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Producing Organic Vinegar Using Pik-iw Bananas (Musa Balbisiana Colla)

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Abstract

The purpose of this study is to develop and produce organic vinegar using Pik-iw bananas and to identify whether the taste, aroma, and quality are acceptable for the final vinegar product. This study aims to provide a sustainable method to use local bananas and to highlight the importance of local agricultural resources. The Pik-iw banana is always overlooked because of its numerous seeds, which makes it less marketable. This product may provide people living in the rural area to have a new business that they can market for their additional income. The researchers used a Design and developmental research with a sequential mixed method research design, involving the use of both qualitative and quantitative instruments. The research was conducted at the Philippine Normal University South Luzon in Lopez, Quezon with 53 respondents as product evaluators. The data gathering tool used by the researchers was an evaluated tool checklist form to measure the different levels of product acceptance as well as the quality of the product. As a data analysis tool, the researchers used ANOVA to determine the level of product acceptance and if there were any differences in the evaluation results. Based on the data gathered, it was found that it can be marketable and acceptable to the consumers. The study's findings showed that the participants had a very positive reaction to the product, with all evaluation criteria receiving a "Strongly Agree" rating and an overall average score of 3.656. The highest score was for overall quality (3.685), followed by aroma (3.655) and taste (3.630), indicating that the participants viewed the product's sensory qualities positively. The results show that the Pik-iw banana (Musa balbisiana Colla) is very successful in promoting both local and organic products.

Keywords: *Pik-iw banana (Musa balbisiana colla), Organic Vinegar, Natural Fermentation, Source of Income*

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Introduction

Seeded bananas *Pik-iw* are always overlooked due to their numerous seeds, leading to the perception that they are discarded and no longer useful. Thus, these wild banana varieties are often wasted, particularly in rural areas where there is limited knowledge regarding their potential for value-added utilization. Bananas are a wholesome component due to their high content of dietary fiber, essential vitamins, and minerals. Banana peels make up around half of the total mass of the fruit (35%-50%) out of all by-products of the banana, such as pseudo-stems, leaves, and blossoms (Ahmadi et al., 2019; Gomes et al., 2022). Singh et al., (2016), in their extensive review, assessed bananas as a significant reservoir of bioactive constituents, including carotenoids, flavonoids, phenolics, amines, ascorbic acid, and vitamin E. The production of organic vinegar derived from wild-seeded bananas presents a viable strategy for mitigating agricultural waste, concurrently furnishing an alternative revenue stream for rural populations. Therefore, studying how to use seeded bananas effectively for vinegar production is a valuable endeavor, supporting sustainable development and the creation of new organic products.

Even though there are many *Pik-iw* or seeded bananas in different areas, they are still not noticed and are not being used because of their many seeds, which is why customers tend to avoid them. A situation like this creates a problem for farmers because this type of banana usually grows naturally, but it cannot be utilized and has no economic value. Because of this, the idea occurred to turn it into something helpful, such as processing it into organic vinegar. Using this, waste can be reduced and farmers can also earn additional income, which can serve as another source of livelihood. The potential acceptability level of the vinegar will be evaluated based on its sensory characteristics such as aroma, taste, and overall quality.

The use of rejected bananas, or the ones that cannot be sold, can serve as an alternative ingredient in making vinegar (Boonsupa et al., 2019). This process is seen as a way to reduce food waste and produce organic vinegar. Fruits that contain natural sweetness, such as *Pik-iw* bananas, are acceptable for this goal (Prisacaru et al., 2021). The seeded banana is commonly used as the main ingredient in vinegar production (Boonsupa et al., 2019).

In this study, the researchers seek to understand how *Pik-iw* bananas are used to make vinegar. The researchers look at how different sourness levels affect the fermentation process, including how long it takes and how acidic the finished product is. The color, flavor, and aroma of the vinegar will also be assessed during the fermentation process. By examining these variables, the researchers hope to learn more about the vinegar-making process and pinpoint the qualities of superior vinegar made from *Pik-iw* bananas.

