Sweet Cherries

A review of their health properties

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Sweet or 'wild' cherries are small fruits which have powerful nutrient and bioactive properties. Rising demands for fresh cherries and the sweet variety has led to more research studies being carried out in this area. Sweet cherries can provide useful amounts of vitamin C, fibre, potassium, phosphorous, magnesium and calcium and are rich in anthocyanins and melatonin. Alongside this, a review of the evidence available has found that sweet cherry consumption may help to reduce inflammation, levels of oxidative stress and improve sleep quality. Additional cherry feeding studies are now needed to further explore what appears to be a promising area of research.

Background

Sweet cherries may also be referred to as 'wild' cherries or *Prunus avium*.[1] These sweet fruits are grown on trees or fans against a wall or fence.[2] Sweet cherries can be grown in the UK and do particularly well in Southern and Central England.[2] Further afield Europe, North America, the Middle East and Africa and Asia Pacific (excluding Japan), Japan and Latin America also produce sweet cherries.[3] One of the most common cultivars grown in the U.S is Bing, which produces large black firm sweet cherry fruits.[4] Jert cherries are also another sweet cultivar grown in the Valle del Jerte, Spain.[5] These two cultivars of sweet cherries are most commonly cited in research studies.

The global market for fresh cherries has been witnessing a steady rise partly fuelled by consumer demands for 'fresh' produce.[3] Within the market sector sweet cherries are experiencing a high demand compared to sour/tart cherries.[3] This particular segment held around 60% of the market in 2017 and is predicted to remain dominant over the next few years.[3] A recent review looking at the effects of cherries *per se* (sweet and tart) recently found that these could promote health by reducing levels of oxidative stress and inflammation.[6] Given the growing interest in sweet cherries this article looks at the nutritional profile and general health properties of this particular cherry cultivar.

Nutritional & bioactive profile

Nutritionally, sweet cherries are renowned for their high nutrient density providing fibre, potassium, vitamin C, carotenoids, the flavonoid quercetin, an array of anthocyanins and melatonin.[7] Cherries, in particular, are one fruit known to have high melatonin content, with UV levels, degree of ripeness, and storage conditions influencing the production of this.[7] The main function of melatonin found in cherry fruits is thought to be as an antioxidant to protect the cherry from the oxidative stress.[9]

As shown in **Figure 1** an 80 g portion of sweet cherries provides useful amounts of fibre, potassium, phosphorous, magnesium and calcium. One portion of sweet cherries also provides 14% of daily vitamin C requirements. As seen in **Table One**, compared with other popular fruits sweet cherries are particularly rich in calcium, magnesium, phosphorous, and potassium. They also provide beta-carotene and the antioxidants lutein and zeaxanthin. Most interesting of all, a portion of sweet cherries provides five times more anthocyanins (cyanidin; 24.1 mg) than an eating apple. When describing 'a portion' of cherries this typically constitutes about 14 fresh cherries, which would qualify as one of the 5 A DAY.[9]

Health properties

A growing number of studies have looked at how eating and drinking sweet cherries can influence health. Given this, a PubMed search for human studies published between 2000 and 2018 was undertaken. Included studies involved the consumption of sweet cherries as the fruit or juice. Trials using tart Montmorency cherries were excluded.

A total of seven trials investigated links between sweet cherries and health. Trials varied in duration with the longest trial lasting 12 weeks[10] and shorter trials taking place over 72 hours[11] or 5 hours post consumption.[12] The amount of cherries ingested also ranged – most involved the consumption of 1-2 portions of cherries, with a portion considered to be 280 g.[13, 14] In instances where cherry juice was consumed, this was just one 200 ml glass daily over 12 weeks.[11]

With regard to findings, five of the trials focused either on inflammation or sleep quality. The others investigated aspects of mood, memory or cognition. Focusing on inflammation, three studies have shown that sweet cherries can help to reduce markers of inflammation.[13, 14, 15] A 28-day trial, comprised of 18 adults (45-61 years), showed that Bing cherry consumption reduced several markers of inflammation, including C-reactive protein, endothelin-1 and interleukin-18, amongst several others.[14] Earlier work by the same team of scientists at the University of California showed that similar amounts of Bing cherries again reduced C-reactive protein and nitric oxide levels by 25% and 18% respectively.[15] Other work with 10 healthy women who consumed two 280 g servings of Bing cherries after an overnight fast observed that C-reactive protein and nitric oxide levels significantly reduced, just three hours after ingestion.[12]

