

Irish Section of The Nutrition Society, 17–19 June 2009

Analysis of carotenoid content and bioaccessibility from different Irish-grown tomato varieties

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Research suggests that the inclusion of carotenoids in the diet may be associated with a reduced risk of human chronic degenerative diseases⁽¹⁾. Foods such as tomatoes have been promoted for consumption because of their abundant source of carotenoids, i.e. lycopene, β -carotene and lutein. Thus, the objectives of the present study were to: first, analyse the carotenoid content of different tomato varieties, i.e. cherry, plum, round and high-lycopene round on the vine (round HLB); second, determine carotenoid bioaccessibility from these foods. Carotenoid bioaccessibility, which is defined as the amounts of carotenoid(s) that are available for absorption in the gut after digestion, is a good indicator of carotenoid bioavailability^(2,3).

The tomatoes were Irish grown and purchased from a local supermarket chain. All work was performed under amber light to minimise carotenoid photodecomposition. Each food was weighed (2 g), homogenised and subjected to an *in vitro* digestion procedure^(2,3). Micelle fractions were isolated from digested samples using ultracentrifugation. Both undigested and digested samples were extracted twice using a solvent mixture of hexane–acetone–ethanol (2 : 1 : 1, by vol.) and the carotenoid content of the samples was quantified by HPLC, as previously described⁽²⁾. Bioaccessibility is defined as the proportion of carotenoids present in the micelles compared with that contained in the original food (expressed as a percentage).

Tomato	Content ($\mu\text{g}/100\text{ g}$)				Bioaccessibility (%)			
	Lycopene		β -Carotene		Lycopene		β -Carotene	
	Mean	SE	Mean	SE	Mean	SE	Mean	SE
a. Cherry	2304	258	489 ^d	43.7	0.25 ^c	0.06	2.23 ^d	0.22
b. Plum	2589	151	441 ^d	68.3	0.66	0.11	1.25	0.13
c. Round	1471 ^d	146	343	12.9	0.79 ^{ad}	0.16	1.44	0.52
d. Round (HLB)	3169 ^c	509	235 ^{ab}	23.3	0.20 ^c	0.03	0.68 ^a	0.12

Values are means for four independent experiments. ^{a,b,c,d}Means with unlike superscript letters were significantly different (one-way ANOVA, followed by Tukey's multiple comparison test; $P < 0.05$).

Lycopene content was higher in the round HLB ($P < 0.05$) tomatoes as well as the cherry and plum tomatoes compared with the normal round variety. On the other hand, β -carotene content was greater in both cherry and plum tomatoes ($P < 0.05$) as well as the round variety when compared with round HLB tomatoes. Lycopene was more bioaccessible from round tomatoes compared with cherry and round HLB varieties; however, bioaccessibility of lycopene from all the tomatoes was relatively low. β -Carotene bioaccessibility was greater from cherry tomatoes ($P < 0.05$) when compared with the round HLB variety. In conclusion, varietal differences were seen in the content and bioaccessibility of lycopene and β -carotene from tomatoes. Bioaccessibility of β -carotene was generally higher than that of lycopene.

This work was supported by Science Foundation Ireland (PI Award 04/IN3/B509).

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