THE FOOD STANDARDS AGENCY

Nutritional Survey of Diet in the United Kingdom

Required/essential vitamins: Vitamin C (Survey 1A/08).

FSA proposal calls on ALL PUBLIC ANALYSTS to measure the levels of vitamin C in a range of cooked and uncooked foodstuffs, which form part of the UK diet, to ensure suitable source quantities are available.

Daily Requirement: Adults 40 mg.

Possible Sources: Fruit and vegetables.
Primary sources include: peppers, broccoli, Brussels sprouts, sweet potatoes, oranges and kiwi fruits.

Methodology: Two approaches:
1) Primary screening of sources with and without cooking,
2) Intensive instrumental techniques after screening.

Method 1: Screening method using dilute sulphuric acid extraction and grinding agents to release Vitamin C. Separation of extract (including vitamin C) from tissue by centrifugation. Collection and standard dilution of extract (including vitamin C). Measurement of vitamin C content of diluted extract using standard DICPIP solution (selective reagent to vitamin C).

Primary Source Material: Green Peppers (cultivar of *Capsicum annum*; domestic availability, source type No.1A/08/GP).

Analytical Chemists: Please complete the following grids to allow processing of your data for this survey. The experimental processing script supplied (1A/08/GP/EPS) should be followed.

Standardisation of DICPIP

Titrate an aliquot (5.0 mL) of standard vitamin C with DICPIP solution. Complete Grid 1 but do not calculate the mean until the blank has been determined.

Grid 1

Volume of DICPIP (mL)	Titre 1	Titre 2	Titre 3
Starting Value			
Final Value			
Titre (Volume)			
Mean Value (blank corrected)			

Determination of the Blank

Titrate an aliquot (5.0 mL) of water with DICPIP solution. Subtract the mean blank titre from all other titres.

Grid 2

Volume of DICPIP (mL)	Titre 1	Titre 2	Titre 3
Starting Value			
Final Value			
Titre (Volume)			
Mean Value			

Vitamin C in Diluted Raw Pepper Extract

Titrate an aliquot (10.0 mL) of diluted raw pepper extract with DICPIP solution.

Grid 3

Volume of DICPIP (mL)	Titre 1	Titre 2	Titre 3
Starting Value			
Final Value			
Titre (Volume)			
Mean Value (blank corrected)			

Method Used to Cook the Peppers

Please tick method of cooking used:

☐ Baked   ☐ Boiled   ☐ Microwave

Vitamin C in Diluted Cooked Pepper Extract

Titrate an aliquot (10.0 mL) of diluted cooked pepper extract with DICPIP solution.

Grid 4

Volume of DICPIP (mL)	Titre 1	Titre 2	Titre 3
Starting Value			
Final Value			
Titre (Volume)			
Mean Value (blank corrected)			

Grid 5

If the cooking method was boiling, then titrate the water in which the pepper was cooked and complete **Grid 5**.

The cooking water will need to be diluted to an appropriate known volume; however, the precise dilution will depend on the amount of water remaining after cooking.

Titrate an aliquot (10.0 mL) of diluted cooking water with DICPIP solution.

Volume of DICPIP (mL)	Rough	Titre 1	Titre 2	Titre 3
Starting Value				
Final Value				
Titre (Volume)				
Mean Value (blank corrected)				

Calculations

Determination of DICPIP Factor

If the vitamin C standard solution concentration is 0.5005 g vitamin C in every Litre (or written as 0.5005 g/L) and the titration of 5.0 mL of this vitamin C solution with DICPIP (from the standardisation of DICPIP, **Grid 1**) gave a volume value (titre) of XX**.**XX mL, then, complete the calculation:

Factor = g vitamin C / mL DICPIP = 0.5005 × [5.0 / 1000] × [1 / XX.XX]

This means that every mL of this batch of DICPIP used in any titration is equivalent to the number of grams of vitamin C given by the Factor above. Please write this Factor value on the board and in the box below.

Factor (g vitamin C / mL DICPIP)	

Determination of Vitamin C in Raw Peppers

Multiply your mean titre value from **Grid 3**, by the Factor:

g vitamin C in 10 mL of diluted raw pepper extract = Factor × mean titre value

Because the aliquot of diluted extract (10.0 mL) that was titrated was taken from a 50.0 mL volumetric flask, the total quantity of vitamin C in the 50.0 mL flask is:

g of vitamin C in volumetric flask = g vitamin C in 10 mL × [50.0 / 10.0]

This amount of vitamin C is from 10.0 g of raw pepper. Since the Food Standards Agency prefers values in terms of 100 g of pepper, multiply by 10:

g vitamin C in 100 g raw pepper = g of vitamin C in volumetric flask × 10

g vitamin C in 100 g raw pepper	

Determination of Vitamin C in Cooked Peppers

Multiply your mean titre value from **Grid 4**, by the Factor:

g vitamin C in 10 mL of diluted cooked pepper extract = Factor × mean titre value

Because the aliquot of diluted extract (10.0 mL) that was titrated was taken from a 50.0 mL volumetric flask, the total quantity of vitamin C in the 50.0 mL flask is:

g of vitamin C in volumetric flask = g vitamin C in 10 mL × [50.0 / 10.0]

As before, this amount of vitamin C is from 10.0 g of pepper. So to present the value in terms of 100 g of pepper, multiply by 10:

g vitamin C in 100 g cooked pepper = g of vitamin C in volumetric flask × 10

Cooking Method	
g vitamin C in 100 g cooked pepper	

Determination of Vitamin C in Water Used for Boiling

Only complete this section if boiling was used as the cooking method

Multiply your mean titre value from **Grid 5**, by the Factor:

g vitamin C in 10 mL of diluted cooking water = Factor × mean titre value

Because the aliquot of diluted extract (10.0 mL) that was titrated was taken from a volumetric flask of volume V mL (*e.g.* V may be 150.0 mL or 250.0 mL), the total quantity of vitamin C in the flask is:

g of vitamin C in volumetric flask = g vitamin C in 10 mL × [V / 10.0]

Multiply by 10 to present your value in terms of 100 g of pepper:

g vitamin C in 100 g cooked pepper = g of vitamin C in volumetric flask × 10

g vitamin C in 100 g cooked pepper	

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