Prunes from California

Prune Research

www.californiaprunes.co.uk
Digestive Health

Prunes are the only natural, whole fruit to achieve an authorised health claim in Europe: **Prunes contribute to normal bowel function when 100g are eaten daily.** EU register ‘condition of use of the claim’ states: *The claim may be used only for food which provides a daily intake of 100 g of dried plums (prunes). In order to bear the claim, information shall be given to the consumer that the beneficial effect is obtained with a daily intake of 100 g of dried plums (prunes).* This health claim was achieved following a six year application process by the California Prune Board. References outlined below include those papers used to support this submission.

There have been several randomised controlled studies exploring the role of prunes in digestive health, including most recently a study by Lever et al (2015) on 120 healthy adults, which showed a significant increase in stool weight compared to the control (300ml water) following a daily intake of 120g prunes and 300ml water for 4 weeks (see graph). Attaluri et al (2011) compared the effects of prunes (50g twice daily) with psyllium (11g twice daily), both containing 6g fibre per day, on common symptoms of constipation for 3 weeks with a 1 week wash out period. This cross over study of 40 subjects with chronic constipation, showed that prunes ‘were more effective than psyllium for the treatment of mild to moderate constipation and should be considered as a first line therapy.’ Other population groups that have been studied include elderly subjects (Sairanen 2007), postmenopausal women (Lucas 2004) and men with mild hypercholesterolemia (Tinker 1991).

Potential mechanisms that can explain how prunes may benefit digestive health are suggested to be multifactorial (Stacewicz-Sapuntzakis 2013; Lever 2014). Additional studies have investigated mechanisms and these include animal studies, which are starting to explore effects on the gut microbiome, and specific disease states such as colon cancer and IBS.

**Digestive Health References:**


Satiety

Fruit is generally regarded as satiating due to its lower energy content compared to other foods; and its fibre content. The form of the fruit may impact satiety, fruit juice for example has a lower fibre content than its fresh equivalent, and research has suggested that juice has a lower satiating effect than the whole fruit (Farajian 2010). Dried fruit is more energy dense due to the removal of water (energy and fibre content per individual fruit is similar however), and tends to be a source of fibre, so its effect on satiety may also differ.

Prunes have a low GI of 29 (Foster-Powell 2002) and high fibre content (7.1g/100g), and their role in satiety has been explored in several human studies including by the research team at Liverpool University (Harrold et al 2014), which investigated the effect of high dose prune intake in 100 overweight and obese adults as part of a weight management programme – see abstract below.

Furchner-Evansons (2010) compared the effects of snacks – prunes, low fat cookies, white bread, and water (used as a control) on satiety in 19 women. The fibre and sugar content of the snacks differed, but were matched for energy (238kcal), with similar carbohydrate, fat and protein content. Snacks were consumed on different days, and separated by at least one day. Satiety was assessed by hunger ratings for 2 hours following the snack, and then subjects consumed a meal until they were satisfied. The authors concluded that ‘consuming prunes as a snack suppresses hunger relative to a low-fat cookie as evidenced by lower glucose and/or satiety-regulating hormone concentrations’.

Other Satiety References:


Introduction
Consumption of dried fruit has been advised against during weight loss despite evidence it enhances satiety. This study examined whether (i) incorporating prunes into a weight loss intervention undermined weight control; (ii) low fibre consumers could tolerate the inclusion of prunes in their diet for a 12-week period, and (iii) prunes induced chronic beneficial changes in appetite.

Methods
100 overweight and obese low-fibre consumers (74F, 26M; age 43(SEM1.3) y; BMI 29.8 (SEM0.3) kg/m2) completed a randomised between-subjects study with two groups (intervention and active control) to assess the effects of prunes (140g/day F, 171g/day M) on weight and appetite in comparison to control (advice on healthy snacks) over a 12-week period of active weight loss.

