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ACCEPTABILITY OF LAKATAN BANANA PEEL CHIPS IN DIFFERENT FLAVOR ENHANCEMENTS AMONG WVSU–HCC COMMUNITY

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ABSTRACT

This quantitative-experimental study investigated the acceptability of lakatan banana peel chips with different flavor enhancements among the WVSU–HCC community. Forty respondents composed of students, faculty, and non-teaching personnel evaluated four treatments: original, cheese, barbeque, and sour cream. Sensory attributes of appearance, aroma, taste, texture, and overall acceptability were assessed using a 9-point hedonic scale, while statistical analysis was performed through the Kruskal-Wallis H test and Dunn's post hoc test to determine significant differences among treatments.

Findings revealed that all variants were rated within the "Very Acceptable" range across all sensory attributes. Among the formulations, barbeque-flavored (Treatment C) and sour cream-flavored (Treatment D) chips consistently achieved the highest mean scores, particularly in taste, aroma, and overall acceptability. The original variant (Treatment A) obtained the lowest scores but remained acceptable. Statistical tests confirmed significant differences in acceptability, especially between the original and flavored variants, indicating that flavor enhancement played a substantial role in consumer preference.

The study concludes that lakatan banana peel chips are a sustainable, nutritious, and consumer-acceptable snack option, with flavored variants showing greater market potential. These results highlight the value of utilizing banana peels an underutilized agricultural by-product in developing innovative food products that support environmental sustainability, promote healthier snack alternatives, and create opportunities for entrepreneurial ventures.

Chapter 1
INTRODUCTION

This chapter contains nine parts: (1) Background of the study; (2) Statement of the Problem; (3) Hypothesis; (4) Significance of the Study; (5) Definition of Terms; (6) Scope and Limitation of the Study; and (7) Conceptual Framework of the study

Part One, Background of the study, contains the underlying context of the research paper.

Part Two, Statement of the Problem, states the general and specific problems that the study wants to address and seek answer for.

Part Three, Hypothesis states the hypothesis to be tested.

Part Four, Significance of the Study, states who will most likely to benefit the concluded data of this study.

Part Five, Definition of Terms, operationally and conceptually define the terms used in the study in order to give clarity.

Part Six, Scope and Delimitation of the Study, shows the scope and Delimitations in the process of the study.

Part Seven, Conceptual Framework of the study, shows the relationships among the variables of the study.

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Background of the Study

There is a lot of interest in using agricultural by-products, especially those derived from crop plants, as a source of useful components. The peel of bananas (Musa spp.), like other agricultural by-products, is frequently thrown away despite being a popular food crop around the world. Due to its historical use as food and medicine in several parts of the world, banana peel has the potential to be turned into functional meals.

Zaini, Roslan, Saallah, Munsu, Sulaiman & Pindi (2022).
The banana chip and peel community micro business in Bandung needs help in marketing promotion and financial management despite the high nutritional potential of banana peels. This initiative aims to enhance local micro-businesses' marketing strategies and financial practices by empowering community members with the necessary skills and knowledge. Sari, Kanya, Kamil & Nandang (2024).

A large quantity of bananas is produced annually and its peel, which accounts for about one third of the fruit weight, is mostly discarded as waste. The peel has been traditionally used for the treatment of various ailments. This by-product is rich in phenolics with over 40 individual compounds identified. A large quantity of banana (102 million tonnes of fresh fruit) is produced annually (FAOSTAT., 2012). The peel accounts for about 35% of the whole fruit weight (Vu, Scarlett, & Vuong, 2016), therefore approximately 36million tonnes of banana peel is generated every year and this is a potential material for further utilisation. However, most of the banana peel is usually discarded into landfill or with general waste. Scarlett & Vuong (2018)

The primary by product of banana processing, banana peels make up 30% of the fruit and pose a risk to the environment. Because of their high dietary fiber and phenolic content, banana peels are a promising byproduct for a variety of uses in nutraceuticals and medicine. Banana peels are a rich source of phytochemical components, mostly antioxidants such phenolics, flavonoids, gallocatechin, anthocyanins like cyaniding and delphinidin, as well as catecholamines, carotenoids, vitamins, and minerals, according to numerous studies. Adetuyi, Ogundipe, Ogunlana, Egbuna, Estella, Mishra & Achar(2022).

Chips are the most widely consumed snack kind and people eat them all year round throughout all age groups. To ascertain the impacts, a central composite face cantered design was used of chips' thickness (mm), frying temperature (°C) and frying duration (min) on their overall acceptability, moisture content, fat content, hardness and color. Udomkun, Innawong (2018). The most significant items that are often fried are chips or crisps, which are typically served as thin discs or occasionally as sticks. Adeniji & Tenkouano (2007).

Snack foods' value on the global market rises yearly. On the other hand, excessive snacking, particularly junk food, leads to a number of health issues. Thus, healthy snacks are regarded as an alternate option for consumers. A banana's high levels of health-promoting chemicals make it one of the ingredients used to make healthful snacks like banana chips. However, the deep-frying procedure results in a high oil content in the fried chips, which shortens their shelf life and increases the risk of health issues. Several combination approaches, including hydrocolloid coating (guar gum or carboxyl methyl cellulose) combined with freezing and moisture reduction combined with freezing (MRF), are suggested in this study as pre-frying treatments. Panang, Thikeaw, Soubsub, Olanwanit & Phahom (2023)

Banana peel are often discarded part of the banana fruit, so the researcher decided to conduct this study to discover the acceptability of converting banana peels into chips. Banana peel are often discarded part of the banana fruit, so the researcher decided to conduct this study to discover the acceptability of converting banana peels into chips.

The potential use of discarded banana peels is feasible as a protein source. The banana peel texture is firm, thick, and filled with a substantial amount of protein, fiber, minerals, and other essential nutrients. Banana peels contain a healthy combination of vitamin C, vitamin A, and amino acids; accordingly, banana peels are highly recommended for everyday consumption. Additionally, banana peels are rich in lutein, an active vitamin and antioxidant, hence their consumption will promote eye health and reduce the spread of macular degeneration.

Banana peels have a significant amount of insoluble fiber, and when consumed, the high fiber content is a good regulator of the digestive system, maintaining overall gastrointestinal health. Peels of bananas are also considered waste and are either subjected to composting or discarded because they have no economic value after the banana pulping process. This waste disposal without treatment affects the environment as well as human health. Thus, it is beneficial to consider innovative value-added applications for these by-products.

Statement of the Problem

The researchers' aims to determine the acceptability of lakatan banana peel in Different Flavor Enhancements among WVSU- HCC community.

