

Consumer Acceptance Testing of Nipa (*Nypa fruticans*) Marmalade Filled Roll (NMFR) for Product Development

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Abstract

This research will lead to commercializing the technology generated by the Aklan State University (ASU) - Ibaday, Aklan, Philippines. The investigation aims to find the consumers' acceptance of the nipa (*Nypa fruticans*) marmalade-filled roll for product development. The descriptive method was employed in the study. The data was gathered from the participants of the Regional Science and Technology Week (RSTW) at the Iloilo Convention Center (ICON), Iloilo City, Philippines. The 150 tasters were selected through purposive sampling. Based on the results, the tasters represent various age groups, gender, and occupations. The sensory testing revealed that the product was liked very much by tasters in terms of appearance, flavor, texture, aroma, and overall acceptability. The tasters had a positive first reaction to the product and rated its innovativeness as "very innovative". Similarly, the tasters disclosed that "very likely" they will buy the product if it is available for sale and will tend to recommend it to their colleagues. Moreover, the results further revealed that the gender of the tasters and their tendency to buy the product has a significant correlation. Consequently, occupation and innovativeness, and occupation and tendency to recommend the product were found to have significant correlations, respectively. Likewise, the taste of the product satisfied the tasters. However, the tasters revealed that packaging should be improved. Further study along with this, specifically on shelf life and proximate analysis, is recommended before bringing the product to a bigger market.

Keywords: *Nipa (Nypa fruticans) marmalade; consumer testing; product development*



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INTRODUCTION

The global population has been rising over the last century. As the population increases, the food demand is expected to surge (Elferink & Schierhorn, 2016). The increase in income in the developing country (Hofstrand, 2014) contributes to the increase in food demand. To meet the increasing demand for food, the agricultural sector is encouraged to produce an enormous amount of food crops and be advanced in the practice of postharvest technology to avoid waste of food resources. The Philippines also contributes to the increase in demand for food, as its GDP grows by 6.2 percent in the third quarter of 2019. The food service industry is seen to expand in tandem with the growing population and rising income (Masigan, 2019).

According to Director Gelonga of DOST region VI, there is a need to address the critical gaps in various areas through research and development for the region to attain its full development potential. The commercialization of the research results is encouraged to respond to the challenge of achieving Ambisyon Natin 2040, which will create opportunities for Filipinos to enjoy matatag, maginhawa, at panatag na buhay.

In response to the challenge of the Philippine long-term vision, the ASU Research, and Development Services, as stated in its goals to conduct researches that can generate new

knowledge, best practices, and appropriate technology. The office has produced research using nipa (*Nypa fruticans*) fruit marmalade. The research output's composition and procedures were granted Utility Model registration by the Intellectual Property Rights Office of the Philippines. To add the value of nipa marmalade, it was used as fillings to the bread roll. A bread roll is commonly called a bun, a baked product that is usually consumed by Filipinos for breakfast and snacks. Using local ingredients like nipa in product development and for commercialization may provide access to opportunities for local people, specifically the nipa growers.

This research is anchored on the harmonized regional R and D agenda 2018-2022 developed by the [Regional Research Council \(2018\)](#) related to the functional food programs stressing that agriculture and forestry resources can be efficiently utilized if functional food can be made out of local raw materials. Considering that the nipa filled roll is a new product, there is a need to conduct consumer testing to determine if the product is acceptable to the consumers. This tool is very vital in assessing the consumers' preference in terms of human senses through the sensory quality of the product, such as appearance, texture, flavor, and aroma. Similarly, a consumer study is very crucial in understanding the relationship between the food and sensory quality and human liking of the product and to bring improvement to the product to meet the consumers' satisfaction.

