Development of Musa Acuminata-Based Coffee Beverage

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ABSTRACT

This study aimed to develop a coffee-type beverage using banana blossom (Musa acuminata) as the raw material and to evaluate its sensory acceptability and microbiological characteristics. The product development process involved selecting, washing, slicing, drying, roasting, grinding, extracting and packaging banana blossom. Several trials were conducted to improve the attributes of the coffee-type beverage. Sensory evaluation was carried out with a five-point acceptability scale. The grand mean score reported was 4.32. Among the attributes evaluated aroma received the weighted mean of 4.50 followed by color at 4.46, texture at 4.27 and taste at 4.11. Microbiological analysis showed a coliform count of no more than 10 CFU/g, an aerobic plate count of 300 CFU/g and a yeast and mold count of 27 CFU/g. The sensory evaluation results indicated that the coffee-type beverage was highly acceptable based on the score. However the microbiological acceptability of the coffee-type beverage still needs verification against relevant standards. Further studies are recommended to establish the composition of banana blossom to determine the caffeine content of the coffee-type beverage and to evaluate its shelf life. These investigations would provide evidence, about the composition, quality and storage stability of the coffee-type beverage.

Keywords: Musa acuminata, banana blossom, coffee-type beverage, product development, sensory evaluation, microbiological analysis

INTRODUCTION

Agricultural societies utilize some parts of crops which are otherwise neglected and show potential applications in food development. One of the examples is the banana flower which is prevalent in many places. However, there remains a considerable room for improvement in utilizing the plant to develop food products and especially beverages. It is highly significant to apply the use of agricultural plants to the production of innovative products.

The banana blossom is made up of parts that incorporate dietary fiber, proteins, minerals, and other bioactive components that are of interest in the food research area (Soans et al., 2023). Other research articles also provided some information on the potential functionality of banana blossom as well as the possible utilization of the material for food development in general. At the same time, additional research must be conducted to verify the feasibility of using banana blossoms for creating coffee-type drinks. It should also be noted that banana blossoms do not contain any caffeine, which is a characteristic component of coffee products, but this must be confirmed later once the new product is made.

With the growing interest in the alternatives derived from the plants in beverage production, chances are there to investigate the agricultural products not commonly utilized for producing beverages. One possible option is the evaluation of banana blossom that could involve techniques like drying, roasting, and grinding so that it acquires some characteristics of roasted beverages. Nevertheless, its sensory acceptability and microbial properties should be studied as well.

Overall, the study was carried out for the development of the coffee-like beverage from the raw material banana flower (Musa acuminata). The technique used in the study included several procedures: washing, drying, roasting, grinding, brewing, and packing. The crafted beverage was tested according to the sensory and consumer evaluations involved in the study; the microbial analysis included the total coliform count, aerobic plate count, as well as the count of yeasts and molds in the sample used for study. Thus, the results of product development, sensory evaluation, and microbial analysis can be seen as a beginningfor the further research.

Objective of The Study

The study examined whether banana blossom can serve as a caffeine-free coffee substitute, focusing on its microbiological safety and sensory qualities. Microbiological testing makes sure that food safety standards are met. Sensory testing of color, smell, taste, mouth feel, and general acceptability shows how well consumers like the product and how ready it is for the market.

METHODOLOGY

Research Design

This study applied an experimental approach. Fresh banana flowers were subjected to processes of cleaning, slicing, drying, roasting, grinding, and brewing so that the drink could be produced. The prepared drink was tested in sensory evaluations and microbial analysis.

Participants and Sampling

The study involved 53 participants, consisting of 50 consumer participants and 3 expert participants. The experts included professionals with expertise in food technology, including DOST specialists, scientists, chefs, baristas, and specialty coffee shop managers. Among the 50 consumer participants, 26 were female and 24 were male. The three expert participants consisted of 1 male aged 28 and 2 females aged 25 and 26.

Fifty consumer participants aged 18-24 years (18 years old,9 participants, 19 years old,12 participants, 20 years old,24 participants, 21 years old,3 participants, 23 years old,1 participant, 24 years old,1 participant) were recruited. Purposive sampling was used for the sensory assessment. Participants were recruited from Bulacan State University–Sarmiento Campus and included consumers and professionals.

Product Development

The banana blossom (Musa acuminata) was carefully selected, washed, and chopped into smaller pieces. The prepared banana blossom was oven-dried for 3–4 hours and then roasted at 20°C–30°C for 20–30 minutes. After roasting, it was ground into a very fine powder with a consistency similar to white granulated sugar. The ground banana blossom was then brewed using half a cup of hot water for 30 minutes. Six trials were conducted, with the final trial involving modifications to the preparation, drying, roasting, and brewing procedures to improve the product's color, taste, aroma, and bitterness.

The production process used 250 g of banana blossom as the raw material, with clean water used for washing. Ingredient preparation took approximately 30 minutes, grinding took 10–15 minutes, and packaging took approximately 45 minutes. The final powdered banana blossom coffee was packaged in quantities of 125 g per package. The packaged product was stored at room temperature in a sealed package and kept in a clean cabinet.

