HERCULEAN JOURNAL INTERNATIONAL MULTI-DISCIPLINARY RESEARCH JOURNAL
Vol. 1 No. 6

# Level of Acceptability of Banana Inflorescence (*Musa Paradisiaca)* Pickle

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## ABSTRACT

Browsing the literature, it was appeared that utilization of Banana inflorescence has found to have limited reference as to its utilization, although there is already evidence that people used the former to make pickles, the foregoing study believe s that it is best to document it so as it will be added on the pool of knowledge. Specifically, the study aimed to assess the level of acceptability of Banana inflorescence (Musa Paradisiaca) as a pickle. With the use of consumer preference test among the 75 consumers, it was shown that the new product has no difference with the available product in the market. However, its aroma and taste, Aroma A and Taste A both have a significant difference with the available pickle on the market. Perhaps this may due to a much enhance flavor and ingredients used were all locally available from the producer's kitchen. When it comes to the consumer's willingness to buy the product, data have shown that it has no significant difference with the product already available in the market. This implies that people tend to buy whatever is available in the market provided that it is safe to consume and nearly similar to what they previously buying. (Most of the time it's out of curiosity). On the Over-all Taste Acceptability assessment, the data shows a significant difference between the two products, where code A (Banana Inflorescence Pickle) is much more acceptable than the product subjected for comparison. This argument is supported by the qualitative assessment of the participants on the new product (Banana Inflorescence Pickle).

**Keywords:** *pickle, banana inflorescence,aroma,texture,flavour*

## INTRODUCTION

Banana is a staple crop of the Filipinos and is known worldwide because of the beneficial properties use in medicine, as a food and as a source of income for most of the planters and to the sum of money it contributes to the economy of a country. This agricultural crop is abundantly planted in tropical and subtropical regions of the world benefitting from the various advantages mentioned above. As noted, the tree is cultivated mainly for its fruit and the remaining were served as underutilized wastes. Hence if not given attention in managing these resources to its fullest capacity this will result to a much more ecological problem than we thought of. (Padam et al. 2012; Essien et al. 2005; Shah et al.2005; Yabaya and Ado 2008). Today, banana producers are looking into ways to turn these products into a much more advantageous on their part adding value that could still generate income or could at least beneficial to them in other way.

Banana is an herbaceous flowering plant from the family of Musaceae family (Probojati et al.,2021). The edible and cultivated banana tree comes from wild species of Musa acuminata, Musa Balbisiana and Musa Paradisiaca (Brown et al.2017). This musa however are originated from India to Papua New Guinea. (Arvanitoyannis & Mavromatis 2009; De lange et al. 2009; Nelson,Ploetz & Kepler 2206). At present, banana tree is widely cultivated in India having been recorded as the number one producer and exporter of banana followed by China, Philippines, Brazil, Indonesia, Ecuador, Guatemala, Angola,

United Republic of Tanzania. In the Philippines particularly in the Region 2, Banana fruits of the region largely came from Isabela which accounts to more than half of the total Banana produced in the province in 2020. On the figures included, 74.2% is Saba variety followed by Latundan with 13.9%, Lacatan is 9.4%, Bungulan is 1.6%, Cavendish variety is 0.1% and the least produced accounts to other varieties present in the region. (PSA, 2020).

Banana tree could grow up to meters with parts namely pseudostem, leaf, and Banana inflorescence which could turn into a fruit once it grows up for days. Banana inflorescence is referred as Banana Blossom or Banana Heart and typically used by the locals as staple. Its structure includes the flowers that turns into a bunch of fruit once it has set, where the male bud which left hanging needs to be cut because it already reaches maturity. These flowers are encapsulated by a large bract with bright colored which serves as a protector of the female and male flowers. Flowers are referred as polygamous since it composed of staminate flowers, bisexual flower and pistillate flowers. The inflorescence particularly the inner part of it and the flowers underneath are eaten as vegetable and sometimes added as food ingredients among Asians. (Wickramarachchi & Rana mukhaarachhi,2005).

