



USING

RAISINS

AS A REFINED SUGAR SUBSTITUTE



CALIFORNIA RAISINS

Sweet by Nature

calraisins.org



APPLICATION RESEARCH STUDY

RESEARCH REVIEW & SUMMARY

In this paper, we'll explore the functional benefits and opportunities for California-grown raisins and raisin ingredients as a refined sugar substitute in baked goods, using a Vegan Spiced Oatmeal Raisin Cookie as a model system.

We'll showcase the benefits of using raisins in food manufacturing and foodservice applications, determining the optimum raisin ingredient and percent utilization. When applicable, the California Raisin formulas were compared to commercial benchmarks and control formulas.

KEY BENEFITS

KEY BENEFITS OF USING CALIFORNIA RAISINS IN VEGAN SPICED OATMEAL RAISIN COOKIES

- Alternative to refined or artificial sugars
- Reduced overall sugar content and added sugars declaration
- Created a moist, less-cakey cookie with 100% substitution of sugar
- Enhanced flavor

FUNCTIONALITY AND SUMMARY OF FINDINGS

California Raisins are naturally sweet with no added sugars. Raisins can substitute for refined sugars and other sugars that must be declared as added sugar on the new FDA Nutrition Facts Panel. Whole raisins and raisin paste can be substituted for traditional sweeteners and do not need to be declared as added sugar.

To determine the refined sugar substitution potential that raisins have, raisin paste was used as a sugar substitute in a vegan spiced oatmeal cookie recipe. Raisin paste was substituted for sugar at the following percentages: 25%, 50%, 75%, and 100%, and compared to a control cookie that was 100% refined sugar.

During formulation, the recipes that contained more raisin paste had a stronger baking soda flavor; to overcome this, spices and vanilla were increased, and a small amount of almond extract was added. The replacements at 25% and 50% both had a very similar light and cakey texture and flavor to the control sample. The 75% and 100% raisin paste samples were denser than the control, had a stronger, sweet raisin flavor, and were darker in color. All samples were baked at the same temperature and the same range of time.

Refer to Table 1 for detailed observations of each sample.

Table 1: Refined Sugar Substitution with Raisin Paste

SAMPLE	OBSERVATIONS
Control: 0% Raisin Paste (100% Refined Sugar)	<ul style="list-style-type: none">• Wet and sticky dough• Crunchy outer texture when baked• Soft and cakey inner texture; moist• Strong spice and mild raisin flavors
25% Raisin Paste (75% Refined Sugar)	<ul style="list-style-type: none">• Wet and sticky dough• Crunchy outer texture when baked• Soft and cakey inner texture; moist• Strong spice and mild raisin flavors
50% Raisin Paste (50% Refined Sugar)	<ul style="list-style-type: none">• Wet dough, stiffer than control• Less crunchy outer texture when baked• Denser inner texture but still moist• Strong spice and stronger raisin flavors
75% Raisin Paste (25% Refined Sugar)	<ul style="list-style-type: none">• Stiff dough, not sticky• Less crunchy outer texture when baked• Positive moist and slight underbaked cookie texture, not as cakey• Strong spice and strong raisin flavors
100% Raisin Paste (0% Refined Sugar)	<ul style="list-style-type: none">• Stiff dough, not sticky• Softer outer texture when baked• Positive moist and slight underbaked cookie texture, not as cakey• Strong spice and strong raisin flavors

