	0.60	5.88	2.16
S7	Mean	25.57	4.05	801.92	0.04	0.43	1.01	12.19	212.01	1635.88	1229.33	21.52	3.74	2150.00	0.58	8.39	1.16	22.17
	St. Dev.	0.37	0.06	1.65	0.00	0.00	0.02	0.05	1.01	5.79	1.77	0.07	0.02	6.60	0.08	0.09	0.05	0.16
	Min	25.31	3.99	800.96	0.04	0.43	0.99	12.13	210.99	1630.25	1227.76	21.45	3.73	2145.55	0.49	8.33	1.11	22.01
	Max	26.00	4.10	803.83	0.04	0.43	1.03	12.24	213.00	1641.82	1231.25	21.59	3.77	2157.58	0.66	8.49	1.21	22.32
	Median	25.39	4.07	800.97	0.04	0.43	1.00	12.20	212.05	1635.58	1229.00	21.53	3.73	2146.87	0.59	8.35	1.15	22.17
	RSD	1.46	1.53	0.21	2.55	0.14	2.02	0.44	0.47	0.35	0.14	0.33	0.62	0.31	14.45	1.09	4.35	0.70
S8	Mean	17.05	3.78	601.65	0.25	0.34	0.86	10.44	183.85	1154.97	1085.83	10.52	2.13	1833.38	2.51	7.68	0.74	24.61
	St. Dev.	0.17	0.03	1.06	0.00	0.00	0.02	0.03	0.91	4.87	2.61	0.07	0.02	3.87	0.08	0.10	0.05	0.22
	Min	16.89	3.74	600.65	0.25	0.34	0.84	10.40	182.89	1151.22	1082.88	10.47	2.10	1829.48	2.43	7.61	0.69	24.39
	Max	17.24	3.80	602.77	0.25	0.34	0.88	10.47	184.71	1160.47	1087.81	10.60	2.14	1837.21	2.60	7.80	0.79	24.83
	Median	17.03	3.80	601.55	0.25	0.34	0.85	10.45	183.95	1153.21	1086.80	10.50	2.14	1833.44	2.51	7.64	0.74	24.60
	RSD	1.02	0.84	0.18	0.44	0.14	1.98	0.31	0.50	0.42	0.24	0.64	0.92	0.21	3.31	1.29	6.69	0.90