In the study conducted by (Lau et al.2019) it was comprehensively discussed the utilization of Banana inflorescence as an ingredient for functional food. Nutritional and bioactive constituents of the tree is explained extensively as well. However, there is still lack of references as to the utilization of the Banana inflorescence like in a study where 1-2% extracts of banana inflorescence are added to pork burger and the results shows that the addition of hydroethanolic extract of the banana inflorescence have no negative effect on the physicochemical and sensory properties of the product. (Schmidt et al.,2016). Banana inflorescence extracts were used as antioxidants of meat products which control the oxidation of lipid during storage. The process was done naturally. And the acceptability did not change although there was 2% extract added into the product. (Rodrigues et al., 2020). Furthermore, with 4%,6% and 8% banana inflorescence extracts added to a plain cake there was a significant change on the sensory and physical properties as this was correlated to the % of extract added. The ash content as well as the fat and protein content have found to be increasing as the level of the extract increased. (Tasmin et al. 2020). In a study where 10%, 20% and 30% of fresh banana blossom is added in each batter of making nut chocolate, it shows that there is a better acceptability rate in the 20% incorporate of the blossom. (Komal and Kaur, 2019). Same findings when a 20% banana blossom is incorporated in the batter of dark chocolate. It actually got a highest score of the general acceptability. (Sharmilla,2015).

Banana flower can be consumed fresh and could be made into various products like dehydrated vegetable, canned food and pickled food. (Wickramarachchi et al., 2005). Pickles can be made from the male bud and even from pseudostem and immature fruit. (Mohapatra et al. 2010).

Pickle is a preserved food with incorporation of salt or vinegar. The process is called pickling which involves vegetables or fruits and even herbs and spices. It is believed that this process of food preservation has known long time ago even before mankind discovered microorganism (Guizani and Mothershaw,2006). In Asia although there are numerous ways to preserve food, pickling is somehow known by only few of the people. Unlike in the western part of the world like Europe and America where pickling is known by many. And this practice is part of their culture, (Fellows, 2002).

Pickling is a process of preserving food which last for months. It involves two processes (1) brining and (2) acidification of the ingredients with the used of vinegar or

lemon. And the process itself affects the texture and flavor of the food. Factors such as the intrinsic properties (pH, nutrient content, antimicrobial agents, oxidation/reduction potential, water activity, biological structure and moisture content) and its extrinsic properties like the atmosphere and packaging, temperature and relative humidity are parameters that affect the rate to which microorganisms inhibit a food. That is why in any food processing, it must be understood that these critical factors affect the safety of any food products. And this absolutely must be applied in pickling. Pasteurization is also important factor to make sure that microorganism will not inhibit in the food preserve. In a tropical area of the world, refrigeration is also an advantage to extend the shelf life of a product and to slows the growth of microorganism (Evans, J Aa* Russell, S Lb, James, Ca and Corry, J E L, 2006).
In the above context where Banana inflorescence have found to have limited literature as to its utilization, although there is already evidence that people used the former to make pickles, the foregoing study believes that it is best to document it so as it will be added on the pool of knowledge about pickling.

Browsing the literature, it was highlighted that Banana inflorescence have high moisture content and therefore it is not suitable to keep it longer which suggest that it only has a short life span. (Sheng Z. et al.2010; Lau B.F et al., 2019). However, Wickramarachchi and Ranamukhaarachchi, (2005), pointed out that when the banana inflorescence is pre-treated with a 0.2% citric acid solution for 30 min followed by a drying process at 50 degrees Celsius for 6 hours the end product will have an acceptable appearance and could achieve overall quality. The outcome is dehydrated and the browning will be lessened.

With the aforementioned problem, the study therefore aims to produce a highly acceptable Banana pickle which has the ability to have a longer shelf life and be able to compete with the available pickles offered by the established marketers.

## MATERIALS AND METHODS

### *Sample Preparation*

Making a Banana Blossom pickle requires a strict compliance when it comes to hygiene and sanitation of paraphernalia following the procedure and making sure that quality of ingredients is used.

### *Equipment*

- Casserole to where you boil the banana blossom
- Large knife and cutting board
- Disposable food gloves
- Wooden long spoon
- Large and clean basin
- Solid measuring cup
- Gas range/Burner
- Strainer

### *Ingredients*

- 1 kg banana blossom
- 2 medium size ginger
- 5 onions (medium size)
- 3 pcs carrot (big size)
- 2 cups vinegar (5% alcohol)
- 3/4 white sugar
- 1 tbsp salt
- 1 tbsp pepper
- 125 grams chili (optional)

### *Preparation*

1. Clean banana blossom by removing that match stick-like or pistil of the flower together with the calyx. Discard also the outer bract of the blossom since it has a hard texture. Chop the soft part of the blossom.