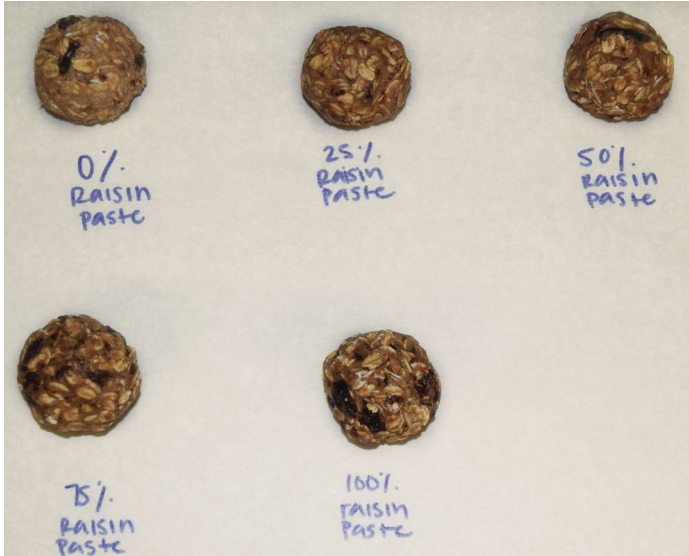
RESULTS

Findings showed that 100% substitution of refined sugar with raisin paste led to a cookie that was desirable and true to the cookie form and texture. Depending on the amount of refined sugar substituted, the cookie will have a different but still appealing flavor and texture.

FORMULAS

The cookie formulas below (excluding the control) can be marketed as having reduced sugar, no or reduced added sugar, natural sugars and fiber from a fruit source, being vegan/plant-based, and made with real California Raisins.

Uncooked Dough: 45g portions



Cooked Dough: 45g portions



Control Crumb



50% Raisin Paste Crumb



100% Raisin Paste Crumb



CONTROL 100% Refined Sugar

Ingredients	% Total by Weight
Oats	29.7
All-Purpose Flour	18.5
Sugar, Granulated	16.6
Vegan Butter	15.8
Whole California Raisins, Soaked in Boiling Water	11.4
Oat Milk (or Other Vegan Milk)	5.0
Vanilla Extract	1.4
Cinnamon, Ground	0.7
Baking Soda	0.2
Nutmeg, Ground	0.2
Ginger, Ground	0.2
Salt	0.1
Cardamom, Ground	0.1
Almond Extract	0.1
TOTAL	100.00

25% Raisin Paste

Ingredients	% Total by Weight
Oats	29.6
All-Purpose Flour	18.5
Vegan Butter	15.8
Sugar, Granulated	12.4
Whole California Raisins, Soaked in Boiling Water	11.5
Oat Milk (or Other Vegan Milk)	5.0
California Raisin Paste	4.2
Vanilla Extract	1.4
Cinnamon, Ground	0.7
Baking Soda	0.2
Nutmeg, Ground	0.2
Ginger, Ground	0.2
Salt	0.1
Cardamom, Ground	0.1
Almond Extract	0.1
TOTAL	100.00

50% Raisin Paste

Ingredients	% Total by Weight
Oats	29.6
All-Purpose Flour	18.5
Vegan Butter	15.8
Whole California Raisins, Soaked in Boiling Water	11.5
Sugar, Granulated	8.3
California Raisin Paste	8.3
Oat Milk (or Other Vegan Milk)	5.0
Vanilla Extract	1.4
Cinnamon, Ground	0.7
Baking Soda	0.2
Nutmeg, Ground	0.2
Ginger, Ground	0.2
Salt	0.1
Cardamom, Ground	0.1
Almond Extract	0.1
TOTAL	100.00

75% Raisin Paste

Ingredients	% Total by Weight
Oats	29.6
All-Purpose Flour	18.5
Vegan Butter	15.8
California Raisin Paste	12.4
Whole California Raisins, Soaked in Boiling Water	11.5
Oat Milk (or Other Vegan Milk)	5.0
Sugar, Granulated	4.2
Vanilla Extract	1.4
Cinnamon, Ground	0.7
Baking Soda	0.2
Nutmeg, Ground	0.2
Ginger, Ground	0.2
Salt	0.1
Cardamom, Ground	0.1
Almond Extract	0.1
TOTAL	100.00

100% Raisin Paste

Ingredients	% Total by Weight
Oats	30.2
All-Purpose Flour	18.4
California Raisin Paste	16.5
Vegan Butter	15.7
Whole California Raisins, Soaked in Boiling Water	11.4
Oat Milk (or Other Vegan Milk)	4.9
Vanilla Extract	1.3
Cinnamon, Ground	0.7
Baking Soda	0.2
Nutmeg, Ground	0.2
Ginger, Ground	0.2
Salt	0.1
Cardamom, Ground	0.1
Almond Extract	0.1
TOTAL	100.00

BENCHTOP PROCESSING METHOD

PREPARE

Prep

Toast oats in a skillet over medium heat for 5-7 minutes or in a 350°F oven for 8-10 minutes or until lightly toasted and fragrant (optional but recommended).