Table S4. - Continued

Sample		Al	Ba	Ca	Cd	Co	Cr	Cu	Fe	K	Mg	Mn	Ni	S	Si	Sr	Ti	Zn
S9	Mean	15.03	2.52	500.00	0.20	0.25	0.07	7.19	56.90	952.28	850.18	6.90	1.62	1300.69	0.28	5.49	0.98	15.85
	St. Dev.	0.11	0.01	1.09	0.00	0.00	0.01	0.03	0.01	6.25	2.98	0.06	0.01	2.86	0.00	0.07	0.07	0.15
	Min	14.90	2.51	498.90	0.20	0.25	0.07	7.16	56.89	945.52	847.20	6.85	1.61	1298.58	0.28	5.41	0.91	15.69
	Max	15.10	2.54	501.07	0.20	0.25	0.08	7.22	56.91	957.85	853.16	6.96	1.63	1303.94	0.28	5.56	1.05	15.99
	Median	15.08	2.52	500.05	0.20	0.25	0.08	7.19	56.90	953.47	850.19	6.89	1.61	1299.54	0.28	5.49	0.98	15.87
	RSD	0.74	0.48	0.22	0.28	0.31	10.91	0.47	0.01	0.66	0.35	0.85	0.83	0.22	0.00	1.35	7.31	0.94
S10	Mean	14.93	2.18	502.65	0.05	0.30	0.46	9.82	181.14	1222.70	1144.14	11.68	3.07	1805.69	0.28	5.93	0.32	20.45
	St. Dev.	0.16	0.03	1.41	0.00	0.00	0.02	0.03	0.96	4.73	3.73	0.08	0.02	5.04	0.00	0.06	0.04	0.25
	Min	14.76	2.15	501.15	0.05	0.30	0.45	9.80	180.25	1218.23	1140.22	11.59	3.06	1801.55	0.28	5.88	0.28	20.20
	Max	15.06	2.20	503.95	0.05	0.30	0.48	9.85	182.15	1227.65	1147.66	11.76	3.09	1811.31	0.28	5.99	0.37	20.70
	Median	14.96	2.20	502.85	0.05	0.30	0.45	9.82	181.02	1222.22	1144.53	11.68	3.06	1804.22	0.28	5.92	0.33	20.45
	RSD	1.04	1.16	0.28	0.00	0.42	3.53	0.29	0.53	0.39	0.33	0.70	0.64	0.28	0.00	1.00	12.72	1.22
S11	Mean	24.60	3.94	584.13	0.30	0.56	0.43	11.27	188.64	1855.09	1200.81	12.34	3.78	1965.26	4.37	7.63	1.41	22.07
	St. Dev.	0.37	0.01	1.01	0.01	0.00	0.01	0.27	0.76	5.81	3.13	0.02	0.01	7.42	0.08	0.07	0.05	0.25
	Min	24.26	3.92	583.15	0.29	0.56	0.42	11.03	187.92	1849.58	1198.16	12.32	3.77	1958.86	4.29	7.57	1.37	21.87
	Max	24.99	3.95	585.16	0.30	0.56	0.43	11.56	189.43	1861.15	1204.26	12.36	3.78	1973.39	4.44	7.71	1.46	22.35
	Median	24.55	3.93	584.07	0.30	0.56	0.43	11.21	188.56	1854.53	1200.00	12.35	3.77	1963.54	4.38	7.63	1.42	22.00
	RSD	1.50	0.35	0.17	1.92	0.13	1.19	2.40	0.40	0.31	0.26	0.19	0.15	0.38	1.80	0.90	3.29	1.14
S12	Mean	23.64	4.36	751.13	0.12	0.53	2.63	17.14	478.95	2962.35	1564.86	20.18	4.93	3010.16	5.71	8.76	1.64	34.57
	St. Dev.	0.39	0.05	1.05	0.00	0.00	0.02	0.19	0.76	4.78	4.59	0.05	0.00	5.21	0.09	0.06	0.07	0.34
	Min	23.22	4.30	750.06	0.12	0.52	2.61	16.95	477.96	2958.09	1560.54	20.14	4.93	3004.66	5.62	8.70	1.59	34.23
	Max	24.00	4.40	752.15	0.12	0.53	2.65	17.33	480.03	2967.52	1569.68	20.24	4.93	3015.02	5.80	8.82	1.72	34.91
	Median	23.70	4.38	751.16	0.12	0.53	2.63	17.14	478.86	2961.43	1564.36	20.17	4.93	3010.81	5.72	8.76	1.63	34.56
	RSD	1.67	1.22	0.14	0.52	0.64	0.71	1.11	0.16	0.16	0.29	0.27	0.07	0.17	1.57	0.72	4.02	1.00

Table S5. Present study Vs. literature data for elemental composition of dark chocolate

Reference	Present study	[6]	[25]	[27]	[28]	[29]	[26‡,65&]	[30]	[31]	[32]
*	ICP-OES	ICP-MS		ICP OES and ICP-MS§		ICP-OES		ICP-OES	ICP-OES	MIP-OES†
**	43-99%	53-85%	50-70%	55-85%	60-90%	70-75%	‡ 44-90% & 50-100%	70-85%	40-90%	55-85%
Al	11.38-36.19		9.9-30.1		5.6-13.8	7.2-112			5.4-69	
Ba	1.69-4.36		4.25-8.99		5.4-8.0	2.90-6.85			2.03-6.28	
Ca	337.69-908.12		449-1421	578–1157	643.3-908.3	118-884		533.3-1027.4	319.9- 1318.9	653-903
Cd	0.03-0.3		0.043-0.510			0.022-0.178	0.004-3.15&			
Co	0.19-0.56		0.286-0.668		0.33-0.58	0.047-0.457				
Cr	0.07-2.63	0.48 - 2.91	0.41-2.27			0.23-1.69		0.1-0.2		0.003-2.8
Cu	6.70-17.14		8.5-26.7	7.6–13.6§	14.3-20.2	9.5-16.2	5.05-16.5‡	7.5-8.5	21.5-39.5	7.6-19.5
Fe	56.9-478.95		45.7-162		97.3-112.4	37.8-179		28.9-33.1	99.41 – 331.7	57-227
K	695.3-2962.1			4613–7006	4655.5-7201.1	4950-12700		3651.1-4209.9	381.9-1082.7	4885-8574
Mg	663.48-1564.86		1104-2383	1268–1910	1587.8-2522.1	855-1590		1416.7-1993.9	1348.4- 3622	1083-2775
Mn	6.9 - 21.52		10.2-21.5	9.7–14.7§	16.5-20.5	7.90-16.2		7.7-11.1	14.5-15.5	9.6-25.2
Ni	1.62-4.93		2.57-7.93		3.6-6.1	2.29-5.90			4.5-9.2	5.0-9.0
S	1053.6-3009.7		669-1443						417.77-639.52	
Si	0.28- 5.7		27-100			8.2-219				
Sr	3.70- 8.76		5.74-7.81		0.04-0.08	4.20-7.90			5.5-6.2	
Ti	0.08-1.64		0.002-0.006							
Zn	12.15-34.6		18.5-41.5	38.4–64.8§	22.4-35.2	16.3-28.9		17.7-20.5	16.86-39.26	20.4-33