The following questions were answered in this research:

1. What is the level of acceptability of lakatan banana peel chips in the 4 different treatments in terms of appearance, aroma, texture, taste, and general acceptability as assessed by the respondents?
2. Is there a significance difference in the acceptability level of lakatan banana peel chips in the 4 treatments as to appearance, aroma, taste, texture, and flavor as assessed by the respondents?

Hypothesis

There is no significant difference in the acceptability of lakatan banana peel chips in the four treatments as to appearance, aroma, taste, texture and flavor as assessed by the respondents.

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Significance of the study

Specifically, the result of this study would be beneficial to the following:

Community. The findings of this study is enable the community to gain insights into the Acceptability of Banana Peel Chips among the community not only to have more options for choosing snacks but also a budget friendly one.

Farmers. This research is beneficial to farmers by providing a way to repurpose banana peel as raw materials for new products instead of discarding them and it can also increase the demand for banana peel - based items, leading to increased profitability and supporting sustainable practices.

Future Researchers. This research is valuable to future researchers it can serve as a reference for further studies on sustainable food practices and product innovation.

Students. This research benefits to Students as they can have information about sustainable food and more innovative products, such as banana peels in food production to enhance their understanding in creating eco- friendly solutions.

Definition of Terms

For clarity and understanding, the following terms were given conceptual and operational definitions:

Acceptability. The concept of acceptability encompasses people's affective attitudes toward a new discovery treatment, their intentions to use it (e.g., willingness to engage with the intervention), their actual use of the intervention (e.g., frequent interactions with the intervention), and their satisfaction after engaging with the intervention. (Perski & Short 2021)

In this study acceptability refers to the extent to which the sensory evaluators perceive and evaluate the banana peel chips as agreeable based on specific sensory attributes, including flavor, texture, aroma, appearance, and overall appeal using a standardized sensory evaluation tool.

Appearance. Refers to something's visual or sensory qualities, which include things like color, form, size, texture, and general visual qualities. It is widely used to evaluate or characterize how an object, person, or thing is presented externally in a variety of contexts, such as research studies, product evaluations, or subjective assessments (Maria Aliza 2019).

In this study the appearance is use to examine the overall visual impact to the invention of a product.

Aroma. An odor that is detectable by the sense of smell and through the lower portion of the mouth, which houses the nasal and oral cavities, is conceptually known as aroma (ISIC, 2023)
In this study aroma refers to the odor present in the banana peel chips

Banana Peel. A large quantity of bananas is produced annually and its peel, which accounts for about one third of the fruit weight, is mostly discarded as waste. The peel has been traditionally used for the treatment of various ailments. Vu, Scarlett & Vuong (2018).

In this study the banana peel is use to determine the acceptability of newly invented snacks the banana peel chips from our target respondent. The researchers utilized lakatan banana peel is characterized by its medium thickness, smooth surface, and slightly fibrous inner lining. At full ripeness, the peel exhibits a bright yellow to golden coloration with occasional brown speckling, indicating peak sugar development. Its firm yet pliable structure makes it suitable for thermal processing methods such as blanching, drying, and frying, making it viable raw material for snack food production.

Chips. Conceptually, a small, thin, crisp, usually salty piece of food is prepared by frying or baking (Chip, 2023).

In this study, chips refer to the product made from banana peels. These are rectangular shaped banana peels fried till golden brown and comes with 3 varieties of flavors.

Flavor. Flavor encompasses several elements, including taste and fragrance, and is defined as the overall impression created by oral processing of food (Pu et al., 2022; Wei, Dan, Zhao, & Wang, 2023).
In this study flavor refers to the blend of taste of banana peel chips.

Taste. refers to our senses and has a significant role in how we appreciate food and beverages (Zhang et al., 2020).
In this study refers to the flavor of the banana peel chips when tasted in the mouth by the respondents

Texture. Conceptually, texture describes the qualities of food that are perceptible through hand and tongue contact (Dahl, 2020)
In this study texture refers to the physical characteristic of the chips (crispiness, crunchiness, hardness, and smoothness) that influence their mouthfeel and overall acceptability.

Scope and Delimitation of the Study

There were 40 students, faculty, and staff at West Visayas State University- Himamaylan City Campus as respondents of the study.

The treatments are Treatment A comprises of original banana peel chips. Treatment B comprises of cheese flavor banana peel chips. Treatment C comprises of barbeque flavor banana peel chips. Treatment D comprises of sour cream flavor banana peel chips.

In this study was intended to determine which of the given treatment is the most acceptable as frying method.

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Conceptual Framework

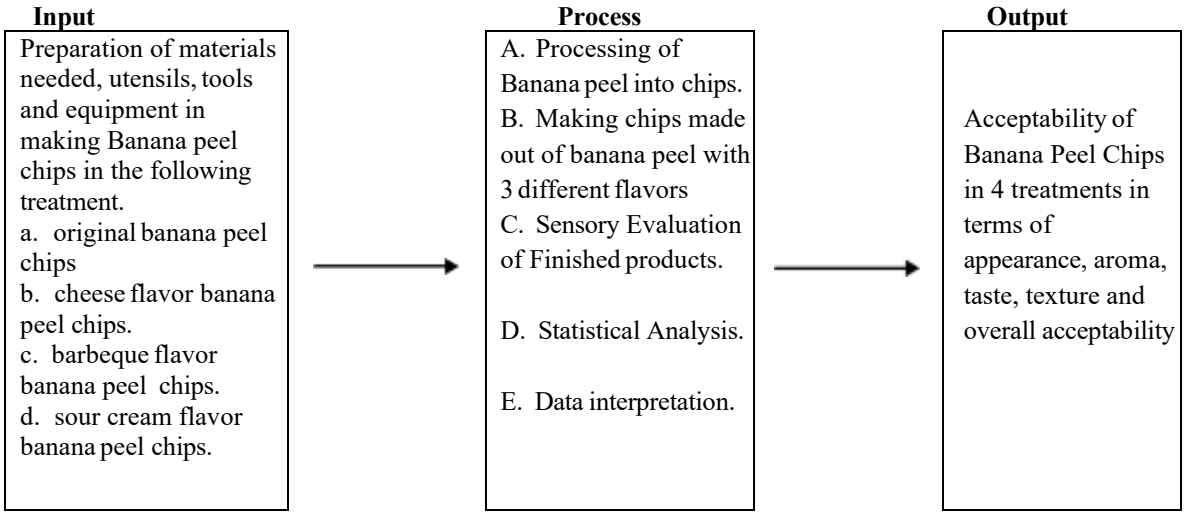


Figure 1. Shows how the study will be conducted by using Banana peel in making Chip

Chapter 2

REVIEW OF RELATED LITERATURE

Chapter Two is comprised of three parts: (1) Conceptual Literature; (2) Related Studies; and (3) Summary of the Review of Related Literature.

