

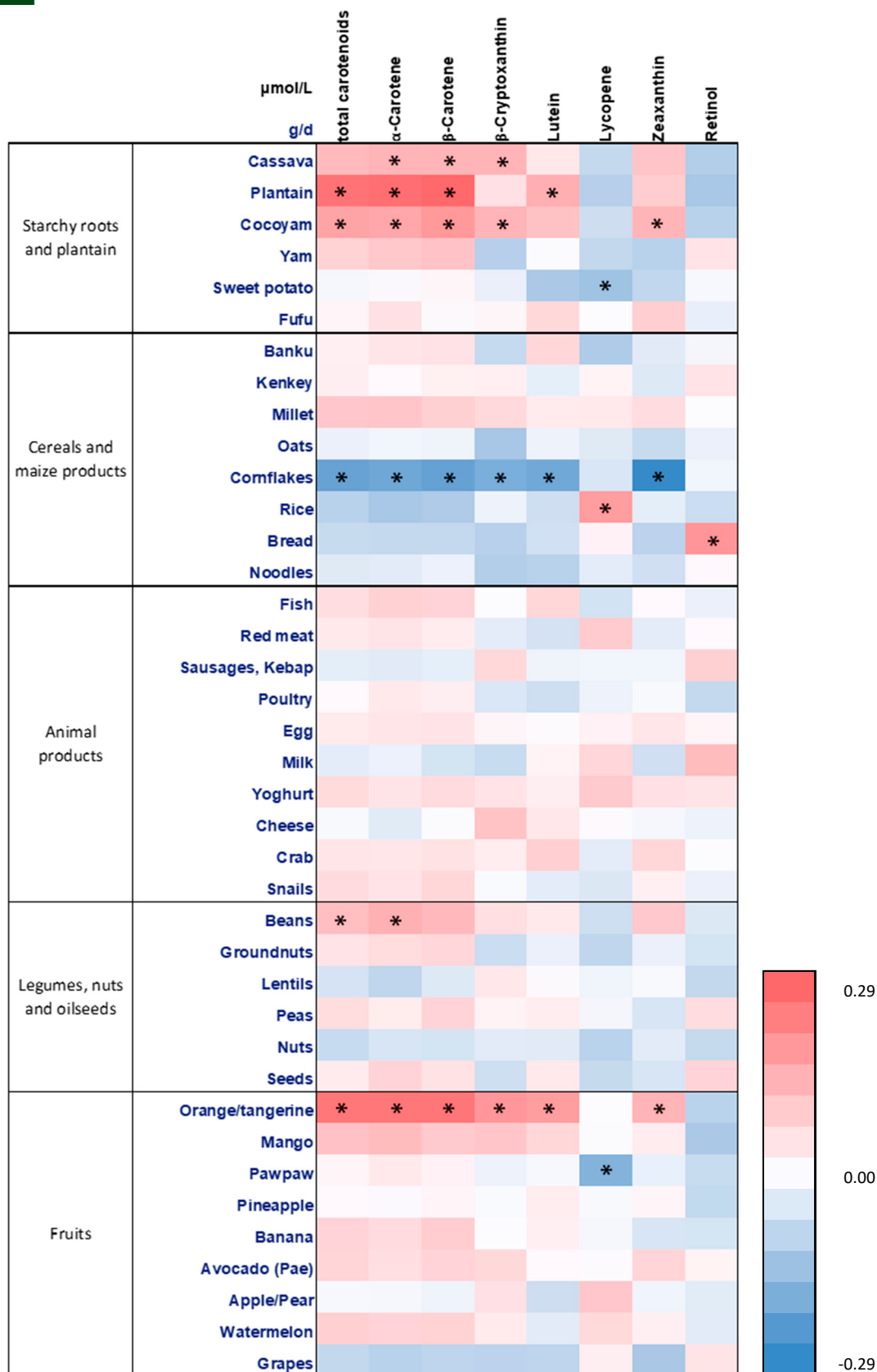


Figure S1. Spearman correlation of plasma carotenoid and retinol concentrations [$\mu\text{mol/L}$] with calculated intake [g/d] per food group; * $p < 0.05$