Pik-iw banana *(Musa balbisiana colla)* is one of the local varieties of banana that is abundant and characterized by its many seeds. It is often ignored and considered to have no economic value. As a result, *Pik-iw* bananas frequently become waste and are simply discarded, while only the trunk is sometimes utilized as animal feed. To address this issue and reduce waste, the *Pik-iw* banana can be developed into fermented vinegar as an alternative to commercially available vinegars, also a livelihood opportunity for the locals, an environment-friendly food processing method. This utilization promotes proper and effective use of the banana, minimizes waste, and can generate positive outcomes for the community.

In line with this, the study aims to use the underutilized ripe *Pik-iw* banana *(Musa balbisiana colla)* in the development of organic vinegar. Through this research, the researchers seek to develop a new product using the wasteful, discarded, and uneaten fruits of *Pik-iw* banana. This study also aims to promote environmental sustainability by using fruits such as *Pik-iw*

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which are often overlooked and left to waste. This study will demonstrate that *Pik-iw* banana can be transformed into a useful product, which will benefit not only the environment but also the community

Sustainable Development goal 15 Life on Land by reducing waste, preserving biodiversity, and promoting sustainable use of resources, contributing to a healthier environment Vinegar production through fermentation converts the natural sugars present in bananas into acetic acid, resulting in a product_that contains bioactive compounds with antimicrobial, antioxidant, and digestive health benefits SDG 3 Good Health and well- being by reducing waste, preserving biodiversity, and creating a product with health benefits, boosting rural income. It is also support on Sustainable Development Goal 12 Responsible Consumption and Production, this study proposes the development of fermented vinegar from *Pik-iw* bananas as a sustainable alternative to commercially produced vinegars and Sustainable Development Goal 8 Decent Work and Economic Growth, there is a need to explore alternative and value-adding uses for seeded bananas, such as processing them into organic vinegar.

The assimilation of the fermentation and pickling process under the TESDA Food Processing NCll Training Regulation involves the application of food safety practices, ensuring that fermentation, preparation and pickling are integrated and perform all activities and preparation of materials, tools and integrate the proper preparation of raw materials, equipment, sanitation and controlled fermentation.

Vinegar is a fermented food with a diversity of uses including seasoning, salad dressing, and flavoring for foods. Since ancient times, it has been considered a remedy for health, and today, there are different types of vinegar on the market, and many others are under development. Determination of the physicochemical characteristics of the new types of vinegar is necessary to improve them. Therefore, the aim of this paper is to compare the physicochemical characteristics of vinegar obtained from banana peels (with or without boiling peels) at different ages, with those of commercial vinegars.The vinegar made from banana peels was aged in the laboratory, while the commercial vinegar was purchased from local markets. Prisacaru et al. (2021).

Research Questions

1. What specific ingredients and materials are essential in the formulation of vinegar derived from *Pik-iw* bananas?

2. What are the critical steps and methods employed to achieve natural fermentation in *Pik-iw* banana vinegar production?

3. What are the observed characteristics of the produced natural vinegar in terms of:
   3.1. Acidity;
   3.2. Color;
   3.3. Taste?

4. What is the acceptability level of the produced organic vinegar, especially in terms of:
   4.1. Aroma;
   4.2. Taste;
   4.3. Overall Quality?

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Methodology

The researchers used the design and development research approach as a method to create an organic vinegar made from Pik-iw bananas or seeded bananas. Through this development process, the researchers can determine each formulation to identify which version is better and will meet the desired product standards. Design and development research (DDR) is a very systematic study of design, development, and assessment processes in order to provide an empirical foundation and to produce instructional and non-instructional goods or tools, as well as new or better development models S. Jaya (2021). This method employs a wide range of methods, including quantitative and qualitative techniques.