Part One, Conceptual/Logical Framework, Focuses on theoretical connection between variables/ Focuses on the systematic structure of process and outcomes

Part Two, Related Studies, includes relevant researches and studies that may provide additional and concrete data related to the Acceptability of Banana Peel Chips among WVSU-HCC Community.

Part Three, Summary of the Review of Related Literature, provides summary of the conceptual/logical framework and related studies.

Related Studies,

A great source of energy, bananas are among the earliest fruits that humans have ever eaten. In addition to being consumed fresh, bananas are used to make banana powder when they are not yet ripe, which is then used to make unique goods such high- fiber bread, slowly digestible cookies, and extruded pasta and noodles (Kumar et al., 2021).

As they are low in fat and calories, banana chips are a popular snack around the world and are found in high-quality nutritional food products. Color, texture, and ingredients are the main criteria used to categorize it (Ranjha et al., 2022).

Since banana peel powder (BPP) has a high nutritional content, it is thought to be a good addition to meat production. BPP reduces the lipid content of sausages while increasing their dietary fiber, water-holding capacity, and cooking yield (Mohd Zaini et al., 2022). In addition to a considerable increase in moisture, ash content, and cooking yield, the use of BPP to create very low-fat chicken patties resulted in a decrease in emulsion stability, pH, water activity, fat, and cholesterol levels when compared to the control sample (Chappalwar et.al 2021).

A tropical herbaceous plant, bananas belong to the Musaceae family. People who live in tropical and humid areas consider bananas to be one of the most important sources of energy in their diets. Despite their many other uses, they are mostly grown for fresh fruit consumption. The Food and Agriculture Organization (FAO) of the United Nations reports that 119 million tons of bananas were produced globally in 2020. The peel, which makes up 35–40% of the fruit and is now thrown away as trash, is the primary byproduct of the banana processing industry. It is also underutilized and poses a risk to the environment. These peels are currently discarded as solid waste at great expense or used as disposable material. As a result, identifying applications for peels is important, if not critical, because they contribute to genuine environmental concerns. Dhake, Jain, Jagtap & Pathare (2023).

At different stages of maturation, bananas' nutritional makeup varies, especially in terms of their sugar and carbohydrate content. When bananas are green, they contain a significant amount of starch and a relatively small amount of sugar. Throughout the full ripening phase, the sugar content dramatically rises while the starch level falls (Evans et al., 2020).

Gujrat, Maharashtra, and Tamil Nadu are the states in India that produce the most bananas, with respective total output of 66, 58.2, and 47.9 tons/ha. Andhra Pradesh, Uttar Pradesh, West Bengal, Karnataka, Madhya Pradesh, Bihar, Odisha, and Assam are among the other states that produce bananas. On average, 38.25 tons of bananas are generated per hectare throughout the nation (Uma & Kumar, 2020).

Flavor is a key factor influencing consumer preferences and food acceptability, making the study of food aroma compounds a significant focus for the food industry. Currently, approximately

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80% of these compounds are produced through chemical synthesis. However, alternative methods are being explored to address the growing consumer demand for "clean label" products and "natural" aromas. One promising approach is the bio-production of food aroma compounds through the fermentation of vegetable waste. Research has shown that fungi, yeasts, and lactic acid bacteria can generate aroma compounds during this process, producing sweet, fruity, and floral notes, as well as cheesy, buttery, creamy, green, herbal, and grassy characteristics. The substrates used include agricultural by-products such as rice bran, as well as fruit supply chain waste like pomace, peels, and pods. Despite its potential, scaling up this method presents challenges, as the production of aromas is highly dependent on the specific strains used and the type of waste processed. Addressing these technical issues is essential to ensure the process's feasibility and prevent failures during larger-scale application. Melini & Melini (2024)

Musa spp. are the botanical name for bananas. is one of the most widely grown and eaten fruits, producing a significant amount of trash (peel) every year. The goal of the current review was to integrate the useful qualities and activities of banana peel.
Banana peel organic composition, which includes protein, lipids, fibers, and carbs, produces a number of bioactive compounds. According to research, these bioactive substances, which include alkaloids, flavonoids, phenolics, and steroids (tannic acid, catechol, β-sitosterol, and ferulic acid), aid in a variety of biological processes and have antitumor, antiparasitic, antibacterial, antifungal, antiaging, antioxidant, and antiviral properties. Its bioactive ingredients work to treat illnesses and infections. According to the study, banana peels are a useful waste with a number of uses across several industries like pharmaceutical, cosmetics, food, lather, biodiesel and bioethanol. Hashim, Hamid, Gul & Akbar (2023).

Reducing food loss and waste throughout the supply chain is a key objective of the Food and Agriculture Organization (FAO) as part of the global sustainable development goals (UN General Assembly, 2015). Among the most frequently discarded food items are fruits and vegetables, with consumers often discarding inedible components such as peels and stalks (Ferro et al., 2022). One notable example is the banana peel, which constitutes approximately 40% of the entire banana fruit (Musa sapientum, shum.). Although banana peels are typically not consumed, several studies have highlighted their potential as a valuable food ingredient due to their high fiber and mineral content (Soto-Maldonado et al., 2020). Incorporating banana peel into various food products—such as fish patties, pasta, bread, muffins, cereal bars, biscuits, and sausages—has been found to enhance not only their nutritional profile but also their sensory qualities, making them more acceptable to consumers (Maschio et al., 2023).

The majority of the fast-food market is made up of fried meals. Nonetheless, efforts to reduce the amount of oil in products are being used by rising consumer health consciousness. By using certain barriers, including hydrocolloid coatings, high oil absorption can be prevented. This study assessed the physicochemical traits of banana fruit cultivars as well as the impact of hydrocolloid coatings on the quality attributes of banana chips (Santos, & dos Ouros, 2023).

The term "banana" in botanical nomenclature describes a huge, subtropical, perennial, evergreen monocot herb that is a member of the genus Musa and family Musaceae. Over a thousand varieties of bananas are grown and manufactured worldwide. Among these species, Musa cavendishi, Musa paradisiaca, and Musa sapientum are the three that are most frequently grown. According to recent data released by the Food and Agriculture Organization (FAO), 1 (Mostafa, 2021).

The development of key organoleptic traits in ripe bananas, such as their smooth surface and sweet flavor, is significantly influenced by differences in carbohydrates (Evans et al., 2020).

Summary of the Review of Related Literature

This study focuses on the utilization of banana peels, an often-discarded byproduct, as a sustainable ingredient in food production. The research involves standardized recipes for banana peel chips, experimenting with varying proportions of banana peel (BP) and all-purpose flour (APF). The treatments range from 25% to 100% APF to assess flavor, texture, and acceptability. The process involves blanching banana peels, preparing batter with specific ingredients, and frying to produce crisp chips.