Make

- 1 Preheat oven to 375°F.
- 2 In a mixer with the paddle attachment, cream butter, raisin paste, and sugar (if using) until well blended.
- 3 Add in vegan milk, vanilla bean paste, almond extract and salt. Next, mix in flour, baking soda, spices, and oats until combined.
- 4 Fold in soaked raisins and refrigerate the dough for 1 hour.
- 5 Scoop cookies (#30 scoop or 45-50g portions) onto a parchment-lined baking sheet 2" apart.
- 6 Bake for 14-17 minutes and cool on a rack before serving.

Optional Add-Ins

Roasted pecans, walnuts or almonds, thick shredded coconut, or top with flaked sea salt.



NUTRITION FACTS PANEL

Compared to the control formula (100% refined sugar), the formulas with raisin paste have reduced declared added sugar, reduced total sugars, an increase in potassium, and a slight reduction in overall calories.

CONTROL 100% Refined Sugar

Nutrition Facts	
TBD servings per container	
Serving size	1 cookie (45g)
Amount per serving	
Calories	190
% Daily Value*	
Total Fat 7g	9%
Saturated Fat 5g	25%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 95mg	4%
Total Carbohydrate 30g	11%
Dietary Fiber 2g	7%
Total Sugars 12g	
Includes 8g Added Sugars	16%
Protein 3g	
Vitamin D 0mcg	0%
Calcium 20mg	2%
Iron 1mg	6%
Potassium 112mg	2%

*The % Daily Value tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

CONTROL- 100% Refined Sugar Formula Ingredient Declaration

100% Refined Sugar (Control) Formula Ingredient Declaration: Oats, Enriched Flour (Wheat Flour, Niacin, Iron, Thiamin Mononitrate, Riboflavin, Folic Acid), Sugar, Organic Cultured Vegan Butter (Organic Coconut Oil, Filtered Water, Organic Sunflower Oil, Organic Cashews, Organic Sunflower Lecithin, Sea Salt, Cultures), Raisins, Oat Milk (Oats, Water, 2% or Less of Expeller Pressed Canola Oil, Dipotassium Phosphate, Calcium Carbonate, Tricalcium Phosphate, Sea Salt, Dicalcium Phosphate, Riboflavin, Vitamin A, Vitamin D2, Vitamin B12), Vanilla Bean Paste, Cinnamon, Baking Soda, Nutmeg, Ginger, Salt, Cardamom, Almond Extract.

CONTAINS: Wheat, Tree Nuts (Coconut, Cashews).

100% Raisin Paste Formula

Nutrition Facts	
TBD servings per container	
Serving size	1 cookie (45g)
Amount per serving	
Calories	180
% Daily Value*	
Total Fat 7g	9%
Saturated Fat 5g	25%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 100mg	4%
Total Carbohydrate 29g	11%
Dietary Fiber 2g	7%
Total Sugars 9g	
Includes 0g Added Sugars	0%
Protein 3g	
Vitamin D 0mcg	0%
Calcium 24mg	2%
Iron 1mg	6%
Potassium 173mg	4%

*The % Daily Value tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

100% Raisin Paste Formula Ingredient Declaration

Oats, Enriched Flour (Wheat Flour, Niacin, Iron, Thiamin Mononitrate, Riboflavin, Folic Acid), Raisin Paste, Organic Cultured Vegan Butter (Organic Coconut Oil, Filtered Water, Organic Sunflower Oil, Organic Cashews, Organic Sunflower Lecithin, Sea Salt, Cultures), Raisins, Oat Milk (Oats, Water, 2% or Less of Expeller Pressed Canola Oil, Dipotassium Phosphate, Calcium Carbonate, Tricalcium Phosphate, Sea Salt, Dicalcium Phosphate, Riboflavin, Vitamin A, Vitamin D2, Vitamin B12), Vanilla Bean Paste, Cinnamon, Baking Soda, Nutmeg, Ginger, Salt, Cardamom, Almond Extract.

CONTAINS: Wheat, Tree Nuts (Coconut, Cashews).