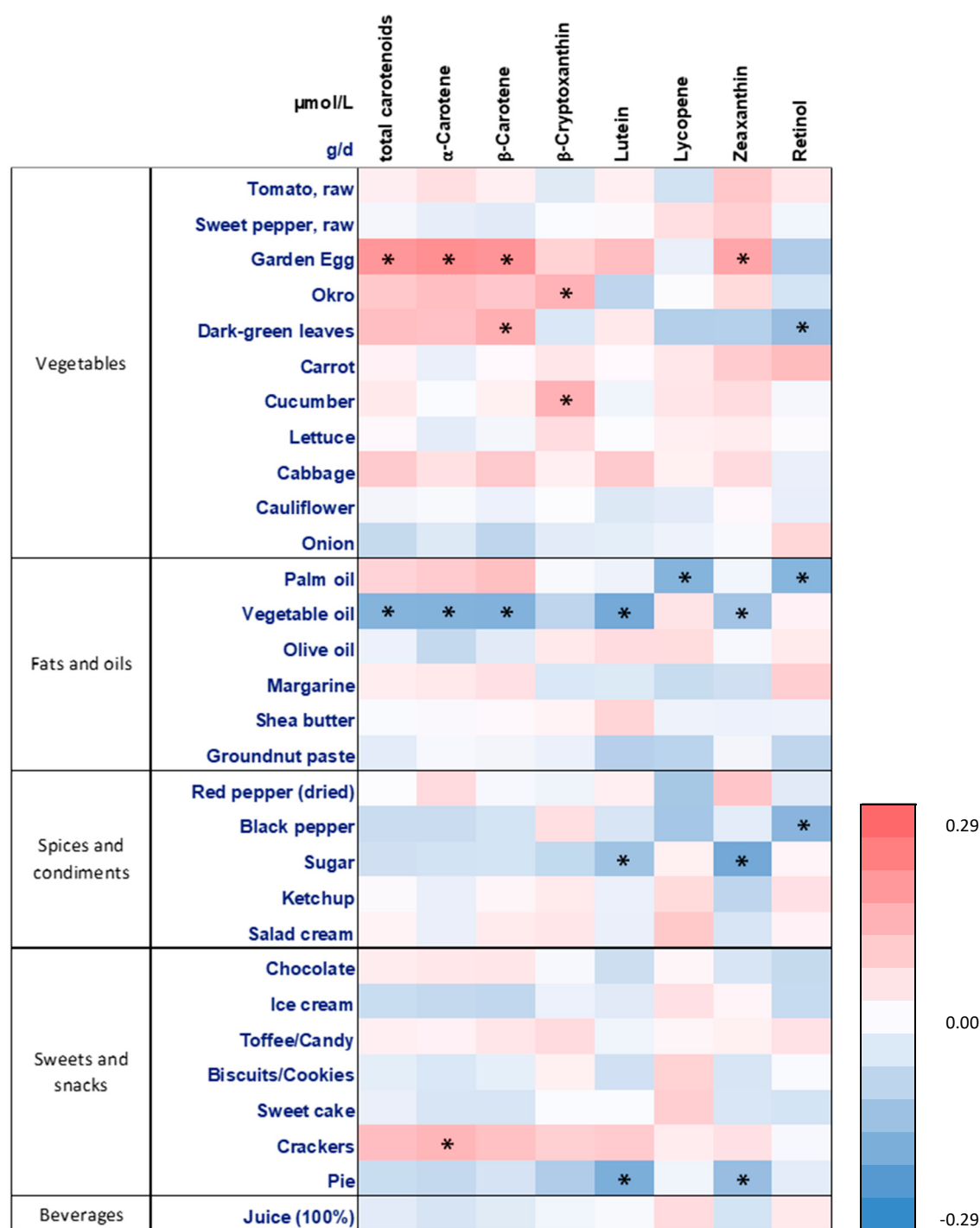


Figure S1 (continued). Spearman correlation of plasma carotenoid and retinol concentrations [$\mu\text{mol/L}$] with calculated intake [g/d] per food group; * $p < 0.05$

Table S1. Concentrations of retinol, α -carotene, β -carotene, β -cryptoxanthin, lutein, lycopene and zeaxanthin analysed in Standard Reference Material® 968d provided by the National Institute of Standards and Technology (NIST).