2. Wash the banana blossom and put it to boil for at least 15 minutes. This will help the blossom remove its bitter taste. Strain the blossom and discard the water.
3. While waiting for the main ingredient to cool down, prepare the other ingredients. Slice other ingredients, julienne for the carrot and ginger, chop for the onion and the garlic will be added as it is.
4. Boil the vinegar without stirring. Once boiled, add the sugar and stir. Add the Banana Blossom, carrot, ginger, onion and garlic. Add the salt and pepper to taste. Let it simmer for at least 2 minutes, after which let it cool and bottle after.




*Figure 1: The procedure in making the Banana Blossom Pickle*

***Data Gathering Tool***

In order to elicit necessary information about the objective of the study a quantitative descriptive analysis survey was used which was group into two. The first part deals with the profile of the participants while the second part is focus on describing the food product with the used of lexicon descriptors. More so, to determine the following parameters; Product Acceptability, Willingness to Purchase and the Overall Taste Acceptability, a consumer preference taste test was used. The tools used in this study undergone pilot testing to make sure that data gathered are valid and reliable.

***Data Gathering Procedures***

After pilot testing of the questionnaire survey the researcher had given the tool to the participants and discuss the objectives and the consent form. After which, the tool was retrieved immediately.

***Data Analysis***

To analyze the results gathered from the participants' responses, a Frequency and Ppercentage Distribution was used in order to determine the number of female respondents from male respondents along with the variables of age and their knowledge about the product in terms of its Aroma, Texture, Appearance and Flavor. The respondents were purposively selected with the following criteria; (1) 18 years old and above; (2) healthy and no other health concern; (3) have interest in participating in the study. Weighted Mean Average and Standard Deviation on the other hand was utilized in order to shed lightt on impression of the participants on the product presented. This is used to determine the parameters; Product Acceptability, Willingness to Purchase and the Overall Taste Acceptability of the product. Additionally, standard deviation was used in order to look into the significant differences of responses on the Consumer Preference Test.

**Table 1. The Sociodemographic Profile of the Respondents and their self-assessment when it comes to their knowledge on Pickle. (*n*=33)**

| Variable | Characteristics | Frequency | Percentage |
|---|---|---|---|
| Gender | Male | 9 | 27.27 |
| | Female | 24 | 72.72 |
| Age | 18 - 25 | 4 | 12.12 |
| | 26-35 | 15 | 45.45 |
| | 36 - 45 | 6 | 18.18 |
| | 46 - 55 | 3 | 9.09 |
| | 56-65 | 5 | 15.15 |
| Have you ever consumed a pickle? | Yes | 31 | 93.93 |
| | No | 2 | 6.06 |
| What type of pickle did you already consume? | Sweet Pickle Relish | 22 | 41.51 |
| | Atchara/Papaya Pickle | 25 | 47.17 |
| | Mango Pickle | 0 | 0 |
| | Bamboo shoot Pickle | 6 | 11.32 |
| | Others | 0 | 0 |
| How often do you eat pickle? | Everyday | 1 | 3.03 |
| | 3 to 5 times a week | 0 | 0 |
| | Once a week | 1 | 3.03 |
| | Only on weekend | 1 | 3.03 |
| | On Special Occasion | 30 | 90.91 |
| | Others | 3 | 3.03 |
| Is Banana Inflorescence new to you? | yes | 25 | 75.75 |
| | no | 8 | 24.24 |

As shown in Table 1, Nine (9) with 27.27% of the population were male and twenty-four (24) or 72.72% were females. The consideration of gender profile in the study is taken into account because according to a study of Ogundijo, D., et al (2022) males consumed more fast foods with lesser attention to the food nutrition because they are less frequently using nutritional label when buying and have lower knowledge on nutrition unlike females. This gap on the literature only answers the data collected on this study that males have lesser interest in participating in such study because they have lesser knowledge when it comes to food nutrition. Meanwhile, most of the participants were from age ranges 26-35 (45.45%) and the least is 46- 55 ages (9.09%). The results may be impacted by the study conducted by Drewnowski, A., & Shultz, J.M., (2001) that as adults get older, they tend to eat less and decided to make different food choices. Perhaps this is associated with other sociodemographic variable such as marital status, income, lifestyle and may be because of health-related concerns.