In order to proceed with the development process, the researchers first secured the approval of the University authorities to ensure that all procedures complied with the institutional standards. In the first phase, the researchers harvested unripe *Pik-iw* banana (*Musa balbisiana colla*) fruits using a sharp bolo from Barangay San Rafael, Lopez, Quezon. The harvested fruits need to ripen naturally until the color turns yellow with a slight brown as a sign of ripeness after which they are thoroughly cleaned to remove dirt and impurities and prepared for processing. In the second phase, all the needed ingredients and equipment for vinegar fermentation were set. The equipment included containers, cutting equipment, measuring equipment, and materials for sanitization. The use of different types of PPE's such as gloves, hairnets, and aprons was also set to ensure that the process was clean and sanitary. The third phase involved matching or slicing fruits in a clean basin using a knife. The fourth phase involved putting the mashed banana in a container that was well sealed and leaving it for some weeks. The banana would undergo natural fermentation. In the fifth phase the researchers strained the fermented mixture, separating the liquid from the banana mixture using a cheesecloth, after which the strained liquid is transferred into a clean container that is airtight. The sixth phase of this process is the continuation of the fermentation process in order for the liquid to clear up and attain its final acidity, during which pasteurization could take place, as well as product testing for safety, acidity, and quality. For the seventh phase, it involved the packaging and labeling of the developed vinegar in clean and sterilized bottles. This was followed by the testing and evaluation of the developed *Pik-iw* Banana Vinegar to ascertain its acceptability.

The *Pik-iw* bananas that will be used for the study will come from *Pik-iw* Farm, a local banana farm in Barangay San Rafael Lopez, Quezon. Using the expert criterion sampling design, 53 evaluators will be chosen to test the vinegar products. These evaluators will include consumers, faculty members, students, and researchers. Before the study's data collection, three research experts will check the instrument to make sure that the items to be measured are clear, relevant, and appropriate.

The data analysis used qualitative and quantitative methods. Specifically, the researchers applied the qualitative methods for Questions 1 and 2, the combination of qualitative and quantitative Methods for Question 3, and Question 4. Meanwhile, for the evaluation, the researchers used the mean or the weighted mean. All data collected was tallied using Microsoft Excel.

The researchers used informed consent and food safety standards as the main ethical principles of the study (World Health Organization [WHO], 2017). Permission was given by all participants before they took part in the product checking. Food safety protocols were also carefully followed during the whole production process of organic vinegar using *Pik-iw* bananas

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from the beginning to the end (Fukuda, 2015). These ethical practices followed the guidelines recommended in related literature. All procedures in producing organic vinegar using Pik-iw bananas followed the proper food safety and sanitation guidelines (Anal, 2019).

Results and Discussion

This study addresses the limited research on the usage of *pik-iw* or *Musa balbisiana colla* in organic vinegar production, particularly in terms of the fermentation process. The consumer acceptability as a sustainable and the value-added product. Thus, the researchers aimed to develop a flavored *Pik-iw* vinegar by incorporating selected local ingredients to improve its flavor profile. Also, this study focuses on the production of organic vinegar using *Pik-iw* Bananas, including the ingredients and the material used.

Ingredients Required in Making a Pik-iw Banana Vinegar

To develop the *Pik-iw* Banana Vinegar, the researchers identified the required contents including the materials, in producing the *Pik-iw* Banana Vinegar. Table 1 presents the findings of the study in preparing *Pik-iw* Banana Vinegar.

