

# Using Prune Juice Concentrate in Whole Wheat Bread and Other Bakery Products

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Prune juice is a familiar sight on grocery shelves but until recently it has not been used widely in concentrated form as a food ingredient. Successful applications of the concentrate have included a range of bakery products (1) as well as dairy and snack foods and some beverages (2). In many cases, the properties derived from prunes are used to replace other additives. It has been theorized that prune juice might inhibit mold development in bakery products due to its high malic acid content as well as traces of benzoic and salicylic acids (1,2). In addition, the concentrate has been used as a natural sweetener, colorant, and humectant.

Since prune juice has traditionally been considered by consumers to be a healthful and natural food, the ongoing trend toward a more healthful diet and lifestyle should continue to stimulate increased use of prune products in the coming decade.

Although the nutritional properties of prunes are widely recognized, little work has actually been performed to elucidate their functional properties in bakery products. In this article, we discuss the results of laboratory tests to examine and quantify prune juice concentrate baking qualities, mold-inhibiting properties, and effects on final product quality of yeast-leavened baked goods, as well as suggestions as to how these properties might be used in development of new products.

Prune juice concentrate is a standardized product made by concentrating a water extract of dried prunes to 70 Brix. It has a natural dark brown color. Unlike many other fruit juice concentrates, it does not require refrigeration and is free from sulfites and other artificial preservatives.

## **Prune Juice Concentrate**

Table 1 shows the composition of typical prune juice concentrate. The sucrose, fructose, and dextrose are readily available as fermentable sugars in yeast-leavened doughs. Unique in fruit juices is the high level of sorbitol found in prune juice concentrate. While sorbitol is reported to be 60% as sweet as sucrose, it is not fer in yeast dough's. It has been used to improve keeping properties of military canned bread (3). Prune juice concentrate can provide a natural means by which sorbitol can be introduced into products to improve sweetness, humectancy, and lower water activity. Medically, sorbitol has been used as a cathartic and as a sugar substitute, for diabetics (4). It is also a common ingredient in sugar-free, non carcinogenic gums and candies. The high potassium and low sodium content in prunes favors its use in products designed for individuals who are taking diuretics to manage their elevated blood pressure.

## **Use In Whole Wheat Bread**

A basic 100% whole wheat bread formula (Table II) was used to evaluate the effect of prune juice concentrate on mold growth, baking properties, and finished product attributes. Prune and raisin juice concentrates were evaluated at 6.0, 9.0, and 12.0% of the flour against a no-additive control and 0.125% calcium propionate, with total sugar and water contents held constant to a; that any effects seen were not due simply to variation in these components of the finished product. Following a two-hour cooling period to allow adequate mold spore contamination, the noticed loaves were packaged in 1.25-mil poly bags, held at ambient temperature and humidity, and observed daily for visible mold growth. A second set of loaves was used to evaluate crumb and crust character, loaf volume, flavor, texture, and toasting properties.

**Table I. Typical Composition of Prune Juice Concentrate**

Component	Amount
Soluble solids(min°Brix by refractometer)	70
Fructose, %	16
Glucose,%	24
Sorbitol	14
Sucrose, %	0.5
Total carbohydrates, %	65-68
Protein, %	1.5-2.5
Ash, %	1.5-2.4
Total dietary fibet, %	0.05-0.1
Sodium, ntgf 100 g	20-40
Potassium, mg 100 g	800-1.000
Calcium, mg/100 g	25-40
Iron, mg/100 g	2-4
Organic acids, %	
Malic	1.0
Oxalic	0.5
Glutaric	0.02
Citric	0.01

**Table II. Control Formula and Method for the Evaluation of Prune Juice Concentrate In Whole Wheat Bread**

Ingredient	Amount, % of flour
Whole wheat flour	100.0
Water	65.6
Wheat gluten	2.0
Yeast (compressed)	5.0
Mineral yeast food,	0.5
Soy Oil	2.5
Sugar (granulated)	8.0
Ascorbic acid	0.015

Procedure: Mix so full development, allow 20-rein fermentation time, scale 430 g for 32-inch pan, bench rest for 10 min, mold, pan. and proof to 3/4 in. above pan lip, bake for 22 min. at 390 F (199°C), cool for 2 hr prior to bagging.

### Mold-Inhibiting Properties

As revealed in Table III, prune juice concentrate appeared to inhibit mold growth at 9.0 and 12.0% usage levels. At 9.0% addition, additional 3 days of mold-free shelf life resulted, beyond that of the sucrose control. At 12.0% usage, this increased to 4-1/2 day, equal to the effect of calcium propionate. Of course. actual 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% would seem appropriate for mold inhibition purposes. however, (fruit juice concentrates also provide other functions of importance to food processors.

**Table III. Effect of Fruit Concentrates on Mold Inhibition and Loaf Volume of Whole Wheat Bread**

% Prune or Raisin Juice Concentrate	Sucrose %	Loaf Volume. Cm	Average Days until Molding
None (Control. Table II)	8.0	1,975	10.0
6% Prune	4.73	2,000	10.0
6% Raisin	4.10	2,000	10.0
9% Prune	3.1	2,000	13.5
9% Raisin	2.15	2,000	12.5
12% Prune	1.46	2,000	14.5
12 % Raisin	0.2	2,025	14.0
None (0.0125% Calcium Propionate)	8.0	1,950	14.5

## Finished Product Attributes

**Flavor:** Whole grain breads, including 100% whole wheat, tend to have a bitter grainy aftertaste which is reduced by either prune or raisin juice concentrate. Even when used at 12.0%, neither juice imparted a characteristic prune or raisin flavor to the product. The property of “rounding out” the flavor of baked products may make these fruit juice concentrates useful in the development of sodium-reduced breads.

