

Target Audience

The target audience for our product is college-aged adults looking for a quick, on-the-go item. We designed a product for students who want to start their day with a boost of energy.

Competition

Rise Breakfast Bar
Price: \$1.99/bar (40g)
Calories: 180



Luna Breakfast Bar
Price: \$1.25/bar (48g)
Calories: 190



Java Jolter Bar (Our Bar)
Price: \$1.50/bar (50g)
Calories: 190



When compared to the Rise Bar and the Luna Bar, our bar contains 5g of fiber which is more than both the Luna bar (3g) and the Rise Bar (4g). Also our bar contains less sugar than both the Rise and the Luna bars.

Innovative and Novel

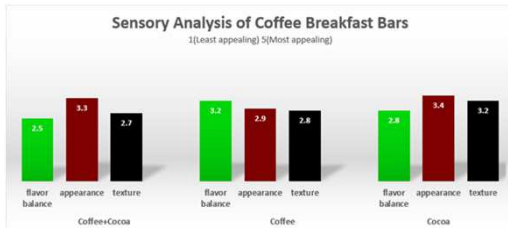
- Combines the flavors found in a cup of coffee into an energizing breakfast bar
- Uses healthy, whole foods to maximize nutritional benefits
- Incorporates layers of flavor that range from crunchy base to chocolate drizzle

Product Formulation

The initial product formulation involved Nutella in the base (nougat layer). During our testing, we found that the Nutella was too dense and too sweet. Also, we found that the coffee beans were too large in the coffee and cream layer on top of the bar. In our second product formulation, we replaced the Nutella with almond butter and reduced the size of the coffee beans. In order to add flavor to the almond butter, we tested three flavors: coffee, cocoa, and a combination of coffee and cocoa. In the final formulation, we added pretzel pieces for an added crunch to the nougat layer.

Sensory Analysis

After the second production lab, our bars were sampled by panelists from the ABE 201 class. The bars were scored on a 5 point scale (1-worst, 5-best) for flavor balance, appearance, and texture. The panelists were asked to leave comments on potential improvements. Below is a graph of the results from the sensory analysis.



Final Product Selection

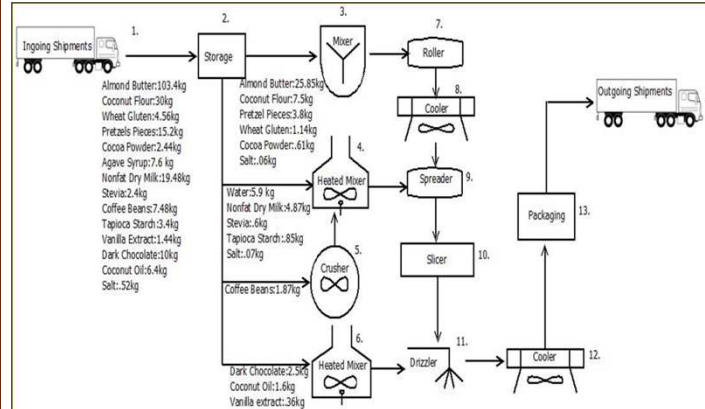
Many panelists agreed that the coffee flavor was too strong, so we eliminated the instant coffee in the nougat and reduced the amount of coffee beans in the cream layer. The panelists also noted that the bar needed a "crunchy" texture. We took this into account in our final product formulation and added crushed pretzel pieces to the nougat layer. Listed below is final ingredient list and formula for a 12 bar batch.

Ingredient	Mass (g)
Almond Butter	258.5
Coconut Flour	75.0
Wheat Gluten	11.4
Agave Syrup	19.0
Coffee Beans	18.7
Nonfat Dry Milk	48.7
Water	59.0
Stevia	6.0
Tapioca Starch	8.5
Cocoa powder	6.1
Vanilla Extract	3.6
Salt	1.3
Pretzels	38.0
Dark Chocolate	25.0
Coconut Oil	16.0

Java Jolter Bar

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ABE 201
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Process Flow Diagram



One Shift: 8 hours One batch: 1200 bars, 120 min

All quantities are on a per batch basis except the shipment amounts. Shipment amounts are on a per shift basis.

Mass Balance

Total Components	
Component	Mass (g)
Nougat Base Layer	
Almond Butter	258.5
Coconut Flour	75.0
Wheat Gluten	11.4
Agave Syrup	19.0
Salt	0.7
Pretzels	38.0
Cocoa Powder	6.1
Total	408.7
Coffee Cream Layer	
Coffee Beans	18.7
Nonfat Dry Milk	48.7
Stevia	6.0
Water	59.0
Salt	0.6
Tapioca Starch	8.5
Total	141.5
Chocolate Drizzle	
Dark Chocolate	25.0
Coconut Oil	16.0
Vanilla Extract	3.6
Total	44.6
Total (12 bars)	594.8
One Bar	49.57

Lessons Learned & Future Revisions

Despite our bar's predicted success in the market, further developments could be made for the product. Inspired by the coffee industry, our bar could incorporate a variety of flavors found in creamers and popular espresso drinks. Mixing the product with other popular flavors, such as pumpkin spice or peppermint mocha, could greatly improve its marketability around seasonal changes. By reducing the amount of water absorbed by the crushed coffee beans, we could also improve the overall stability and shelf life of the bar.