Table 1. *Ingredients Required in Producing a Pik-iw Banana Vinegar*

Flavor Set	*Ingredients*
Set 1: Original *Pik-iw* Vinegar	*Pik-iw* Vinegar
Set 2: Sinamak or Spiced *Pik-iw* Vinegar	*Pik-iw* Vinegar, Chili, Garlic, Ginger, Onion, Pepper, Salt and Sugar
Set 3: Pinakurat or Extra hot *Pik-iw* Vinegar	*Pik-iw* Vinegar, Chili, Onion, Salt, Pepper, Sugar
Set 4: *Pik-iw* Pipino Vinegar	*Pik-iw* Vinegar, Cucumber, Onion, Salt, Pepper, Sugar
Set 5: Sweet and Spicy *Pik-iw* Vinegar	*Pik-iw* Vinegar, Onion, Salt, Sugar

There are five (5) sets developed for the banana vinegar made from *Pik iw*. The first set includes the Original *Pik-iw* Vinegar. The second set highlights the use of Sinamak or Spiced Vinegar (Labuyo, Garlic, Ginger, Onions, Salt, Pepper, Sugar). Third set is the use of Pinakurat or Extra hot *Pik-iw* vinegar (Extra hot). The fourth set is the *Pik-iw* Cucumber Vinegar (Onion, Cucumber, Salt, Pepper, Sugar) and last is the Sweet and spicy *Pik-iw* vinegar (Sugar, Onion, Pepper, Salt).

From the prior studies, vinegar is widely used in the food industry. domestically for pickling vegetables and fruits, an ingredient in flavourings like salad dressings, ketchups, and mayonnaise; and traditionally as a food seasoning and additive. These are produced from different raw materials and use different fermentation methods to give unique tastes and flavors. (Perumpuli & Dilrukshi, 2022).

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Table 2. Steps and Methods in Producing a *Pik-iw* banana vinegar

Processes of the *Pik-iw* Banana in Vinegar Production

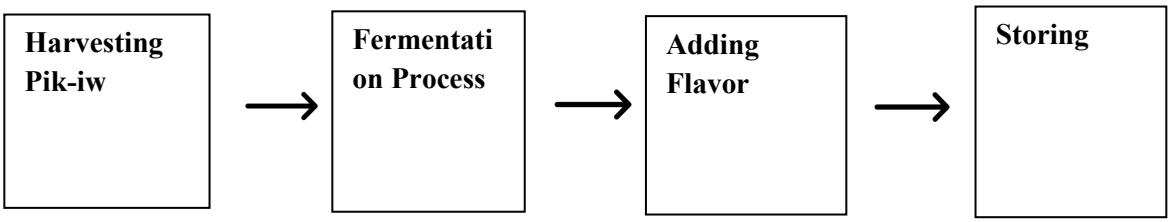

Figure 1. Processes of the *pik-iw* banana in vinegar production

For the first phase, the researchers harvested *Pik-iw* bananas using a bolo and allowed them to mature in a clean sack. Once the bananas were fully ripe, they were thoroughly washed.

For the second phase, the researchers prepared the matured *Pik-iw* bananas, two basins, two clean containers, and other sanitary materials. The bananas were first peeled and then mashed in a basin using a wooden spoon. The mashed bananas were transferred to a sealed container to undergo fermentation for 30 days. After fermentation, the solids were separated from the liquid and lastly the resulting vinegar was stored in a clean and sealed glass bottle.

For the third phase, there are five sets with different ingredients. Set 1 is made up of 2 cups of *Pik-iw* banana vinegar only. Set 2 includes 2 cups of *Pik-iw* banana vinegar mixed with 10 pieces of chili, 1 bulb of garlic, ¼ kilo of ginger, 1 medium-sized onion, 1 tablespoon of pepper, 1 tablespoon of salt, and 2 tablespoons of sugar. Set 3 is composed of 2 cups of *Pik-iw* banana vinegar, 20 pieces of chili, 1 medium-sized onion, 1 tablespoon of salt, 1 tablespoon of pepper, and 2 tablespoons of sugar. Set 4 includes the 2 cups of *Pik-iw* banana vinegar with 3 pieces of cucumber, 1 medium-sized onion, 1 tablespoon of salt, 1 tablespoon of pepper, and 2 tablespoons of sugar. In set 5 it includes 2 cups of *Pik-iw* banana vinegar, 1 medium-sized onion, 1 tablespoon of salt, and 2 tablespoons of sugar.

