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Utilization of sweet potato (*Ipomea batatas* L.) into noodles: Its sensory evaluation and acceptability

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Abstract
Instant noodles are a popular convenience food in the Philippines but pose health risks due to their high sodium content and synthetic additives. This study explores the development of a healthier noodle alternative using *Ipomoea batatas* var. Hannah (white sweet potato) as a substitute for wheat flour. Sweet potato, rich in carbohydrates, beta-carotene, and antioxidants, offers nutritional and functional benefits while supporting local agriculture. The research focused on starch extraction, noodle formulation, and sensory evaluation based on aroma, color, firmness, taste, and texture. Results revealed high acceptability among respondents, particularly younger and female consumers, highlighting sweet potato starch as a viable ingredient for nutritious noodle production. The findings emphasize sweet potato's potential to enhance food security, promote sustainable production, and reduce dependence on imported wheat, providing both health and economic advantages.

Keywords: Sweet potato noodles, starch extraction, sensory evaluation, healthy alternative, food sustainability

Introduction

Background of the Study

Wheat-based products such as instant noodles have become one of the most popular ready-to-eat foods in the Philippines due to their convenience, affordability, and appealing taste. However, regular consumption of instant noodles poses health concerns, particularly the increased risk of heart disease, stomach cancer, and stroke, which are mainly attributed to their high sodium content and the use of synthetic additives (Swan, 2021) [7]. To address these health concerns, there is a growing need to develop healthier noodle alternatives made from locally available and nutritious ingredients.

Sweet potato (*Ipomoea batatas* L.), a starchy root crop belonging to the morning glory family (*Convolvulaceae*), is a promising substitute for wheat in noodle production. It is widely cultivated in tropical and subtropical regions and is abundant in the Philippines, particularly in Lanao del Sur. Locally known as *camote* or *ube* in the Meranao term, sweet potato serves as a valuable food source that can be boiled, fried, roasted, or processed into flour, chips, alcohol, and other food products. Its versatility, high carbohydrate content, and availability make it a suitable raw material for noodle development.

Beyond its nutritional value, sweet potato possesses several health-promoting properties. Studies have shown that it contains bioactive compounds with anti- inflammatory, anti-cancer, and anti-diabetic effects (Mohanraj & Sivasankar, 2014) [6]. It is also rich in beta-carotene, a precursor of vitamin A, which is essential for vision and immune function. Sweet potato varieties with high beta-carotene and anthocyanin content offer antioxidant benefits that help prevent cancer, cardiovascular diseases, and premature aging. These attributes position sweet potato as both a functional food and a potential solution to malnutrition and food insecurity.

In addition to its nutritional and medicinal value, sweet potato can contribute to sustainable food production and agro-industrial development. The crop can be processed into flour, starch, pectin, or fermented products such as soy sauce, vinegar, and alcohol (Amitdemelyn, 2024). The purple-fleshed varieties, rich in anthocyanin, can be used as natural food colorants, providing a healthier alternative to synthetic dyes commonly used in food processing. This not only enhances the aesthetic quality of food products but also aligns with the growing consumer preference for natural and health-promoting ingredients.

The wide range of uses and benefits of sweet potato provides significant opportunities for product diversification and value addition, especially in rural areas. Its use in noodle production can help reduce reliance on imported wheat while promoting local agricultural sustainability. Moreover, developing a fresh, sweet potato-based noodle product can encourage consumers to make healthier food choices without compromising taste or quality. Such an innovation supports the goals of food security, nutrition improvement, and local economic development (Rozi, 2021).

In this study, the researchers utilize *Ipomoea batatas var. Hannah*, also known as white sweet potato. This cultivar is characterized by its cream-white flesh that turns yellow when cooked and has a mildly sweet flavor that complements other ingredients (Boyette, 2023). By using this variety, the researchers aim to develop a nutritious, palatable, and appealing fresh noodle product that can serve as an alternative to commercially available instant noodles.

The study focuses on the formulation, processing, and sensory evaluation of sweet potato noodles. It seeks to determine the methods of starch extraction from sweet potatoes, the transformation of this starch into noodles, and the sensory characteristics such as aroma, color, firmness, taste, and texture of the final product. Furthermore, the research examines how the inclusion of sweet potato affects the noodles' properties and overall quality.

Statement of the Problem

This study seeks to answer the following research questions:

1. What are the steps in developing starch from sweet potato?
2. What are the processes involved in transforming sweet potato starch into noodles?
3. What are the palatability characteristics of sweet potato fresh noodles in terms of aroma, color, firmness, taste, and texture?
4. What are the effects of sweet potato on the properties and quality of noodles?

Objectives of the Study

1. To develop starch using sweet potato.
2. To determine the processing steps for sweet potato noodles.
3. To evaluate the sensory characteristics of sweet potato noodles based on aroma, color, firmness, taste, and texture.
4. To determine the effects of sweet potato on the properties and quality of noodles.