Turning to sleep, research at the University of Extremadura, Spain has published two studies looking at Jert cherries and nocturnal sleeping quality. One blinded crossover study found that Jert cherries helped to improve sleep quality which was determined by assessing a number of factors including sleep efficiency, the number of awakenings at night, nocturnal activity and actual time spent sleeping.[15] Interestingly in this study levels of 6-sulfatoxymelatonin (the main metabolite of melatonin) were found to be higher in urine first voided in the morning, indicating that cherry ingestion could have improved sleep by providing additional melatonin.[15] A three-day trial at the same University, where 200 g Jert cherries were eaten twice a day as lunch and dinner desserts, also showed that cherry consumption helped to step up sleep quality. Benefits were seen in relation to sleep time and nocturnal activity whilst increases in 6-sulfatoxymelatonin urine levels were again seen. The antioxidant capacity of urine was also increased indicating that sweet cherries may help to counteract oxidation when sleeping as well as improving sleep quality.[11]

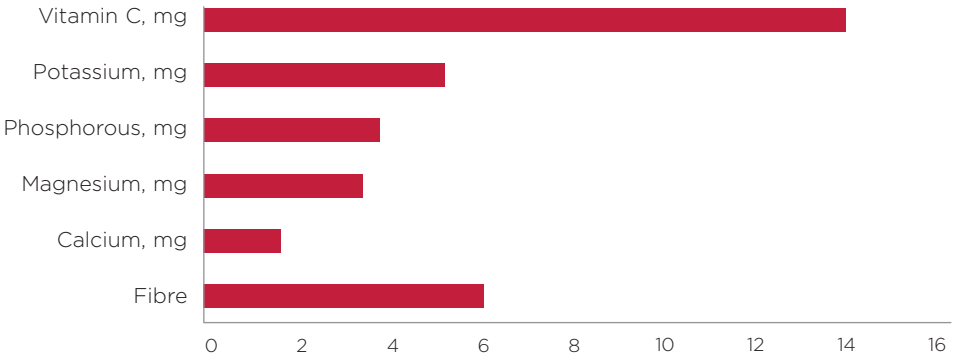
Two other studies have looked at aspects or mood, memory or cognition. Most recently, a 12-week trial found that 200 ml/day of cherry juice significantly improved verbal fluency, short-term memory and long-term memory, indicating that cherry anthocyanins could help to improve cognitive (brain health) outcomes in older adults with mild-to-moderate dementia.[10] Other work at the University of Extremadura, Spain, has shown that Jerte Valley cherries (200 g twice daily), renowned to be high in tryptophan, serotonin and melatonin, reduce urinary cortisol levels and increased 5-hydroxy-indoleacetic acid levels (the metabolite of serotonin), indicating that the consumption of these could reduce stress and anxiety and help to improve mood.[16] See **Table Two**.

Discussion

Previous reviews have focused on tart cherries and health, finding that these can reduce levels of inflammation and oxidative stress and have a possible role in exercise recovery.[17] Given current market growth and consumer demands, however, the present review has focused on 'sweet' cherries.

An assessment of the nutritional profile shows that sweet cherries are nutrient dense. A small 80 g portion (1 of 5-A-DAY) can provide a large dose of vitamin C and useful amounts of fibre, potassium, phosphorous, magnesium and calcium (**Figure 1**). Alongside this, sweet cherries also provide a range of important bioactive components including anthocyanins and melatonin.[7] It should, however, be considered that other factors such as UV concentration, degree of ripeness, postharvest storage conditions, and processing can also alter the amounts of nutrients and bioactive components.[18]

Figure 1: Theoretical Contribution of Sweet Cherries (80 g raw) to Daily Nutrient Recommendations



Key: DRV = Dietary Reference Value (PHE, 2016).

Table One: Nutritional Profile of Sweet Cherries and Other Popular Fruits (raw)

	Sweet cherries	Apple (eating)	Peach (yellow)	Pear	Plum
	Per 80 g portion				
Fibre (g)	1.7	1.9	1.2	2.5	1.1
Calcium (mg)	10	4.8	4.8	7.2	4.8
Magnesium (mg)	8.8	4.0	7.2	5.6	5.6
Phosphorous (mg)	20	10	16	9.6	13
Potassium (mg)	178	85.6	152	92.8	126
Vitamin C (mg)	5.6	3.7	5.3	3.4	6.0
Choline (mg)	4.8	2.7	4.9	4.1	1.5
Carotene, beta, (µg)	30	22	130	12	152.3
Lutein and zeaxanthin (mg)	68	23	73	35	58
Cyanidin (an anthocyanin) (mg)	24.1	4.5	1.1	1.5	1.3

Source: Data extracted and equated from the USDA database.