For the fourth phase the researchers use proper storage and packaging. By transferring the vinegar mixture into a clean container and sterilized bottles. Next the containers are sealed tightly to maintain the quality of the product and lastly it should be stored in a cool and dry place to ensure its safety.

Pik-iw banana vinegar is made using a step-by-step and organized process to produce a sustainable product. The proper harvesting and preparation of ripe *Pik-iw* bananas is the first step in ensuring high-quality raw materials. The vinegar is then given the desired flavor while maintaining safety and the quality standards through a 30 day fermentation process. Additionally, adding different flavor variations enhances the product's taste and diversity and draws in more potential customers. Appropriate storage and packaging methods are also employed to preserve the vinegar's quality and extend its shelf life.

In order to create a sustainable product that is of high value for consumers, the production of *Pik-iw* banana vinegar follows a methodical process. The first step in preparing *Pik-iw* banana vinegar is to ensure that the banana is harvested at the correct ripeness (ripe & prime). During the fermentation process, the product is allowed to ferment for a period of 30 days in order for the

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banana vinegar to achieve the desired taste; during this time, safety and quality standards will also be maintained.

The addition of different flavours of banana vinegar will add variety to the flavour profile and appeal to a larger number of potential customers when they make a decision about whether to purchase the product. The use of certain storage techniques will assist in maintaining the quality of the product and prolonging the shelf life of the product.

Observed Characteristics of Pik-iw Banana Vinegar

This section presents the observed characteristics of the produced organic vinegar derived from *Pik-iw* bananas in terms of acidity, color, and taste.

Acidity. The produced vinegar exhibited a moderately strong level of acidity as a result of the natural fermentation process. The 1 month fermentation process helped a lot with the sourness of the vinegar. Color. The vinegar produced from *Pik-iw* bananas ranged from light to golden brown in color. The original vinegar is clearer, while the flavored variants had a deeper color due to the ingredients added such as chili, onion, and cucumber. Taste. The taste of the *Pik-iw* banana vinegar varies from mildly to strongly sour. The different flavors such as sweet and spicy, pinakurat, sinamak, and cucumber vinegar also helped enhance the overall taste of the vinegar and make it more appealing to the consumers.

Nutritional Content in *Pik-iw* Banana Vinegar

The researchers provided a formal request letter to the nutritionist to ensure the validity, reliability and credibility of the study. The Researchers consulted to the expert nutritionist to have the nutritional content of the produced *Pik-iw* vinegar thoroughly assessed and verified. The results obtained were carefully reviewed and validated by the nutritionist to confirm the accuracy and dependability of the data. This process will ensure that the nutritional content or information presented are credible and can be confidently used for further analysis or practical applications.

Nutritional Content of Pik-iw Banana Vinegar

This table presents the nutritional content of the product Producing Organic Vinegar Using *Pik-iw* Bananas

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Table 3. *Nutritional Content of Pik-iw Banana Vinegar*

Original *Pik-iw* Banana Vinegar		**Sweet and Spicy Vinegar**		**Pinakurat (Hot and Spicy)**		**Sinamak *Pik-iw* Vinegar**		**Pipino Vinegar**	
Content	*Daily Value*	*Content*	*Daily Value*	*Content*	*Daily Value*	*Content*	*Daily Value*	*Content*	*Daily Value*
Calories	0	Calories	20	Calories	20	Calories	155	Calories	120
Carbohydrates	(1g) 0.28%	Carbohydrates	(4.5g) 1,6%	Total Fat	(2g) 0%	Total Fat	(0g) 0%	Total Fat	(0.2g) 0%
Protein	(0.3 g) 0.4%	Protein	(0.5 g) 1%	Sodium	(1100 mg) 0%	Carbohydrates	(37g) 0%	Sodium	(1 mg) 0%
		Sodium	350mg 15%			Protein	(2.4g) 5%	Carbohydrates	(29.5 g) 11%
						Sodium	(3,491mg) 152%		

