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SENSORY EVALUATION OF PLANT-BASED PASTA MADE FROM WATER SPINACH AND BANANA BLOSSOM

Judilyn C. Mateo-Nakamura[1*], Czarina M. Ajusan [2], Jefferson N. Alicante [3], Jovel M. Del Rosario [4], Andrea D. Garcia [5], Sophia Grace S. Tamo-o (†) [6]

[1] MBA, MAEd-TLE Assistant Professor of College of Education-Laboratory High School (COEd), Nueva Ecija University of Science and Technology, Philippines
[2] Student of Bachelor of Technology and Livelihood Education – Major in Home Economics College of Education, Nueva Ecija University of Science and Technology, Philippines
[3] Student of Bachelor of Technology and Livelihood Education – Major in Home Economics College of Education, Nueva Ecija University of Science and Technology, Philippines
[4] Student of Bachelor of Technology and Livelihood Education – Major in Home Economics College of Education, Nueva Ecija University of Science and Technology, Philippines
[5] Student of Bachelor of Technology and Livelihood Education – Major in Home Economics College of Education, Nueva Ecija University of Science and Technology, Philippines
[6] Deceased, Student of Bachelor of Technology and Livelihood Education – Major in Home Economics College of Education, Nueva Ecija University of Science and Technology, Philippines

[*]Corresponding Author

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ABSTRACT

The study explored the potential of water spinach and banana blossom as functional ingredients for plant-based pasta, which offered sustainability benefits and gained consumer acceptance. Sensory evaluation helped determine whether the pasta was appealing in terms of color, aroma, texture, and taste, which was crucial for its success in the market.

Different formulations were tested to determine the most suitable composition for the plant-based pasta. Investigating microbial growth strengthened the study by ensuring that the product remained safe and viable for commercial production. While these ingredients had potential, they were not widely explored in pasta manufacturing. Further research highlighted their sustainability and suitability for mainstream food products.

Data was collected through questionnaires as a tool for sensory evaluation. The plant-based pasta demonstrated excellent microbiological safety, with no harmful contaminants and stable pH levels over 14 days. Sensory evaluation indicated high acceptability, with participants generally rating its aroma, texture, and taste favorably. Compared to commercial pasta, experts and students preferred the plant-based version across all attributes, while teachers favored its aroma.

The study successfully formulated plant-based pasta that met consumer preferences. Microbial analysis confirmed its safety, with no harmful contaminants and stable pH levels over 14 days. Sensory evaluation showed high acceptance, with strong ratings for color, aroma, texture, and taste. Compared to commercial pasta, experts and students preferred the plant-based version, while teachers favored its aroma. The research effectively covered development, safety, sensory evaluation, and comparative analysis.

KEYWORDS: *Banana Blossom, Microbial Analysis, Plant-Based Pasta, Sensory Evaluation and Water Spinach*

1.INTRODUCTION

Pasta is a staple food traditionally made from durum wheat semolina and water, shaped into sheets or various forms. It differs from noodles, which are usually made from common wheat or alternative flours such as rice, buckwheat, or quinoa. Pasta is valued for its versatility and nutritional contribution, particularly as a carbohydrate-rich energy source (Porter, 2024)[1]. However, conventional pasta production faces challenges in sustainability, resource efficiency, and dietary inclusivity, prompting the need for innovation in both ingredients and processing methods (Cappelli & Cini, 2021)[2].

In the Philippines, the pasta and noodles market continues to grow due to urbanization, rising middle-class consumption, and global culinary influences. Consumers increasingly seek convenient, Western-style dishes, creating opportunities for novel local products (Wresearch, n.d.). For instance, in Nueva Ecija, Chanos Chanos popularized Bangus Spaghetti, a tomato-based pasta featuring milkfish

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flakes, offering a culturally relevant and nutritious alternative (Guzman, 2023)[3].

While banana blossom and water spinach have been widely studied, their potential in plant-based pasta remains underexplored, particularly within the framework of the United Nations Sustainable Development Goals (SDGs). This study aligns with SDG 12: Responsible Consumption and Production, and SDG 9: Industry, Innovation, and Infrastructure, which advocate for sustainable resource use, resilient food systems, and innovative production methods. The research evaluates the physicochemical properties (pH), microbial safety (*Staphylococcus aureus*, *Salmonella* spp., *Escherichia coli*, molds, and yeasts), and sensory attributes (color, aroma, texture, and taste) of the plant-based pasta to determine its quality, safety, and consumer acceptability, supporting its potential as a sustainable, nutritious, and culturally relevant alternative to conventional pasta.

Figure_ 1. Plant-based Pasta
(Left: Raw Plant-based Pasta, Right: Dried Plant-based Pasta)

2. OBJECTIVES

1.To formulate plant-based pasta using water spinach and banana blossoms as primary ingredients.
2.To describe the functional properties of water spinach (kangkong) and banana blossoms as ingredients in pasta formulation in terms of:
  2.1. Physicochemical properties, specifically pH level; and
  2.2. Microbial properties, specifically:
    2.2.1. Staphylococcus aureus count;
    2.2.2. Salmonella species count;
    2.2.3. Escherichia coli count;
    2.2.4. Mold count; and
    2.2.5. Yeast count.
3.To describe the sensory evaluation of the plant-based pasta made from water spinach and banana blossoms in terms of:
  3.1. Color;
  3.2. Aroma;
  3.3. Texture; and
  3.4. Taste.
4. To determine whether there is a significant difference in the sensory evaluation between the formulated plant-based pasta and commercialized pasta based on the opinions of:
  4.1. Experts (food and business);
  4.2. Teachers; and
  4.3. Students.