The result of the study is very important in launching the nipa filled rolled to the market to make sure that the product is acceptable among the consumers. The main objective of this study was to determine the consumers' acceptability of the nipa marmalade-filled roll. Specifically, it sought to answer the following questions:

1. What is the profile of the respondents in terms of age, gender, and occupation;
2. What is the consumer's level of acceptance of the sensory property of the product in terms of:
 - 2.1. appearance
 - 2.2. flavor
 - 2.3. texture
 - 2.4. aroma
 - 2.5. overall acceptability?
3. How does the consumer perceive the product in terms of:
 - 3.1. the first reaction to the product
 - 3.2. quality of the product
 - 3.3. innovativeness of the product?
4. How likely will the consumer buy the product if it is available for sale?
5. How likely are the consumers to recommend the product to their colleagues?
6. What are the things that consumers like most about the product?
7. What are the things that the consumers would like to improve in the product?
8. Is there a significant correlation between consumers' profiles and the product's acceptability in terms of:
 - 8.1. appearance, flavor, texture, aroma, and overall acceptability; and
 - 8.2. first reaction to the product, quality of the product, innovativeness of the product, tendency to buy and recommend the product?

LITERATURE REVIEW

The theory of reason action (TRA), created by [Fishbein and Ajzen \(1977\)](#) in the late 1960s, centers on the analysis of the importance of pre-existing attitudes in the decision-making process. The core of the theory posits that consumers act on behavior based on the intention to create or receive a particular outcome. In this analysis, consumers are rational actors who choose to act in their best interest. According to the theory, specificity is critical in the decision-making process. From the time the consumers decide to act, and when the time action is completed, the consumer retains the ability to change their mind and decide on a different course of action. Marketers can learn several lessons from the theory; when marketing a product to consumers, marketers must associate with positive results, and those results must be specific and by using concepts effectively linking the product to the result. Relative to the study, the parameters used in the data collection may serve as a guide in enhancing the attributes of the product to attain consumers' acceptance.

The study on bakery consumers, which aimed to understand consumer behaviors as well as their purchase decision process, showed that consumers attend bakeries mostly to buy perishable foods and for immediate consumption. The results also indicated that consumers demonstrated a positive mental association with bread, bakeries, and baked products, including those produced by other companies than bakeries. Likewise, consumers are now willing to pay more for baked products than for products from other industries, although they have been showing preferences for baked products. The consumer's preferences were based on the following parameters: minimum or basic attributes, differentiating attributes for the general public, and differentiating attributes for specific publics ([Souki et al., 2016](#)).

Based on the exploratory factor analysis conducted by [Jadhav et al. \(2019\)](#), results revealed that product and brand recognition, affordability, availability, and packages are important factors that influence preferences for bakery products. Hypothesis testing results show that products are dependent on the income of the consumer. Moreover, affordability, availability, and efficient packaging are independent of the income of the consumers.

Moreover, the study on the consumers' perception and sensory properties of bakery products fortified with chicken showed that fortification with chicken protein powder caused sensory changes, especially in texture, such as less spongy, crumbly, stronger density, and moist texture for chocolate cakes. The sensory changes resulted in small yet significantly lower consumer acceptance of rye bread, but no significant differences in liking the chocolate cakes were found. All samples were above the acceptability level of Danish consumers ([Liu et al., 2022](#)).

RESEARCH METHOD

Research Design

The study applied the descriptive method of research involving description, encoding, analysis, and interpretation of conditions that existed during the time of the investigation.

Locale and Time of the Study

The preparation of samples was done at the Kukabread Bakery, Makato, Aklan, Philippines. On the same day, the samples were brought to the Iloilo Convention Center during the RSTW on

October 24, 2019, and were set up for consumer testing. The evaluation of the product was done on October 24, 2019, from 9:00 A.M. – 11:00 A.M. and 2:00 P.M. – 4:00 P.M.

Panelist of the Study

The panelists of the study were composed of hundred fifty (150) participants of the RSTW. According to [Stone and Sidel \(1993\)](#), the increase in the number of consumers compared to the laboratory test is necessary to counterbalance the expected increase in variability due to the inexperience of the consumer participants and the novelty situations. The panelists were recruited to participate in the evaluation in which most of them were intercepted at the exhibit area of ASU.