Tables 3 presents the nutritional composition of the five flavors of *Pik-iw* Banana Original, Sweet and Spicy, Pinakurat (Hot and Spicy), Sinamak (Spiced) and Sukang Pipino each with a serving size of 1 tablespoon (15 ml) and a total of 10 servings per bottle or container. Table 2 shows that the Original Flavor contains 0 calories per serving, along with 1 g of carbohydrates (0.28% Daily Value) and 0.3 g of protein (0.4% Daily Value), indicating that it contributes minimal energy and nutrients to the daily diet and can be used as a flavor-enhancing food product without significantly affecting macronutrient intake.Also indicates that the Sweet and Spicy Flavor provides 20 calories per serving, 4.5 g of total carbohydrates (1.6% Daily Value) including 0.5 g of dietary fiber (2% Daily Value) and 3.5 g of total sugars, with 2.5 g coming from added sugars (5% Daily Value), as well as 0.5 g of protein (1% Daily Value) and 350 mg of sodium (15% Daily Value). It is also rich in antioxidants like polyphenols, minerals like potassium, phosphorus, and calcium, as well as other compounds like Vitamin C, which is in the form of ascorbic acid, and acetic acid, which give it nutritional value and extend its shelf life. Also, it shows that Pinakurat (Hot and Spicy) Flavor contains 20 calories, 2g of total fat with 0.5g of saturated fat, and 1,100mg of sodium in each serving and shows that Sinamak Flavor has 155 calories per serving size, the highest among all the variants; it has 37g total carbohydrates, which is(13% Daily Value) 2.3g dietary fiber, which is 8% Daily Value; 24g total sugars; among these total sugars, 10g is added sugars or(20% Daily Value) it also has 2.4g protein or (5% Daily Value) 0g total fat; and a relatively high amount of sodium at 3,491mg or (152% Daily Value)It also presents the nutritional composition of the Sukang Pipino flavor. According to the data presented in the table, the product has a nutritional value that includes approximately 120 calories per serving. It has a little amount of total fats and sodium. It also has a relatively higher amount of carbohydrates at 29.5g, which includes 0.8g of dietary fibers and 26.5g of total

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sugars. It also has a relatively lower amount of proteins at 1g. The product is a good source of potassium and Vitamin C.

The nutritional content of *Pik-iw* banana vinegar is unique, especially for the health-conscious consumers. It has 0 calories per serving, which means it can be added to meals without increasing daily calorie intake, making it better for the individuals who monitor and manage their diet. Even though it is low in calories, it still provides beneficial components such as antioxidants, vitamin C, and minerals like potassium, phosphorus, and calcium. Since it is made from *Pik-iw* bananas and does not contain synthetic ingredients it offers a more natural and healthier option compared to commercial vinegar products. Nutritional information on foods is necessary for achieving nutritional security and addressing malnutrition globally (B. Mohanty et al., 2017).

Packaging of Pik-iw Banana Vinegar

The researchers considered using plastic acrylic bottles to ensure safer and more efficient transfer of vinegar from *Pik-iw* bananas and to prevent any damage to the product. Because this bottle is lightweight, it also helps reduce the costs and energy consumption during transportation. Acrylic has a high-quality, glass-like appearance, which enhances the product's perceived value to consumers.