Table 1: Summary of the Six Product Development Trials

Trial	Processing Approach or Modification	Observation or Result	Decision for the Next Trial
Trial 1	Ready-made preserved banana blossom was used and roasted	The product was excessively salty.	Washing the banana blossom was

	without washing.		considered to reduce the saltiness.
Trial 2	Preserved banana blossom was washed before roasting.	The product was less salty, but saltiness and a burnt taste remained.	Fresh banana blossom was used in the subsequent trial.
Trial 3	Fresh banana blossom was manually shredded. Sun drying and oven drying were explored.	Sun drying produced a flavor closer to coffee but depended on weather conditions. Oven drying offered better process control, although the product color needed improvement.	Oven drying was considered for further product development.
Trial 4\	Oven drying was used to improve the product's color and flavor.	The color and flavor improved, but further sensory refinement was needed.	Additional adjustments were made in the next trial.
Trial 5	Further adjustments were made to the preparation and oven-drying process.	The color and flavor improved, but the desired roasted bitterness was still lacking.	Further modifications to the processing procedure were made.
Trial 6	Final modifications were made to the preparation, drying, roasting, and brewing procedures.	The final trial was reported to have the desired color, taste, aroma, and bitterness.	The final product was selected for sensory evaluation.

Research instrument and sensory evaluation

A researcher-developed questionnaire using a five-point Likert scale was used to collect evaluations of the developed banana blossom (Musa acuminata) coffee beverage. The sensory evaluation involved 53 respondents, including 3 experts.the respondents evaluated the beverage by examining aroma, color, texture, taste and overall acceptability.the collected responses were analyzed with the weighted mean to find the level of acceptability of each attribute, in the sensory evaluation. Frequency and percentage were also used to summarize the respondents' demographic characteristics, when applicable. The weighted mean scores were interpreted using the five-point acceptability scale, ranging from Not Acceptable to Highly Acceptable.

Microbiological Analysis

Test results for the sample analyzed at a certified analytical laboratory for total coliform count using AOAC Official Method 991.14, aerobic plate count using U.S. FDA BAM method, and yeast and molds method using the U.S. FDA BAM method. The results were analyzed using descriptive analysis such as frequency, percentage, and weighted average. The five Point Likert scale categorizes the ratings where 4.21-5.00=Highly Acceptable, 3.41-4.20=Acceptable, 2.61-3.40=Moderately Acceptable, 1.81-2.60=Slightly Acceptable, and 1.00-1.80=Not Acceptable.

RESULTS

Product Development Result

Six trials were conducted to develop the banana blossom (Musa acuminata) coffee beverage. During the early trials, the researchers encountered difficulties in controlling the roasting process and achieving the desired product characteristics. In the subsequent trials, fresh banana blossom was used, and sun drying was compared with oven drying. Sun drying produced a flavor closer to coffee in one trial, although the outcome depended on weather conditions. In contrast, oven drying provided better control over the drying process. Adjustments were made throughout the trials to improve the product's color, flavor, aroma, and roasted bitterness. Based on the researchers' observations, the final trial achieved the desired color, flavor, aroma, and roasted taste.

Table 2: Microbiological Results

Test	Actual Value	Stated Standard
Yeast and Mold Count	27 CFU/g	Less than 10^4 CFU/g
Aerobic Plate Count	300 CFU/g	Less than 10^4 CFU/g
Total Coliform Count	<10 CFU/g	Less than 10 CFU/g

The microbiology analysis of the coffee product made from Musa acuminata showed total coliform count of less than 10 CFU/g, aerobic plate count of 300 CFU/g and yeast and mold count of 27 CFU/g. The total coliform count and aerobic plate count results were included in the report of the lab dated August 17, 2026, while the yeast and mold count results were included in the report of July 21, 2026. They reflect the micro-key performance indicators of the sample. Though the research results indicate that the results comply with the relevant standard values, it is vital to specify which standards, categories and acceptable limits we are mentioning.

Table 3: Sensory Evaluation Results

Sensory Attribute	Weighted Mean	Interpretation
Aroma	4.50	Highly Acceptable
Color	4.46	Highly Acceptable
Texture	4.27	Highly Acceptable
Taste	4.11	Acceptable
Grand Mean	4.32	Highly Acceptable

Analysis of the sensory characteristics of the coffee drink based on Musa acuminata was performed using the five-point acceptability rating scale. The results obtained indicated that the aroma received the highest weighted mean of 4.50 while the lowest score was received by the taste at 4.11. A grand mean of 4.32 indicates that the coffee drink was considered acceptable by the respondents.

Among various sensory characteristics that were evaluated, aroma was scored the highest while taste was the lowest. Therefore, respondents rated the aroma of coffee drink higher than its taste. The low score of taste indicates that this characteristic can be improved in the future formulation process as well as roasting trials. In addition, it should be mentioned that study results reflect opinions of respondents related to its preparation rather than its comparison with coffee.

CONCLUSION

The experiment was successful in the production of a beverage resembling coffee from Musa acuminata (banana flower). The scores revealed from the perceptual analysis provided the global average rating of 4.32, which is acceptable. Aromas received the highest and flavors received the lowest score in comparison to other sensory elements, meaning that there is still much work in this area. The microbiological assessment included the analysis of total coliforms, aerobic plate counts, and yeast and molds. Further research is needed to formulate microbiological standards.

RECOMMENDATIONS

1. Improve taste of the banana blossom coffee beverage because its flavor has the lowest weight mean score of the aromatic parameters, yet it remains acceptable.

2. Optimize drying, roasting, and grinding process controls so that flavors, colors and textures of the product would be at their best.

3. Conduct research on formulation and production improvement.

4. Investigate nutrition value of the product.

5. Conduct consumer acceptance testing with a larger group of participants.

ETHICS STATEMENT

Participation in the sensory evaluation was voluntary. The respondents were informed about the purpose of the study and the nature of the product evaluation. The information collected was used solely for research purposes, and the respondents' personal information was treated confidentially.

Data Availability Statement

The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable privacy and confidentiality requirements.

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