Analyte	NIST	Potsdam Lab	
	Concentration of the SRM 968d	Measured concentration ($n = 5$)	CV%
Retinol ($\mu\text{mol/L}$)	1.09 ± 0.17	1.04 ± 0.04	3.88
α-carotene ($\mu\text{g/mL}$)	0.018 ± 0.004	0.008 ± 0.001	8.77
β-carotene ($\mu\text{g/mL}$)	0.145 ± 0.013	0.127 ± 0.007	5.27
β-cryptoxanthin ($\mu\text{g/mL}$)	0.050 ± 0.024	0.048 ± 0.002	3.63
Lutein ($\mu\text{g/mL}$)	0.085 ± 0.028	0.076 ± 0.007	9.50
Lycopene ($\mu\text{g/mL}$)	0.517 ± 0.063	0.440 ± 0.022	5.04
Zeaxanthin ($\mu\text{g/mL}$)	0.041 ± 0.009	0.032 ± 0.003	10.06

Data are presented as means $\pm$ standard deviations. CV, coefficient of variation.

Table S2. Concentrations of plasma total carotenoids, provitamin A and retinol, and vitamin A deficiency across genotypes of the variants in the BCO1 gene

	n	total carotenoids [$\mu\text{mol/L}$]	p-value	provitamin A [$\mu\text{mol/L}$]	p-value	retinol [$\mu\text{mol/L}$]	p-value	vitamin A deficient [%]	χ^2 p-value
rs6564851									
TT	89	2.59 (2.21-3.50)		2.03 (1.66-2.80)		0.77 (0.64-0.92)		37.1 (33)	
GT	82	3.22 (2.17-4.02)	0.111	2.69 (1.70-3.42)	0.110	0.77 (0.65-0.87)	0.748	35.4 (29)	0.753
GG	18	2.93 (2.16-3.80)		2.21 (1.68-3.27)		0.80 (0.62-0.96)		27.8 (5)	
GT/GG	100	3.07 (2.17-4.02)	0.042	2.48 (1.69-3.38)	0.042	0.77 (0.64-0.88)	0.719	34.0 (34)	0.659
MAF	0.31								
rs7500996									
TT	90	2.80 (2.10-3.78)		2.12 (1.66-3.27)		0.75 (0.62-0.90)		37.8 (34)	
CT	76	3.07 (2.24-3.93)	0.486	2.51 (1.68-3.27)	0.492	0.78 (0.67-0.91)	0.613	30.3 (23)	0.416
CC	23	2.62 (2.17-3.23)		2.02 (1.70-2.41)		0.79 (0.62-0.94)		43.5 (10)	
CT/CC	99	2.81 (2.23-3.83)	0.555	2.27 (1.70-3.23)	0.607	0.79 (0.65-0.92)	0.339	33.3 (33)	0.524
MAF	0.32								
rs10048138									
GG	71	3.00 (2.08-4.05)		2.24 (1.61-3.33)		0.76 (0.62-0.89)		35.2 (25)	
AG	92	2.77 (2.12-3.67)	0.708	2.11 (1.66-3.04)	0.631	0.78 (0.66-0.91)	0.822	32.6 (30)	0.443
AA	26	2.77 (2.31-3.98)		2.18 (1.88-3.45)		0.74 (0.64-0.94)		46.2 (12)	
AG/AA	118	2.77 (2.21-3.76)	0.744	2.14 (1.70-3.22)	0.828	0.77 (0.65-0.92)	0.533	36.6 (42)	0.958
MAF	0.38								

