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## Research Article

# Product Innovation, Acceptability and Cost Analysis of the White Variety of 'Sibujing' (*Allium ampeloprasum*) for Potential Beverage

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## Abstract

**Background and Objective:** Some types of new food product development involve combining two or more kinds of fruit and vegetable juices to produce a food that mixes nutritional values. Such new products present different and pleasant tastes, are recommended by the food industry and are well accepted by consumers. This study aimed to identify the natural plant sugars of the *Allium Ampeloprasum* and to determine the acceptability of a new beverage consisting of a mix of *Allium ampeloprasum* and apple, pineapple and lemon. **Materials and Methods:** A quantitative descriptive method was used to describe the level of acceptability of the *Allium Ampeloprasum* beverage. Qualitative data were used in the study to conduct a cost analysis. Two phases of evaluations were conducted. In the first phase of the evaluation, the acceptability of four different formulations for each fruit beverage was evaluated by ten experienced panelists using descriptive and sensory preferences. The results provided a base for choosing the most acceptable formulation to be evaluated by consumer-type panelists. Brix Determination was conducted to identify the natural plant sugar contents. **Results:** *Allium Ampeloprasum* contains 18.33 g of sugar/210 g. It can be seen that the sweetness is relatively high as it reaches 18.33% Brix. Results showed that all of the drinks evaluated are acceptable; however, the blend using pineapple has the highest acceptability as determined in the second phase of evaluation. **Conclusion:** In conclusion, a potential beverage using *Allium ampeloprasum* is a verified innovative idea that can be offered in addition to the usual drink choices.

**Key words:** *Allium Ampeloprasum*, sibujing, apple, lemon, pineapple, potential beverage, sensory evaluation, cost-benefit analysis

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**Data Availability:** All relevant data are within the paper and its supporting information files.

## INTRODUCTION

Consumers are becoming more health-conscious regarding the foods they consume<sup>1</sup> and for their beverage choices. Demands are constantly changing from basic concerns (improving food safety, shelf life and reducing wastage) to developed foods having special characteristics in terms of nutritional value, palatability and convenience<sup>2</sup>. Hence, healthy drinks are becoming more popular and can provide major health benefits<sup>3</sup>. Sarpong *et al.*<sup>4</sup> has developed a mixed fruit juice from cabbage and orange; De Carvalho<sup>5</sup> developed a healthy drink with coconut water-cashew and apple juice; Jan and Masih<sup>6</sup> mixed a pineapple juice blend with carrot and orange juice to develop a health drink. Following this trend of mixed fruit drinks, the researchers would like to introduce a health drink utilizing the sibujing plant.

"Sibujing" is the local name for *Allium ampeloprasum*, a prevalent spice in Maranao cuisine and delicacies that is grown in abundance in Iligan and Marawi. A well-known product made from sibujing is palapa, a flavored mix or condiment that is widely available in Muslim areas. *A. ampeloprasum* belongs to the family Amaryllidaceae in the *Allium* species, which are characterized by herbaceous geophyte perennials<sup>7,8</sup>. Moreover, it is a species related to leek (*Allium porrum* L.) and is traditionally considered its wild progenitor<sup>9</sup>. In folk and Maranao medicine, this plant is used in diverse ways to cure ailments such as fever, infant teething discomfort, infections and inflammation. Studies have also revealed that this plant is used to prevent and treat many diseases such as cancer, gastritis and gastroduodenal disorders<sup>8</sup>. According to Dey and Khaled<sup>10</sup>, "Sibujing contains several macro and micronutrients that are beneficial to health."

However, there has been no research on using "sibujing" as a beverage. Moreover, when people think of "sibujing", it is often associated with the flavored mix, palapa; the researchers considered other ways to utilize this local raw material. One innovation is by blending this plant to form a natural health drink. Much research has been conducted to identify sibujing's medicinal properties, antioxidant properties and biochemical properties but no work has been reported so far regarding the formulation of new beverages using this plant.

Thus, the objective of this study was to provide the physicochemical attributes of extracted *A. ampeloprasum* as well as its natural sugar content. Given this, the following aims were addressed: to develop a new product by combining sibujing, apple, pineapple and lemon fruits; to assess the product quality; to perform cost analyses and cost-benefit analyses of those formulations evaluated as having the highest acceptability.

## MATERIALS AND METHODS

**Methods:** In this study, a quantitative descriptive method was used to describe the acceptability level of *A. Ampeloprasum* beverages. Qualitative data were also used in the study in the form of a cost analysis. The results of the cost analysis are also presented in descriptive form. To achieve this, common products that are readily available in markets were identified. All samples were collected from local public markets and grocery stores.