Ethical Considerations

The researcher made sure that the tasters were of their free will to participate in the study. They were given the freedom to withdraw at any point during the conduct of the evaluation. The tasters have likewise assured the confidentiality of all the responses or information they shared in the study.

Preparation of the Samples

Preparation of the nipa-filled roll for consumer testing. The rolls were prepared at the Kukabread Bakery, Makato, Aklan, Philippines, using its standard dough recipe for roll preparation. The recipe for nipa marmalade used for filling was adopted from the composition and procedures of the nipa marmalade registered utility model for ASU.

Data Gathering Procedures

A validated researcher-made questionnaire was used in the study. The content validation was conducted by five (5) faculty of ASU who are knowledgeable in marketing and product development. The questionnaire has three parts; part one is about the profile of the tasters, and part two is about the sensory qualities of the product in which the tasters used 9-point hedonic scales in assessing the product's appearance, flavor, texture, aroma, and overall acceptability. Part three solicited the tasters' perception of the product in terms of the first reaction to the product, quality of the product, innovativeness of the product, tendency to buy if the product is available today, and how likely they will recommend the product to their colleagues. The questionnaire is also drawn if what were mostly likable about the product and the attribute of the product which preferred to be improved.

Evaluation

The products were set up at the exhibit booth of the ASU at ICON during the RSTW on October 24, 2019. Brief information about the study was given to the tasters. Each of the tasters was given samples to be tested, and then questionnaires were provided.

Data Analysis

After the data was gathered and tallied, it was then subjected to SPSS version 20 for analysis, employing descriptive statistics such as frequency and percentage. The Pearson Chi-Square was

used to determine if there is significant correlation existed. The Alpha p-value was set at a .05 level of significance.

FINDINGS AND DISCUSSION

Profile of the Respondents

Table 1 presents the profile of the tasters who participated in the consumer testing of the nipa marmalade-filled roll. The results revealed that the majority of the tasters were female, 94 or 63%, while the males were 53 or 35%. The results implied that equality in gender was observed in inviting the panel of tasters.

It can be noticed in Table 1 that the majority of the tasters were between 18-36 years (younger adults), 77 or 51%. It is also shown that there were tasters aged between 57-65 years old (older adults), 14 or 9%. The results explained that the tasters came from varying stages of life, which means that they represented the target consumers of the product.

In terms of occupation, it can be gleaned that the majority of the tasters belong to Class 1 occupation, 61 or 41%, persons who are professionals and engaged in executive, administrative or clerical duties. Class 4 students comprised 50 or 33% of the tasters. There were tasters belonging to Class 3, 10, or 7%; they are persons who engaged in occupations requiring manual labor, heavy machinery, or exposure to certain hazardous conditions. The profile of the tasters indicated that there is diversity in terms of consumers' occupations.

Table 1. Profile of the Tasters

Category	Frequency	Percentage
A. Gender		
Female	94	35%
Male	53	63%
B. Age		
11-17 (Young)	22	15%
18-36 (Younger Adult)	77	51%
37-56 (Middle-Aged Adult)	37	25%
57-65 (Older Adult)	14	9%
C. Occupation		
Class 1	61	41%
(Professionals and persons engaged in executive, administrative or clerical duties)	29	19%
Class 2	10	7%
(Persons engaged in skilled or semi-skilled work and not exposed to hazardous conditions)	50	33%
Class 3		
(Persons engaged in occupations requiring manual labor or heavy machinery or exposure to certain hazardous conditions)		
Class 4		
(Students in elementary, secondary, and tertiary level)		
TOTAL NO. OF CONSUMERS	150	100%

Consumers' Acceptability of the Products' Sensory Quality

It can be observed in Figure 1 that the majority of the tasters like very much the sensorial quality of the product in terms of appearance, flavor, texture, aroma, and overall acceptability. It is also apparent that the respondents like the product extremely in terms of its sensory quality, such as appearance, 35 or 21%; flavor, 52 or 35%; texture, 45 or 30%; aroma, 45 or 30%; overall acceptability, 56 or 37%.