Related studies highlight the nutritional and functional potential of bananas and banana peels. Bananas, rich in starch and sugar, serve as a base for diverse food products. Banana peels contain bioactive compounds such as alkaloids, flavonoids, and antioxidants, offering health benefits like antibacterial, antifungal, and anti-inflammatory properties.

Additionally, banana peel powder (BPP) enhances food products like sausages and chicken patties by improving fiber content and water-holding capacity while reducing fat and cholesterol. The study also explores sustainable practices, such as bio-production of aroma compounds from vegetable waste, including banana peels, through fermentation. This method generates natural flavors like sweet, fruity, and floral notes, addressing consumer demand for "clean label" products. However, challenges in scaling up due to strain and waste dependency must be addressed for industrial application. Overall, the research underscores the potential of banana peels in reducing food waste, improving nutrition, and supporting sustainable food systems.

Chapter 3
RESEARCH DESIGN AND METHODOLOGY

This chapter consists of Seven parts: (1) Research Design; (2) Research Method; (3) Respondents of the Study; (4) Research Instruments; (5) Data Gathering Procedure and Data Analysis

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Procedure; and (6) Ethical Consideration.
Part One, Research Design, describes the general arrangement or design of the study.
Part Two, Research Method, pertains to method used by the researchers.
Part Three, Respondents of the Study describes the population of interest and the sampling of subjects used in the study.
Part Four, Research Instruments, presents the instrument used to gather the data.

Part Five, Data Gathering Procedure and Data Analysis Procedure, provides a step- by-step process in gathering the data and in conducting the study and guides the researchers in selecting the appropriate statistical tools employed in data gathering and interpretation.
Part Six, Ethical Consideration, a set of principles that guide the research designs and practices.

Research Design

This research utilized the experimental method. To determine the differences between the second set, it refers to the first set. For many scholarly and scientific investigations, it is an indispensable method. It allows us to test theories, produce new products, and make significant discoveries. Respondents will evaluate a modified questionnaire used in the study (Bhat, 2023).

The design was employed to statistically assess the Acceptability of Lakatan Banana Peel Chips in Different Flavor Enhancements among the WVSU-HCC Community in terms of appearance, aroma, taste, texture, and general acceptability.

Research Method

These researchers conducted this study using a quantitative approach. Quantitative research, according to Bhandari (2020), is the process of collecting and analyzing numerical data. It can be applied to determine averages and trends, create hypotheses, investigate causality, and extrapolate results to broader populations. To collect quantitative data, researchers will often need to use operational definitions, which translate abstract concepts into observable and measurable measurements.

Ingredients	Procedure
500g lakatan banana peel ¼ cup all-purpose flour 1 cup rice flour 2 tbsp cornstarch 2 tbsp sugar ½ teaspoon salt 1 cup water 1 teaspoon cinnamon powder ½ cup cheese powder ½ cup sour cream powder ½ cup barbecue powder	1. Wash lakatan banana peels thoroughly and remove any remaining banana flesh. 2. Blanch the banana peel for 2-3 minutes. 3. Drain and let them cool. In a food processor, blend the softened banana peels into a fine paste. 4. Add all-purpose flour, rice flour, cornstarch, sugar, salt, and cinnamon powder. 5. Pour water while blending until it becomes smooth. 6. Grease a lanyera (steaming tray) with oil. 7. Pour the banana peel mixture evenly into the tray. 8. Steam for 3 - 5 minutes over medium heat until it sets and firms up. 9. Let it cool completely before removing it from the tray. 10. Once cooled, transfer to a cutting board and slice into chip-sized pieces. 11. Arrange the pieces on a tray. Sun-dry for 2-3 days until it became super dry. 12. Deep fry in hot oil until crisp 13. Let it cool down, then coat with different flavoring powder.

Respondents of the Study

The respondents of this study consist of 40 individuals from West Visayas State University – Himamaylan City Campus, specifically: 10 non-teaching personnel, 10 faculty members, and 20 students. The selection of faculty and non-teaching staff was based on their experience and discernment in evaluating sensory attributes such as appearance, aroma, taste, and texture, making them reliable judges for product evaluation. Meanwhile, students were included to assess the overall acceptability of the banana peel chips, as they represent a broader consumer base. The evaluators' responses will serve as the primary data source for this study, focusing on the general acceptability of the banana peel chips in terms of appearance, aroma, taste, texture, and overall acceptability.

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Table 1. Distribution of the respondents

Group	n	Percent (%)
A. Non-teaching personnel	10	25 %
B. Students	20	50 %
C. Faculty	10	25%
Total	40	100%

Research Instruments

This research study utilized an adapted questionnaire from (Peryam & Pilgrim, 1957). The questionnaire would assess the products based on a 9-point Hedonic Scale to assess the Sensory Acceptability of each variable (Appearance, Aroma, Taste, and Texture) of Banana Peel Chips.

Table 2. Level of Acceptability Scale

Score	Mean Range	Verbal Description	Verbal Interpretation
9	8.50-9.00	Like it a lot	Highly Acceptable
8	7.50-8.49	Like it very much	Very Acceptable
7	6.50-7.49	Like it moderately	Moderately Acceptable
6	5.50-6.49	Like it slightly	Slightly Acceptable
5	4.50-5.49	Neither like or dislike it	Neither Acceptable/Unacceptable
4	3.50-4.49	Didn't like it slightly	Slightly Unacceptable
3	2.50-3.49	Didn't like it moderately	Moderately Unacceptable
2	1.50-2.49	Didn't like it very much	Very Unacceptable
1	1.00 -1.49	Didn't like it at all	Highly Unacceptable

Data Gathering Procedure

This research utilized an adapted questionnaire based on the Nine-Point Hedonic Scale developed by Peryam & Pilgrim (1957) to gather data on the sensory evaluation of banana peel chips. The instrument was modified to suit the needs of the study and was used to assess four (4) different product treatments.

Each treatment was evaluated based on four sensory attributes: appearance, aroma, taste, and texture. Respondents rated each attribute using the following scale: 9 – Highly Acceptable (HA) 8 – Very Acceptable (VA) 7 – Moderately Acceptable (MA) 6 – Slightly Acceptable (SA) 5 – Neither Acceptable nor Unacceptable (NAU) 4 – Slightly Unacceptable (SU) 3 – Moderately Unacceptable (MU) 2 – Very Unacceptable (VU) 1 – Highly Unacceptable (HU). The data collected through this instrument provided the basis for evaluating the overall acceptability of banana peel chips.