Energy Balance

Stove

Heating Coffee Cream Mixture:

$.300\text{kW} \times .08\text{hr} = 86\text{ kJ}$

$C_p = 4.180(.67) + 1.711(.13) + 1.547(.10)$

$C_p = 3.18\text{ J/g}^\circ\text{C}$

$\Delta H = (141.5\text{g}) \times (3.18\text{ J/g}^\circ\text{C}) \times (66-20)$

$\Delta H = 20.7\text{ kJ}$

Thermal Efficiency $20.7/86 \times 100 = 24\%$

Heating Chocolate Mixture:

$.300\text{kW} \times .05\text{hr} = 54\text{ kJ}$

$C_p = 4.180(.10) + 1.711(.04) + 1.928(.60)$

$C_p = 2.04\text{ J/g}^\circ\text{C}$

$\Delta H = (44.6\text{g}) \times (2.04\text{ J/g}^\circ\text{C}) \times (62-20)$

$\Delta H = 3.8\text{ kJ}$

Thermal Efficiency: $3.8/54 \times 100 = 7.0\%$

Freezer

Cooling Nougat Bar:

$15\text{kW} \times .5\text{hr} = 270\text{ kJ}$

$C_p = 4.180(.14) + 1.711(.15) + 1.928(.45) + 1.547(.25) + .908(.01)$

$C_p = 2.10\text{ J/g}^\circ\text{C}$

$\Delta H = (408.7\text{g}) \times (2.10\text{ J/g}^\circ\text{C}) \times (0-20)$

$\Delta H = -17.2\text{ kJ}$

Efficiency: $17.2/270 \times 100 = 6.4\%$

Potential Process Hurdles

- Mixing the nougat dough in large batches may result in inconsistent texture
- Crushing the beans and pretzels in large quantities may result in inconsistent sizes
- Melting the chocolate in large batches may result in hot spots on the bottom of the burner and lead to burnt chocolate
- The cooling process would require large amounts of space due to a continuous feed of bars through freezer
- Blades on the slicer may build up with bar residue, resulting in rough cuts
- Chocolate cooling before exiting the drizzler, causes a build up of solid chocolate

Project Guidelines

Our product has 93.00% whole foods by mass and qualifies as a health bar. The macronutrients include high protein and monounsaturated fat content from the almond butter and milk powder with a reasonable amount of carbohydrates. The micronutrient content is met by the calcium and iron levels from the milk powder, almond butter and coconut flour. After taking sensory analysis results into account, our team created and tested the final bar. We feel that the addition of pretzels to our bar meets the consumer desire for coffee taste, "bar" appearance, and crunchy texture. We also feel that the added caffeine content makes the bar more marketable than other breakfast bars such as the Luna and Rise bars.

Nutrition Facts

Java Jolter Bar

Nutrition Facts	
Serving Size 1 bar 50g	
Amount Per Serving	
Calories 190	Calories from Fat 120
% Daily Values*	
Total Fat 13g	20%
Saturated Fat 2g	10%
Trans Fat 0g	
Polyunsaturated Fat 2g	
Monounsaturated Fat 9g	
Cholesterol 0mg	0%
Potassium 270mg	8%
Sodium 74mg	3%
Total Carbohydrate 17g	
Dietary Fiber 5g	20%
Sugars 4g	
Protein 8g	16%
Calcium 21%	Iron 22%
*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.	
Calories	2,000
Calories	2,500
Total Fat	Less than 65g
Sat Fat	Less than 20g
Cholesterol	Less than 300mg
Sodium	Less than 2400mg
Total Carbohydrate	300g
Dietary Fiber	25g

The Rise Bar

Nutrition Facts	
Serving Size 1 bar 40 g	
Servings Per Container 12	
Amount Per Serving	
Calories 180	Calories from Fat 90
% Daily Values*	
Total Fat 10g	15%
Saturated Fat 1g	5%
Trans Fat 0g	
Cholesterol 0mg	0%
Potassium 200mg	6%
Sodium 45mg	2%
Total Carbohydrate 17g	6%
Dietary Fiber 4g	16%
Sugars 10g	
Protein 5g	10%
Iron 4%	
*Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.	
Calories	2,000
Calories	2,500
Total Fat	Less than 65g
Sat Fat	Less than 20g
Cholesterol	Less than 300mg
Sodium	Less than 2400mg
Total Carbohydrate	300g
Dietary Fiber	25g

One 50g bar contains 79mg caffeine