

Soy Based Nutrient Dense Boba Pearl

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Purpose & Background

Purpose: To create a nutrient dense soy based boba pearl to compete with nutrient void tapioca pearl

Background: Bubble tea is a sweet tea with tapioca based pearls. This industry has experienced exponential growth and provides a market for nutrient rich substitutes.

Market Analysis

- 1,300 North American storefronts for bubble tea
- Target Demographic: Millennials ages 18-24, but anyone who enjoys boba
- Bubble tea market on the rise since 2012
- Health conscious consumers are driving the market towards a alternative to traditional tapioca pearls

Impact & Sustainability

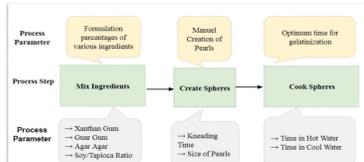
- Encourage nutritious alternative to combat decline in national health
- Tapioca pearls made exclusively in Asia & inclusion of soy would bring market to North America

Constraints

- Competitors: Boelle, Tea Zone, Wufuyuan
- Consumers expect traditional mouthfeel
- Launching new product into an established market

Prototype Formulation

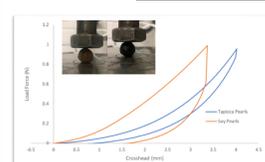
15 iterations with various parameters.



Prototype Viability

Nutrition profile of soy pearl (left) vs. tapioca pearl (right).

| Nutrition Facts (100g) | | Nutrition Facts (100g) | |
|------------------------|-----|------------------------|-----|
| Serving size | | Serving size | |
| Amount Per Serving | | Amount Per Serving | |
| Calories 340 | | Calories 360 | |
| % Daily Value* | | % Daily Value* | |
| Total Fat 1g | 2% | Total Fat 0g | 0% |
| Saturated Fat 1g | 2% | Saturated Fat 0g | 0% |
| Trans Fat 0g | 0% | Trans Fat 0g | 0% |
| Cholesterol 0mg | 0% | Cholesterol 0mg | 0% |
| Sodium 70mg | 1% | Sodium 70mg | 1% |
| Total Carbohydrate 55g | 20% | Total Carbohydrate 55g | 20% |
| Dietary Fiber 1g | 2% | Dietary Fiber 1g | 2% |
| Total Sugars 5g | 10% | Total Sugars 5g | 10% |
| Included Sugars 5g | 10% | Included Sugars 5g | 10% |
| Sugar Alcohol 0g | 0% | Sugar Alcohol 0g | 0% |
| Protein 0g | 0% | Protein 0g | 0% |
| Vitamin D 0mg | 0% | Vitamin D 0mg | 0% |
| Calcium 100mg | 2% | Calcium 100mg | 2% |
| Iron 0.4mg | 7% | Iron 0.4mg | 7% |
| Potassium 1800mg | 40% | Potassium 1800mg | 40% |



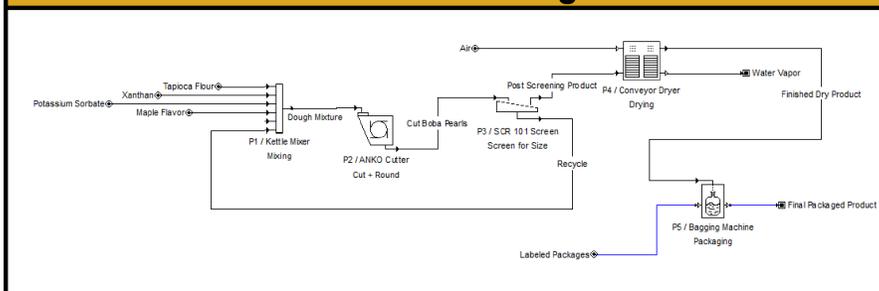
Compression testing to mimic mouthfeel.

Product Recipe

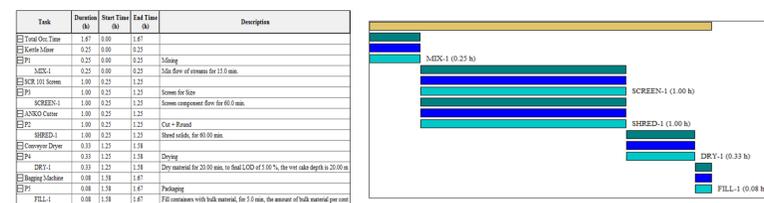
| Ingredient | Functionality | Amount per Batch (kg) |
|--------------------|------------------|-----------------------|
| Defatted soy flour | Nutrition | 71.75 |
| Tapioca starch | Flavor | 17.5 |
| Xanthan Gum | Thickening Agent | 0.788 |
| Potassium sorbate | Preservative | 0.438 |
| Maple flavoring | Flavor | 0.525 |
| Water | Binder | 84 |

A serving size of 50 grams per drink would supply 16 grams of protein, 19% of recommended fiber, and 20% of daily recommended potassium.