Table S2 (continued). Concentrations of plasma total carotenoids, provitamin A and retinol, and vitamin A deficiency across genotypes of the variants in the BCO1 gene

rs6420424										
GG	63	2.93 (2.21-3.78)		2.18 (1.66-3.22)		0.77 (0.64-0.94)		36.5 (23)		
AG	92	2.73 (2.09-3.78)	0.758	2.09 (1.63-3.24)	0.684	0.79 (0.67-0.92)	0.318	30.4 (28)		0.218
AA	34	2.87 (2.31-3.91)		2.33 (1.87-3.42)		0.72 (0.58-0.88)		47.1 (16)		
AG/AA	126	2.74 (2.16-3.80)	0.830	2.12 (1.66-3.26)	0.877	0.77 (0.64-0.91)	0.924	34.9 (44)		0.830
MAF	0.42									
rs8044334										
TT	35	2.75 (2.24-3.71)		2.27 (1.75-3.22)		0.74 (0.61-0.89)		32.9 (15)		
GT	91	2.81 (2.21-3.78)	0.957	2.13 (1.70-3.22)	0.984	0.78 (0.66-0.93)	0.392	31.9 (29)		0.502
GG	63	2.93 (2.05-4.05)		2.18 (1.45-3.50)		0.77 (0.64-0.90)		36.5 (23)		
GT/GG	154	2.83 (2.14-3.83)	0.897	2.14 (1.66-3.27)	0.918	0.78 (0.65-0.92)	0.190	33.8 (52)		0.310
MAF	0.43									

Continuous variables are presented as medians (interquartile ranges), categorical variables are shown as percentages (numbers)

Table S3. Plasma concentrations of provitamin A carotenoids across genotypes of the variants in the BCO1 gene

	n	α-carotene [μmol/L]	p-value	β-carotene [μmol/L]	p-value	β-cryptoxanthin [μmol/L]	p-value
rs6564851							
TT	89	0.56 (0.47-0.75)	0.085	1.40 (1.12-1.91)	0.086	0.09 (0.06-0.12)	0.127
GT	82	0.69 (0.49-0.94)		1.88 (1.10-2.42)		0.10 (0.08-0.12)	
GG	18	0.58 (0.46-0.81)		1.52 (1.19-2.29)		0.11 (0.08-0.14)	
GT/GG	100	0.66 (0.46-0.91)	0.053	1.73 (1.13-2.41)	0.029	0.10 (0.08-0.13)	0.075
MAF	0.31						
rs7500996							
TT	90	0.60 (0.46-0.87)	0.642	1.43 (1.12-2.28)	0.507	0.09 (0.06-0.12)	0.692
CT	76	0.65 (0.46-0.90)		1.73 (1.11-2.22)		0.10 (0.07-0.13)	
CC	23	0.55 (0.49-0.75)		1.37 (1.10-1.63)		0.09 (0.06-0.12)	
CT/CC	99	0.62 (0.47-0.86)	0.664	1.55 (1.10-2.14)	0.620	0.09 (0.07-0.13)	0.755
MAF	0.32						
rs10048138							
GG	71	0.60 (0.46-0.94)	0.795	1.55 (1.08-2.29)	0.577	0.10 (0.07-0.13)	0.567
AG	92	0.61 (0.46-0.86)		1.46 (1.10-2.04)		0.09 (0.07-0.12)	
AA	26	0.64 (0.50-0.83)		1.47 (1.27-2.40)		0.09 (0.06-0.12)	
AG/AA	118	0.61 (0.48-0.86)	0.943	1.46 (1.17-2.07)	0.747	0.09 (0.06-0.12)	0.310
MAF	0.38						

Table S3 (continued). Plasma concentrations of provitamin A carotenoids across genotypes of the variants in the BCO1 gene

