

## Executive Summary

Tomato Carotenoids 2009. A report prepared for Mark Christensen, Central Tree Crops Research Trust

McGhie TK, Comeskey DJ

September 2009

The phytochemical constituents of tomatoes that are believed to contribute to their health benefits include the carotenoids (lycopene and  $\beta$ -carotene).

Twenty-six tomato cultivars were sent to Plant & Food Research for the measurement of individual carotenoids by High Performance Liquid Chromatography (HPLC). The major carotenoids present were lycopene (0.04 to 3.18 mg/100 g FW) and  $\beta$ -carotene (0.13 to 1.10 mg/100 g FW). Total carotenoid concentrations ranged from 0.65 to 4.61 mg/100 g FW.

The carotenoids present and the concentrations measured in these tomato cultivars were similar to those found in tomato cultivars analysed previously in 2008 and early 2009.

For further information please contact:

Tony McGhie  
The New Zealand Institute for Plant & Food Research Ltd  
Plant & Food Research Palmerston North  
Private Bag 11600  
Manawatu Mail Centre  
Palmerston North 4442  
NEW ZEALAND  
Tel: +64-6-953 7684  
Fax: +64-6-351 7050  
Email [tony.mcghie@plantandfood.co.nz](mailto:tony.mcghie@plantandfood.co.nz)

## Introduction

The Tree Crops Research Trust is interested in the potential health benefits of tomatoes. The phytochemical constituents of tomatoes that are believed to contribute to their health benefits include the carotenoids (such as lycopene and  $\beta$ -carotene) and polyphenolics (such as quercetin rutinoside, naringenin chalcone, and chlorogenic acid). Plant & Food Research has measured the individual carotenoid components of tomato cultivars supplied by the Tree Crops Research Trust throughout the 2009 growing season.

## Materials and Methods

### Sample Preparation

Samples of tomato were sent to Plant & Food Research, Palmerston North and immediately frozen at  $-18^{\circ}\text{C}$  on receipt. Each sample was homogenised while being kept frozen using a Hobart food chopper; dry ice was added to ensure samples remained frozen during the homogenisation process

### Analysis

Carotenoids were extracted from portions of the homogenised fruit samples with acetone following the addition of  $\text{Na}_2\text{CO}_3$  and anhydrous  $\text{Na}_2\text{SO}_4$ . The crude acetone extract was partitioned with diethyl ether, evaporated to dryness and dissolved in acetone. Reversed-phase HPLC was used to separate and measure the individual carotenoids. Calibrations of authentic lutein and  $\beta$ -carotene were prepared for quantitation.  $\alpha$ -carotene and  $\beta$ -carotene were quantified as  $\beta$ -carotene equivalents and lutein and zeaxanthin as lutein equivalents. The method was similar to that described by McGhie & Ainge (2002).

## Results and Discussion

The concentrations of the phytochemicals measured are provided below in Table 1.

The major carotenoids present were lycopene (0.04 to 3.18 mg/100 g FW) and  $\beta$ -carotene (0.13 to 1.10 mg/100 g FW). Total carotenoid concentrations ranged from 0.65 to 4.61 mg/100 g FW.

Twenty-six tomato cultivars were sent to Plant & Food Research for measurement of individual carotenoids by High Performance Liquid Chromatography (HPLC). Lycopene was carotenoid usually present at the highest concentration, and lycopene concentrations in the tomato samples ranged from 0.04 ('Dad's Sunset') to 3.18 mg/100 g FW ('Black Striped Cherry').  $\beta$ -Carotene concentrations ranged from 0.13 ('Dad's Sunset') to 1.01 mg/100 g FW ('Black Striped Cherry'). The cultivar 'Dad's Sunset', which has a bright yellow colour, contained only a trace amount of lycopene but had the highest concentration of a carotenoid that could not be identified with the standards currently available.

The carotenoids present, and the concentrations measured, in these tomato cultivars were similar to those found in tomato cultivars analysed previously in 2008 and early 2009.

Table 1. Concentrations of carotenoids in the tomato cultivars provided by the Tree Crops Research Trust.

Tomato Cultivar	Carotenoid Concentration (mg/100 g FW)				
	<i>lutein</i>	<i>Unidentified carotenoid</i>	<i>β-carotene</i>	<i>lycopene</i>	<i>Total Carotenoids</i>
'Dad's Sunset'	0.04	1.01	0.13	0.04	1.21
'Stump of the World'	0.10	n.d.	0.24	0.32	0.65
'Black Bear'	0.18	n.d.	0.50	0.59	1.26
'Black and Brown Boar'	0.22	n.d.	0.30	0.61	1.13
'Chocolate'	0.26	n.d.	0.46	0.65	1.38
'Black Bell'	0.15	n.d.	0.27	0.75	1.17
'Eva Purple Ball'	0.11	n.d.	0.31	0.83	1.25
'Black Plum'	0.33	n.d.	0.54	0.88	1.75
'Missouri Love Apple'	0.10	n.d.	0.33	0.89	1.32
'Oxheart' (Koanga)	0.15	n.d.	0.40	0.93	1.47
'Purple Calabash'	0.57	n.d.	0.33	0.94	1.85
'Chinese Purple'	0.18	n.d.	0.26	1.04	1.47
'Black Roma' (Koanga)	0.21	n.d.	0.32	1.06	1.59
'Amazon Chocolate'	0.30	n.d.	0.44	1.14	1.88
'Black Russian'	0.27	n.d.	0.31	1.17	1.75
'Noir de Crimme'	0.17	n.d.	0.52	1.18	1.88
'Brandywine Pink'	0.06	n.d.	0.34	1.21	1.62
'Azyochka'	0.09	n.d.	0.45	1.21	1.76
'Isle Capri' (Francies)	0.12	n.d.	0.35	1.28	1.74
'Cherokee Blue'	0.16	n.d.	0.34	1.32	1.83
'Bedouin'	0.18	n.d.	0.31	1.36	1.85
'Giant Belgium'	0.08	n.d.	0.42	1.45	1.95
'Negro Azteca'	0.39	n.d.	0.43	1.47	2.29
'Black Cherry'	0.38	n.d.	0.65	1.82	2.85
'Elfin'	0.10	n.d.	0.67	2.85	3.62
'Black Striped Cherry'	0.42	n.d.	1.01	3.18	4.61

n.d. = not detected

## References

McGhie TK, Ainge GD 2002. Color in fruit of the genus *Actinidia*: Carotenoid and chlorophyll compositions. *Journal of Agricultural and Food Chemistry* 50, 117-121.