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## Carotenoid composition of tomatoes

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Plant & Food Research Palmerston North

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## 1 BACKGROUND

In previous research, funded by Heritage Food Crops, we have demonstrated that the tetra-*cis* lycopene present in some tomatoes is more bioavailable than the all-*trans* lycopene, which is commonly present in red tomatoes. Heritage Food Crops is now interested in identifying varieties of tomato that contain high concentrations of tetra-*cis* lycopene.

## 2 MATERIALS AND METHODS

Ninety-one tomato fruit samples were provided by Mark Christensen, Heritage Food Crops, and were stored at -18°C from when they arrived at PFR Palmerston North until analysis.

Lab Book Reference: MB63

To obtain a representative sample for chemical analysis all, or a portion, of the frozen tomato fruit provided was homogenised with dry ice. A subsample of frozen powdered tomato fruit was extracted with solvent (methanol/tetrahydrofuran) and the carotenoid composition measured by reversed-phase C30 ultra performance liquid chromatography (UHPLC) with UV/vis detection. Each component was quantified by comparison with an authentic standard except for tetra-*cis* lycopene. An authentic standard was not available for tetra-*cis* lycopene and quantification was achieved by comparison with an all-*trans* lycopene standard together with a correction factor to account for the differences in absorbance between tetra-*cis* lycopene and all-*trans* lycopene. The quantitative results are expressed on a per weight basis (mg/100 g fresh weight).

### 3 RESULTS

**Table 1. Carotenoid concentrations (mg/100g FW) in samples of tomato fruit measured by UHPLC.**

Genotype	lutein	tetra-cis lycopene	beta-carotene	all-trans- lycopene
Amish Yellowish Orange Oxheart	n.d.	8.21	n.d.	n.d.
Orange Crimea	0.04	8.04	n.d.	n.d.
Olga's Round Golden Chicken Egg	0.05	7.27	n.d.	n.d.
Golden Green	0.05	7.12	n.d.	n.d.
Orange Fleshed Purple Smudge	0.03	6.99	n.d.	0.04
Orange Roma	0.02	6.92	n.d.	0.08
Ilse's Orange Latvian	n.d.	6.73	n.d.	n.d.
Barnes Mountain Orange	n.d.	6.54	n.d.	n.d.
Summer Cider Apricot	n.d.	6.15	n.d.	n.d.
Big Orange	0.03	6.14	n.d.	n.d.
Tangella	0.03	6.13	n.d.	n.d.
Hawaiian Pineapple	0.03	6.13	n.d.	n.d.
Hurma Ukrainian	0.03	5.76	n.d.	n.d.
Aunt Gerties Gold	0.06	5.73	n.d.	n.d.
Tobolsk	n.d.	5.73	n.d.	0.06
Chuck's Golden	n.d.	5.47	n.d.	n.d.
Moonglow	n.d.	5.38	n.d.	n.d.
Amish Orange Sherbert Heirloom	n.d.	5.36	n.d.	n.d.
Persimmon	0.02	5.24	n.d.	n.d.
Djena Lees Golden Girl	0.04	5.23	n.d.	0.04
West Virginia	n.d.	5.05	n.d.	n.d.
Amana Orange	0.07	5.04	n.d.	0.01
Elfie (orange)	0.06	4.94	n.d.	0.01
Faribo Goldheart	0.03	4.90	n.d.	n.d.
Orange Valencia	0.08	4.60	n.d.	n.d.
Orange Beefsteak	0.02	4.56	n.d.	n.d.
Sibirische Orange	0.05	4.56	0.44	0.11
Elbe	0.03	4.31	n.d.	n.d.
Large Yellow Amish	0.04	4.28	n.d.	n.d.
Turkey Champ	0.04	4.26	n.d.	0.02
Yellow Brandywine Platfoot Strain	0.13	4.15	n.d.	n.d.
Orange Strawberry	0.03	4.14	n.d.	n.d.
Big Yellow	0.04	4.06	n.d.	0.03
Gary Ibsen's Gold	0.03	4.00	n.d.	n.d.
Alice Brewer	0.02	3.82	n.d.	n.d.
Roughwood Golden Plum	0.14	3.82	n.d.	n.d.
Persimmon	n.d.	3.82	n.d.	n.d.
Mountain Gold	0.02	3.60	n.d.	n.d.
Brown's Yellow Giant	n.d.	3.57	n.d.	n.d.
Elfie(red)-orange	0.09	3.46	n.d.	n.d.
Sakharniy Zeltiy	n.d.	3.42	n.d.	n.d.
Yoder's Yellow German	0.02	3.40	n.d.	n.d.
Bursztyn	0.03	3.34	n.d.	n.d.
Russian Persimmon	0.05	3.10	n.d.	n.d.
King's Gold (Koanga)	0.04	3.02	n.d.	n.d.
Russian Persimmon	0.05	2.93	0.52	0.01
Small Lap	0.12	2.87	n.d.	n.d.
Yoders Yellow German	0.03	2.65	n.d.	0.01
Orange Bourgoin	n.d.	2.62	n.d.	n.d.
Yellow Oxheart	0.02	2.58	n.d.	n.d.
Earl of Edgecomb	0.11	2.52	n.d.	n.d.
Golden Grape	0.06	2.50	0.42	0.06
Orange Plum	0.03	1.84	n.d.	n.d.
Homer Fike's Yellow Oxheart	0.05	1.74	n.d.	0.01
Old Wyandotte	0.02	1.65	n.d.	n.d.
Gary's Golden Bear	0.08	1.64	n.d.	0.01
Small Sweet Orange	0.12	1.63	0.66	0.12
Alice Brewer	0.02	1.55	n.d.	n.d.
Yellow Russian	0.02	1.48	n.d.	n.d.
Valencia	0.04	1.33	n.d.	n.d.
Pegs Round Orange	0.02	1.08	n.d.	n.d.
Orange Latvian	0.02	0.93	n.d.	n.d.