The tasters claimed that they extremely liked the nipa marmalade-filled roll. Moreover, only a few of the tasters responded to the question if they neither liked nor disliked the product, specifically in matters of appearance, 5 or 1%, and texture, 2 or 1%. Based on their responses, it can be derived that the product is acceptable to the tasters based on the specific sensorial quality used in the survey.

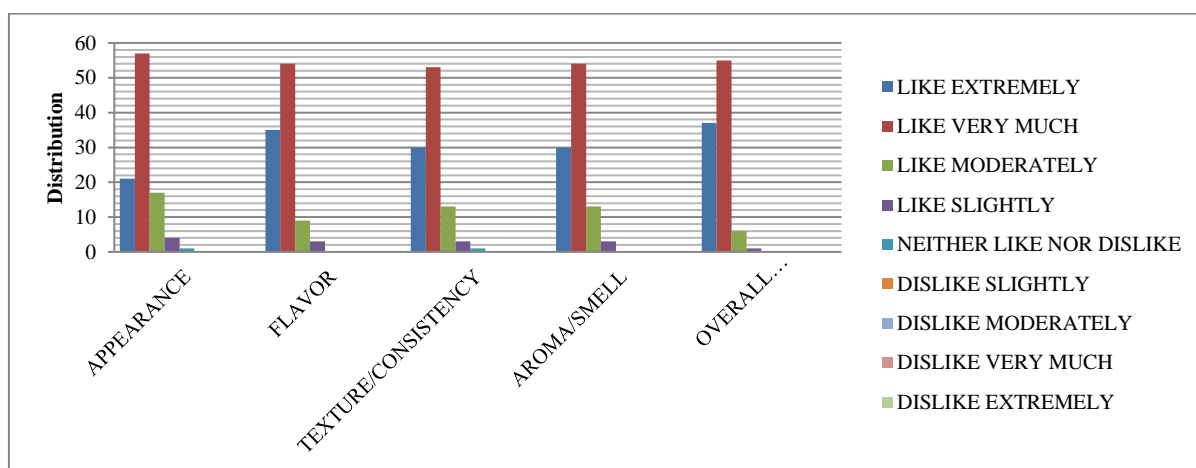


Figure 1. Consumers' Acceptability of the Products' Sensory Quality

Consumers' First Reaction to the Nipa Marmalade Filled Roll

The consumers' first reaction to the product is reflected in Figure 2. Majority of the tasters, 89 or 59%, revealed that their first reaction to the product was very positive, consequently. 54 or 36% of the tasters indicated that their reaction was somewhat positive. Based on the results, it can be inferred that the product was positively accepted by the tasters.

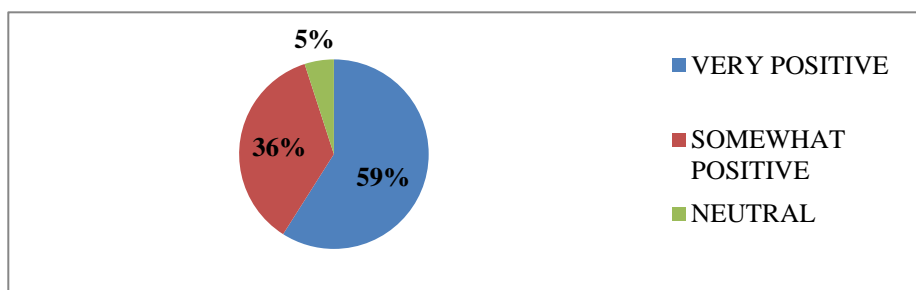


Figure 2. Consumers' First Reaction to the Product

Consumers' Perception of the Quality of Nipa Marmalade Filled Roll

Figure 3 reflects the consumers' perception of product quality. It can be noticed that the majority of the tasters stated that the product was of high quality, 78%. On the other hand, only 1% of the tasters assessed that the product was of low quality. Based on the result, it can be implied that the product is acceptable among the tasters in matters of its quality.