50% Raisin Paste Formula

Nutrition Facts	
TBD servings per container	
Serving size	1 cookie (45g)
Amount per serving	
Calories	190
% Daily Value*	
Total Fat 7g	9%
Saturated Fat 5g	25%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 100mg	4%
Total Carbohydrate 29g	11%
Dietary Fiber 2g	7%
Total Sugars 10g	
Includes 4g Added Sugars	8%
Protein 3g	
Vitamin D 0mcg	0%
Calcium 22mg	2%
Iron 1mg	6%
Potassium 142mg	4%

*The % Daily Value tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.

50% Refined Sugar Formula Ingredient Declaration

Oats, Enriched Flour (Wheat Flour, Niacin, Iron, Thiamin Mononitrate, Riboflavin, Folic Acid), Organic Cultured Vegan Butter (Organic Coconut Oil, Filtered Water, Organic Sunflower Oil, Organic Cashews, Organic Sunflower Lecithin, Sea Salt, Cultures), Raisins, Sugar, Raisin Paste, Oat Milk (Oats, Water, 2% or Less of Expeller Pressed Canola Oil, Dipotassium Phosphate, Calcium Carbonate, Tricalcium Phosphate, Sea Salt, Dicalcium Phosphate, Riboflavin, Vitamin A, Vitamin D2, Vitamin B12), Vanilla Bean Paste, Cinnamon, Baking Soda, Nutmeg, Ginger, Salt, Cardamom, Almond Extract.

CONTAINS: Wheat, Tree Nuts (Coconut, Cashews).

INGREDIENT INSIGHTS AND FUNCTIONAL BENEFITS SUMMARY

California Raisins are a viable refined sugar substitute in this Vegan Spiced Oatmeal Raisin Cookie application. Both 50% and 100% sugar substitution with raisin paste yielded uniquely desirable texture outcomes that could benefit other types of cookie formulations as well.

California Raisins used as a refined sugar substitute should be tested in additional cookies and other baked good recipes to see the impact on flavor and texture. Oatmeal raisin cookies have a mild raisin taste, and the addition of more raisin paste desirably increased the overall raisin flavor. Chocolate-based, nut butter-based, and other non-vegan cookies with strong flavors will pair well with the raisin paste's flavor and color. With other bold-flavored cookies, more leavening agent can be added to prevent the denser crumb that was achieved in the vegan oatmeal raisin formula.

CALIFORNIA RAISINS OVERVIEW

PRODUCTS AND PROCESSING

California Raisins are simply grapes that have been cleaned, dried, de-stemmed, and washed. The majority of California-grown raisins are the *Vitis vinifera* varietal and are typically either sun-dried on trays or dried on the vine.¹ Natural seedless varieties include Thompson Seedless, Fiesta, Selma Pete and DOVine. Other California varietals include Zante Currant, Muscat and Sultana.¹

The California Raisin industry offers a variety of raisins and raisin ingredients that are suitable for food manufacturing and foodservice applications. Raisins feature in a variety of applications ranging from bakery, breads, cereals, condiments, confectionery, dairy, and snacks, just to name a few.

California-grown raisins are available in a multitude of forms such as whole raisins (various sizes and varieties), raisin paste (made from whole, ground raisins), and raisin juice concentrate that make them ideal for many applications.

PROCESSING

California Raisins are grown in the sunny fields of California and can take three full years from initial planting before bearing fruit that is subsequently dried.¹ Raisins are harvested either by the traditional hand method or with a mechanical harvester, which became widely available in the 1990s.¹

After harvesting and drying, raisins are evaluated by government inspectors to ensure that they meet strict quality standards.¹ Next, any remaining stems are removed, and the raisins are packaged or further processed to create raisin paste or raisin juice concentrate.¹ Thanks to these high-quality standards, California Raisins have never been linked to any cases of foodborne illness according to the CDC.¹

Golden raisins are produced when fresh grapes are harvested and dried using drying tunnels to preserve the golden color.¹

For more in-depth information on raisin processing and harvesting, please refer to the [California Raisins Industry Brochure](#).

NEED PRODUCT DEVELOPMENT INSPIRATION?