Concentrations are expressed as mg/kg

*Methods; Inductively coupled plasma optical emission spectrometry (ICP-OES); Inductively coupled plasma mass spectrometry (ICP-MS); Microwave-induced plasma optical emission spectrometry (MIP-OES)

**Cocoa percentage

Table S6. Parameters of post-hoc Fisher test - LSD

Cd	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12
S1	0.0000	0.0000	0.0000	0.0984	0.2052	0.0059	0.0041	0.2148	0.1643	0.0140	0.2681	0.0912
S2	0.0000	0.0000	0.0000	0.0984	0.2052	0.0059	0.0041	0.2148	0.1643	0.0140	0.2681	0.0912
S3	0.0000	0.0000	0.0000	0.0984	0.2052	0.0059	0.0041	0.2148	0.1643	0.0140	0.2681	0.0912
S4	0.0984	0.0984	0.0984	0.0000	0.1067	0.0926	0.0943	0.1163	0.0659	0.0844	0.1696	0.0073
S5	0.2052	0.2052	0.2052	0.1067	0.0000	0.1993	0.2011	0.0096	0.0408	0.1912	0.0629	0.1140
S6	0.0059	0.0059	0.0059	0.0926	0.1993	0.0000	0.0018	0.2089	0.1585	0.0081	0.2622	0.0853
S7	0.0041	0.0041	0.0041	0.0943	0.2011	0.0018	0.0000	0.2107	0.1602	0.0099	0.2640	0.0871
S8	0.2148	0.2148	0.2148	0.1163	0.0096	0.2089	0.2107	0.0000	0.0504	0.2008	0.0533	0.1236
S9	0.1643	0.1643	0.1643	0.0659	0.0408	0.1585	0.1602	0.0504	0.0000	0.1503	0.1037	0.0732
S10	0.0140	0.0140	0.0140	0.0844	0.1912	0.0081	0.0099	0.2008	0.1503	0.0000	0.2541	0.0772
S11	0.2681	0.2681	0.2681	0.1696	0.0629	0.2622	0.2640	0.0533	0.1037	0.2541	0.0000	0.1769
S12	0.0912	0.0912	0.0912	0.0073	0.1140	0.0853	0.0871	0.1236	0.0732	0.0772	0.1769	0.0000
*LSD	0.0033											

