

California Dried Plum Board

Technical Bulletin

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California Dried Plums Offer Bakers Innovative Solutions to Control and Reduce Fat, Calories, Sugar and Carbohydrates While Extending Shelf Life

California Dried Plums' Natural Components

What makes California dried plums so effective as a bakery ingredient? Naturally occurring components:

- 7.5% fiber that attracts moisture in baked goods
- 15% sorbitol that holds moisture in baked goods and extends shelf-life
- Reducing sugars such as glucose and fructose that also contribute moisture retention and sweetness
- 1.5% malic acid that potentiates flavors, particularly in fat-reduced baked goods, and also inhibits mold development thus extending shelf-life

SUGAR COMPOSITION OF CALIFORNIA PRUNE PLUMS, DRIED PRUNES AND PRUNE JUICE (g/100 g)

<u>Sample</u>	<u>Glucose</u>	<u>Fructose</u>	<u>Sucrose</u>	<u>Sorbitol</u>	<u>Total</u>
Fresh Prune Plum	3.1	3.3	4.4	2.7	13.5
Dried Plums	23.4	16.0	ND	15.0	54.4
Prune Juice Concentrate (64° Brix)	30.6	14.5	0.7	17.8	63.6

ND: Non Detected

Source: Stacewicz-Sapuntzakis M. et al, Chemical Composition and Potential Health Effects of Prunes: A Functional Food? *Critical Reviews in Food Science and Nutrition* 41(4): 251-286 (2001), and, California Dried Plum Board

California Dried Plums Retain Moisture in Baked Goods

Dried plums are an effective bakery humectant. This is due to the unique combination of fiber (half of which is soluble), sorbitol and reducing sugars glucose and fructose that retain and then hold moisture.

California dried plums are unique among natural humectants due to the presence of this high level of naturally occurring sorbitol. As a result, dried plums can be effectively used in place of sorbitol or other sugar alcohols while maintaining a "natural" formulation. While sorbitol is an effective humectant, it is only 60% as sweet as sucrose. As the sorbitol in dried plums is not readily fermentable, unlike honey or high fructose corn syrup, it remains largely as a humectant in yeast-leavened baked goods.

A common criticism of dual-textured cookies is the excessive sweetness of the soft inner portion. Honey, raisin juice concentrate, invert sugar and high conversion corn syrups all rely upon their sweet reducing sugar content to lower water activity. California dried plums, however, can be used at higher levels to produce a chewy texture and low water activity while maintaining the desired sweetness.

California Dried Plums Increase Shelf Life

California dried plum purees, powders and juice concentrates provide a natural solution to maintaining moisture and inhibiting mold development in baked goods. Dried plum powders can be easily incorporated into dry bakery mix systems using a simple all-purpose formula with endless possibilities for creative customization.

Prune juice concentrate appears to inhibit mold growth at 9.0 and 12.0% usage levels. At 9.0% addition, an additional 3 days of mold-free shelf life has been achieved, beyond that of a sucrose control. At 12.0% usage, this increased to 4-1/2 days, equal to the effect of calcium propionate. Of course, usage levels will depend on the specific formula and process in new product development. For typical yeast fresh baked goods, a starting usage level of 9.0% seems appropriate for mold inhibition purposes. (*Sanders, S, Prunes in Bakery Products, A.I.B. Technical Bulletin 12(3) 1990*).

California dried plums are unique in their naturally high sorbitol content. Sorbitol is an effective humectant, and thus helps to keep bakery products soft and moist over an extended shelf life. The reducing sugars, fructose and glucose work with sorbitol to provide further humectancy.

California Dried Plums Reduce Fat

Bakers use shortening for several reasons. Among the most important are air entrapment during the sugar/shortening or "creaming" stages and the maintenance of a tender and moist texture in the finished product. **California dried plums contain a unique blend of both soluble and insoluble fibers** that help to form a stable film around air and leavening gas during mixing and bench time to function in a manner similar to shortening.

California dried plums also contain a **high level of naturally occurring sorbitol**. Sorbitol is one of the most effective humectants known and thus helps to keep the finished product soft and moist over an extended shelf life.