rs6420424							
GG	63	0.62 (0.46-0.89)	0.694	1.50 (1.16-2.28)	0.670	0.09 (0.07-0.12)	0.903
AG	92	0.57 (0.46-0.86)		1.41 (1.09-2.22)		0.09 (0.07-0.12)	
AA	34	0.65 (0.48-0.85)		1.55 (1.19-2.43)		0.10 (0.06-0.14)	
AG/AA	126	0.60 (0.47-0.86)	0.897	1.47 (1.10-2.23)	0.866	0.09 (0.07-0.12)	0.951
MAF	0.42						
rs8044334							
TT	35	0.66 (0.46-0.89)	0.873	1.55 (1.17-2.06)	0.985	0.09 (0.06-0.11)	0.579
GT	91	0.61 (0.47-0.86)		1.47 (1.12-2.22)		0.10 (0.07-0.12)	
GG	63	0.59 (0.45-0.91)		1.49 (0.98-2.29)		0.09 (0.07-0.15)	
GT/GG	154	0.60 (0.46-0.86)	0.610	1.48 (1.09-2.23)	0.926	0.09 (0.07-0.13)	0.374
MAF	0.43						

Continuous variables presented as medians (interquartile ranges)

Table S4. Plasma concentrations of non-provitamin A carotenoids across genotypes of the variants in the BCO1 gene

	n	lutein [μmol/L]	p-value	lycopene [μmol/L]	p-value	zeaxanthin [μmol/L]	p-value
rs6564851							
TT	89	0.12 (0.09-0.17)	0.469	0.37 (0.25-0.47)	0.753	0.037 (0.027-0.048)	0.665
GT	82	0.13 (0.10-0.17)		0.39 (0.29-0.49)		0.034 (0.026-0.047)	
GG	18	0.12 (0.08-0.20)		0.39 (0.30-0.50)		0.034 (0.027-0.058)	
GT/GG	100	0.13 (0.09-0.17)	0.235	0.39 (0.29-0.49)	0.454	0.034 (0.026-0.049)	0.434
MAF	0.31						
rs7500996							
TT	90	0.13 (0.09-0.17)	0.748	0.39 (0.26-0.47)	0.827	0.037 (0.027-0.049)	0.863
CT	76	0.13 (0.09-0.18)		0.36 (0.29-0.47)		0.035 (0.025-0.049)	
CC	23	0.11 (0.09-0.16)		0.39 (0.29-0.49)		0.036 (0.025-0.043)	
CT/CC	99	0.12 (0.09-0.12)	0.827	0.37 (0.29-0.49)	0.869	0.035 (0.025-0.048)	0.587
MAF	0.32						
rs10048138							
GG	71	0.13 (0.09-0.18)	0.789	0.39 (0.30-0.50)	0.499	0.036 (0.027-0.052)	0.938
AG	92	0.13 (0.09-0.16)		0.39 (0.27-0.45)		0.035 (0.025-0.047)	
AA	26	0.12 (0.10-0.19)		0.36 (0.24-0.47)		0.036 (0.028-0.050)	
AG/AA	118	0.13 (0.09-0.17)	0.619	0.37 (0.25-0.46)	0.299	0.035 (0.026-0.047)	0.878
MAF	0.38						

Table S4 (continued). Plasma concentrations of non-provitamin A carotenoids across genotypes of the variants in the BCO1 gene

rs6420424							
GG	63	0.14 (0.09-0.18)	0.803	0.39 (0.26-0.48)	0.875	0.037 (0.027-0.055)	0.648
AG	92	0.13 (0.09-0.17)		0.39 (0.29-0.47)		0.035 (0.025-0.047)	
AA	34	0.12 (0.10-0.15)		0.36 (0.24-0.51)		0.036 (0.027-0.053)	
AG/AA	126	0.13 (0.09-0.17)	0.517	0.37 (0.28-0.48)	0.895	0.035 (0.027-0.047)	0.380
MAF	0.42						
rs8044334							
TT	35	0.12 (0.09-0.15)	0.467	0.36 (0.26-0.45)	0.297	0.04 (0.03-0.05)	0.612
GT	91	0.13 (0.09-0.18)		0.36 (0.25-0.47)		0.04 (0.03-0.05)	
GG	63	0.11 (0.08-0.18)		0.40 (0.30-0.50)		0.03 (0.02-0.05)	
GT/GG	154	0.13 (0.09-0.18)	0.892	0.39 (0.28-0.49)	0.324	0.04 (0.03-0.05)	0.918
MAF	0.43						

Continuous variables are presented as medians (interquartile ranges)