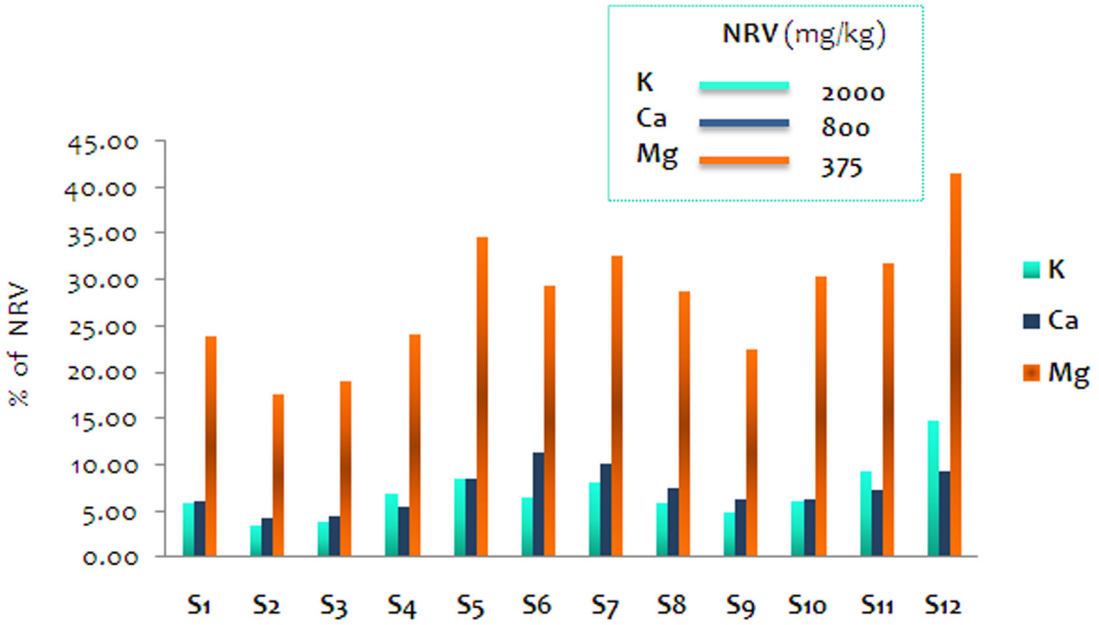

Figure S1. Percentage of K, Ca and Mg dietary intake from 100 g of dark chocolate compared with nutritional reference values (NRV)
(*NRV according to ref. [45])

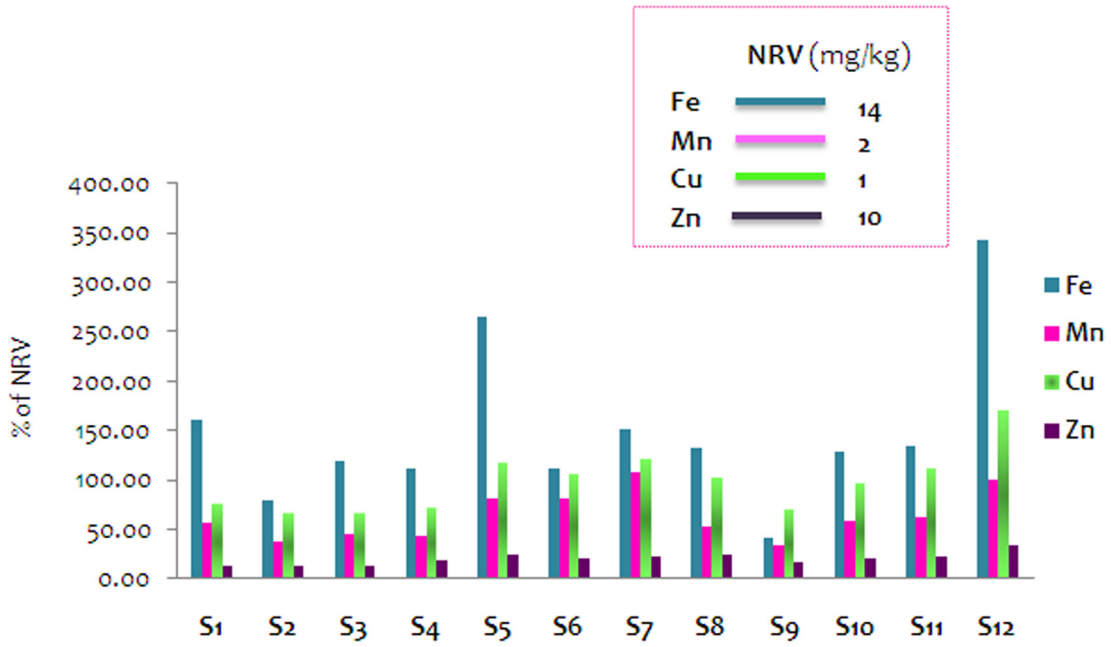

Figure S2. Percentage of Fe, Mn, Cu and Zn dietary intake from 100 g of dark chocolate compared with nutritional reference values (NRV)*
(*NRV according to ref. [45])

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