Process Flow Diagram



Process Scheduling



Process Requirements

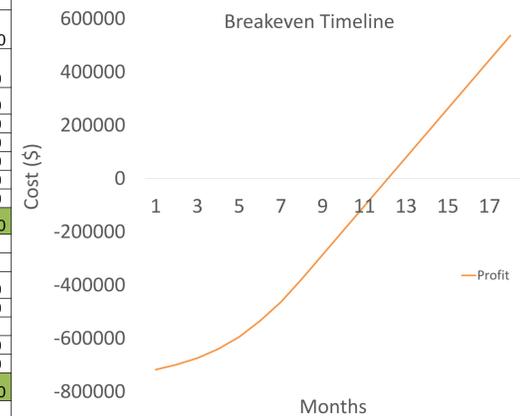
| | Amount | Unit |
|--------------------|---------|---------------|
| Power Used | 179.525 | kWh / batch |
| Cycle Time | 1.67 | Hours / batch |
| Batch Production | 34 | 3-kg bags |
| Monthly Production | 121,271 | lbs |
| Powder Inputs | 90.474 | Kg / Batch |
| Flavoring Input | 0.525 | Kg / Batch |
| Water Requirement | 85 | Kg / Batch |
| Water Recycled | 76 | Kg / Batch |

Alternatives

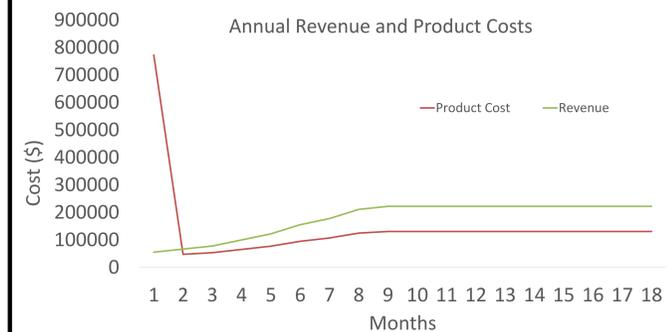
- Extruder System: able to cut dough but not as precise
- Freeze Drying: preserving product through rapid freezing and then a vacuum to remove ice by sublimation
- Pectin: structural agent but did not produce desired texture

Economic Analysis

| Entity | Cost |
|----------------------------------|---------------------|
| Direct Cost | |
| Purchased Equipment Delivered | \$156,530.00 |
| Purchased Equipment Installation | \$70,438.50 |
| Instrumentation and Controls | \$28,175.40 |
| Piping | \$25,044.80 |
| Electrical System | \$15,653.00 |
| Buildings | \$39,132.50 |
| Yard Improvements | \$23,479.50 |
| Service Facilities | \$62,612.00 |
| Total Direct Cost | \$421,065.70 |
| Indirect Costs | |
| Engineering and Supervision | \$51,654.90 |
| Construction | \$61,046.70 |
| Legal Expenses | \$6,261.20 |
| Contractor Fees | \$26,610.10 |
| Contingency | \$54,785.50 |
| Total Indirect Costs | \$200,358.40 |
| Fixed Capital Investment | \$621,424.10 |
| Working Capital | \$109,571.00 |
| Total Capital Investment | \$730,995.10 |



| Per 3 Months of Production | Average Production Capacity | Revenue | Total Costs | Profit | Account Balance |
|----------------------------|-----------------------------|--------------|--------------|---------------|-----------------|
| 1-3 | 30% | \$199,980.00 | \$873,904.30 | -\$673,924.30 | -\$673,924.30 |
| 4-6 | 57% | \$377,740.00 | \$237,949.20 | \$139,790.80 | -\$534,133.50 |
| 7-9 | 92% | \$611,050.00 | \$362,689.20 | \$248,360.80 | -\$285,772.70 |
| 10-12 | 100% | \$666,600.00 | \$392,389.20 | \$274,210.80 | -\$11,561.90 |
| 13-15 | 100% | \$666,600.00 | \$392,389.20 | \$274,210.80 | \$262,648.90 |
| 16-18 | 100% | \$666,600.00 | \$392,389.20 | \$274,210.80 | \$536,859.70 |



| Costs Per Pound | Cost, \$ |
|-----------------|----------|
| Production Cost | \$1.62 |
| Sale Price | \$3.03 |
| Profit | \$1.41 |

| Equipment | Cost |
|----------------------|---------------------|
| Mixing | \$56,000.00 |
| Cutting and Rounding | \$16,000.00 |
| Drying | \$37,530.00 |
| Packaging | \$47,000.00 |
| Total | \$156,530.00 |

Future Work

Improve the mouthfeel of soy pearl to match that of the tapioca pearl

Increase amount of soy in product

Continuous improvement of process

Lower production costs

Market research on product