

SUPPLEMENTARY DATA

β -carotene bioaccessibility from biofortified maize (*Zea mays*) is related to its density and is negatively influenced by lutein and zeaxanthin.

Table S1: Total carotenoid content in raw regular and biofortified hybrids of maize developed in India. The values are expressed as Mean $\pm$ SD of six independent observations.

Hybrids	Trait	Total content of carotenoids before cooking ($\mu\text{g}/100\text{ g}$)				
		LUT	ZEA	B-CRYP	AC	BC
MSC	Normal	1200.4 $\pm$ 19.91	766.94 $\pm$ 16.58	285.87 $\pm$ 24.06	61.99 $\pm$ 6.23	83.96 $\pm$ 7.37
DHM 121		329.74 $\pm$ 23.76	868.89 $\pm$ 14.44	667.54 $\pm$ 29.26	27.40 $\pm$ 12.65	89.53 $\pm$ 4.95
BML7		504.54 $\pm$ 10.23	2143.17 $\pm$ 47.00	1145.99 $\pm$ 21.35	41.91 $\pm$ 4.69	224.8 $\pm$ 6.46
Pusa-AQH4	QPM	459.19 $\pm$ 21.02	839.00 $\pm$ 23.02	232.00 $\pm$ 13.30	474.00 $\pm$ 10.61	50.50 $\pm$ 17.21
HQPM1		231.00 $\pm$ 27.52	136.00 $\pm$ 11.36	76.00 $\pm$ 11.21	307.00 $\pm$ 17.90	420.00 $\pm$ 18.87
Pusa-PV-16-2	Pro-VA	209.39 $\pm$ 19.73	216.74 $\pm$ 32.18	61.00 $\pm$ 4.26	355.00 $\pm$ 15.72	759.00 $\pm$ 10.68
Pusa-PV-16-3		349.00 $\pm$ 11.36	166.00 $\pm$ 29.52	60.00 $\pm$ 8.05	1084.00 $\pm$ 42.46	1036.00 $\pm$ 13.91
Pusa-PV-16-4		152.00 $\pm$ 33.12	285.00 $\pm$ 21.95	112.00 $\pm$ 18.11	414.00 $\pm$ 16.92	602.00 $\pm$ 32.44
Pusa-APQH4	Pro-VA+QPM	133.63 $\pm$ 38.83	272.00 $\pm$ 13.77	83.00 $\pm$ 6.79	397.00 $\pm$ 34.75	766.00 $\pm$ 27.54
PUSA-APQH8		814.00 $\pm$ 19.64	432.00 $\pm$ 11.57	752.00 $\pm$ 14.43	2046.00 $\pm$ 23.07	414.00 $\pm$ 19.71

Table S2: Carotenoid content in cooked regular and biofortified hybrids of maize developed in India. The values are expressed as Mean±SD of six independent observations.

Hybrids	Trait	Total content of carotenoids after cooking (µg/100 g)				
		LUT	ZEA	B-CRYP	AC	BC
MSC	Normal	1057.35±66.02	665.54±39.88	250.42±14.87	66.47±5.02	86.32±4.37
DHM 121		326.15±20.45	777.31±59.09	590.76±28.10	25.04±1.78	91.90±6.09
BML7		483.36±26.74	1940.29±96.44	964.09±110.02	44.33±2.18	185.58±15.06
Pusa-AQH4	QPM	419.87±26.63	780.66±66.28	223.44±12.06	426.08±33.65	44.49±3.59
HQPM1		228.38±15.94	133.56±7.89	79.48±1.75	277.09±24.87	363.80±24.36
Pusa-PV-16-2	Pro-VA	210.30±15.08	199.23±9.10	59.34±3.54	313.05±30.53	655.15±46.30
Pusa-PV-16-3		332.53±25.13	151.70±10.46	59.20±4.92	839.36±81.30	808.44±94.28
Pusa-PV-16-4		139.32±8.21	276.60±19.38	105.76±7.95	366.04±25.67	475.62±49.36
Pusa-APQH4	Pro-VA+QPM	124.60±10.96	247.24±11.15	88.15±5.81	319.57±35.33	589.48±62.05
PUSA-APQH8		726.46±60.24	369.52±29.38	644.24±51.136	1739.56±89.00	345.90±31.05

Table S3: The retention of xanthophylls and provitamin A carotenoids (%) after cooking in regular and biofortified maize hybrids. The values are expressed as percent of total content of individual carotenoids.