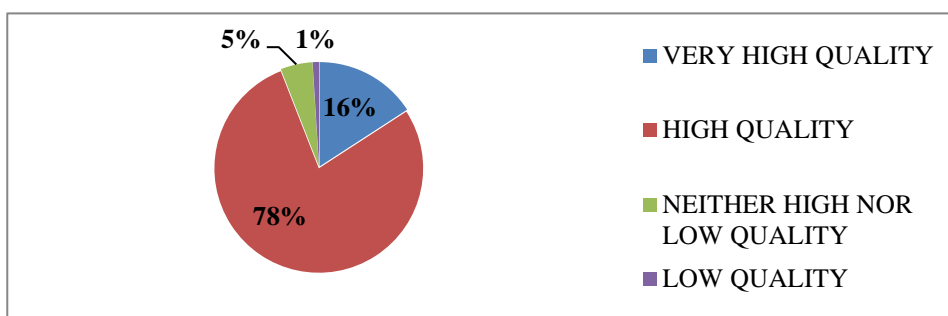


Figure 3. Consumers' Perception of Product Quality

Consumers' Perception of Product's Innovativeness

Figure 4 discloses the consumers' perception of the innovativeness of the product. Based on the data reported in Figure 4, it can be reckoned that the majority, 102 or 68% of the tasters disclosed that the product is very innovative, 28 or 19% confirmed that the product was extremely innovative, while one (1) or 1% of the tasters revealed that the product was not so innovative. Consequently, it can be gleaned that the majority of the tasters believed that the product was new in the market.

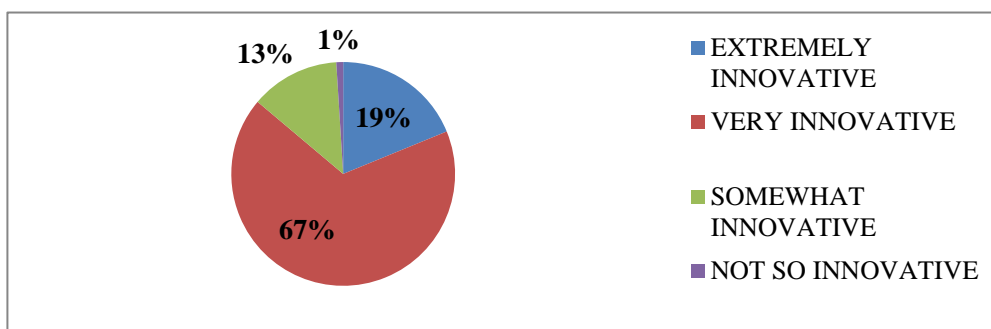


Figure 4. Consumers' Assessment of Product's Innovativeness

The tendency of the Consumers to Buy the Product

When the tasters were asked if they would buy the product if it were available, the majority, or 74% of them, conveyed that very likely they would buy the product, while only 1% indicated that not so likely they would buy the product. Based on the results, it can be said that the product met the taste interest of the consumers.