Packaging of Pik-iw Banana Vinegar

This table presents the packaging design of a product "Producing Organic Vinegar Using *Pik-iw* Bananas"

Table 4. *Packaging of Pik-iw Banana Vinegar*

Figure 2. Packaging of Pik-iw Banana Vinegar

The table presents the packaging of *Pik-iw* Banana Vinegar in its different flavors such as original, pinakurat, sinamak, sukang pipino, and sweet and spicy. The product is packed in an acrylic bottle where the sticker logo is visibly placed at the front and the nutritional facts at the back. The packaging is both functional and for marketing. The logo at the front makes the product attractive and identifiable. The inclusion of the nutritional facts at the back makes the

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product transparent and allows for consumer choice. The packaging is transparent in that it presents the essential facts about the product. The packaging is both attractive and functional. Packaging in food is one of the most important steps in the food industry for several reasons, such as hygiene, practical use, fast and easy consumption, extended shelf life, and proper preservation of foods (Çaglarırmak, 2017). *Pik-iw* banana vinegar will be packaged in acrylic bottles. This type of packaging was chosen for several reasons. First, it is durable and helps prevent damage during transportation and handling, which is especially important for rural distribution. Second, plastic acrylic bottles give the product a premium and clean appearance, making it more attractive to customers. Third, using an acrylic bottle keeps the product lighter and more convenient for customers to carry and store. Packaging plays a big role in product marketing and in influencing customers to buy, because packaging provides a clear picture that helps identify the product and serves as a means of communication between the product and the customers. It also acts as an identifier. The first and most important task of packaging is to make sure that the food is preserved and protected in good condition (S. Gilaninia et al., 2013)

To Identify if the *Pik-iw* vinegar meets the standards. The researchers conducted an acceptability evaluation, and the process was participated by several groups of evaluators, namely: (1) Subject Matter Experts or Course Professors; (2) Future researchers or BTLE students; (3) Consumers. The evaluation was done on February 14- March 2, 2026. A project pitching activity was conducted on February 14, 2026, with various groups of respondents while on the remaining dates the researchers visited the SMEs/CPs for the evaluation of the product. There are a total of 53 evaluators who assessed the product using the validated evaluation tools. Table 4 presents the acceptability evaluation results.

Table 5. Results of the Acceptability Level evaluation of the *Pik-iw* Vinegar

Criteria	**Evaluators**			MS	QD	R
	SME	FRS	CON			
AROMA	3.833	3.580	3.554	3.655	SA	2
TASTE	3.800	3.455	3.636	3.630	SA	3
OVERALL QUALITY	3.583	3.682	3.679	3.685	SA	1
TOTAL	3.738	3.572	3.623	3.656	SA	----

Legend:

SME- Subject Matter Experts/Course Professor	1.00 to 1.75- Strongly Disagree (SD)
FR- Future Researchers/BTLE Students	1.76 to 2.50- Disagree (D)
CON- Consumers	2.51 to 3.25 Agree (A)
MS- Mean score	3.26 to 4.00- Strongly Agree (SA)
QD- Qualitative Description	

The criteria on overall quality received the highest evaluation rating with a mean score of 3.685, which is interpreted as strongly Agree placing it in the first rank among the evaluated criteria. This indicates that the respondents highly appreciated the overall acceptability and general characteristics of the product. It is followed by aroma, which obtained a mean score of 3.655, also interpreted as strongly Agree ranking second among the criteria. The taste received

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an evaluation rating of 3.630, described as strongly Agree, placing it in the third rank. The result indicates that the respondents evaluated the product. All the criteria were rated strongly Agree with a total product evaluation mean score of 3.656, which suggests that the product was highly acceptable to the respondents.

The Overall Quality of something is what people think about when they look at the research that is going on. This research finds five things that people think are important when it comes to the quality of something. These things are how something tastes and smells and looks and feels and if it is good for you and safe to eat and easy to get. People also think about where something comes from and if it's organic or not. (Pramudito et al., 2025). When we talk about Aroma we are talking about how something smells. There was a review in 2022 that looked at how people figure out if something smells good or not. They found that certain tiny particles in the air like aldehydes and esters can affect how people like the smell of something. They used machines to find these particles and see how strong they were. They found that the stronger the smell the more people liked it. This is why Aroma is a part of the Overall Quality of something. (Al-Khalili et al., 2025). The taste of something is also very important. Some researchers, like Mulheren and his team, looked at how people taste things and how they affect them. They found that the taste of something can affect how people swallow. They need to do more research to be sure about this. They looked at 48 studies, about how people taste things and how they affect their bodies. The researchers think that taste is connected to how people swallow. They need to do more work to confirm this. The Overall Quality of something including the Aroma and the Taste is what people think about when they decide if they like something or not. (Mulheren et al., 2022).