From the trials identified and evaluated it appears that sweet cherries could support health by reducing levels of inflammation and oxidative stress. These findings are also aligned with that reported in other recent publications.[7] Inflammation is ultimately a defence mechanism and part of the body's immune system. Examples of inflammatory conditions include: asthma, Crohn's disease, ulcerative colitis but other factors such as high-intensity exercise, suffering from a cold or a flu can also trigger inflammation.[18] So, it seems that sweet cherries help to reduce inflammation meaning that their consumption could be useful in these instances, but trials are needed to confirm this. In terms of potential mechanisms some recent research has found that pectin polysaccharides found within sweet cherries could be the key to some of these 'immune-enhancing' effects.[19]

Turning to sleep it appears that sweet cherry consumption could help to step up sleep quality with studies reporting improvements in sleep efficiency, reduced number of awakenings, nocturnal activity and actual sleep time.[15] Matthew Walker, a neuroscientist at the University of California has recently published his book *Why We Sleep*[20] which explains that if you're sleeping for less than seven hours a night you could be doing yourself a disservice as grave as that of smoking – good quality sleep is needed to help to body recuperate and preserve health. One pool of thought is that cherry fruits, due to their high melatonin content, could protect against oxidative processes that contribute to distorted sleeping patterns.[15] Jert cherries have also been found to be a good source of L-tryptophan[21] which could also have implications for sleep[15] as tryptophan is thought to induce 'sleepiness'[22] helping to doze off. Again, however, trials are needed to look at this specifically.

Finally, other work[10, 16] has shown that eating 200 g sweet cherries twice daily reduced cortisol and boosted levels of a urinary serotonin metabolite (5-hydroxyindoleacetic acid) indicating that stress levels were reduced whilst mood improved in middle-aged and elderly adults. So, it seems that sweet cherries could be useful for those suffering from stress and/or anxiety or poor mood although ongoing research is needed to reconfirm these emerging findings.

Conclusions

There are increasing demands for fresh and indeed sweet cherries. Whilst consumers appear to enjoy the sweet juicy taste of these fruits the benefits of sweet cherries appear to go beyond their taste. Sweet cherries can provide an array of nutrients and bioactive components – from vitamin C and fibre to anthocyanins with potent antioxidant capacities that may help to reduce inflammation and melatonin which could help to improve sleep quality. Ongoing trials are clearly needed, but cherries should not be overlooked as a valuable fruit to integrate within the daily diet.

Table Two: Key Publications

Author	Subjects	Focus	Intervention	Main findings
Kent *et al.* (2017)[10]	n=49	Memory and cognition	200 ml/day of cherry or control juice	The anthocyanin-rich beverage improved total anthocyanin consumption in older adults with mild-to-moderate dementia, potentially improving cognitive outcomes.
Kelley *et al.* (2013)[13]	n=18 adults	Inflammatory markers	Bing sweet cherries (280 g/d)	Cherry consumption reduced several biomarkers associated with inflammatory diseases.
Garrido *et al.* (2013)[15]	n=30	Sleep quality	Jerte Valley cherry-based product or placebo	The cherry-based product improved nocturnal rest, measured by sleep efficiency, number of awakenings, total nocturnal activity, sleep latency, assumed sleep, actual sleep time and immobility.
Garrido *et al.* (2012)[16]	NR	Mood	Jerte Valley cherry-based product or placebo	The Jerte Cherry product lessened anxiety in middle-aged and elderly participants and enhanced subjective mood parameters in young participants.
Garrido *et al.* (2010)[11]	n=12	Sleep quality, antioxidant profile	200 g PRUNUS AVIUM L. twice daily	Beneficial effects on actual sleep time, total nocturnal activity, assumed sleep, and immobility. Sig. increases in 6-sulfatoxymelatonin levels and total antioxidant capacity in urine.
Kelley *et al.* (2006)[14]	n=18 adults	Inflammatory markers	Bing sweet cherries (280 g/d)	Circulating concentrations of C-reactive protein and nitric oxide decreased.
Jacob *et al.* (2003)[12]	n=10 women	Inflammatory markers	Two servings (280 g) of cherries after an overnight fast	Plasma C-reactive protein and nitric oxide concentrations decreased 3 h post dose ($P < 0.1$), plasma ascorbic acid indicated that dehydroascorbic acid in fruits is bioavailable as vitamin C.