On the participants response as to their experienced consuming pickle, 31 (93.93%) have said that they had already tasted a pickle while 2 (6.06) have not yet tasted one. And among the most consumed pickle, Atchara/Papaya pickle got the highest score of 25 with 47.17%, the least is Mango Pickle. While on the frequency of eating pickle, 30 (90.91%) have said that they consume pickle occasionally. And in the last question if they knew Banana Inflorescence Pickle, 25 participants answered yes while the 8 participants have said that the product is new to them. In a survey conducted by Jarden Company, a global consumer products company, they argued that almost everyone (86%) like pickles especially the Baby boomers (90%). Additionally, in a survey among Americans as to how they want

their pickle to be presented is prefer it on sandwich or burger. Moreover, eigthy four (84%) of the population knows that cucumber can be pickled and the rest doesn't know that other foods can also be pickled and are tastier like the Banana Inflorescence Pickle however, not all have decided to pack and produce just like those available on the market.

**Table 2. Participant's Acceptability on the New Product (Banana Inflorescence Pickle) Versus the Pickle Available on The Market**

| CODE A | | MEAN | DESCRIPTION |
|---|---|---|---|
| 1. | Color/Appearance | 4.41 | Acceptable |
| 2. | Aroma/Smell | 4.76 | Acceptable |
| 3. | Taste/Flavor | 4.67 | Acceptable |
| **CATEGORICAL MEAN** | | **4.61** | **Acceptable** |
| **CODE B** | | | |
| 1. | Color/Appearance | 4.36 | Acceptable |
| 2. | Aroma/Smell | 4.27 | Acceptable |
| 3. | Taste/Flavor | 4.23 | Acceptable |
| **CATEGORICAL MEAN** | | **4.29** | **Acceptable** |

The results of the participant's acceptability on the new product (Banana Inflorescence Pickle or Code A along with Code B which is the available product on the market was statistically generated through weighted mean average, hence the overall categorical mean for the new product Code A considering the variables color/appearance, Aroma/Smell and Taste/Flavor is 4.61, Acceptable. Whilst, Code B or the pickle which is available in the market got also an Acceptable descriptor with 4.29 categorical mean. This results link in the conceptual framework presented by Hirschman, Elizabeth C (1980) where she incorporates three (3) constructs which are highly relevant to consumer behaviorr, these are novelty seeking, innovativeness and consumer creativity. Therefore, for a newly product to be likened by consumers, this product must be creative and has enough features or characteristics to indulge consumer to buy it.

**Table 3: Participant's Willingness to Purchase on The New Product (Banana Inflorescence Pickle) Versus the Pickle Available on The Market**

| VARIABLE | MEAN | DESCRIPTION |
|---|---|---|
| Code A | 4.60 | Extremely Willing |
| Code B | 4.49 | Extremely Willing |
| **CATEGORICAL MEAN** | **4.55** | Extremely Willing |

The new product (Banana Inflorescence Pickle) garnered a mean average of 4.60 with 'Extremely willing' as description. Meanwhile Code B (pickle available in the market) got 4.49 mean with same description of 'Extremely willing'. The categorical mean is 4.55, extremely willing descriptor.

**Table 4. Consumer Preference for A New Pproduct (Banana Inflorescence Pickle) Vversus the Pickle Available in The Market Using a Preference Test With 75 Consumers**

| GROUP | N | MEAN | SD | t- value | p- value | Decision |
|---|---|---|---|---|---|---|
| Color A | 75 | 4.41 | 0.66 | 0.445 | 0.658 | Not Significant |
| Color B | 75 | 4.36 | 0.93 | | | |
| Aroma A | 75 | 4.76 | 0.43 | 4.195 | < .001 | Significant |
| Aroma B | 75 | 4.27 | 0.94 | | | |
| Taste A | 75 | 4.67 | 0.50 | 4.082 | < .001 | Significant |
| Taste B | 75 | 4.23 | 0.97 | | | |
| Willingness A | 75 | 4.60 | 0.49 | 1.270 | 0.208 | Not Significant |
| Willingness B | 75 | 4.49 | 0.71 | | | |
| Overall taste aacceptability A | 75 | 2.84 | 0.64 | 3.939 | < .001 | Significant |
| Overall taste aacceptability B | 75 | 2.67 | 0.70 | | | |