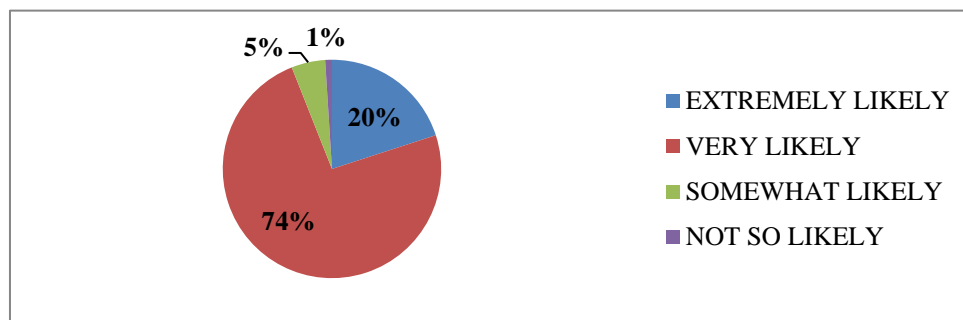


Figure 5. The tendency of the Consumers to Buy the Product

Consumers' Tendency to Recommend the Product

On the range of One Hundred (100), the majority of the tasters indicated an 80% tendency that they will recommend the product to their colleagues, 69 or 46%, while 39 or 26% of the tasters stated that 90% the tendency that they will recommend the product. However, only 1 or 1% claimed the 30% tendency to recommend the product. The result may imply that the product will be marketable, considering the best advertisement, which is a positive word of mouth from the tasters.

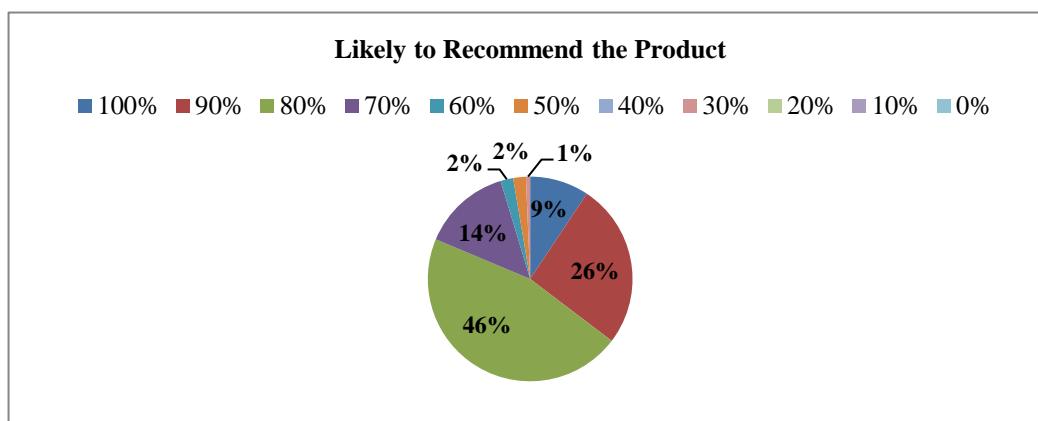


Figure 6. Consumers' Tendency to Recommend the Product

Product Attributes that the Consumers Like Most

Table 2 exhibits the things that the consumers like most about the product. The tasters manifested ten common answers from the open-ended questions on the things that they liked most about the product. The tasters claimed that rank 1 conveyed that "the taste meets their taste buds and its right combination of sweetness and a bit salty, buttery taste"; rank 2, "Proud Filipino Product"; rank 3, "the product is very innovative"; rank 4, "the sweetness of *Pungo* is exotic", rank 5, "the smell of the product stimulated my cravings to eat more rolls". On the other hand, the least common answer was "the product looks organic and unique", which ranked 10 among the responses of the tasters.

Table 2. Product Attributes that the Consumers Like Most

Attribute	Rank
Taste is balanced; it meets the taste buds	1
It's a Filipino product	2
The idea of using nipa as bread filling	3
Very new, innovative, creative, and original	4
The sweetness of the nipa filling, its exotic	5
Smells stimulate my cravings	6
Flavor is unique	7
The chewy flavor of the filling	8
The dough roll is very soft, and its filling matches the taste	9
The appearance looks organic and unique	10

Consumers' Recommendation for the Improvement of the Product

The claims of the tasters on the question about the things they like to improve about the product are shown in Table 3. The data stated that among the ten (10) common answers, rank 1 state that "design appropriate packaging materials"; rank 2, "put more filling"; rank 3, "prepare other flavors for the consumers to choose from"; rank 4, "appearance has to be improved"; rank 5, "a twist for the product's shape". On the other hand, the least common answer uncovered by the tasters was, "study the nutritive aspect of the product", which is rank 10 among the answers presented by the tasters.