References: **1.** United States Department of Agriculture National Agricultural Library (2018). "Prunus avium". Germplasm Resources Information Network (GRIN). Accessed online: https://data.nal.usda.gov/dataset/germplasm-resources-information-network-grin (April 2018). **2.** Royal Horticultural Society (2018). Cherries. Accessed online: www.rhs.org.uk/advice/grow-your-own/fruit/cherries (April 2018). **3.** Transparency Market Research (2017). Fresh Cherries Market - Global Industry Analysis, Size, Share, Growth, Trends and Forecast 2017 – 2022. Accessed online: www.transparencymarketresearch.com/fresh-cherries-market.html (April 2018). **4.** McCune LM, et al. (2011). Cherries and health: a review. Crit Rev Food Sci Nutr.; 51(1): 1-12. **5.** Gonzalez-Gomez et al. (2010). Sweet cherry phytochemicals: Identification and characterization by HPLC-DAD/ESI-MS in six sweet-cherry cultivars grown in Valle del Jerte (Spain). Journal of Food Composition and Analysis; 23(6): 533-539. **6.** Kelley DS et al. (2018). A Review of the Health Benefits of Cherries. Nutrients; 10(3). pii: E368. **7.** McCune LM et al. (2011). Cherries and health: a review. Crit Rev Food Sci Nutr.; 51(1): 1-12. **8.** Zhao Y et al. (2013). Melatonin and its potential biological functions in the fruits of sweet cherry. J Pineal Res.; 55(1): 79-88. **9.** NHS (2018). Fruit and Vegetable Portion Sizes. Accessed online: www.nhs.uk/Livewell/5ADAY/Documents/Downloads/5ADAY_portion_guide.pdf (April 2018). **10.** Kent K, et al. (2017). Consumption of anthocyanin-rich cherry juice for 12 weeks improves memory and cognition in older adults with mild-to-moderate dementia. Eur J Nutr.; 56(1): 333-341. **11.** Garrido M et al. (2010). Jerte Valley cherry-enriched diets improve nocturnal rest and increase 6-sulfatoxymelatonin and total antioxidant capacity in the urine of middle-aged and elderly humans. J Gerontol A Biol Sci Med Sci.; 65(9): 909-914. **12.** Jacob RA, et al. (2003). Consumption of cherries lowers plasma urate in healthy women. J Nutr.; 133(6): 1826-1829. **13.** Kelley DS, et al. (2013). Sweet bing cherries lower circulating concentrations of markers for chronic inflammatory diseases in healthy humans. J Nutr.; 143(3): 340-344. **14.** Kelley DS, et al. (2006). Consumption of Bing sweet cherries lowers circulating concentrations of inflammation markers in healthy men and women. J Nutr.; 136(4): 981-986. **15.** Garrido M, et al. (2013). A Jerte valley cherry product provides beneficial effects on sleep quality. Influence on aging. J Nutr Health Aging; 17(6): 553-560. **16.** Garrido M, et al. (2012). The consumption of a Jerte Valley cherry product in humans enhances mood, and increases 5-hydroxyindoleacetic acid but reduces cortisol levels in urine. Exp Gerontol.; 47(8): 573-580. **17.** Vitale KC, et al. (2017). Tart Cherry Juice in Athletes: A Literature Review and Commentary. Curr Sports Med Rep.; 16(4): 230-239. **18.** Nordqvist C (2017). Everything you need to know about inflammation. Accessed online: www.medicalnewstoday.com/articles/248423.php (April 2018). **19.** Cao J, et al. (2018). Characteristics and immune-enhancing activity of pectic polysaccharides from sweet cherry (Prunus avium). Food Chem.; 254: 47-54. **20.** The Guardian (2017). Why We Sleep by Matthew Walker review – how more sleep can save your life. Accessed online: www.theguardian.com/books/2017/sep/21/why-we-sleep-by-matthew-walker-review (April 2018). **21.** Garrido M, et al. (2012). A jerte valley cherry-based product as a supply of tryptophan. Int J Tryptophan Res.; 5: 9-14. **22.** Hartmann E (1982-3). Effects of L-tryptophan on sleepiness and on sleep. J Psychiatr Res.; 17(2): 107-113.

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