The data above shows the results generated from a consumer preference test conducted among 75 consumers. Wherein Color A (Banana Inflorescence Pickle) is not significantly different with the pickle (Color B) available in the market. However, when it comes to aroma and taste, Aroma A and Taste A both are (Banana Inflorescence Pickle) is significantly different with the available pickle on the market. Perhaps this may due to a much enhance flavor and ingredients used were all locally available from the producer's kitchen. When it comes to the consumer's willingness to buy the product, data have shown that it has no significant difference with the product already available in the market. This implies that people tend to buy whatever is available in the market provided that it is safe to consume and nearly similar to what they previously buying. (Most of the time it's out of curiosity). On the Over-all Taste Acceptability assessment, the data shows a significant difference between the two products, where code A (Banana Inflorescence Pickle) is much more acceptable than the product subjected for comparison. This argument is supported by the qualitative assessment of the participants on the new product (Banana Inflorescence Pickle).

**Return on Investment (**Yield: 10 bottles (500ml)

| Ingredients | Quantity (AP) | Quantity (EP) | Purchase Price | Unit Cost (AP) | Extension Cost |
|---|---|---|---|---|---|
| Banana Blossom | 3 kg | 1.5 kg | 80/3 kg | 26.67/kg | 40.005 |
| Ginger | 1 kg | 850 grams | 75/kg | 0.075/kg | 63.75 |
| Vinegar | 470 ml | 50 ml | 50/470 ml | 0.11/ml | 5.5 |
| Bell pepper | 200 grams | 180 grams | 150/kg | 0.15/kg | 27 |
| Carrots | 1 kg | 850 grams | 80/kg | 0.08/kg | 68 |
| Sugar | 1 kg | 1 kg | 90/kg | 0.09/kg | 90 |
| Onion | 1 kg | 950 grams | 200/kg | 0.2/kg | 190 |
| Garlic(optional) | 1 kg | 950 grams | 130/kg | 0.13/kg | 123.50 |
| Salt | 150grams | 150 grams | 12/grams | 0.08/gram | 12 |
| Pepper | 250 grams | 250 grams | 95/250 grams | 0.38 grams | 95 |
| **Total Recipe Cost** | | | | | **714.76** |
| **Cost per bottle** | | | | | **71.4755** |

Mark-up = Cost per serving * mark-up rate
= 71.4755*2.5
= 178.69

Selling price = cost per serving + mark-up
= 178.69 +71.4755
= 250.17

## CONCLUSION

The sensorial analysis of a food product along with the assessment on whether this new product is acceptable among consumers or not is very crucial in the food production because producers or even marketers should see to it that any data gathered must be incorporated in the final product. This somehow benefits the producers since all efforts exerted may be paid of through the income coming from the sales of the products.

In the study, the researcher included the demographic profile of the participants because according to the existing research of Verbeke,W (2005) the demographics determinants of the consumers most especially on gender and age variable shows that female with age range from 35 - above, with higher income and well educated have much stronger purchasing interest on functional foods. In general, women are most reflective when it comes to food and its nutrients. Additionally, in the profile, their knowledge on the pickle or any type of pickle was also included to assess if they have enough knowledge about the product. This in turn is an advantage on the researcher to observe if the new product could be an alternative to pickles available in the market.

The second table shows how acceptable the product is among the participants when compared to the available product in the market. The new product earned an acceptable response among the respondents. While on the assessment if participants are willing to purchase the product, it was given a description of extremely willing. The result somehow is in favor with the researcher since it is a manifestation that the new product has the ability to be purchased by the consumers.
Meanwhile, the study also assessed if the attributes of the product is significantly different with the available product in the market. Results shows that when color attributes have no different with the one available in the market but when it comes to its taste and aroma they are differ.

On the same manner consumer's willingness to buy the product has no significant difference on the product already available in the market. Therefore, consumers are willing to buy a product which could be an alternative to the one they are using.

## RECOMMENDATIONS

It is highly recommended to incorporate additional flavor on the product considering other taste parameter. Meanwhile, return on investment is also recommended in generating profit on the product. More creativity when it comes to presenting the product is also recommended.

## ACKNOWLEDGEMENT

The author is grateful to the Isabela State University, San Mariano Campus and to the system as a whole for the opportunity of conducting this research study as well as for the financial support it provided to the researcher.

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