To interpret the results, the following mean score ranges were used: 8.50 – 9.00: Highly Acceptable (HA) 7.50 – 8.49:
Very Acceptable (VA) 6.50 – 7.49: Moderately Acceptable (MA) 5.50 – 6.49: Slightly Acceptable (SA) 4.50 – 5.49:
Neither Acceptable nor Unacceptable (NAU) 3.50 – 4.49: Slightly Unacceptable (SU) 2.50 – 3.49:
Moderately Unacceptable (MU) 1.50 – 2.49: Very Unacceptable (VU) 1.00 – 1.49: Highly Unacceptable (HU) This structured rating scale ensured that the evaluation of sensory characteristics was both standardized and reliable.

Data Analysis Procedure

The collected data from the nine-point hedonic scale questionnaire will be tabulated and organized to determine the overall acceptability of the banana peel chips in terms of appearance, aroma, taste, and texture.

Statistical tools, such as the mean and standard deviation, will be used to interpret the sensory evaluation results. These statistical results will help identify which of the four treatments is the most preferred by the respondents based on their sensory perceptions.

Ethical Consideration

The researchers of this study sent a letter to the Campus Administrator of West Visayas State University - Himamaylan City Campus to seek approval to conduct the study. Once approval was granted, the researchers distributed the questionnaires to the respondents through printed materials. The accomplished questionnaires were collected after the respondents had completed them. Subsequently, the data were tabulated and analyzed using the appropriate statistical tools.

Chapter 4
RESULTS AND DISCUSSIONS

This chapter contains the: (1) Descriptive Data Analysis; and (2) Inferential Data Analysis.

Part One, Descriptive Data Analysis, the type of analysis of data that helps describe, show or summarize data points in a

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constructive way such that patterns might emerge that fulfill every condition of the data.

Part Two, Inferential Data Analysis, generalizes the results obtained from a random (probability) sample back to the population from which the sample was drawn.

Descriptive Data Analysis

Table 3

Level of Acceptability of Lakatan Banana Peel Chips in Four Different Treatments

Group	*n*	Mean	Verbal Description	*SD*
Treatment A Appearance	40	7.65	Very Acceptable	.92
Aroma	40	7.68	Very Acceptable	.83
Taste	40	7.75	Very Acceptable	1.10
Texture	40	7.70	Very Acceptable	.99
General	40	7.69	Very Acceptable	.78
Treatment B Appearance	40	8.03	Very Acceptable	.95
Aroma	40	8.08	Very Acceptable	.76
Taste	40	8.13	Very Acceptable	.79
Texture	40	8.00	Very Acceptable	.88
General	40	8.06	Very Acceptable	.66
Treatment C Appearance	40	8.18	Very Acceptable	.93
Aroma	40	8.45	Very Acceptable	.78
Taste	40	8.48	Very Acceptable	.78
Texture	40	8.15	Very Acceptable	.77
General	40	8.31	Very Acceptable	.72
Treatment D Appearance	40	8.15	Very Acceptable	.95
Aroma	40	8.25	Very Acceptable	.81
Taste	40	8.45	Very Acceptable	.68
Texture	40	8.23	Very Acceptable	.80
General	40	8.27	Very Acceptable	.67

Level of Acceptability of Lakatan Banana Peel Chips in Four Different Treatments in Terms of Appearance, Aroma, Taste, Texture and General Acceptability

Note: 8.51-9.00 Highly Acceptable; 7.51-8.50 Very Acceptable; 6.51-7.50 Moderately Acceptable; 5.51-6.50 Slightly Acceptable; 4.51 5.50 Neither Acceptable/Unacceptable; 3.51-4.50

Slightly Unacceptable; 2.51-3.50 Moderately Unacceptable; 1.51-2.50 Very Unacceptable; 1.00-1.50 Highly Unacceptable

Table 3 shows the level of acceptability of banana peel chips in four different treatments in terms of appearance, aroma, taste, texture and general acceptability.

The sensory evaluation data of banana peel chips across four formulations (Groups A,B, C, and D) demonstrated a strong overall consumer acceptability, with all treatments scoring within the "Very Acceptable" range (mean scores: 7.65 to 8.31). Group C outperformed the others in all sensory parameters, especially in taste (M= 8.48 SD=.78), aroma (8.45), and general acceptability (8.31), highlighting a formulation that aligns well with consumer sensory expectations. This result indicates that minor variations in formulation can lead to noticeable differences in consumer preferences. According to Santos et al. (2019), even small modifications in flavoring and processing can significantly influence consumer ratings in snack products, supporting the

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trend seen in this study where Group C's specific formulation proved most favorable.

Though all treatments shared the same descriptive rating, variations in mean scores suggest nuanced preferences among consumers, possibly due to differences in ingredient composition, seasoning, or preparation techniques. For instance, Group A's slightly lower scores in taste (7.75) and texture (7.70) may reflect a less appealing balance of these sensory characteristics. The low standard deviations (0.66–1.10) rple. This trend is in line with the findings of Chen et al. (2020), who emphasized the importance of consistency in sensory attributes for achieving market success in novel food preinforce a consensus among evaluators, indicating that the responses were consistent across the samoducts, particularly those made from non-traditional ingredients such as by-products or food waste.

These findings align with prior studies affirming the viability of banana peel chips as a nutritious and sustainable snack option. Rashid et al. (2016) demonstrated that sensory characteristics significantly vary across different formulations, reinforcing the importance of optimized recipe development. The sensory appeal and nutritional value of banana-based snacks, particularly those made from waste materials, supporting both environmental sustainability and food security goals. More recently, Kaur and Kumar (2021) further emphasized the role of sensory evaluations in validating consumer readiness for upcycled food products, pointing out that favorable sensory feedback can drive market adoption. The current study's results not only corroborate these findings but also suggest that with the right formulation, banana peel chips can successfully penetrate the functional snack market.

Inferential Data Analysis

Table 4

Differences in the Acceptability of Lakatan Banana Peel Chips Among Four Treatments

Acceptability	*n*	Mean Rank	Kruskal Wallis H	*df*	*p*-value
Treatment Group A	40	56.45			
Treatment Group B	40	75.94			
			19.207	3	.000
Treatment Group C	40	96.78			
Treatment Group D	40	92.84			

*p < .05, significant

Table 4 shows the differences in the acceptability of banana peel chips among four treatments

Results in Table 4 reveals a statistically significant difference in the acceptability of banana peel chips among four treatment groups, $H = 19.207$, $p = .000$. Although the Kruskal-Wallis H test indicates the presence of significant differences among the five treatment groups, it does not specify which specific pairs differ. Therefore, Dunn's post- hoc test was conducted to identify the specific group comparisons contributing to these differences.

Table 4 presents the results of a Kruskal-Wallis H test, which was used to determine whether there were statistically significant differences in the acceptability of banana peel chips among the four treatment groups. The test yielded a significant result (H = 19.207, p = .000), indicating that at least one treatment group differed significantly from the others in terms of acceptability. Given that the p-value is less than .05, the null hypothesis — which states that all groups have the same level of acceptability — is rejected. This implies that the treatment method applied to the banana peel chips had a significant effect on how acceptable the product was to the respondents.