Table 3. Consumers' Recommendation for the Improvement of the Product

Attribute	Rank
Packaging of the product	1
Make the filling thicker, put more filling	2
Prepare various flavors for the consumers to choose from	3
The appearance of the product needs to be improved	4
The shape needs a twist	5
There is a part of the filling which are hard to chew	6
Make the filling sweeter	7
Improve the filling consistency	8
Enrich the dough with local vegetables	9
Study the nutritive value of the product	10

Correlation Between Consumers' Profile and Product Acceptability

Using the Pearson Chi-Square in the data analysis, the results revealed that gender and tendency to buy the product have a significant correlation (p-value at .029) at a 5% level of significance. Similarly, the occupation and the tasters' assessment of the innovativeness of the product (p-value at .001) at a 5% level of significance. Furthermore, occupation and tasters' tendency to recommend the product to their colleagues were found to be significantly correlated. The link between the occupation and the tendency to buy the product may be due to the changing socialization patterns which the groups were exposed and their awareness about the needs for functional foods in their daily activities. The findings may be associated with the theory TRA by

Fishbein and Ajzen (1977) that since the product caught the interest of the tasters, they tended to accept the product and made a recommendation for product enhancement.

CONCLUSIONS

Based on the data, the tasters represented various age groups such as: Young (11-17), Younger Adults (18-36), Middle Aged Adult (37-56), Older Adults (57-65), belonging to a female, male, and LGBT gender, respectively, and engaged in the following occupation: Class 1 (Professionals and persons engaged in executive, administrative or clerical duties), Class 2 (Persons engaged in skilled or semi-skilled work and not exposed to hazardous conditions), and Class 3 (Persons engaged in occupations requiring manual labor or heavy machinery or exposure to certain hazardous conditions). Based on the result, it can be inferred that the tasters represent a common group of consumers that can best evaluate the NMFR quality for target market satisfaction. Based on its sensory qualities, the tasters like the product very much; hence, the product is acceptable to all the target consumers.

The tasters accorded a positive first reaction to the product and expressed that the product was very innovative. Similarly, they tend to buy the product if it is available in the market and declare that they tend to recommend the product to their colleagues. Therefore, it can be inferred that the product received positive acceptance among the tasters.

Gender has a positive correlation to the tasters' tendency to buy the product, while occupation also has a positive correlation to the tasters' perceptions of the innovativeness of the product, and occupation also has a significant correlation to the tasters' tendency to recommend the product to their colleagues. Hence, the result implied that gender and occupation were very influential to the tasters' acceptance of the NMFR. Therefore, these areas may be given attention to ensure consumers' satisfaction with product quality. The product has various attributes that the tasters appreciated most, like its taste, being Filipino-made, its innovativeness, uniqueness, authenticity, and the like. However, there was also product attributes that the tasters suggested being improved, like its packaging, putting more filling, preparing other flavors for the consumers to choose from, and the like. Thus, it is likely that the product can be enhanced to meet the demands, needs, and satisfaction of the panel of tasters.

LIMITATIONS & FURTHER RESEARCH

This study employed the descriptive method of research. The study focused on the consumers' acceptability of nipa-filled rolls (NFR). The tasters were composed of one hundred fifty (150) selected participants of the Regional Science Trade Week (RSTW) at Iloilo Convention Center, Iloilo City, Philippines. For further research, the researcher may adopt the recipe used in the present study for the preparation of the dough of the nipa marmalade-filled roll. The cost analysis of the product in terms of Return on Working Capital may be done. The product may be subjected to proximate and shelf-life analysis. Further study on determining the source and supply of young nipa seeds must be done to ensure the sustainability of the nipa marmalade supply.

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