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# Development and Evaluation of Pineapple-Infused Beetroot Wine: A Study on the Production Process, Physicochemical Properties, and Sensory Analysis

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***Abstract*—** *This research paper presents the development and evaluation of pineapple-infused beetroot wine, focusing on the production process, physicochemical properties, and sensory analysis. The study involved the extraction of beetroot juice through Thermovinification, followed by the addition of sugar and tartaric acid for juice adjustment. Fermentation was initiated using yeast, and continuous monitoring of Brix and pH was conducted over a seven-day period. During fermentation, Brix values decreased gradually from 25º to 9º, while pH levels dropped from 7.0 to 3.1. The final wine had a total soluble solids (TSS) of 90Brix, titratable acidity (TA) of 4.725 gm/lit, and alcohol content of 12.5%v/v. The sensory analysis revealed a fruity aroma with a distinct beetroot fragrance and a sour taste, with the wine displaying a clear reddish color. The research highlights the process of cold stabilization, racking, and blending with pineapple juice in a 3:1 ratio, which resulted in a unique and palatable sensory profile. The physicochemical analysis indicated a significant reduction in Brix, indicating successful fermentation, and a desirable pH level, contributing to the wine's stability and flavor. This study provides valuable insights into the production of pineapple-infused beetroot wine, showcasing its potential as an innovative and distinct alcoholic beverage. The sensory analysis, with its fruity aroma and sour taste, suggests that the wine could appeal to consumers seeking new and exciting flavor experiences. The findings contribute to the growing interest in unconventional wine production and offer a novel approach to utilizing beetroot juice in winemaking. Future research could explore additional infusion possibilities and optimize the blending ratio to achieve a balance between sweetness and acidity for broader consumer acceptance.*

***Keywords*—** *Alcohol Content, Beetroot Flavor, Brix Monitoring, Cold Stabilization, Fruity Aroma.*

## I. INTRODUCTION

The production and evaluation of fruit wines have gained increased attention in recent years, with studies focusing on the development of new blends and their health benefits. Beetroot wine, in particular, has been the focus of several studies due to its high nutritional content and potential health benefits. It has been found to have antioxidant and anti-inflammatory effects, as well as cardiovascular benefits, such as lowering blood pressure and improving endothelial function. Pineapple, on the other hand, is a tropical fruit that is high in vitamins, minerals, and enzymes. It is a good source of antioxidants, and its enzyme bromelain has been linked to digestive and anti-inflammatory benefits

Combining these two ingredients in a wine blend has the potential to offer a range of health benefits, as well as a unique flavor profile. However, there is limited research on the production and evaluation of pineapple-infused beetroot wine.

Therefore, the aim of this project is to develop and evaluate a pineapple-infused beetroot wine, with a focus on the production process, physicochemical properties, and sensory analysis. This will involve a series of experiments to determine the optimal ratio of pineapple juice to beetroot wine, as well as the optimal fermentation conditions.

To achieve this, the first step will be to obtain high-quality beetroot and pineapple juices. The juices will be analyzed for their physicochemical properties, such as pH, total soluble solids, and titratable acidity. The juices will then be blended in different ratios, ranging from 10% to 50% pineapple juice., the blended juices will be fermented using Saccharomyces cerevisiae yeast. The fermentation process will be monitored by measuring the sugar and alcohol content of the wine at different intervals. The optimal fermentation time will be determined by sensory analysis, which will be conducted by a trained panel of tasters.

After fermentation, the physicochemical properties of the wine will be analyzed, including pH, alcohol content, total acidity, and volatile acidity. The sensory properties of the wine will also be evaluated, including aroma, taste, and overall impression. This will be done using descriptive analysis, in which trained tasters will describe the wine using a standardized vocabulary.

The potential health benefits of pineapple-infused beetroot wine are significant, and this project aims to contribute to the growing body of research on fruit wines and their health implications. Beetroot and pineapple are both rich sources of bioactive compounds, and their combination in a wine blend could provide synergistic effects. Betalains, the pigments responsible for the characteristic color of beets, have been found to have antioxidant and anti-inflammatory effects (4). They have also been linked to cardiovascular benefits, such as reducing blood pressure and improving endothelial function Pineapple, on the other hand, contains bromelain, a proteolytic enzyme that has been found to have anti-inflammatory and digestive benefits. It has also been linked to the prevention of blood clots and cardiovascular disease

The combination of these compounds in a wine blend has the potential to provide synergistic effects, leading to improved health outcomes. Furthermore, the unique flavor



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profile of pineapple-infused beetroot wine could make it an attractive alternative to traditional grape wines In conclusion, the development and evaluation of pineapple-infused beetroot wine is an important area of research with significant potential implications for health and the wine industry. This project aims to contribute to the growing body of research on fruit wines and their health benefits, as well as to explore the potential of pineapple-infused beetroot wine for Pineapple juice blended with beetroot wine production health benefits.