Results
The study showed that taking prunes as part of a healthy life-style intervention produced significant changes in body weight (1.99kg/2.4%; p<0.000) and waist circumference (2.5cm/2.3%; p<0.000) from baseline. These were slightly greater than in the active control but did not reach statistical significance. Weight loss between the groups diverged during the last 4 weeks with a trend for greater weight loss in the prune group (p=0.07). Moreover, despite the high daily doses, prunes were well tolerated. These are the first data to demonstrate both effects. Enduring effects on appetite were also observed with AUC analysis demonstrating increased fullness in the prune group after week 8 (p=0.05).

Conclusion
This study clearly demonstrates no negative consequences of including prunes into weight control diets with some indication of benefit to long-term success. This may relate to chronic appetite effects.
Bone Health

A number of promising studies, both human and animal, have investigated the role of prunes in bone health. The most recent randomised controlled trial by Hooshmand et al (2016) monitored bone mineral density (BMD) in 48 osteopenic, postmenopausal women aged 65-79, who ate 0g (control), 50g or 100g prunes daily for 6 months. All subjects consumed a calcium and vitamin D supplement daily. Those receiving the supplements with the prunes fared better, showing a significantly higher total body bone mineral density than those who took the supplements with no prunes. This research builds on earlier work (Hooshmand 2011), which randomly assigned 160 postmenopausal women to two groups supplemented with 100g prunes or 75g apples (energy, carbohydrate, fat and fibre levels were similar), alongside calcium and vitamin D supplements daily. Following the year-long study, authors concluded that prunes improved ‘bone mass by slowing down the rate of bone turnover’.

Whilst research continues to explore the mechanisms by which prunes may benefit bone health, and whether it is specific nutrient components in the prunes, or the whole package that is important, we already know that prunes are high in vitamin K and a source of manganese, two nutrients that contribute to the maintenance of normal bones; and they are also high in potassium, which contributes to normal muscle function.

Schreurs et al (2016) explores the bone-preserving role of prunes specific to radiation exposure, such as astronauts in space, and those receiving radiation therapy as part of treatment for cancer. Researchers from the Universities of California, Irvine and Texas looked at the effect of various antioxidant or anti-inflammatory interventions (including California Prune powder and a control) on mice that received radiation. Researchers observed that the California Prune powder was the most effective in reducing undesired bone marrow cells’ responses to radiation compared to the other interventions. Additionally, they observed that mice on the prune diet did not exhibit decrements (bone volume loss) after exposure to radiation in any of the structural parameters measured. See abstract below for more details.

Another animal study (Shahnazari 2016) also showed improvements in bone health in both young growing and adult mice following two separate experiments: 1): adult mice (6 months old) were fed a diet containing 25% prunes for 1, 2 or 4 weeks; and 2): growing mice (1 and 2 months old) were fed diets containing 5%, 15% or 25% prunes for 4 weeks. The authors converted the 25% diet to be equivalent to a daily intake of 20 prunes in adults and stated that ‘consumption of four prunes/day may be expected to have beneficial effects on bone in children’.


Bone loss caused by ionizing radiation is a potential health concern for radiotherapy patients, radiation workers and astronauts. In animal studies, exposure to ionizing radiation increases oxidative damage in skeletal tissues, and results in an imbalance in bone remodeling initiated by increased bone-resorbing osteoclasts. Therefore, we evaluated various candidate interventions with antioxidant or anti-inflammatory activities (antioxidant cocktail, dihydrolipoic acid, ibuprofen, dried plum) both for their ability to blunt the expression of resorption-related genes in marrow cells after irradiation with either gamma rays (photons, 2 Gy) or simulated space radiation (protons and heavy ions, 1 Gy) and to prevent bone loss. Dried plum was most effective in reducing the expression of genes related to bone resorption (Nfe2l2, Rankl, Mcp1, Opg, TNF-α) and also preventing later cancellous bone decrements caused by irradiation with either photons or heavy ions. Thus, dietary supplementation with DP may prevent the skeletal effects of radiation exposures either in space or on Earth.