3. METHODOLOGY

This study employed through Developmental Design under Quantitative Research Method from which the development of plant-based pasta using water spinach and banana blossoms were systematically tested the different amounts of powdered water spinach, banana blossoms and other ingredients to get the best plant-based pasta formulation. The researchers believed that through developmental research, as opposed to simple instructional development, it has been defined as the systematic study of designing, developing, and evaluating instructional programs, processes, and products that must meet criteria of internal consistency and effectiveness (Richey, R.

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C., n.d.)[4]. Additionally, aside from the development and testing of the plant-based pasta, as another part of the Quantitative Research Method (Bhandari, 2021)[5], numerical data were also gathered from the examined functional properties of *Kangkong* and Banana Blossoms as new ingredients in the pasta formulation for Filipino consumers. This was done through comprehensive assessment of Physicochemical and Microbial Analysis, and the Sensory Evaluation from the respondents.

Figure_ 2. Ingredients

Table 1. Plant-based Pasta Formulation

Ingredients	Percentage (%)
Banana Blossoms	3%
Water Spinach	7%
Glutenous Rice Flour	20%
Tapioca Starch	20%
Water	50%
Salt	Pinch

4. RESEARCH DESIGN

Method: This study employed a developmental design under the quantitative research method to systematically formulate and test plant-based pasta using varying amounts of powdered water spinach and banana blossoms, supported by physicochemical, microbial, and sensory evaluations that generated numerical data. The selected research design establishes a strong evidence base for future product development that may benefit NEUST students and contribute to the wider marketplace.

Table 2. Total number of Respondents

Respondents	Frequency	Percentage (%)
Experts	3	11.53
Teachers	3	11.53
Students	20	76.92
Total	**26**	**100%**

5. STATISTICAL DESIGN

To evaluate the functional properties of water spinach and banana blossoms as novel pasta ingredients, the researchers conducted physicochemical analysis focusing on pH level and microbial analysis assessing Staphylococcus aureus, Salmonella spp., Escherichia coli, molds, and yeasts. pH determines the acidity or alkalinity of pasta and influences chemical reactions, nutrient availability, and overall product stability. Differences between two independent groups were analyzed using the Mann–Whitney U test, which is appropriate for ordinal or non-normally distributed continuous data.

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6. GEOGRAPHICAL AREA

The study was conducted at NEUST–Sumacab Campus in Cabanatuan City, Nueva Ecija, Philippines, chosen for its rich agricultural resources and favorable conditions for growing the study's plant-based ingredients. Additionally, the university's strong emphasis on science and technology makes it an ideal setting for food innovation research and development.

7. RESULTS

Table 3. Results

Parameter	Overall Mean	Verbal Description / Remarks
pH	6.64	Slightly acidic, within acceptable range
Microbial Analysis	ND	No growth detected (Safe)
Color	8.28	LE – LVM (Liked Extremely to Liked Very Much)
Aroma	8.37	LE (Liked Extremely)
Texture	7.96	LVM (Liked Very Much)
Taste	8.08	LE – LVM (Liked Extremely to Liked Very Much)
Experts	8.67	All sensory attributes show **Significant Difference**
Teachers	8.03	Aroma – **Significant**, others – **Not Significant**
Students	8.03	All sensory attributes show **Significant Difference**

The table shows that the plant-based pasta demonstrated good quality and acceptability across all evaluated parameters. The pH was slightly acidic at 6.64, within an acceptable range, and microbial analysis detected no growth, confirming the product's safety. Sensory evaluation indicated high overall scores, with color (8.28), aroma (8.37), texture (7.96), and taste (8.08) rated from "Liked Very Much" to "Liked Extremely." Experts gave the highest mean (8.67), showing significant differences across all sensory attributes, while teachers rated aroma significantly higher than other attributes, and students' ratings (8.03) reflected significant preference across all sensory aspects. Overall, the results suggest that the pasta is safe, stable, and highly acceptable to different consumer groups.

8. SUGGESTIONS

The following suggestions were hereby formulated: Nutritional analysis of plant-based pasta should be considered in future studies to assess its potential health benefits, including its vitamin, mineral, and antioxidant content. However, this was not conducted in the current study due to the high cost of testing. Explore the use of semolina flour in developing plant-based pasta, as its unique properties—such as firm texture and strong structural integrity—may enhance the overall quality, sensory appeal, and cooking performance of the product. And explore and test various types of sauces to identify which best complements the plant-based pasta, enhancing its flavor and overall sensory appeal.

9. CONCLUSION

The study showed that the formulated plant-based pasta successfully combined plant-based ingredients with flour, producing a well-structured, visually appealing product that remained firm during cooking and met consumer sensory preferences. Microbial and pH analyses confirmed that the pasta maintained excellent microbiological safety and stability, with no harmful microorganisms detected and only minimal changes in acidity, indicating safe short-term storage. Sensory evaluation involving experts, teachers, and students revealed high acceptance of the pasta's color, aroma, texture, and taste, with ratings ranging from "liked very much" to "liked extremely." When compared with commercial pasta, the plant-based pasta was generally rated more favorably, particularly by experts and students, while teachers showed a neutral response except for aroma.

This study successfully met its objectives by demonstrating the quality, safety, and acceptability of the plant-based pasta.

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