Blending pineapple juice with beetroot wine can potentially offer a range of health benefits, thanks to the nutritional properties of both ingredients. Here are a few potential health benefits of pineapple-infused beetroot wine: Rich in Antioxidants: Both beetroot and pineapple are rich in antioxidants, which can help to protect the body from damage caused by free radicals. Antioxidants can also help to reduce inflammation and lower the risk of chronic diseases such as heart disease and cancer. Supports Digestive Health: Pineapple contains an enzyme called bromelain, which can help to improve digestion and reduce inflammation in the gut. Beetroot is also rich in fiber, which can support healthy digestion and regular bowel movements. Boosts Immune System: Pineapple is high in vitamin C, which can help to support immune system function and protect against infections. Beetroot is also a good source of vitamin C, as well as other immune-boosting nutrients like iron and folate. Promotes Healthy Blood Pressure: Both beetroot and pineapple contain compounds that may help to lower blood pressure and improve cardiovascular health. Beetroot is particularly rich in nitrates, which can help to improve blood flow and reduce the risk of hypertension. Anti-inflammatory Properties: Pineapple contains bromelain, which has anti-inflammatory properties and can help to reduce pain and swelling. Beetroot also contains compounds that may have anti-inflammatory effects, making this blend potentially helpful for reducing inflammation throughout the body. It's worth noting that the specific health benefits of pineapple-infused beetroot wine will depend on the ratio of ingredients used and the individual characteristics of the wine. It's always a good idea to consume alcohol in moderation and to speak with a healthcare professional before making any significant dietary changes.

## II. Methodology

Beetroot Fruit: 3 kg, Pineapple Juice: 1 ltr, Sugar: 1 kg, Tartaric Acid: 13.5 gm, Diammonium Phosphate: 3.1 gm, Potassium Metabisulfite (KMS) for Washing: 2 gm, Ascorbic Acid: 0.25 gm, Distilled Water: 3.5 liters, Yeast (Saccharomyces cerevisiae): 1.50 gm

Collection and Preparation of Beetroot Juice:

Beetroot fruits were collected and peeled to extract the juice.

Thermo vinification was performed to extract the juice efficiently.

Initial Brix and pH levels of the juice were measured and recorded.

Juice Adjustment:

Sugar and tartaric acid were added to the beetroot juice for adjustment.

Final Brix and pH levels were measured after the adjustment.

Addition of Diammonium Phosphate and Yeast Inoculation:

Diammonium phosphate was added to the juice.

A yeast inoculum was prepared by adding 1.5 gm of yeast in 50 ml of water.

Yeast inoculation was done at room temperature (17°C).

Fermentation Process:

The fermentation process was allowed to continue for 7 days.

Brix levels were checked every 24 hours during fermentation.

Stopping the Fermentation:

The fermentation process was halted when the Brix reached 90.

About 12.5% alcohol was produced from the fermented juice.

Blending with Pineapple Juice:

1 ltr of pineapple juice was blended with 3 ltrs of beetroot wine.

Racking and Cold Stabilization:

Wine was racked three times to separate solids and sediment.

Cold stabilization process was carried out for 24 hours.

Wine Analysis:

The wine's total soluble solids (TSS), titratable acidity (TA), alcohol content, pH, aroma, taste, and color were analyzed.

Bottling:

The final pineapple-infused beetroot wine was bottled and prepared for further evaluation.

## III. Result

The study on the development and evaluation of pineapple-infused beetroot wine yielded the following observations:

*1. Physicochemical Properties:*

- The initial juice had a high total soluble solids (TSS) of 250 Brix, indicating a high sugar content, which decreased to 90 Brix in the final wine.
- The titratable acidity (TA) decreased from 5.2 gm/lit in the initial juice to 4.7 gm/lit in the final wine, indicating a slight decrease in acidity during the fermentation process.
- The pH decreased significantly from 6.9 in the initial juice to 3.1 in the final wine, indicating the transformation of sugars into alcohol and the acidification of the beverage.
- The color changed from a red hue in the initial juice to a clear reddish color in the final wine, indicating the extraction of pigments from the beetroot during fermentation.
- The aroma of the wine was fruity with a distinctive beetroot aroma, which contributed to its unique character.
- The taste of the wine was sour, reflecting the decrease in acidity and the tanginess of the beetroot flavor.



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*2. Fermentation Process:*

- During the fermentation process, the sugar content (Brix) gradually decreased from 25 to 9.0 over a period of seven days. This decrease indicates the conversion of sugars into alcohol by yeast fermentation.
- The pH of the wine decreased steadily from 7.0 to 3.1, reflecting the acidification process and the conversion of organic acids.

*3. Sensory Analysis:*

- The sensory characteristics of the pineapple-infused beetroot wine included a fruity aroma with a prominent beetroot aroma, a sour taste, and a reddish color.

## IV. CONCLUSION

In conclusion, the study successfully developed and evaluated pineapple-infused beetroot wine. The fermentation process resulted in a wine with a decreased sugar content, acidity, and pH. The wine exhibited a fruity aroma with a distinct beetroot aroma, a sour taste, and a reddish color. The findings of this study contribute to the understanding of the production process, physicochemical properties, and sensory analysis of pineapple-infused beetroot wine. Further research can build upon these findings to optimize the production process, improve the sensory attributes, and explore potential health benefits associated with the consumption of this unique beverage.

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