Ugly Food Solutions

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Introduction

About half of the fruits produced in the agricultural industry are wasted every year. Food waste contributes to GHG emissions, climate change, and the loss of priceless resources. We are focused on repurposing “ugly” blueberries that are thrown away because they are not aesthetically pleasing to the customer and aren’t sold in grocery stores. The project addresses the Global Sustainable Development Goals of zero hunger and responsible consumption and production. The valuable nutrients in blueberries were extracted to create an antioxidant-rich powder. The product has health benefits, several applications, and is sustainably produced.

Design Objectives

- Repurpose “ugly” blueberries that do not meet customer standards at the supermarket
- Address Global Sustainable Development Goals
  - Zero Hunger
  - Sustainable Consumption and Production
- Transform the healthy nutrients found in blueberries into a new, sustainable product

Project Deliverables

- A process that transforms the “ugly” blueberries into a new product
- A concentrated, antioxidant-rich powder derived from blueberry extracts
- A list of different uses and applications for the blueberry powder supplement
- A recommendation on how to scale-up the process to meet industry standards

Cost Analysis

Item	Estimated Cost
Blueberries (per lb)	$4.39
Cheesecloth Filter	$3 per cloth
Juicer	$75
Freeze Dryer	$3,000
Power Requirement per batch (freeze dryer & juicer)	$4.57
Estimated Cost for Each Batch	~ $12 (blueberries + cloth + power)

Table 1. The estimated cost of materials

Process Diagram

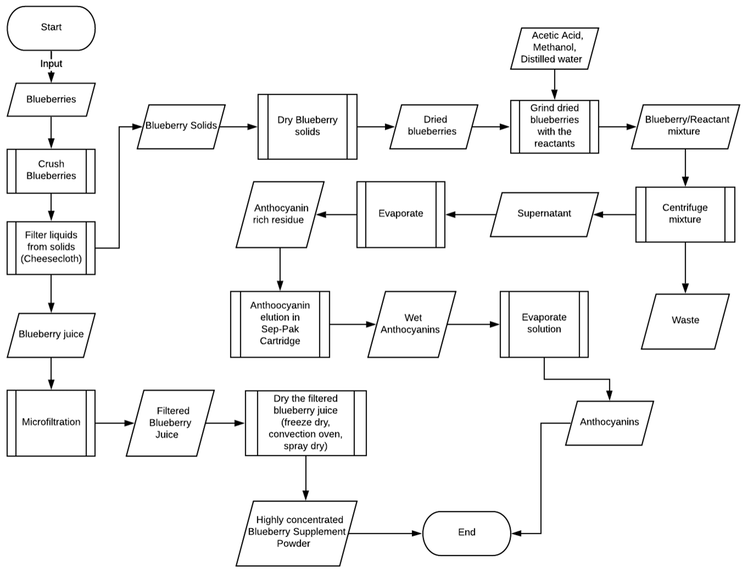

Figure 1: Proposed process flow diagram for blueberry processing

Procedure

1. **Homogenization** - break down the blueberries in a juicer at a controlled temperature in order to separate the liquid juice from the solid skin and seeds
2. **Filtration** - filter the blueberry mixture through a single-layer of cheesecloth and apply pressure to speed up the process
3. **Drying** - freeze-dry the liquid part of the blueberries and dry the solids in a vacuum dryer at 35 degrees Celcius to significantly reduce the moisture content
4. **Test Antioxidant Activity -** Elute the dried blueberry solids with acetic acid and methanol to extract anthocyanins for analysis.

Figure 2. Blueberry filtration after blending

Figure 3. Blueberry solids before vacuum drying

Design Economics

- There would be a large a large initial investment required to implement our solution due to the high price of a freeze dryer
- Costs can be significantly reduced when scaled up
- Food waste accounts for about 8% of global climate pollution
- Imperfect food waste causes a significant monetary loss in the agricultural and food industry
  - Grocery stores throw out 25-50% of all produce
- Approximately 45% of fruits produced every year are wasted
  - almost half of the projected income is lost

Figure 4. Blueberry liquid after completed freeze drying process

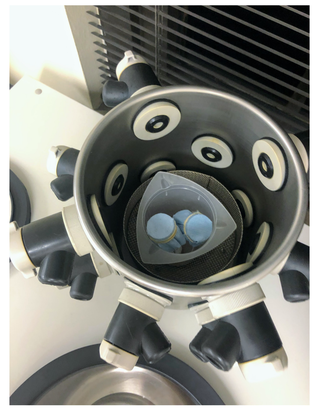

Figure 5. Blueberry liquid in freeze dryer chamber

Final Design & Recommendations

The final proposed recommendation for the blueberry processing is homogenization using a juicer, forced filtration through a cheesecloth, and drying into the final product using a freeze dryer.

The possible applications include adding the powder to smoothies, fruit bowls, yogurt, ice cream, popsicles, etc. The product can easily be added to a variety of processed foods to increase the nutritional value and provide health benefits.

References

[1] “Beauty (and taste!) are on the inside,” Food and Agriculture Organization of the United Nations. [Online]. Available: http://www.fao.org/fao-stories/article/en/c/1100391/. [Accessed: 04-Nov-2019].
[2] Martín-Gómez, Juan, et al. “Influence of Drying Processes on Anthocyanin Profiles, Total Phenolic Compounds and Antioxidant Activities of Blueberry (Vaccinium Corymbosum).” Lwt, vol. 120, 2020, p. 108931., doi:10.1016/j.lwt.2019.108931.
[3] Lohachoompol, Virachnee, George Srzednicki, and John Craske. "The change of total anthocyanins in blueberries and their antioxidant effect after drying and freezing." BioMed Research International 2004.5 (2004): 248-252.