Fat is a principal carrier of flavor in baked goods. Fat coats the inside of the mouth to maximize the flavor delivery of baked goods. **Dried plums contain malic acid that has been shown to be an effective flavor enhancer**. Malic acid is released more slowly than other organic acids and therefore has a greater flavor carry-through during the chewing process. Additionally, malic acid helps to inhibit microbial spoilage and can also serve as the natural acid component in chemical leavening systems.

Thus, it is possible to replace a portion of the butter, shortening or oil in bakery formulas using dried plums with little if any noticeable change in the sensory characteristics of the end product. With proper fine-tuning, reduced-fat baked goods containing dried plums are actually preferred to full-fat alternatives.

California Dried Plums Reduce Calories

California dried plums contain 2.57 calories per gram. Shortening, on-the-other-hand, contains 8.84 calories per gram. **Replacing all or a portion of the shortening in a bakery formula not only reduces the fat content of the finished baked good but the calories** as well.

For example, if 100% of the shortening in a bakery formula is replaced with dried plum puree, the calories are reduced by 85%. If 50% of the shortening is replaced with dried plum puree, the calories are reduced by 43%. This calorie replacement is possible due to dried plums' high sugar content.

Not only are calories reduced but dried plums can also help to reduce sodium levels by as much as 99% if all of the shortening is substituted with dried plum puree and 50% if half the shortening is substituted with dried plum puree.

Still further, important nutrients such as iron and potassium are added when dried plum puree is used to replace shortening. For bakers seeking natural ingredients to satisfy consumer demand for nutritionally enhanced bakery products without any loss of flavor and other sensory characteristics, dried plums are a perfect solution.

Carbohydrate Control...Low Glycemic Response

California dried plums contain about 62.7% carbohydrates per 100 grams. Consequently, when designing nutritionally improved confections, dried plums become a natural consideration. However, the sugars in dried plums do not elevate blood sugar levels rapidly and their glycemic response or index (GI) is in the low range, i.e., 29 +/-4 (*Classification proposed by Dr. J. Brand-Miller--high>70, intermediate 56-69, low <55*). The reasons for this low glycemic index are due to the variation in sugar profiles and fiber content of dried plums.

The Glycemic Index (GI) measures how fast food is likely to raise blood sugar and can be helpful for those who are monitoring their blood sugar level. Per gram of carbohydrate, foods with a high glycemic index produce a higher peak in postprandial blood glucose and a greater overall blood glucose response during the first two hours after consumption than do foods with a low GI.

Both the quantity and quality of carbohydrate influence the glycemic response. By definition, the GI compares equal quantities of carbohydrate and provides a measure of carbohydrate quality but not quantity. In 1997 the concept of Glycemic Load (GL) was introduced to quantify the overall glycemic effect of a portion of food.^{1,2,3} Thus, the GL of a typical serving of food is the product of the amount of available carbohydrate in that serving and the GI of the food. The higher the GL, the greater the expected elevation in blood glucose and in the insulinogenic effect of the food.

California dried plums have a Glycemic Index (GI) of 29 (+/-4) and a Glycemic Load of 10 based on a 60g serving size.

GLYCEMIC INDEX/LOAD OF CALIFORNIA DRIED PLUMS AND SELECTED FRUIT (60g Serving)

<u>Fruit</u>	<u>GI</u>	<u>GL</u>
Fresh apples*	36	6
Bananas*	52	12
Oranges*	42	5
California Dried plums	29	10
Dried apples	29	10
Apricots	30	8
Dates	103	42
Figs	61	16
Raisins	56	25

* 120g serving size

Foster-Powell K, Holt SHA, Brand-Miller JC, *International table of glycemic index and glycemic load values: 2002. Am J Clin Nutr*; 76-5

