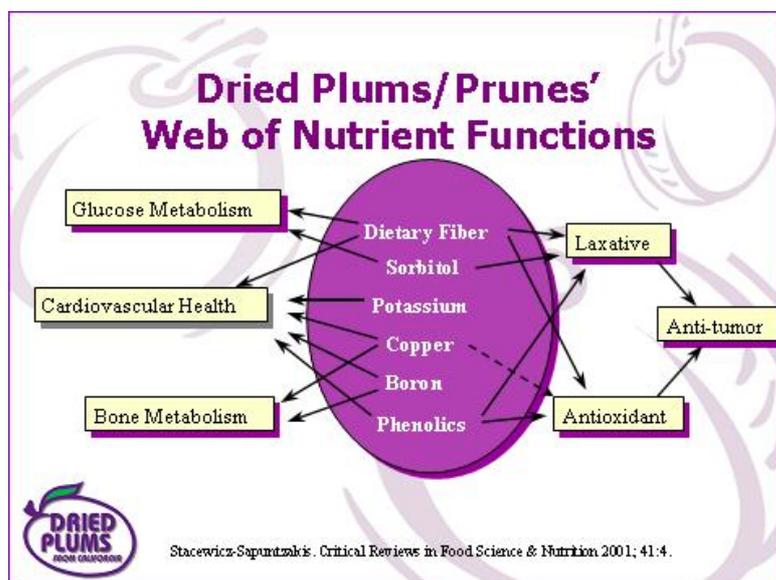


## California Prune Board Nutrition Research Update

### Prune Nutrient Composition

- One-fourth cup of prunes (about 5 or 40 grams) is a serving in the U.S for labeling. This amount (40 g) is the basis for nutrient content claims and health messages.
- A serving (5 prunes) has about 3 grams of dietary fiber. Prunes are a 'good' source (10% of the recommended label value) of dietary fiber; and provide both soluble and insoluble fiber.
- Carbohydrates in prunes include the naturally occurring sugars glucose and fructose.
  - Prunes contain no sucrose, a sugar that can be fermented by bacteria in the mouth and contribute to dental caries. Prunes contain the non-fermentable sugar alcohol, sorbitol.
  - Fructose and sorbitol raise blood sugar levels slowly. Together with dietary fiber, these carbohydrates contribute to prunes' low glycemic index.
- Prunes score high in total antioxidant capacity.
- Prunes have vitamin K and boron – nutrients important for bone health.
- Prunes have potassium – important for heart health and for offsetting the effects of sodium on blood pressure.
- Prunes as a fruit contain no cholesterol; and are low in sodium, fat, and contain no *Trans* fatty acids.
- Prunes contain a number of plant compounds (phytochemicals) including phenolic compounds, which act as antioxidants.

### Prunes' Web of Nutrient Functions



Prunes are a source of dietary fiber, sorbitol, potassium, copper, boron and phenolic compounds which form a web of interrelated health promoting functions. Together these compounds help regulate glucose metabolism, promote cardiovascular health, are involved in bone metabolism, protect against cancer, and contribute to digestion<sup>1</sup>.

## Benefits of Prunes – Summary of Research

Prunes.....

- Promote health in general by providing a variety of nutrients, including fiber and potassium.
- Provide needed energy from carbohydrate.
  - College recreational athletes who ate prunes, a banana or energy bar 30 minutes before a 3 mile run reported no gastrointestinal discomfort. They also reported that prunes increased perceived energy levels as much as the other snacks<sup>ii</sup>.
- Promote digestive health
  - Although prunes and prune juice have been traditionally used for the treatment of constipation, their use has not been systematically studied.
  - Research is investigating whether prunes offer a natural, food based, convenient and tastier alternative to over-the-counter laxatives and fiber supplements (Satish Rao, MD, PhD, University of Iowa. Study completed; data analysis to be completed by December 2009).
    - Participants ate prunes (50 g twice a day) for 3 weeks and then switched to a popular laxative/fiber supplement (Metamucil 1 tbls twice a day) for 3 weeks. These amounts provided a total of about 6 g fiber.
    - More subjects reported relief of constipation symptoms while on prunes compared to Metamucil
    - There were no significant differences in palatability and tolerability between prunes and Metamucil.
- Promote bone health
  - In female and male animal models of hormone deficiency related osteoporosis, prunes have positive effects on bone and bone biomarkers. Animal data indicate that prunes can protect from and reverse bone loss.<sup>iii,iv,v,vi</sup>
  - In a small pilot study with postmenopausal women, prunes (100 g or about 10-12) improved biomarkers of bone turnover<sup>vii</sup>.
  - Research is underway to see if prunes (100 g daily) can improve bone density in post-menopausal women (Bahram Arjmandi PhD, RD, Florida State University. Study is completed; data analysis ongoing through 2009).
  - Prunes' role in supporting bone health may be due to several factors. Prunes are rich in phenolic compounds which may inhibit bone resorption and stimulate bone formation as well as function as antioxidants<sup>iii,vi</sup>. Prunes are also a good source of nutrients reported to influence bone health, including boron, potassium and vitamin K<sup>i</sup>.
  - Previous studies on the role of prunes and bone health have been in models of hormone deficiency. A current study is looking at the role of prunes in the normal loss of bone during aging (Bernard Halloran, PhD, University of California, San Francisco; study began early 2009; preliminary results within 6-8 months).
- Promote dental health
  - Dried fruit often is perceived as causing dental decay (cavities) because it is 'sticky.' However, some research indicates no relationship between stickiness and retention of foods on teeth. The carbohydrate and phytochemical content of the food needs to be considered.

