

CALIFORNIA DRIED PLUM BOARD

Technical Bulletin

March 2010

Limit Added Salt in Formulas Naturally With Dried Plums

Abstract

Federal government pressure is mounting for consumers to reduce salt intake. Only about 25% of the salt in the U.S. diet comes directly from the kitchen table salt shaker. A large proportion of the salt in the modern diet is in processed foods. Sodium is one of the most important ingredients in food, and not just for imparting taste. It helps bind together various elements of meat and cheese; it acts as a component in leavening systems, helping make bread rise, for instance; and it serves as a food preservative.

Food processors including ConAgra, Kraft, Kellogg, Pepsico and Sara Lee are among many that have already initiated sodium reduction programs targeting 20-35% decreases. But the primary issue with sodium reduction is one of flavor, particularly if a revised formula is to achieve parity in taste with higher sodium alternatives.

Dried plum ingredients offer food processors opportunities to reduce the amount of added salt in formulations without negatively impacting formula flavor objectives while maximizing consumer flavor expectations. This salt reduction is largely due to dried plums' 1.5-2.0% naturally occurring malic acid.

Background

U.S. health agencies recommend that most adults limit their daily consumption of salt to less than 5.8 grams (2,300 milligrams [mg] of sodium), with 3.7 grams a day preferable. The American Heart Association urges the average American to eat less than 2,300 mg of sodium daily, but also notes that older people, blacks and people with high blood pressure need to go even lower -- to under 1,500 mg per day.

According to the authors of a study in the January 20, 2010 online edition of the *New England Journal of Medicine*, the projected reductions would be similar to the benefits accruing from a 50 percent drop in the smoking rate and a 5 percent decline in body mass index among obese adults.

Only about 25% of the salt in the U.S. diet comes directly from the kitchen table salt shaker. The New York City Health Department announced that it is spearheading the "National Salt Reduction Initiative," which aims for a 20% reduction in salt consumption over five years. The initiative is targeted primarily at restaurants and food manufacturers, which supply the majority of sodium in American diets. Recently FDA announced efforts to gradually reduce sodium in foods.

In the *New England Journal of Medicine* study the researchers, from the University of California, San Francisco, concluded if Americans cut even a mere 1 gram of salt from their meals and snacks every day, the effects would still be stunning, the authors stated: 20,000 to 40,000 fewer cases of coronary heart disease; 18,000 to 35,000 fewer heart attacks; 11,000 to 23,000 fewer strokes; and 15,000 to 32,000 fewer deaths. Given that so much sodium comes from processed food, the authors urged a public health initiative to curb consumption. (*Food Navigator* 1/27/10)

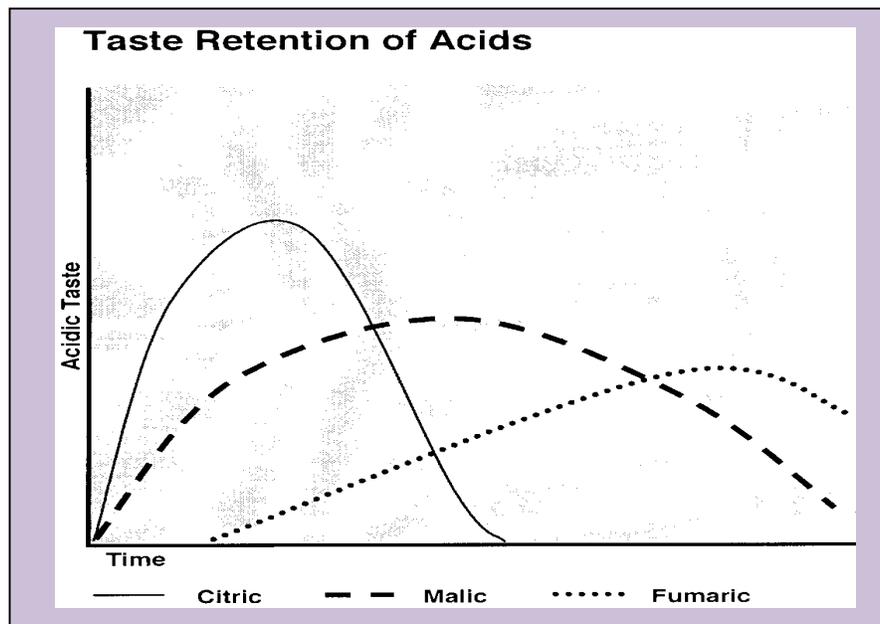
A large proportion of the salt in the modern diet is in processed foods. Sodium is one of the most important ingredients in food, and not just for imparting taste. It helps bind together various elements of meat and cheese; it acts as a component in leavening systems, helping make bread rise, for instance; and it serves as the original food preservative.