The mean ranks reveal the relative preference among the groups, with Treatment Group C (Mean Rank = 96.78) and Group D (Mean Rank = 92.84) receiving the highest levels of acceptability. Group B followed with a mean rank of 75.94, while Group A had the lowest (Mean Rank = 56.45). These rankings align with the results from Table 3, where Groups C and D consistently scored higher in sensory attributes. The statistical evidence confirms that specific treatments significantly influenced consumer perception, supporting the conclusion that some formulations of banana peel chips are more favorably received than others.

The results of the current study, which revealed statistically significant differences in the acceptability of banana peel chips across treatment groups, are consistent with the findings of Rashid et al. (2016). In their study titled "Determination of pectin content in preparation of banana peel chips," the authors reported significant variations in sensory attributes among different formulations of banana peel chips, as confirmed by ANOVA ($p < 0.05$). This suggests that the method of preparation and the specific treatment applied to banana peels substantially influence consumer acceptability. Their findings reinforce the conclusion that product formulation plays a critical role in shaping consumer preferences, thereby supporting the statistical evidence observed in the present study.

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Table 5
Post Hoc Test for the Acceptability of Lakatan Banana Peel Chips Among Four Treatment Groups
Pairwise Comparisons of Treatment

Treatment Group	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
Group A and Group B	-19.49	10.29	-1.89	.058	.349
Group A and Group D	-36.39	10.29	-3.54	.000	.002
Group A and Group C	-40.33	10.29	-3.92	.000	.001
Group B and Group D	-16.90	10.29	-1.64	.100	.603
Group B and Group C	-20.84	10.29	-2.03	.043	.257
Group D and Group C	3.94	10.29	.38	.702	1.000

Note: *Significant if p < .05.* Significance values have been adjusted by the Bonferroni correction for multiple tests.

Table 5 shows the Post Hoc Test for the Acceptability of Banana Peel Chips Among Four Treatment Groups
The sensory acceptability of banana peel chips was assessed across four treatment groups. Following a significant Kruskal-Wallis *H* test, pairwise comparisons were conducted using Dunn's test with Bonferroni adjustment to identify specific group differences.

The adjusted p-values from Dunn's test revealed significant differences between Group A and Group D (adjusted p = 0.002) and Group A and Group C (adjusted p=0.001).

These findings suggest that Group A's acceptability results were notably higher than those of Group C and D. No other pairwise comparisons yielded statistically significant differences.

Table 5 indicate that the post hoc test using Bonferroni correction revealed statistically significant differences in the acceptability of banana peel chips between Group A and both Group D (adjusted p = .002) and Group C (adjusted p = .001). These results indicate that the formulations used in Groups C and D were significantly more acceptable to respondents than the one in Group A. This supports the earlier sensory findings, where Group C received the highest scores in taste, aroma, and overall acceptability. Such outcomes highlight the importance of ingredient optimization and processing methods in enhancing the sensory appeal of food products made from by- products like banana peels. According to Kaur and Kumar (2021), effective product formulation is crucial in developing sustainable food items that are not only nutritious but also sensory-pleasing and market-ready.

Meanwhile, comparisons between other treatment groups, such as Group B vs. Group D and Group D vs. Group C, showed no statistically significant differences after adjustment (adjusted p-values > .05). Although the unadjusted p-value for Group B vs. Group C was .043, the adjusted significance (.257) indicated the difference was not strong enough to be considered statistically significant under stricter criteria. This suggests that Groups B, C, and D were generally perceived similarly in terms of acceptability, with Group A standing out as less favorable. These findings are in line with Chen et al. (2020), who emphasized that when developing food from non-traditional sources, consistency in sensory quality can help ensure consumer acceptance across multiple product variants. Thus, while some variations in preference exist, well-optimized formulations like those in Groups C and D hold promise for sustainable snack development.

The statistical findings from this study, which revealed significant differences in the acceptability of banana peel chips across different treatment groups, are supported by prior research. Rashid, Abidin, and Rahman (2016) conducted a study on the preparation of banana peel chips using different cultivars and evaluated their sensory characteristics. Their results, analyzed through ANOVA, demonstrated significant differences ($p < 0.05$) in sensory attributes among the treatments. This indicates that the formulation and processing methods significantly influence consumer acceptability. The alignment between their findings and the current study reinforces the conclusion that certain banana peel chip formulations particularly those with optimized preparation techniques can enhance sensory qualities and overall consumer preference.

To determine whether the observed differences in acceptability among the four treatment groups could be generalized to the broader population, inferential statistical procedures were utilized. Given the ordinal nature of the data and the assumption of non-normal distribution, the Kruskal-Wallis H test was selected as the appropriate non- parametric method for comparing more than two independent groups.

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As shown in Table 4, the Kruskal-Wallis test yielded a statistically significant result, H(3)=19.207,p<.001H(3) = 19.207, p < .001H(3)=19.207,p<.001, indicating that there were significant differences in the sensory acceptability of banana peel chips among the treatment groups. This outcome provides sufficient evidence to reject the null hypothesis, which assumes that all treatment groups have equal levels of acceptability. The result suggests that the specific formulation and processing methods used in each treatment had a substantial effect on consumer evaluations (Field, 2018).

To further investigate the specific group differences contributing to the overall significance, Dunn's post hoc test with Bonferroni adjustment was performed (refer to Table 5). The pairwise comparisons revealed statistically significant differences between Group A and Group C (adjusted p=.001p = .001p=.001), and between Group A and Group D (adjusted p=.002p = .002p=.002). These results indicate that the formulations used in Groups C and D were rated significantly higher in terms of acceptability compared to Group A. This supports the findings in Table 3, where Groups C and D consistently achieved higher mean scores across all sensory parameters, particularly in taste, aroma, and general acceptability. No other comparisons showed statistically significant differences following adjustment, suggesting a general equivalence in consumer perception among Groups B, C, and D (Kaur & Kumar, 2021).

Furthermore, the relatively low standard deviations observed across all sensory dimensions (ranging from 0.66 to 1.10) suggest a high level of agreement among the respondents, which enhances the internal reliability of the sensory evaluation results (Santos et al., 2019). These findings align with the work of Chen et al. (2020), who emphasized that consistency in sensory characteristics is a key determinant of consumer acceptance, particularly in novel food products derived from non-conventional raw materials such as food waste or agricultural by-products.

The statistical evidence presented in this study is consistent with prior findings by Rashid, Abidin, and Rahman (2016), who demonstrated significant differences in the sensory qualities of banana peel chips as a function of their preparation method. Their research underscores the importance of optimizing processing techniques and formulations to improve the sensory appeal and marketability of sustainable snack alternatives.