Aside from the acceptability evaluation, the researchers also conducted significant difference analysis using ANOVA. Table 6 presents the ANOVA results for the responses of the evaluators

Table 6: *Significant differences Among the criteria of the Acceptability Rating of the Given by the evaluators*

SOURCE	DF	SUM OF SQUARE	MEAN SQUARE	F STATISTICS	P-VALUE
Between Groups	2	0.04361	0.02181	1.8477	0.237
within groups	6	0.07081	0.0118		
Total	8	0.1144	0.0143		

The test statistic F equals **1.847717**, which is in the 95% region of acceptance: [0 : 5.1433]. In other words, this means that the difference between the sample averages of all groups is not big enough to be statistically significant. The results show that there is no significant difference among all groups.

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Table 7: Significant Difference Among the Criteria of the Acceptability Rating

SOURCE	DF	SUM OF SQUARE	MEAN SQUARE	F STATISTICS	P- VALUE
Between Groups	2	0.3529	0.1798	0.905	0.4066
within groups	156	30.9765	0.1986		
Total	158	31.3294	0.1984		

Since p-value > α, H_0 is accepted. The test statistic F equals **0.90502**, which is in the 95% region of acceptance: [0 : 3.054]. In other words, the difference between the sample averages of all groups is not big enough to be statistically significant. The results show that there is no significant difference among all groups.

Conclusions

The *Pik-iw* banana (*Musa balbisiana Colla*) is known for its numerous seeds but it is often overlooked. This study addresses the lack of local and organic vinegar options by testing whether these bananas can be made into vinegar. The analysis showed that the overall quality received the highest average score of 3.685, which indicates a "Strongly Agree" response. This suggests that the participants had a very positive view of the product's general characteristics and how acceptable they found it. Aroma (3.655) and taste (3.630) also received "Strongly Agree" ratings. Therefore, the product's overall mean score of 3.656 suggests it was highly acceptable to the participants.

The significance of this study is the use of the *Pik-iw* banana, which shows that it is often not used because of its many seeds. The *Pik-iw* banana that is ignored can still be used and processed to make vinegar. It also shows the importance of using wasted *Pik-iw* to reduce agricultural waste and use it to develop quality products. Making vinegar using *Pik-iw* bananas can also be a source of income for the residents of the community who usually just throw it away. This study is important because it shows that what is ignored and usually thrown away, like the *Pik-iw* banana, can be made into a meaningful and useful product. The study was limited to areas where there are many *Pik-iw* bananas that can be used to produce organic vinegar. There is a limited number of respondents who evaluated the product. Because of this, the results related to the aroma, taste, and overall quality may not represent the preferences of a larger population. The fermentation process conducted in the study used only limited materials to produce organic vinegar. Other types of fermentation methods were not explored, which may influence the outcome of the product.

IMPLICATIONS AND RECOMMENDATIONS

Based on the feedback gathered by the researchers during the product pitching, several evaluators stated that the developed vinegar had a pleasant taste and could become marketable in the future. Some evaluators also mentioned that the product has the potential to be developed into a liquor. In line with this, it is recommended for future researchers to allow a longer fermentation period in order to further enhance the acidity, flavor, and overall quality of the vinegar. Furthermore, future studies may investigate other possible products that can be

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developed from *Pik-iw* bananas to ensure their proper utilization and to increase their economic value. This study proved that the *Pik-iw* banana can be a meaningful and useful product like an organic vinegar, a quality product that is beneficial not only to the community but also to the environment.

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