Food processors including ConAgra, Kraft, Kellogg, Pepsico and Sara Lee are among many that have already initiated sodium reduction programs targeting 20-35% decreases in sodium. But the primary issue with sodium reduction is one of flavor, particularly if a revised formula is to achieve parity in taste with higher sodium alternatives.

Companies are reluctant to make low-sodium claims because consumers and chefs associate salt with good taste and flavor. In fact, if consumers are told a food product is low-sodium they have to be convinced that it tastes good. Fortunately, dried plum ingredients offer food processors opportunities to reduce the amount of added salt in formulations without negatively impacting flavor objectives while maximizing consumer flavor expectations.

Dried Plums' Natural Salt-Reduction Capabilities

Dried Plums contain about 1.5-2.0% naturally occurring malic acid. This organic acid has been shown to be an effective flavor enhancer. Malic acid is released more slowly than other organic acids and thus has a greater carry-through during the chewing process. Taste retention allows for up to a 20-25% reduction in salt added to food formulations permitting other formula flavor contributors to become more perceptible.



MALIC ACID'S FLAVOR ENHANCEMENT AND BLENDING ABILITIES

- Intensifies the impact of many flavors in foods or beverages, often reducing the amount of flavor needed,
- Blends distinct flavors resulting in a well-rounded flavor experience,
- Improves aftertaste by extending the impact of some flavors,
- Boosts savory flavors like cheese and hot peppers in snack food coatings, and deepens and broadens the flavor profile of many products, resulting in a richer, more natural flavor experience.

Source: Bartek Ingredients, Inc.

Dried Plums' Potassium Content

Newer evidence suggests that dietary potassium may play a role in decreasing blood pressure. Potassium is involved in nerve function, muscle control and blood pressure. A diet low in potassium and high in sodium may contribute to the risk for high blood pressure; therefore, increasing potassium may protect against hypertension in those sensitive to high levels of sodium.

Potassium works with sodium to maintain the body's water balance. One possible explanation for potassium's protective effect against hypertension is that increased potassium may increase the amount of sodium excreted from the body. Most Americans do not get enough potassium in their diets. The recommended daily potassium intake is 4.7 grams a day.

For people who have hypertension, following an overall eating plan called DASH (Dietary Approaches to Stop Hypertension) may be useful for lowering blood pressure. The DASH diet is higher in potassium, magnesium, and calcium, and lower in total fat, saturated fat, and sodium than the typical American diet. Sodium is added to most highly processed foods while potassium is not. A variety of potassium-rich foods should be eaten daily as well as eating more fresh and frozen foods, which are usually lower in sodium. (*Colorado State University*)

Dried Plums are rich in potassium. Every 100 grams of dried plums contains 733 mg of potassium. Prune juice concentrate contains 752 mg of potassium per 100 g, dried plum puree 852 mg, fresh plum juice concentrate 834 mg and dried plum powder 1,050 per 100 mg.

Dried Plum Salt Reduction Applications

Two food product categories where dried plums have been particularly effective in reducing added salt are baked goods and processed meat products.