**Crumb and Crust Color:** Both prune and raisin juice concentrates imparted both a darker crumb color and a shinier, slightly darker color than is observed in loaves baked with sucrose alone. Elimination of artificial color such as caramel and/or replacement of the often-used bitter dark molasses could result.

**Softness:** With increasing levels of fruit juice concentrate, loaves seemed subjectively softer, more moist, and less crumbly than with sucrose only. No difference was observed between prune and raisin juice in these respects. Product developers may wish to evaluate this property in terms of eliminating or reducing the levels of emulsifiers such as mono- and diglycerides that might otherwise be used.

**Toasting Properties:** At all levels tested, both juice concentrates produced loaves that browned during toasting slightly more than the control. This is likely due to a slightly higher residual reducing sugar content in the juice concentrate than in the sucrose-only products, despite the equalization of total sugar referred to earlier.

## Baking Properties

**Loaf Volume:** As shown in Table I both prune and raisin juice loaves consistently had slightly higher volume than those with sucrose only or with calcium propionate. Variety breads containing high levels of whole grains and fiber generally require the use of added wheat gluten and dough-strengthening emulsifiers such as sodium stearoyl lactate or ethoxylated monoglycerides. The use of prune juice concentrate as a natural dough strengthener might reduce the requirements for such additives.

**Mixing Time:** Prune juice concentrate at the 12.0% level caused a slight reduction in mixing time (0.5 min) not seen with raisin juice concentrate. This degree of reduction would not be a problem for the baker. No effect on mix time was seen at lower levels.

**Proof Times:** Prune juice concentrate at 9.0 and 12.0% resulted in a five-minute (8%) increase in proof time. If using prune juice concentrate at levels of 9.0% or above, bakers may wish to increase yeast levels slightly to maintain a uniform proof time.

## New Product Development

For purposes of product development, the important properties of prune juice concentrate discussed in the foregoing section may be summarized as follows: natural color (replacing caramel color and/or molasses), natural sweetener, natural preservative (replacing calcium propionate), dough strengthener (allowing reduced levels of dough conditioners), humectant, and flavor enhancer.

These properties of prune juice were utilized to produce a natural, high fiber English muffin (Table IV), with prune juice and diced prunes replacing refined sugar. No other preservatives, colors, or dough conditioners are required to produce a top quality product. As English muffins are generally required to have an extended shelf-life relative to pan bread, prune juice concentrate provided added moistness, softness and mold inhibition. As with whole wheat bread, the flavor of prunes helps to mask any bitter or grainy aftertaste associated with added fiber and whole grain cereals.

In a similar manner, prune juice concentrate was used to produce a moist, no-cholesterol bran muffin (Table V). The full complement of reducing sugars as well as the sorbitol of the prune juice is available to provide exceptional humectant properties. The result is an extended shelf-life muffin with excellent resistance to crumbling. The natural color provided by the juice concentrate complements the high fiber product image.

**Table IV Formula and Method for English Muffins with Added Fiber**

<b>Ingredient</b>	<b>Amount, lb</b>
Patent flour	70
Oats (steel cut)	10
Rolled oats (thick)	5
Rye flour	5
Rice bran (stabilized)	10
Water (variable)	83
Yeast (compressed)	8
Salt	1.75
Prune juice concentrate	12
Vegetable oil	1
Wheat gluten	3
Prunes (diced, 1/4 in.)	30
Protease tablets, per 100 lb Flour	1 Tablet

Procedure Presoak oats, rye, and rice bran for about 1 hr in 40 lb of the water, Add all other ingredients (except prunes) and mix to full development. Add prunes end mix another 1—3 min to fully incorporate Final dough temperature humid be 68—70°F (20 C). Scale 1, oz per 6 muffins, round, and dust with a suitable muffin coat ( corn flour/meal). Allow 7-10 min. for intermediate proofing prior to sheeting. Grill at approximately 3900 F (199° C) for 4.5 mitt, flip and grill at 350° F (177°C) for an additional 3.5 mitt. Times and temperature may vary according to particular oven conditions.

**Table V. Formula and Method Moist Bran Muffins for Super Moist Bran Muffins**

<b>Ingredient</b>	<b>Amount, lb</b>
Patent flour	100.0
Oat bran	40.0
Prune juice concentrate	40.0
Sugar (granulated)	95.0
Sodium aluminum phosphate	2.0
Baking soda	1.5
Salt	3.3
Cinnamon	1.6
Margarine	30.0
Vegetable oil	20.0
Egg white	30.0
Vanilla	To Taste
Water	85.0
Prunes (diced 1/4 in.)	60.0

Procedure Mix flour, oat bran, prune juice concentrate, sugar, sodium aluminum phosphate, baking soda, salt, cinnamon, margarine, and oil until well blended and the dough forms pea-sized lumps. Add egg white, vanilla, and water, and mix just until well incorporated. Add diced prunes and mix in on low speed just until evenly distributed. Dispense into greased or lined muffin cups, and bake at 380 (193-204°C) for 20-25 min depending on muffin size.

## Conclusion

Prune juice concentrate can serve as a natural preservative in yeast-leavened baked products. With its other attributes of natural color, dough strengthening, flavor enhancement, sweetening, and humectancy, it can be considered a multi-purpose natural food ingredient.

## References

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