Visit the [California Raisins website](#) or download our [INNOVATION BROCHURE](#).

COMPOSITION AND NUTRITION

Table 2, below, shows average values of the commonly tested physical and chemical properties of California Raisins. The chemical and physical properties of raisins contribute greatly to the functional properties in the next section.

Table 2: Physical & Chemical Properties of California Raisins² (Average Values)

Product	PH	Water Activity	Moisture Content	Sugar Content (g/100g)
California Raisins, Whole (Mixed Varieties)	3.5-4.0	0.51-0.56 (13-15% Moisture at 25°C)	Varies, Based on Processing	Total: 68-70g Glucose, Fructose, Sucrose, and Fructose/ Glucose

NUTRITIONAL FACTS PER SERVING

California Raisins are naturally low in fat and sodium, and as whole fruit, raisins contain unrefined sugars and dietary fiber, making them a nutritious additive with numerous uses in product development and culinary applications.

Nutritional Facts of Raisins per 40g Serving³

Nutrition Facts	
1 serving per container	
Serving size	1/4 cup (40g)
Amount per serving	
Calories	120
% Daily Value*	
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 10mg	0%
Total Carbohydrate 32g	12%
Dietary Fiber 2g	7%
Total Sugars 26g	
Includes 0 Added Sugars	0%
Protein 1g	
Vitamin D 0mcg	0%
Calcium 25mg	2%
Iron 0.7mg	4%
Potassium 298mg	6%
* The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.	
Ingredients: California Raisins	

FUNCTIONAL PROPERTIES

The table below is a brief overview of a few functional properties that raisins can provide in a formula, either to substitute an ingredient or to provide a specific attribute to a product. Raisins retain their flavor for an extended period, can enhance a food's flavor without overwhelming the overall taste, and can function as a substitution for sugar or fat in baking scenarios.

Table 3: Functional Properties of Raisins and Raisin Ingredients

Functional Property	Description	Uses and Purpose
Added Sugar Reduction	Raisins are a dried fruit full of natural sugars. As a whole fruit, the sugars in raisins do not need to be declared as "added sugar" on nutritional fact panels.	<ul style="list-style-type: none"> Substitute refined and other added sugar sources with raisins to claim "no added sugar" The Dietary Guidelines recommends consumers should limit their calories from added sugars to less than 10% of total calories daily
Plant-Based Fat Substitute	Fibers and sugars in raisins, along with the soft, chewy texture, mimic fat and richness ²	<ul style="list-style-type: none"> Natural fat substitute for baked goods Substitute high-fat animal products with plant-based product Overall calorie reduction
Binding/Texture and Enhancer/ Bulking Agent	Texture and low moisture content of raisins aid in creating chewy textures and binding dry ingredients ²	<ul style="list-style-type: none"> Optimal for use in baked goods, bars, and other products that use a liquid or paste binder Manipulate textures of products to become chewier without adding liquid Prevents case hardening
Shelf-Life Extension Inhibit Mold Growth/ Natural Preservative	Flavor stability, low water activity, antioxidants, and acids like propionic, glutamic, and tartaric acids inhibit mold growth. ² High percentages of natural sugars and fiber bind free water.	<ul style="list-style-type: none"> Alternative to chemical-sounding and artificial preservatives
Limit Water Activity	Raisins have a lower water activity due to their intact skin, glucose, and fructose content ²	<ul style="list-style-type: none"> Prevent microbial growth Reduce overall water activity in final products
Flavor Stability	Sweetness and fruity flavor of raisins can be stable for up to 15 months when stored in optimal conditions ²	<ul style="list-style-type: none"> Stable sweetness and flavor in products Flavors not affected by manufacturing Natural alternative to refined sugars and sweeteners
Flavor Enhancement	Raisins contain about 2% tartaric acid, a known flavor enhancer, as well as precursors to the Maillard reaction from the drying process ²	<ul style="list-style-type: none"> Able to improve or intensify added flavors (including natural flavors)
Flavor Compatibility	Raisins have a naturally sweet and mild flavor that pairs well with other sweet flavors and spices ²	<ul style="list-style-type: none"> Able to carry flavors well with underlying sweetness Add complexity and balance

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