Baked Goods

Some of the contributions that salt makes to baked goods include:

- Salt slows down all the chemical reactions in the dough, including calming fermentation activity to a steadier level.
- Salt also makes dough a little stronger and tighter.
- Salt impacts the shelf life of baked goods, but its effects depend on weather conditions. Salt is hydroscopic. Consequently, in humid climates, it will trap moisture from the air, making a crisp crust soggy, and therefore shortening shelf life. In dry climates, however, the salt helps hold water in the bread longer, inhibiting staling, and thus extending the bread's shelf life.
- Salt, of course, adds flavor to baked goods. It also potentiates the flavor of other ingredients, including butter and flour.

Dried plums perform many of these same functions when added to baked goods and substitutes for these salt functions when salt is reduced in the formula.

Fiber. Dried plums contain a unique blend of both soluble and insoluble fiber, which helps to form a stable film around air and leavening gas during mixing and bench time. These fibers are also believed to have the ability to entrap flavor components for gradual release during mastication

Sorbitol/Reducing Sugars. Sorbitol is an effective humectant, and thus helps to keep bakery products soft and moist over an extended shelf life. Reducing sugars, fructose and glucose, work with sorbitol to provide further humectancy.

Malic Acid. Dried plums' malic acid is an effective flavor enhancer. Malic acid is released more slowly than other organic acids and thus has a greater carry-through during the chewing process. Additionally, malic acid helps to inhibit microbial spoilage and can also serve as the natural acid component of chemical leavening systems.

In addition to salt, dried plums can also replace other bakery ingredients. Dried plums have replaced emulsifiers, caramel color and calcium propionate. Shortening and refined sugars have also been reduced. Thus, resulting products have a shorter, simpler ingredient statement, lower fat and a lower sodium content.

Meat And Poultry

Salt is added to meats for several reasons:

- Salt assists in reducing and preventing microbial growth.
- Salt aids in extracting salt soluble meat proteins for emulsion stability.
- Salt increases the ability of the meat to bind during cooking and to increase the water-holding capacity of meat products
- Salt enhances basic meat taste and flavor.

In most of today's meat and processed meat products the concentration of salt is too low to preserve the product without other food safety interventions, but the impact of salt is fundamental to the production of meat products. In whole muscle products like chops, roasts, or hams, salt is used to decrease the loss of moisture during cooking and storage. In a processed meat product, salt helps to bind the meat proteins together and acts as a binding agent between meat and fat emulsions. In sausages, hot dogs, and deli meats, using salt stabilizes the meat structure during cooking so that the final product sold to the consumer has a uniform texture and does not crumble or fall apart during storage.

Dried plums have been shown to function in meats in many of the same ways as salt, particularly in water-binding, moisture retention, tenderizing, as a preservative and, of course, as a flavor enhancer.

Fiber. Dried plums' fiber attracts moisture in meats and poultry. Dried plums have also been used to replace alkaline phosphates that are often added to processed meats in addition to salt to bind moisture.

Sorbitol. The sorbitol in dried plums holds moisture in meats particularly when cooked and held under heat. While most dried plum ingredients have about 15% sorbitol, the sorbitol in dried plum powder is 26%.

Malic acid. The malic acid in dried plums enhances and rounds out meat savory flavors as well as flavors contributed by spices, herbs and seasonings.

Antioxidants. The antioxidant content of dried plums has been shown to inhibit the growth of many common meat pathogens, extend shelf life and reduce the effects of lipid oxidation or warmed-over flavor in pre-cooked meats. Dried plums have an ORAC value of 8577 with most of the antioxidant composition being chlorogenic and neo-chlorogenic acids.