**Brix determination:** To evaluate the natural plant sugar contents, a refractometer (Milwaukee MA871) was used. The tests were conducted by the Food Innovation Center of the University of Science and Technology of the Southern Philippines (Mindanao, Philippines).

**Beverage preparation:** This research involves developing a food product that makes use of the food product development process adapted from the product and process development described by Winger and Wall<sup>2</sup>. Some parts of the process were modified based on the product development flow of this study. During the product trials, the researchers prepared four formulations for each variety of fruit. *A. ampeloprasum* were washed thoroughly in tap and running water to remove dirt. The proportions of the main ingredient, namely, *A. ampeloprasum* were different between the formulations while the proportions of the other ingredients were the same. To ensure the accuracy and precision of the measurements, the researchers used a digital scale. Decoction was conducted by boiling the plant bulbs with chopped fruits at high heat for 10 minutes with 448 g of water along with *A. ampeloprasum* until the water volume decreased by half. Honey was then added to the heated mixture during a simmering time of 5 min. Four formulations were prepared for each fruit variety.

**Sensory evaluations:** There were two evaluation phases. For the first evaluation, experienced panelists who are faculty members involved with food-related subjects were purposely chosen as research participants to determine the most acceptable formulations and the most ideal beverage characteristics for consumers. Before the beginning of the sensory evaluation, the panelists were given a short orientation regarding how the product evaluation would be conducted. The participants were asked to rate the formulations in terms of color, aroma, taste and texture.

The participants determined the acceptability of each attribute. They were also asked to rate the general acceptability of the beverages using a 9-point hedonic scale. The verbal categories were assigned numerical scores and ranged from “like very much” as a score of 9 to “dislike very much” as a score of 1<sup>11</sup>. The four treatments were coded using random numbers to avoid providing information to the panel that may have led to biases during the evaluation. The researchers then served a shot glass during the procedure, then water and unsalted crackers were provided for rinsing the mouth to refresh palates before tasting the next sample<sup>12,13</sup>. The quantitative descriptive analysis of the sensory attributes of the product was significant for determining whether the developed food product met standard specifications. The general acceptability of the product was measured to determine whether the product was acceptable and ideal for consumption. The results of the evaluation were for choosing the most acceptable products that were then evaluated by the consumer-type evaluators.

In the second phase of the evaluation, which was conducted at the Food Laboratory of the school, consumer evaluators evaluated the formulations with the highest acceptability as rated by the experienced panelists. For consumer acceptance, the panelists were randomly chosen and, by definition, they were representative of the consumer population<sup>14,15</sup>. In the next phase of product evaluation, a panel of one hundred consumer-type individuals was chosen from the Technology Teacher Education major in foods. Three formulations were presented based on the results of the first evaluation phase. Evaluation forms were distributed and explained before the product evaluation. Information from these consumers was valuable for determining preferences, degree of acceptability, product use and consumer opinions<sup>16</sup>. Each panel member was provided with samples of each formulation and only water was served for cleansing the palate since it was observed that serving such items as crackers, bread, or apples made the process more complicated during consumer testing<sup>17</sup>. The panel evaluated the products using the hedonic scale to measure the acceptance or preference for the products.

**Cost-benefit analysis:** In this study, a cost-benefit analysis was used to help entrepreneurs identify the highest return on an investment based on costs, resources and risks involved in the study. A bill of materials, tools and equipment and projected sales were identified to calculate the data needed to determine if the new product would be feasible.

## RESULTS AND DISCUSSION

**Brix determination:** The results showed that the chemical analysis of total soluble solids, which was mainly represented by sugar and other ionic minerals, was 18.33% Brix  $\pm$  0.29 sugar. Higher Brix or percentage of sugar values correspond to higher sweetness<sup>18</sup>. It can be seen that the sweetness is relatively high as it reaches 18.33% Brix and is assumed to contain 18.33 g of sugar/210 g of Allium. The Brix results were higher than the value reported by Dey and Khaled<sup>10</sup>, who reported that the content of *A. ampeloprasum* was 5.9 g of sugar. It is noteworthy that the results presented for the plant extract from other studies may differ for different regions of the world. This may be due to many factors including the type of solvent utilized in the extraction method, which has a vital role in the extraction process<sup>8</sup>. Table 1 reports the natural sugar content extracted from the pure *A. ampeloprasum* plant.

