

Final Technical Report

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Berries and Brews: Understanding the Market and Technological Processing  
Opportunities of Michigan Grown Fruit in the Craft Beverage Industry

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## **Goals and Objectives**

Use of fruits in craft beverages seem to be on the rise to provide unique flavor and aroma profiles. In order to promote Michigan-grown fruits in the craft beverage industry, it is critical to provide relevant data to help farmers and beverage makers be the most efficient in their production processes. These data include current market characteristics and quantitative measure of effectiveness with various fruit processing techniques. Understanding to what extent demand and supply exists for Michigan grown fruits and berries in the Michigan craft beverage industry is necessary to discern the opportunities and the potential cost implications for advancement in processing technology. In the long-run, capturing the current profile of Michigan fruits' used by the craft beverage industry is critical to properly assess the economic impact of beverage making protocols, types of fruits available, and fruit yield, however such data is not readily available. Quantitative data on various processing techniques for extracting flavor/aromatic compounds is also important for beverage makers to have so they can choose the most cost effective production processes.

With the work presented in this proposal, our goal is to provide valuable information about the use of Michigan grown fruits to the craft beverage industry by completing the following three tasks: 1) Develop a market overview on the current use of fruit by the Michigan craft beverage industry, 2) Analyze the effectiveness of multiple fruit processing techniques in extracting flavoring compounds. 3) Estimate the production costs of each processing method. By completing these three tasks we will be able to provide the Michigan craft beverage industry and farmers with valuable information on the market for Michigan grown fruit, advancements in fruit processing methods, and the production cost implications to brewers of those advancements. We believe this information can assist beverage makers in their production decisions.

## **Results, Conclusions and Outcomes**

1) Develop a market overview on the current use of fruit by the Michigan craft beverage industry

Survey was designed with the consultation with one of our local collaborator, Keweenaw Brewing Company. We were successfully capture the current usage and identify hurdles and opportunities of using Michigan grown fruits in brews. Figure 1 shows one of the data from the survey. Responses and key findings are being analyzed in preparation for publication.

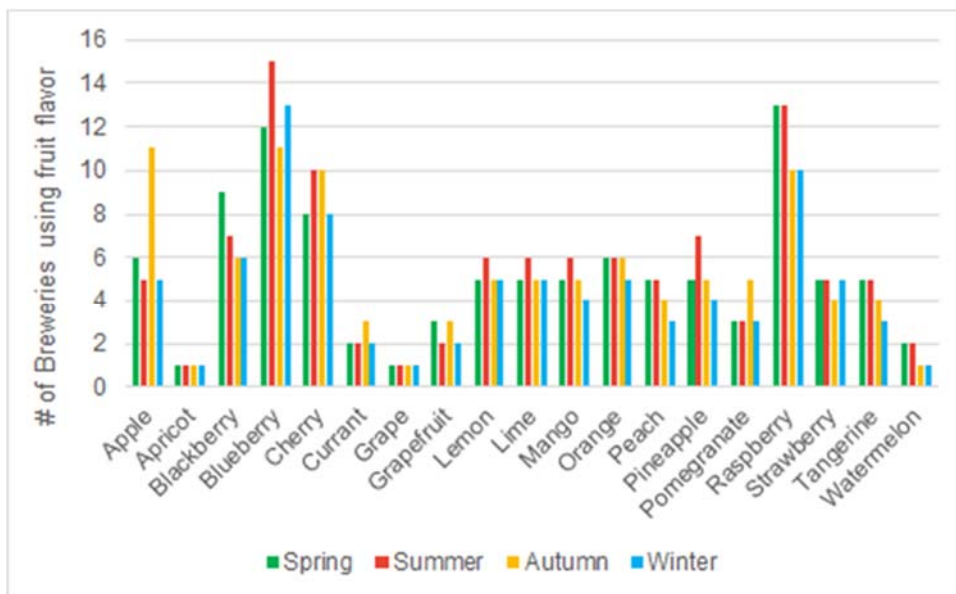


Figure 1: FFAB Availability by season and fruit usage

2) Analyze the effectiveness of multiple fruit processing techniques in extracting flavoring compounds

Compound analyses with Mass spectrometer was conducted. Commercially available analyses program for aromatic compounds were not suitable to identifying ones prominently found in blueberries, thus we worked on developing new workflows/algorithms to process data from berry samples using NIST standard of blueberry and cranberry. Using the established workflow, mass spectrometry data from various forms of blueberry (NIST standard, Blueberry from local farm-frozen, brewer’s syrup, 100% blueberry juice) were processed and compared. Data being analyzed for publication.

Table 1 Sample pairs that went through differential analysis and number of statistically significant species.

Sample 1	Sample 2	Number of Significant Species
<b>Brewer’s Best Natural Blueberry Flavoring</b>	Brewer’s Best Natural Cranberry Flavoring	698
<b>Blueberry paste stored at -20°C</b>	Cranberry paste stored at -20°C	723
<b>Whole blueberries stored at -20°C</b>	Whole cranberries stored at -20°C	646
<b>Blueberry paste stored at -20°C</b>	Blueberry paste stored at -80°C	581
<b>Brewer’s Best Natural Blueberry Flavoring</b>	Blueberry paste stored at -20°C	731
<b>Blueberry paste stored at -20°C</b>	Whole blueberries stored at -20°C	580

3) Estimate the production costs of each processing method.

Original plan was to use shockwave facility on Michigan Technological University Campus to treat blueberry and assess the efficacy of flavoring compound extraction. If the shockwave treatment increase the extraction of those aromatic/flavoring compounds, this may reduce the cost of introducing fruits in brew and potentially increase the fruit usage in their products. This task was incomplete due to the lack of availability of both facility (closed during pandemic, relocation required after reopening) and technician. We plan to conduct this task as the facility relocation has completed.

### **Time Span**

Grant period, 4/1/2020-12/31/2021

### **Work Accomplished/ Methods**

#### **Communication Activities, Accomplishments and Impacts**

Market analyses using survey data and fruit cultivation data in Michigan were summarized and in preparation of publication for *Beverage*. Five students from College of Business worked on the project attended Midwest Economic Association meeting in March 2021. Mass spectrometry data processing was part of a Chemistry graduate student's project, and summarized in the form of Master Thesis. Six students and 5 faculties were directly involved in the project as well as we collaborated with a local brewer (Keweenaw Brewing Co., South Range, MI) and Blueberry farm (Gierke Blueberry Farm, Chassell, MI) during the project.

### **Budget Narrative**

This project was conducted consistent with the budget proposed by the principle investigator. No matching funds or additional sources of funding were sought nor contributed to the work described herein.