Conceptual Framework

The conceptual framework illustrates the relationship between the input, process, and output of the study. The *input* involves the processing steps of sweet potato starch and noodle preparation. The *process* includes sensory evaluation assessing taste, texture, color, firmness, and aroma and determining the noodle's physical and quality characteristics. The *output* represents the final product: high-quality sweet potato fresh noodles that are nutritious, palatable, and a healthier alternative to conventional instant noodles.

Research Design

The study used an experimental design with quantitative and descriptive methods to analyze the production process and sensory qualities of sweet potato noodles.

Equipment and Materials

- **For starch making:** peeler, knife, chopping board, blender, cheesecloth, bowl, dehydrator.
- **For noodle making:** steamer, dehydrator, mixing bowl, spoon, cutter, weighing scale, microwavable plastic.
- **Main ingredients:** 500 g sweet potato starch and 5 cups of water.

Locale of the Study

The experiment was conducted at the Mindanao State University - Main Campus, Marawi City, specifically at the Food Processing Laboratory of the College of Agriculture.

Procedures

A. Sweet Potato Starch Preparation

1. Wash, peel, and cut 3 kg of sweet potatoes.
2. Soak to prevent discoloration, then blend with water.
3. Strain using cloth and squeeze out liquid; repeat twice.
4. Let the liquid settle for 4 hours; decant water.
5. Dry the starch at 50°C for 5 hours, then grind to fine powder.

B. Sweet Potato Noodle Preparation

- Mix 500 g starch with 5 cups water.
- Transfer to microwavable plastic and steam.
- Cool, dry, and cut into noodle strands.
- Dry at 50°C for 3 hours or by sun drying.
- Pack and store properly.

Data Gathering Procedure

A survey questionnaire was used, consisting of two parts: (1) respondent profile, and (2) sensory evaluation of noodles using a 9-point hedonic scale (1 = dislike extremely; 9 = like extremely). One hundred randomly selected students from the College of Agriculture, MSU-Main Campus, participated during the 1st semester of A.Y. 2024- 2025. Data were analyzed using descriptive statistics: Frequency and Percentage - to describe respondent profiles and product ratings ($\% = (f/n) \times 100$). Mean ($\bar{X} = \Sigma X / N$) -to determine average sensory ratings.These tools provided insights into the acceptability and quality of sweet potato fresh noodles.

Results

The majority of respondents were aged 21-24 (64%), and most were female (74%). Most of the respondents were third-year students (35%) from the Agribusiness Management department (34%). The aroma of sweet potato noodles was most favorably received by younger students, females, and students from specific departments.

Demographic Distribution of Sweet Potato Noodles Based on Properties Younger individuals, especially females aged 17-24, rated the color of sweet potato noodles more favorably. Females showed a stronger preference for the noodle color (27%) compared to males (8%).Third-year students and those from the Plant Science department gave the most favorable ratings for the color

Discussion
The findings suggest that sweet potato starch is a viable raw material for producing acceptable noodles with favorable sensory qualities. The high acceptability across various attributes indicates consumer readiness to adopt sweet potato noodles as a healthy alternative to traditional wheat-based noodles.

Consumer preferences are influenced by demographic factors, with younger individuals and females showing more enthusiasm, particularly for aroma and texture. This insight provides valuable guidance for targeted marketing and product positioning. The physicochemical analyses support the feasibility of using sweet potato starch, highlighting its functional properties such as water retention and swelling, which are critical for noodle quality. In comparison with international studies, the Filipino context demonstrates similar favorable outcomes, emphasizing the potential for local industries to develop sweet potato-based noodle products for health-conscious consumers.

Conclusions
Sweet potato starch is highly acceptable as an ingredient for noodle production due to its favorable properties and consumer acceptance. Sensory attributes such as taste, aroma, and color significantly influence overall acceptability, with taste being the most critical. Demographic variables, particularly age and gender, significantly affect preferences, with younger and female respondents showing higher liking. The formulated sweet potato noodles meet consumer expectations, indicating their potential as a nutritious and acceptable food product.

Recommendations
Product Development: Further optimization of formulations, considering flavor enhancers and textural improvements to cater to diverse preferences, especially among older consumers. Marketing Strategies: Emphasize health benefits, natural color, and aroma targeted toward health-conscious young consumers and females. Commercialization: Encourage local food industries and small-scale producers to adopt sweet potato starch for noodle manufacturing. Further Research: Investigate shelf-life stability, nutritional profiling, and potential gluten-free claims of sweet potato noodles.

Significance and Implications
This study underscores the potential of sweet potato as a sustainable and nutritious raw material for noodle production. It aligns with current trends toward healthier eating and alternative protein sources, contributing to food diversification and security.

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