Hybrids	Trait	Retention of maize carotenoids (%)				
		LUT	ZEA	B-CRYP	AC	BC
MSC	Normal	88.08	86.78	87.67	107.23	102.81
DHM 121		98.91	89.46	88.50	91.40	102.65
BML7		95.80	90.53	84.13	105.77	82.55
Pusa-AQH4	QPM	91.44	93.05	96.31	89.89	88.10
HQPM1		98.87	98.21	104.58	90.26	86.62
Pusa-PV-16-2	Pro-VA	100.43	91.92	97.28	88.18	86.32
Pusa-PV-16-3		95.28	91.39	98.67	77.43	78.03
Pusa-PV-16-4		91.66	97.05	94.43	88.42	79.01
Pusa-APQH4	Pro-VA+QPM	93.25	90.90	106.20	80.50	76.96
PUSA-APQH8		89.25	85.54	85.67	85.02	83.55
MEAN		94.30	91.48	94.34	90.41	86.66

Table S4: Carotenoid content in digesta obtained post-simulated *in vitro* digestion of cooked regular and biofortified hybrids of maize developed in India. The values are expressed as Mean±SD of six independent observations.

Hybrids	Trait	Carotenoid content in digesta (ng/mL)				
		LUT	ZEA	B-CRYP	AC	BC
MSC	Normal	612.63±3.02	349.54±30.05	138.18±3.56	39.30±1.74	43.25±1.74
DHM 121		179.63±3.38	439.82±12.01	322.11±7.79	12.07±0.71	42.92±1.53
BML7		287.31±3.56	1096.47±4.76	551.24±19.19	21.48±1.88	97.99±4.79
Pusa-AQH4	QPM	243.41±7.52	435.47±6.78	109.86±2.38	216.54±4.96	21.08±1.34
HQPM1		130.31±1.78	70.85±1.49	38.35±3.02	147.23±7.84	202.59±8.25
Pusa-PV-16-2	Pro-VA	120.10±1.94	102.34±2.92	30.80±2.10	167.20±8.41	376.46±10.24
Pusa-PV-16-3		176.25±9.83	83.76±3.03	31.52±2.40	473.03±13.23	459.53±10.81
Pusa-PV-16-4		80.74±1.52	152.89±3.23	59.56±0.74	192.44±4.78	243.89±4.54
Pusa-APQH4	Pro-VA+QPM	71.02±1.70	128.93±2.59	45.51±3.99	165.84±11.80	316.97±7.12
PUSA-APQH8		427.73±8.80	210.76±2.28	356.28±8.82	983.44±10.16	175.05±10.56

Table S5: Carotenoid content in the aqueous micellar fraction isolated from digesta of cooked regular and biofortified hybrids of maize developed in India. The values are expressed as Mean±SD of six independent observations.

Hybrids	Trait	Carotenoid content in aqueous micellar fraction (ng/mL)				
		LUT	ZEA	B-CRYP	AC	BC
MSC	Normal	399.94±21.32	262.96±21.38	79.13±6.52	9.80±1.30	16.19±1.42
DHM 121		104.43±3.56	294.53±36.11	208.27±14.63	4.53±0.94	17.82±2.32
BML7		169.71±3.19	684.82±33.22	304.91±19.55	10.11±1.46	47.48±1.51
Pusa-AQH4	QPM	148.20±7.24	266.56±6.48	59.27±6.97	87.90±2.85	10.20±1.99
HQPM1		81.31±8.91	44.61±3.07	16.36±5.36	51.14±1.21	92.48±7.66
Pusa-PV-16-2	Pro-VA	62.08±6.13	67.44±9.95	19.30±6.94	85.93±6.13	190.76±8.48
Pusa-PV-16-3		111.45±9.42	52.44±10.06	18.51±2.38	231.32±3.99	252.97±20.93
Pusa-PV-16-4		55.38±12.05	93.25±9.13	23.93±3.17	83.98±8.60	144.58±15.63
Pusa-APQH4	Pro-VA+QPM	49.73±6.38	91.82±9.68	18.61±4.90	87.17±6.06	196.46±12.56
PUSA-APQH8		259.59±22.46	146.30±2.56	229.57±3.92	505.37±21.73	88.50±7.62

Table S6: The cellular uptake of provitamin A and non-provitamin A carotenoids in differentiated Caco-2 cells post-incubation of the micellar fraction, obtained from digesta of cooked regular and biofortified hybrids of maize developed in India. The values are expressed as Mean±SD of six independent observations.

Hybrids	Trait	Carotenoid uptake by Caco-2 cells (ng/well)				
		LUT	ZEA	B-CRYP	AC	BC
BML7	Normal	5.19±0.27	38.28±0.38	12.62±0.37	ND	0.5±0.25
Pusa-AQH4	QPM	6.54±0.27	19.05±0.88	2.91±0.24	ND	0.44±0.09
Pusa-PV-16-2	Pro-VA	2.03±0.14	1.76±0.17	1.21±0.23	1.12±0.16	9.27±0.66
Pusa-PV-16-3		3.52±0.58	1.43±3.69	1.23±0.29	1.84±0.24	10.80±0.37
Pusa-APQH4	Pro-VA+QPM	2.99±0.21	5.66±0.32	1.58±0.49	1.40±0.16	7.43±0.90
PUSA-APQH8		7.13±0.29	5.66±0.35	11.01±0.28	1.22±0.09	2.42±0.54