In conclusion, the inferential analysis substantiates that minor adjustments in product formulation can produce statistically significant variations in consumer preference. The superior performance of Groups C and D highlights the potential of specific formulations to enhance product acceptability. These results underscore the importance of rigorous product development in ensuring the commercial viability and sensory competitiveness of functional food products made from underutilized resources such as banana peels.

Chapter 5
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This chapter contains the: (1) Summary of the Problem, Methods and Findings; (2) Conclusions; and (3) Recommendations.

Part One, Summary of the Problem, Methods and Findings, presents the results obtained from the study.

Part Two, Conclusions, presents the conclusions derived from the study.

Part Three, Recommendations, presents the suggestions based on the results and conclusions derived from the study.

Summary of the Problem, Methods and Findings

This study primarily aimed to determine the acceptability of lakatan banana peel chips in different flavor enhancements among the WVSU-HCC community. To support this objective, relevant data were collected to evaluate the community's perception and willingness to consume banana peel chips. The gathered information addressed the research questions and enabled the researchers to properly interpret the findings. This study was conducted to highlight the potential of banana peels as a sustainable and alternative ingredient in snack production. Based on the results of the survey, it was statistically shown that the respondents were generally open to and accepted the idea of consuming banana peel chips.

Specifically, this study sought to answer the following questions:

1. What is the level of acceptability of lakatan banana peel chips in the 4 different treatments in terms of appearance, aroma, texture, taste, and general acceptability as assessed by the respondents?
2. Is there a significance difference in the acceptability level of lakatan banana peel chips in the 4 treatments as to appearance, aroma, taste, texture, and flavor as assessed by the respondents?

Findings

1. Level of acceptability of lakatan banana peel chips in the four treatments The results of the sensory evaluation revealed that all four treatment groups (A, B, C, and D) were rated within the "Very Acceptable" range across all attributes—appearance, aroma, texture, taste, and general acceptability. Among the treatments, Group C consistently received the highest mean scores, followed by Group D, while Group A obtained the lowest scores, though still within the same acceptability range. These findings indicate that while all formulations were generally well-accepted, Groups C and D demonstrated superior consumer acceptability, suggesting that specific formulation factors positively influenced the sensory perception of lakatan banana peel chips.
2. Significant difference in the acceptability of lakatan banana peel chips among the four treatments The Kruskal-Wallis H test revealed a statistically significant difference in the acceptability of banana peel chips among the four treatment groups (H = 19.207, p < .001). Post hoc analysis using Dunn's test with Bonferroni adjustment showed that significant

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differences existed between Group A and both Group C and Group D, with the latter groups being rated significantly higher. No significant differences were observed among Groups B, C, and D, which indicates comparable levels of consumer preference among these treatments. This confirms that formulation and processing methods had a substantial effect on sensory evaluation, with optimized treatments producing higher levels of acceptability.

Conclusion

The findings of this study demonstrate that banana peel chips are generally well received by the WVSU–HCC community. All four variations treatment A, B, C, and D as "Very Acceptable" in terms of appearance, aroma, taste, texture, and overall quality. However, statistical analysis revealed that the flavored variants, particularly the treatment C and D, were significantly more favored than the treatment A. This emphasizes the impact of flavor enhancements in improving the sensory appeal of food products made from unconventional ingredients like banana peels.

These results determine the potential of banana peels as a sustainable and nutritious ingredient in snack production. By transforming what is typically an agricultural waste product into an appealing food item, this study supports efforts in food innovation, environmental sustainability, and cost effective nutrition. The community's positive response suggests a readiness to embrace sustainable food alternatives, especially when developed with attention to taste and sensory satisfaction. This shows the importance of careful formulation and flavor development in promoting consumer acceptance of innovative food items.

Recommendations

Based on the results and conclusions, the following recommendations were drawn:

1. Enhance Product Development with Flavor Innovation. Since flavored treatments particularly treatment C and D received the highest acceptability ratings, future product development should focus on improving and diversifying flavor options. Exploring other flavors such as spicy, sweet chili, or even localized favorites may further increase consumer interest and acceptance.
2. Promote Awareness and Education on Sustainable Food Practices. The high acceptability of banana peel chips suggests an opportunity to educate the public on the benefits of using food by-products. Campaigns or seminars could be organized within the community or schools to highlight the nutritional and environmental value of repurposing banana peels and similar materials.
3. Conduct Further Research on Shelf Life and Nutritional Content. Future studies should examine the shelf stability of banana peel chips, including packaging methods to extend freshness. Additionally, conducting a detailed nutritional analysis would provide consumers with more informed choices and highlight the health benefits of the product.
4. Expand the Study to a Larger and More Diverse Population. To strengthen the generalizability of the findings, similar research should be conducted involving a larger sample size from different age groups, regions, or socioeconomic backgrounds. This will help determine if preferences and acceptability remain consistent across broader populations.

For the Community, it is recommended that members of the community consider banana peel chips as a sustainable, affordable, and nutritious snack option. The development and consumption of such products not only promote healthier eating habits but also support environmental awareness by reducing food waste.

For Farmers, banana peels often treated as waste, can serve as valuable raw materials for new food products like chips. Farmers are encouraged to explore partnerships with local entrepreneurs or food processors to repurpose banana peels. This can help increase the demand for banana-based innovations, providing farmers with new revenue streams while promoting eco-friendly practices.

For Future Researchers, it is recommended that future researchers build upon this study by exploring additional flavor variations, nutritional analysis, shelf-life stability, and consumer behavior toward upcycled food products. This study can also inspire thesis work or product development projects aimed at sustainable food innovation.

For Students, it is highly suggested that students are encouraged to use this research as a foundation for expanding their knowledge on sustainable food practices and product innovation. By exploring the potential of banana peels in food production, they can gain deeper insights into eco-friendly solutions and develop their creativity and skills in creating nutritious, cost-effective, and environmentally conscious food products.