Genotype	lutein	tetra-cis lycopene	beta-carotene	all-trans- lycopene
Tess' Landrace Currant (red)	0.18	0.15	0.89	4.14
Burbank (Koanga)	0.18	n.d.	1.10	8.56
Alice Brewer (red)	0.20	n.d.	0.90	6.49
<b>Lycoplus</b>	<b>0.12</b>	<b>n.d.</b>	<b>0.47</b>	<b>5.98</b>
Russian Persimmon (red sport)	0.32	n.d.	1.12	5.98
Dark Orange Muscat (red)	0.20	n.d.	1.16	5.48
Amish Gold (red)	0.23	n.d.	1.18	5.25
Russian Persimmon (red sport)	0.22	n.d.	0.86	3.51
Dicoff's Yellow	0.16	n.d.	0.68	1.94
Branscomb's Orange	0.04	n.d.	2.61	1.40
Tangerine Mystery	0.09	n.d.	4.00	1.39
La Carotina	0.08	n.d.	3.62	0.94
Orange Russian	0.17	n.d.	0.87	0.90
Amish Gold (orange)	0.13	n.d.	4.35	0.19
Goldene Konigen	0.19	n.d.	0.51	0.18
Big Orange Stripe	0.17	n.d.	1.00	0.12
Amber Coloured	0.18	n.d.	0.17	0.07
Orange Pixie	0.25	n.d.	0.13	0.03
Wonder (Koanga)	0.17	n.d.	0.09	0.01
Lycopersicon macrocarpum lutea	0.19	n.d.	0.05	n.d.
Ueberreich	0.02	n.d.	0.03	n.d.
Tess' Landrace Currant (yellow)	0.31	n.d.	0.30	n.d.
Gold Ball	0.16	n.d.	0.28	n.d.
M1 Tomato (re-named 'Golden Eye Tomato')	0.19	n.d.	5.37	n.d.
Primary Colours	0.12	n.d.	0.04	n.d.
Golden Ponderosa	0.23	n.d.	0.33	n.d.
Gamma Climenhagen	0.16	n.d.	0.17	n.d.
Old Ivory Egg	0.21	n.d.	0.16	n.d.
Hawke's Bay Yellow (Koanga)	0.12	n.d.	0.11	n.d.

<sup>a</sup> Not detected n.d.

### 3.1 Qualifying statement

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