Bakery Formulas

NATURAL WHEAT BREAD FORMULA IMPROVEMENT

Ingredient	Old Formula Baker's %	New Formula Baker's %
Patent Flour	70.00	70.00
Whole Wheat	25.00	25.00
Water	61.00	63.00
Wheat Gluten	2.00	--
Salt	2.25	1.50
Soybean Oil	3.00	0.50
High Fructose Corn Syrup	11.00	6.00
Monoglyceride	0.50	--
Yeast	3.50	3.50
Yeast Food	0.50	--
Sodium Stearoyl Lactylate	0.50	--
Caramel Color	0.50	--
Calcium Propionate	0.20	--
Enzyme Conditioner*	--	0.25
Dried Plum Puree	--	4.00
TOTALS	179.95	173.75

*Enzyme-Based Bromate Replacer

Source: ASBE Bulletin No. 228, Sanders, 9/93

LOW/REDUCED-FAT BRAN MUFFINS

Ingredient	Old Formula Baker's %	New Formula Baker's %
Sugar (granulated)	31.00	31.00
Fructose (crystalline)	15.0	--
Salt	1.25	1.00
Bread Flour	75.00	75.00
Wheat Bran	25.00	25.00
Baking Powder	2.00	2.00
Baking Soda	1.00	1.00
Modified Starch	1.00	--
Emulsifier Blend	6.00	--
Tapioca Starch	4.75	--
Non-Fat Milk	64.00	64.00
Water	50.00	50.00
Egg White	34.00	15.00
Sodium Benzoate	0.10	--
Dried Plum Puree	--	30.00
TOTALS	296.60	294.00

Source: ASBE Bulletin No. 228, Sanders, 9/93

REDUCED-FAT APPLE CINNAMON MUFFINS

Ingredient	Control	Added Salt	Added Salt
	Baker's %	Reduced 25% Baker's %	Reduced 40% Baker's %
Vegetable Oil	29.06	22.66	22.60
Whole Egg	46.49	46.23	46.11
Granulated Sugar	101.75	101.19	100.92
Vanilla	1.39	1.38	1.37
Baking Powder	1.05	1.04	1.04
Baking Soda	1.39	1.38	1.37
Salt	1.75	1.32	1.04
Cinnamon	1.75	1.75	1.74
All Purpose Flour	100.00	100.00	100.00
Dried Plum Powder	--	6.12	6.11
Diced Apples	23.25	23.12	23.05
TOTALS	307.88	306.19	305.35

Procedure:

1. Mix first four ingredients for 1 minute on low speed.
2. Add remaining ingredients and mix for 1 minute on low speed.
3. Weigh 60 g of dough per muffin in muffin pan sprayed with non-stick spray.
4. Bake at 350F for 20 minutes.

WHOLE WHEAT BREAD

Ingredient	Control	Added Salt	Added Salt
	Baker's %	Reduced 25% Baker's %	Reduced 40% Baker's %
Unbleached Bread Flour	100.00	100.00	100.00
Whole Wheat Flour	47.06	48.64	48.63
Honey	14.71	15.20	15.18
Molasses	4.86	5.01	5.01
Salt	1.65	1.27	1.02
Active Dry Yeast	1.09	1.12	1.12
Water	69.10	71.43	71.41
Unsalted Butter (Melted)	8.32	6.88	6.87
Dried Plum Powder	--	5.09	5.09
TOTALS	246.79	254.64	254.33

Procedure:

(Using Hobart-type mixer) Batch size for one loaf 850g.

1. Mix yeast, honey, molasses, salt and water (125°F) until yeast is dissolved.
2. Add bread flour, whole wheat flour, melted butter and dried plum powder and mix with dough hook until four is mixed in.
3. Knead dough 50 times and put in bowl.
4. Cover and incubate for about 2 hours or until twice its original size.
5. Knead dough 50 more times and shape into loaf and place in greased loaf pan.
6. Cover and incubate for about 2 hours.
7. Bake for 35 minutes at 350°F.

Meat & Poultry Formulas

BEEF & CHICKEN FORMULAS (Per Ten Pounds Of Meat At A 10% Pickup)

Ingredient	Control	Added Salt Reduction
Water	60 oz	60 oz
Phosphate	.448 oz	--
Salt	2 oz	1 oz
Plum Concentrate	--	4 oz

Procedure:

Beef: Needle prior to vacuum tumbling. Pull 24 lbs. of vacuum and tumble for 23 minutes.

Chicken: Pull 18 lbs of vacuum and tumble for 15 minutes