Reduced Carb Oatmeal Cookie

Ingredients	(%)
All Purpose Flour-Bleached	28.75
Maltitol Syrup-92%	19.70
Maltitol Syrup-72%	15.02
Quick Oats	11.27
All Purpose Vegetable Shortening	10.52
Dried Plum Powder	7.27
Almond Powder	2.91
Water	1.85
Baking Soda	0.47
Granulated Salt	0.47
Whey Protein Concentrate-80%	0.47
Whole Dried Eggs	0.47
Lecithin	0.47
Cinnamon	0.28
Vanilla Extract	0.08
Total	100.00

Procedure:

1. Preheat oven to 350°F.
2. Blend vegetable shortening, maltitol, baking soda, salt, whey protein concentrate, eggs, cinnamon, dried plum powder, vanilla, almond powder, and lecithin together in a mixer until well mixed (about 3 minutes on high speed). Scrape bowl.
3. Blend in water and oats while continuing to mix (1 minute on low).
4. Add flour slowly to mixture on low speed. Blend 2 minutes then scrape bowl.
5. Blend for 1 minute on low speed.
6. Deposit about a 15 g/cookie onto a parchment-lined cookie sheet about 2 inches apart.
7. Bake for about 12 minutes or until browned.
8. Remove from sheet and cool on wire rack.

Oatmeal Cookie Nutrition Facts		
Serving size	28g	
Calories	110	
Calories from fat	35	
		% Daily Value
Total fat	4g	6%
Saturated fat	1g	4%
Cholesterol	0mg	0%
Sodium	90mg	4%
Total Carbohydrate	20g	7%
Dietary fiber	<1g	3%
Sugars	0g	
Sugar alcohol	10g	
Protein	2g	
Source: California Dried Plum Board		

Reduced Carb Cranberry Orange Bran Muffin

INGREDIENTS	(%)
Water	23.29
Maltitol Syrup	22.87
Flour, all-purpose	13.76
Eggs	8.04
Vegetable Shortening	6.77
Dried Plum Powder	6.60
Cranberry Pieces	5.59
Crude Wheat Bran	2.91
Oat Fiber, 500	2.75
WPC-80	2.54
Baking Powder	1.38
Oat Fiber, 780	1.38
Orange Peel	1.17
Inulin	0.53
Salt	0.32
Xanthan Gum	0.09
Sucralose	0.01
TOTAL	100.00%

Procedure:

1. Measure out dried plum powder and wheat bran into a bowl. Add half of the formula water. Mix and set aside
2. Mix all remaining dry ingredients except oat fibers (flour, WPC-80, inulin, xanthan gum, salt, baking powder and sucralose) in a second bowl and set aside.
3. Cream sugar alcohol and shortening in a Kitchen Aid mixer on highest speed for 4 minutes. Stop and scrape bowl twice during this time.
4. Add eggs slowly to the maltitol/shortening mixture, while beating on low speed. Scrape bowl twice.
5. Mix in plum/bran mixture on low speed, just until combined.
6. Fold in half of the flour mixture, stir in remaining water, then the remainder of the flour mixture, then the oat fibers, mixing just until combined.
7. Add cranberry pieces and orange peel and gently mix.
8. Place 55g batter in each muffin cup.
9. Bake at 400° F for 15 minutes.

Cranberry Orange Bran Muffin Nutrition Facts

Serving size	55g	
Calories	140	
Calories from fat	45	
		% Daily Value
Total fat	5g	8%
Saturated fat	1.5g	7%
Cholesterol	20mg	7%
Sodium	160mg	7%
Total Carbohydrate	29g	10%
Dietary fiber	4g	6%
Sugars	3g	
Sugar alcohol	14g	
Protein	3g	
Source: California Dried Plum Board		

- (1) Salmeron J, Ascherio A, Rimm E, et al. Dietary fiber, glycemic load, and risk of NIDDM in men. *Diabetes Care* 1997;20:545-50
- (2) Salmeron J, Manson J, Stampfer M, Colditz G, Wing A, Willett W, Dietary fiber, glycemic load and risk of non-insulin-dependent diabetes mellitus in women, *JAMA* 1997;277:472-7
- (3) Liu S, Willett W, Stampfer M, et al. A prospective study of dietary glycemic load, carbohydrate intake, and risk of coronary heart disease in US women. *Am J Clin Nutr* 2000;71:1455-61

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