- Plaque bacteria primarily use sucrose to produce acids that lead to the demineralization of the tooth surface, and decay. The main sugars in prunes are fructose and glucose, not sucrose
- Preliminary results from a pilot study indicate that, compared to sucrose, prunes do not lower plaque acidity to the level that could promote demineralization and decay. Prunes returned participants' plaque pH to a more desirable level compared to cookies, grapes, and banana chips (Christine Wu, PhD., University of Illinois, Chicago. Study completed; manuscript being prepared).
- Reduce the risk of heart disease
  - Prunes contain pectin, a fiber that can help lower cholesterol.
  - Previous studies in mice and in men with high levels of cholesterol suggest that prunes or prune fiber can lower cholesterol.
  - Animal studies show that the equivalent of eating 10-12 (100 g) prunes per day, can reduce atherosclerotic lesions in a strain of mice that develop atherosclerosis similar to heart disease in humans<sup>viii</sup>. Prunes reduced the amount of atherosclerotic lesion without a change in cholesterol levels. This suggests that prunes plums may lower the risk of the development of heart disease by affecting the disease process – not just by lowering cholesterol.
- Help manage hunger (satiety)
  - Snacking may help control body weight by controlling hunger, and promote health by improving nutrient intake.
  - Prunes provide carbohydrates, fiber and sorbitol; and have a low glycemic index. As a snack, prunes may be helpful in managing hunger and decreasing subsequent food intake, thereby promoting a desirable body weight.
  - Women eating 100 kcal servings of either prunes or low fat cookies twice daily for two weeks saw no changes in body weight; but had improved intake of fiber, potassium, riboflavin, niacin and calcium; lower fat and cholesterol intake; and lower plasma triglycerides<sup>ix</sup>. Prunes had a higher satiety index than the low fat cookie.

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<sup>i</sup>Stacewicz-Sapuntzakis M et al. Chemical composition and potential health effects of prunes: A functional food? *Critical Reviews in Food Science and Nutrition*. 2001; 41:4.

<sup>ii</sup> Clark, Kristine. *Runners World*, October 2003.

<sup>iii</sup> Reviewed in Hooshmand S and Arjmandi BH. Viewpoint: Dried plum, an emerging functional food that may effectively improve bone health. *Ageing Research Reviews*. 8:122-127, 2009.

<sup>iv</sup> Deyhim F, Stoecker BJ, Brusewitz GH et al. Dried plum reverses bone loss in an osteopenic rat model of osteoporosis. *Menopause*. 12:755-762, 2005.

<sup>v</sup> Arjmandi BH, Lucas EA, Juma S, et al. Dried plums prevent ovariectomy-induced bone loss in rats. *J Am Nutraceutical Assn*, 4:50-56, 2001.

<sup>vi</sup> Bu SY, Hunt TS, Smith BJ. Dried plum polyphenols attenuate the detrimental effects of TNF-alpha on osteoblast function coincident with up-regulation of Runx2, Osterix and IGF-I. *J Nutr Biochem*. 2008.

<sup>vii</sup> Arjmandi, BE, Khalil DA et al. Dried plums improve indices of bone formation in postmenopausal women. *Journal of Women's Health & Gender-based Medicine*. 2002; 11:61-68.

<sup>viii</sup> Gallaher CM and Gallaher DD. Dried plums (prunes) reduce atherosclerosis lesion area in apolipoprotein E-deficient mice. *Br J Nutr*, 101:233-239, 2009

<sup>ix</sup> Howarth LS, Petrisko Y, Furchner-Evanson A, et al. Snack selection influences nutrient intake, metabolism and bowel habits in adult women. 2009 Experimental Biology meeting abstracts, Abstract #545.9.