



Issue 10: February, 2021: This e-bulletin is aimed at health professionals, consumers, growers, farmers, packers, processors, distributors, retailers, and others in the plant foods area.

Peppers ring a loud nutritional bell

Bell peppers (*Capsicum annuum*) are among the most colourful items on retail store shelves. Their strong green, yellow and red colours signal consumers to 'eat colour' or 'eat the rainbow'. Bell (sweet peppers) originated in Mexico, South and Central America, and are members of the same botanical family as tomatoes, egg-plants and potatoes (AMRC-USDA, 2017). Bell peppers also come in other colours i.e. white, brown, purple and lavender, but green peppers that turn yellow and then red as they mature are the most common (CDCP, 2002; USDA, 2021).

Energy, carbohydrate & dietary fibre (DF) contents

Bell peppers are highly nutritious with low energy content 26 (green), 31 (yellow) and 37kcal/100g (red) and have a significant content of vitamins, minerals and antioxidants. Carbohydrates contribute to the majority of the calorie content primarily present as glucose and fructose. These sugars are responsible for the sweet taste associated with bell peppers. Both carbohydrate and DF contents increase as peppers mature i.e. 3.43 (green), 4.73 (yellow) and 5.18% (red) for carbohydrate, and 0.5 (green), 1.2 (yellow) and 3.2% (red) for DF (ANSES-CIQUAL, 2021). The protein and fat contents of bell peppers are low at <1 and <0.5% respectively.

Vitamins and minerals

Bell peppers are an excellent source of bioactive compounds including vitamins A, C, E and B6. Content, in most cases, increases as peppers change from green to yellow to red. β -Carotene is a precursor of vitamin A (retinol) which negates night blindness, corneal ulceration, mucous membrane damage and other conditions via its anti-inflammatory properties. Green, yellow and red peppers contain circa 154, 642, and 554 $\mu\text{g}/100\text{g}$ of β -carotene respectively which equates to circa 40% (yellow peppers) of the recommended daily amount (RDA) for vitamin A in the body. Values for vitamin C are 90 (green), 121 (yellow) and 121mg/100g (red) which is 180% of the RDA (yellow and red peppers). Vitamin C protects cell and skin health, blood vessels, bones and cartilage, and also aids with wound healing. Red peppers (100g) supply about 22 and 30% of the RDAs for vitamins B6 and E respectively with green and yellow peppers supplying lesser amounts. Tocopherols (vitamin E) are major antioxidants and prevent oxidation of lipids (fats) in cell membranes. Vitamin B6 (pyridoxine) is involved in many aspects of macronutrient metabolism

including synthesis and function of neurotransmitters, histamine and haemoglobin (Da Silva & Gregory, 2020).

Bell peppers are a good source of potassium with yellow peppers having the highest content at 220mg/100g i.e. 11% of the RDA. Potassium is needed by all body tissues and increased intake is potentially beneficial to most people without impaired renal handling of potassium for the prevention and control of elevated blood pressure and stroke (Aburto, *et al.*, 2013). Bell peppers contain small amounts of other elements including calcium, magnesium, phosphorus, iron, zinc, selenium, manganese and iodine. The content of vitamins and minerals above in bell peppers is from the ANSES-CIQUAL Food Composition Tables (ANSES-CIQUAL, 2021) and the RDAs from the FSAI (FSAI, 2021).

Pigment compounds and antioxidants

Bell peppers are very active biochemically as they turn from green to yellow to red. Chlorophyll gives bell peppers their initial green colour accounting for 68% of all colour pigments; the remaining 32% are carotenoids. As peppers ripen chlorophyll degrades and the previously masked (by chlorophyll) carotenoid pigments appear (β -carotene, violaxanthin, lutein) giving yellow peppers their colour. Finally, red carotenoid pigments are generated including capsorubin and capsanthin, and give the bright red colour of red bell peppers (Brunning, 2021). Bell pepper carotenoids and vitamins A, C, E together with phenolic compounds, especially flavonoids, are powerful antioxidants and help quench harmful free radicals thus preventing/alleviating a range of inflammatory diseases (Young & Lowe, 2018; also PlantFoods-ucd, Issue 5, 2020).

Take home message: Bell peppers are highly nutritious and should be a frequent dietary item. They are best consumed fresh in a salad or as an accompaniment to a main course rather than cooked (fried/roasted), as cooking may/will reduce the content of some of the beneficial bioactive compounds. Bell peppers have an excellent crisp texture. The aroma of green peppers is largely due to pyrazines. Hexanal and hexanol are the main aroma compounds as peppers ripen through yellow to red and confer a level of sweetness.

References

- *Aburto, N.J. & 4 co-authors. 2013. Effect of increased potassium intake on cardiovascular risk factors and disease: systematic review and meta-analyses. *British Medical Journal*, April, 19 pages. Cite as BMJ 2013;346:f1378.
- *AMRC-USDA. 2017. Agricultural Marketing Resource Center, US Department of Agriculture. On-line at: [Bell and Chili Peppers"](#)
- *ANSES-CIQUAL. 2021. Food Composition Tables. On-line at: <https://ciqual.anses.fr/>
- *Brunning, A. 2021. The chemistry of bell peppers. *Compound Interest* (Cambridge, UK). On-line at: <https://www.compoundchem.com/2016/07/05/bell-peppers/#:~:text=In%20green%20peppers%2C%20a%20significant,very%20characteristic%20of%20green%20peppers>
- *CDCP. 2002. Vegetable of the month: Bell pepper. Centre for Disease Control & Prevention, US Department of Health & Human Services.
- *Da Silva, V.R. & Gregory III, J.F. 2020. "Vitamin B6". In B.P. Marriott, D.F. Birt, V.A. Stallings & A.A. Yates (eds.). *Present Knowledge in Nutrition*, 11th Edition. London, UK, Academic Press (Elsevier).
- *FSAI. 2021. Nutrition Labelling Rules for Foods and Food Supplements, Directive 2008/100/EC. On-line at: https://www.fsai.ie/science_and_health/nutrition_and_health_claims/nutrition_rules_for_foods_and_food_supplements_bearing_claims.html
- *USDA. 2021. US Department of Agriculture, Agricultural Marketing Service. On-line at: <https://www.ams.usda.gov/grades-standards/sweet-peppers-grades-and-standards>
- *Young, A.J. & Lowe, G.L. 2018. Carotenoids – antioxidant properties. *Antioxidants* (Basel), 7, 28-31.

See previous 9 issues of PlantFoods-ucd at: <https://www.ucd.ie/foodandhealth/more/plantfoodsucd/>

Compiled by Grace Mongey & Ronan Gormley, UCD Institute of Food & Health, School of Agriculture & Food Science, Belfield, Dublin 4. **More information from ronan.gormley@ucd.ie
DISCLAIMER: While every care has been taken in ensuring the accuracy of the material presented, no liability as to its use or interpretation is accepted by the authors or by UCD.