Other Bone Health References:

Other Bone Health References:


Dental Health

Dried fruit intake is sometimes recommended to be restricted by dental health professionals to meal times only. The review by Sadler (2016) published in the International Journal of Food Sciences and Nutrition, explores the research around the role of dried fruit, including prunes, and dental health, and the scientific grounds from which the recommendations have been based. Oral health is a complex issue and this literature review shows a lack of consistent data such that more research is needed to ensure evidence-based practice.

Dental HealthReferences:
Review
The following review explores the potential health effects of prunes, this updates the original review by Stacewicz-Sapuntzakis published in 2001.


Abstract
This paper describes composition of dried plums and their products (prune juice and dried plum powder) with special attention to possibly bioactive compounds. Dried plums contain significant amounts of sorbitol, quinic acid, chlorogenic acids, vitamin K1, boron, copper, and potassium. Synergistic action of these and other compounds, which are also present in dried plums in less conspicuous amounts, may have beneficial health effects when dried plums are regularly consumed. Snacking on dried plums may increase satiety and reduce the subsequent intake of food, helping to control obesity, diabetes, and related cardiovascular diseases. Despite their sweet taste, dried plums do not cause large postprandial rise in blood glucose and insulin. Direct effects in the gastrointestinal tract include prevention of constipation and possibly colon cancer. The characteristic phenolic compounds and their metabolites may also act as antibacterial agents in both gastrointestinal and urinary tracts. The indirect salutary effects on bone turnover are supported by numerous laboratory studies with animals and cell cultures. Further investigation of phenolic compounds in dried plums, particularly of high molecular weight polymers, their metabolism and biological actions, alone and in synergy with other dried plum constituents, is necessary to elucidate the observed health effects and to indicate other benefits.

Other Prune Reviews:
Other Prune Research

Research exploring the various ways that prunes may benefit health now spans a wide range of both human and animal studies, as well as in vitro research. These include exploratory work on anti-cancer, anti-inflammatory and antioxidant properties, in particular Hooshmand et al 2015 tested the anti-inflammatory and anti-oxidative properties of prune polyphenols in macrophage cells, as outlined in the abstract below.


Abstract

This study presents the anti-inflammatory and antioxidative properties of dried plum (Prunus domestica L.) polyphenols in macrophage RAW 264.7 cells. We hypothesized that dried plum polyphenols have strong anti-inflammatory and antioxidant properties against lipopolysaccharide (LPS)-induced production of the pro-inflammatory markers, nitric oxide (NO) and cyclooxygenase-2 (COX-2), and the lipid peroxidation product, malondialdehyde, in activated macrophage RAW 264.7 cells. To test this hypothesis, macrophage RAW 264.7 cells were stimulated with either 1 μg ml(-1) (for measurement of NO production) or 1 ng ml(-1) (for measurement of COX-2 expression) of LPS to induce inflammation and were treated with different doses of dried plum polyphenols (0.0, 0.1, 1, 10, 100 and 1000 μg ml(-1)). Dried plum polyphenols at a dose of 1000 μg ml(-1) was able to significantly (P < 0.05) reduce NO production by 43%. Additionally, LPS-induced expression of COX-2 was significantly (P < 0.05) reduced by 100 and 1000 μg ml(-1) dried plum polyphenols. To investigate the antioxidant activity of dried plum polyphenols, macrophage RAW 264.7 cells were stimulated with 100 μg ml(-1) of FeSO4 + 1 mM ml(-1) of H2O2 to induce lipid peroxidation. Dried plum polyphenols at a dose of 1000 μg ml(-1) showed a 32% reduction in malondialdehyde production. These findings indicate that dried plum polyphenols are potent anti-inflammatory and antioxidative agents in vitro.

Other Prune Research References:

Bowen. Role of Commodity Boards in Advancing the Understanding of the Health Benefits of Whole Foods: California Dried Plums. Nutrition Today. Accepted for publication.


Zawilski (2015) Dried plums promote increased antioxidant capacity in smokers and nonsmokers. FASEB. 29; 922.15.