REFERENCES

1. *Adetuyi, B. O., Ogundipe, A. E., Ogunlana, O. O., Egbuna, C., Estella, O.U., Mishra, A. P., & Achar, R. R. (2022). Banana peel as a source of nutraceuticals. In Food and agricultural byproducts as important source of nutraceuticals (pp. 60–70). https://sifisheriessciences.com/journal/index.php/journal/article/downloa/149/143/287*
2. *Adeniji, T. A., & Tenkouano, A. (2007). Effect of processing on micronutrient content of chips produced from some plantain and banana hybrids. Fruits, 62(6), 333–341. https://doi.org/10.1051/fruits:2007033*
3. *Bhandari, P. (2020). What is quantitative research? Definition, uses & methods.Scribbr. https://www.scribbr.com/methodology/quantitativeresearch/Bhat, A. (2023). Surveys: What they are, characteristics & examples. QuestionPro.*

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https://www.questionpro.com/blog/surveys/

4. *Chappalwar, A. M., Dhake, K. P., Jain, S. K., Jagtap, D. D., & Pathare, P. B. (2023). Effect of banana peel flour on rheological, physico-chemical, mineral content and sensory properties of chicken patties. British Food Journal, 125(2), 456–470. https://doi.org/10.1108/BFJ-05-2021-0524*
5. *Chen, L., Zhang, X., & Wang, M. (2020). Consumer preferences and sensory quality of sustainable snack products made from food by-products. Journal of Food Science and Technology, 57(5), 1532–1541. https://doi.org/10.1007/s13197-019-04129-2*
6. *Dhake, K. P., Jain, S. K., Jagtap, D. D., & Pathare, P. B. (2023). Effect of banana peel flour on rheological, physico-chemical, mineral content and sensory properties of chicken patties. British Food Journal, 125(2), 456–470. https://doi.org/10.1108/BFJ-05-2021-0524*
7. *Elkhalifa, A. E. O., Abdelwahab, S. A., & Nour, A. M. (2014). Analytical quality and acceptability of fried and baked banana chips.International Journal of Food Science and Nutrition, 3(5), 55–60.*
8. *Evans, E. A., Ballen, F. H., & Palmateer, A. J. (2020). Banana and plantain production and research in the United States. University of Florida IFAS Extension. https://edis.ifas.ufl.edu/publication/FE1017*
9. *Ferro, M., Bortolini, D. G., & Gallo, M. (2022). Food loss and waste: A global overview. Food and Agriculture Organization of the United Nations. https://www.fao.org/3/cb9364en/cb9364en.pdf*
10. *Food and Agriculture Organization of the United Nations. (2012). Banana exports. http://www.fao.org/fileadmin/templates/banana/documents/SC_meetingDecember_2012/Presentations_SC_2012/SC5-EST_presentation.pdf*
11. *Hashim, M. M., Hamid, A. A., Gul, K., & Akbar, A. (2023). Banana peel: A potential source of bioactive compounds for food and pharmaceutical applications. Journal of Food Science and Technology, 60(1), 1–12. https://doi.org/10.1007/s13197-022-05456-9*
12. *Kaur, H., & Kumar, P. (2021). Development and sensory evaluation of upcycled food products: A sustainable approach to food waste reduction. Waste Management in Agroecosystems, 11(3), 214–222. https://doi.org/10.1016/j.wmre.2021.04.002*
13. *Melini, F., & Melini, V. (2024). Role of microbial fermentation in the bio production of food aroma compounds from vegetable waste.Fermentation, 10(3), 132. https://doi.org/10.3390/fermentation10030132*
14. *Mohd Zaini, H., Roslan, J., Saallah, S., Munsu, E., Sulaiman, N. S., & Pindi, W. (2022). Banana peels as a bioactive ingredient and its potential application in the food industry. Journal of Functional Foods, 92, 105054. https://doi.org/10.1016/j.jff.2022.105054*
15. *Mostafa, M. M. (2021). Banana (Musa spp.): Taxonomy, distribution, and production. International Journal of Fruit Science, 21(1),1–15. https://doi.org/10.1080/15538362.2020.1862689*
16. *Panang, P., Thikeaw, S., Soubsub, S., Olanwanit, S., & Phahom, S. (2023). Effect of pre-treatment processes on physicochemical aspects of vacuum-fried banana chips. International Journal of Food Science & Technology, 58(3), 567–576.https://doi.org/10.1111/ijfs.15678*
17. *Peryam, D. R., & Pilgrim, F. J. (1957). Hedonic scale method of measuring food preferences. Food Technology, 11(9), 9–14.*
18. *Ranjha, M. M. A. N., Irshad, S., & Murtaza, M. A. (2022). Nutritional and sensory evaluation of banana chips prepared with different treatments. Pakistan Journal of Agricultural Sciences, 59(1), 123–129. https://doi.org/10.21162/PAKJAS/22.1019*
19. *Rashid, A., Hossain, M. F., & Khan, M. A. (2016). Effect of different treatments on the sensory characteristics of banana peel chips. International Journal of Food Studies, 5(2), 119–125. https://doi.org/10.7455/ijfs.v5i2.321*
20. *Santos, J. R., & dos Ouros, A. C. (2023). Effect of hydrocolloid coatings on the quality attributes of banana chips. Journal of Food Processing and Preservation, 47(1), e16023. https://doi.org/10.1111/jfpp.16023*
21. *Santos, M. J., Alvarez, C. A., & Rivera, J. R. (2019). Influence of flavoring and processing on consumer perception of alternative snack foods. Food Research International, 116, 1341–1349. https://doi.org/10.1016/j.foodres.2018.09.048*
22. *Sari, N. Z. M., Kanya, N., Kamil, I., & Nandang, N. (2024). Marketing promotion finance and accounting system in banana chip and peel community micro business Bandung. Amalee: Indonesian Journal of Community Research and Engagement, 11(2), 23-25 https://ejournal.insuriponorogo.ac.id/index.php/amalee/article/view/5904*
23. *Scarlett, C. J., & Vuong, Q. V. (2018). Maximising recovery of phenolic compounds and antioxidant properties from banana peel using microwave assisted extraction and water. Journal of Food Science and Technology, 55(9), 3864–3872. https://doi.org/10.1007/s13197-018-3321-1*
24. *Soto-Maldonado, C., Rojas, R., & Morales, E. (2020). Banana peel as a functional ingredient in food products: A review. Journal of Food Science and Technology, 57(10), 3451–3459. https://doi.org/10.1007/s13197-02004409-9*
25. *Udomkun, P., & Innawong, B. (2018). Effect of pre-treatment processes on physicochemical aspects of vacuum-fried banana chips.*
26. *International Journal of Food Science & Technology, 53(5), 1234–1242. https://doi.org/10.1111/ijfs.13693*
27. *Uma, S., & Kumar, V. (2020). Banana production and productivity in India: A state-wise analysis. Journal of Horticultural Sciences,15(2),123–130. https://doi.org/10.5958/0974-0112.2020.00023.7*
28. *Vu, H. T., Scarlett, C. J., & Vuong, Q. V. (2016). Phenolic compounds within banana peel and their potential uses: A review. Journal of Functional Foods, 40, 238–248. https://doi.org/10.1016/j.jff.2017.11.018*
29. *Zaini, H. M., Roslan, J., Saallah, S., Munsu, E., Sulaiman, N. S., & Pindi, W. (2022). Banana peels as a bioactive ingredient and its potential application in the food industry. Journal of Functional Foods, 92, 105054. https://doi.org/10.1016/j.jff.2022.105054*