

## Introduction

- The cranberry is known as the “king” of wholesome fruits. Consumer health trends have focused on clean labels and minimally processed foods.

## Objectives

- The main objective was to develop a minimally processed cranberry chutney, along with the gluten-free biscotti that provided a convenient, light, and tasty product for “healthy strivers.”

## Materials and Methods

### Cranberry Chutney

INGREDIENTS: **Cranberry**, Pear, Apple, Pineapple, Sugar, Anaheim Pepper, Cilantro, Ginger

- Cranberries rank number one in antioxidant content with 9.584 mmol/100 grams; the skin of the cranberry contains the majority of the fruit’s phytonutrients, thus the use of the whole cranberry.

### Gluten-Free Biscotti

INGREDIENTS: All-Purpose Gluten-Free Baking Four, Rice Flour, Sugar, Cranberry, **Egg**, Canola Oil, Baking Powder, **Xanthan Gum**, Anise Seeds

- Xanthan gum increases viscosity to replace the lack of gluten networks in gluten-free products.
- Eggs are a binding agent. They add flavor, color, moisture, and nutrients to baked goods.

### Processing Challenges

- A shelf stable cranberry chutney and gluten-free biscotti was the desired product.
- Several processing methods and formulations were conducted for each component (Figure 1).
- A combination of whole cranberry, pear, apple, pineapple, Anaheim pepper, cilantro, and ginger were evaluated at different levels to determine the appropriate sweetness and heat profile of the chutney (Table 1).
- Ingredients were diced and/or pulverized to provide a uniform consistency.
- Different functional ingredients such as xanthan gum and eggs were added to the biscotti to obtain a uniform product.

## Materials and Methods (Continued)

### Shelf Stability Testing

- The chutney was cooked to an internal temperature of 71.1°C for 60 seconds before being placed in glass jars to conduct an accelerated shelf stability test. Water activity and pH were measured.

### Consumer Testing

- After the formulation was finalized, a focus group (n=7) evaluated the product. Participants ranked to product on appearance, packaging, texture, and taste from 1 (extremely dislike) to 10 (extremely like).

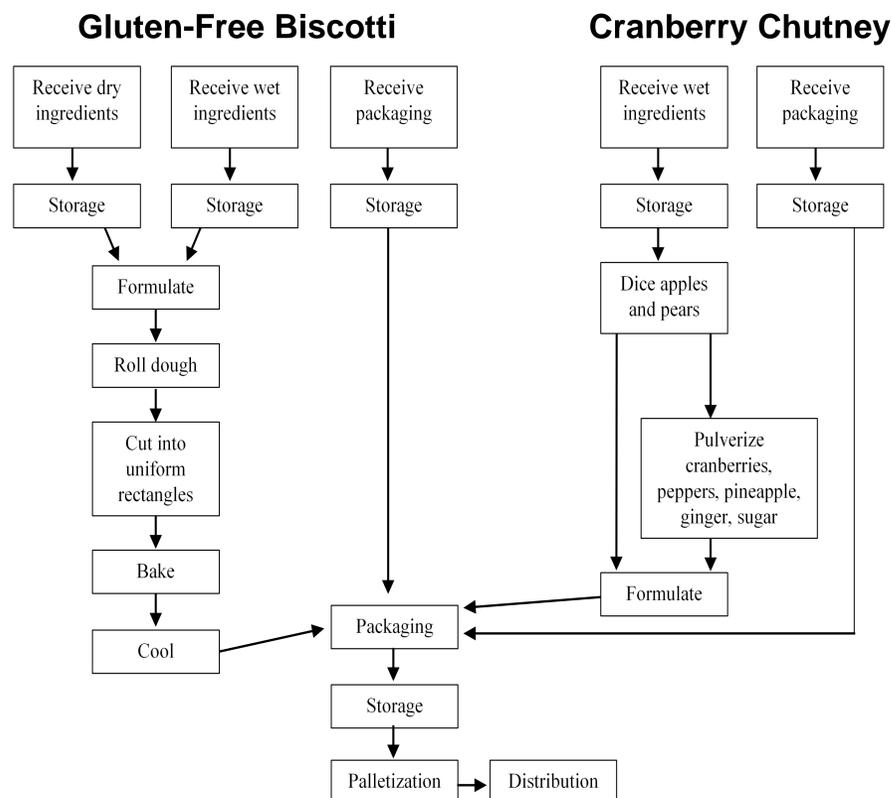


Figure 1: Process Flow Diagram

Table 1: Ingredient Formulation Percentages

Cranberry Chutney	%	Gluten-Free Biscotti	%
Cranberry	30.7	All-Purpose Gluten-Free Baking Flour	34.1
Pear	26.3	Rice Flour	34.0
Apple	13.8	Sugar	21.1
Pineapple	12.1	Cranberry	15.4
Sugar	12.1	Egg	14.6
Anaheim Pepper	2.85	Water	13.8
Cilantro	1.10	Canola Oil	12.1
Ginger	1.10	Baking Powder	1.68
		Xanthan Gum	1.12
		Anise Seeds	0.98
<b>Total</b>	<b>100</b>	<b>Total</b>	<b>100</b>

## Results

- After many trials, the best formulation and processing steps were developed. In Table1, the final ingredient formulation percentages are listed. For the cranberry chutney, 30.7% of the product was cranberry. The gluten-free biscotti had 15.4% cranberry.
- For the chutney, it was found that pulverizing 50% of the pear, and 100% of the cranberry, Anaheim pepper, cilantro, and ginger provided a smooth, uniform texture. The remaining pear and 100% of the apple were diced to a size of 0.5 cm x 0.25 cm to provide an appealing product with crunchy notes. Crushed, canned pineapple was drained and added to the chutney mixture to provide a sweet, fruity flavor.
- The shelf stability of the cranberry chutney was found to be at least one year. The time could increase with a higher cooking temperature or longer holding time. The pH consistently stayed at 2.99. Water activity of the cranberry chutney was 0.976.
- The scores of the 7-person focus group were relatively high. The average scores were 7.21, 7, 6.6, 6.57, and 6 for appearance, mouthfeel, cranberry content, texture, and taste of the chutney, respectively. Although the participants wanted the product to have a higher percentage of cranberry incorporated, they accepted the appearance and taste of the product.



Figure 2: Cranberry Chutney and Biscotti. Photo by Conrad Kabus.

## Conclusion

- Based on focus group results, the cranberry chutney scored favorably above the gluten-free biscotti. The cranberry chutney will provide a unique “sweet and heat” minimally processed product to “healthy strivers.”

## Support

- Ocean Spray provided all cranberries for project.