**Sensory evaluation and acceptability as evaluated by experienced panelists:** There were four formulations of *A. ampeloprasum* combined with an apple beverage, each with varying proportions of *A. ampeloprasum*. Each *A. ampeloprasum* formulation was randomly coded. Formulation 311 had 100 g of *A. ampeloprasum*, formulation 616 had 150 g, formulation 712 had 200 g and formulation 811 had 250 g of *A. ampeloprasum*. The panelists evaluated the acceptability of each sensory attribute for each formulation. Table 2 shows the scores and qualitative descriptions of the acceptability for each formulation of the *A. ampeloprasum* beverage.

In terms of color, formulation apple 311 obtained the highest score of 4.50, followed by formulations apple 712 and apple 811 with 4.20 scores. The lowest mean score was for formulation apple number 616 with a 4.10 score. Most of the scores had an acceptability description of “like moderately.” These results imply that the research respondents somewhat liked the color of the four formulations, whether it was yellow or dark yellow.

The aromas of the four treatments were also rated as moderately pleasant by the respondents. Formulation numbers 311 and 712 obtained the highest score of 4.20, followed by formulation number 811 with a 4.00 score. The formulation apple number 616 received the lowest score

Table 1: The natural sugar content of extracted *A. ampeloprasum*

Description	Weight	Parameters	Result
Allium (Sibujing)	210 g	7	18.33% Brix $\pm$ 0.29

Table 2: Characteristics of the four formulations and the acceptability of each characteristic for *A. ampeloprasum* and the apple beverage

Characteristics	Formulation							
	Apple 311		Apple 616		Apple 712		Apple 811	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Color	4.5	Yellow	4.1	Dark yellow	4.2	Dark yellow	4.2	Dark yellow
Overall acceptability	7.8	Like very much	7.4	Like moderately	7.2	Like moderately	7.2	Like moderately
Aroma	4.2	Moderately pleasant	3.8	Moderately pleasant	4.2	Moderately pleasant	4.0	Moderately pleasant
Overall acceptability	7.7	Like very much	7.7	Like very much	7.6	Like very much	7.4	Like very much
Taste	4.6	Sweet	4.6	Sweet	4.0		4.3	
Overall acceptability	8.3	Like very much	7.9	Like very much	8.0	Like very much	7.9	Like very much
Texture	4.8	Thin	4.8	Thin	4.8	Thin	4.0	Slightly thick
Overall acceptability	8.3	Like very much	8.3	Like very much	8.0	Like very much	7.2	Like moderately

Table 3: Characteristics of the four formulations of *A. ampeloprasum* and the pineapple beverage

Characteristics	Formulation							
	Pineapple 311		Pineapple 616		Pineapple 712		Pineapple 811	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Color	4.2	Dark yellow	4.3	Dark yellow	4.4	Dark yellow	4.4	Dark yellow
Overall acceptability	7.4	Like moderately	7.2	Like moderately	7.0	Like moderately	7.5	Like very much
Aroma	3.9	Moderately pleasant	3.2	Pleasant	3.5	Pleasant	3.4	Pleasant
Overall acceptability	7.6	Like very much	7.0	Like moderately	6.8	Like moderately	6.6	Like moderately
Taste	4.6	Sweet	3.3	Sour	3.0	Sour	2.8	Sour
Overall acceptability	7.9	Like very much	7.1	Like moderately	6.4	Like slightly	6.3	Like slightly
Texture	4.6	Thin	4.5	Slightly thin	4.9	Thin	4.9	Thin
Overall acceptability	8.0	Like very much	7.3	Like moderately	7.4	Like moderately	7.4	Like moderately

Table 4: Characteristics of the four formulations of *A. ampeloprasum* and the lemon beverage

Characteristics	Formulation							
	Lemon 311		Lemon 616		Lemon 712		Lemon 811	
	Mean	Description	Mean	Description	Mean	Description	Mean	Description
Color	4.2	Dark yellow	3.8	Dark yellow	3.9	Dark yellow	4.4	Dark yellow
Overall acceptability	7.2	Like moderately	7.3	Like moderately	7.2	Like moderately	7.9	Like very much
Aroma	3.6	Pleasant	3.4	Moderately pleasant	3.9	Moderately pleasant	4.1	Moderately pleasant
Overall acceptability	7.4	Like moderately	7.4	Like moderately	7.6	Like very much	7.6	Like very much
Taste	3.8	Slightly sweet	3.8	Slightly sweet	3.1	Sour	3.2	Sour
Overall acceptability	7.1	Like moderately	7.4	Like moderately	7.2	Like moderately	7.1	Like moderately
Texture	5	Thin	5	Thin	4.8	Thin	4.7	Thin
Overall acceptability	7.5	Like very much	7.5	Like very much	7.6	Like very much	7.6	Like very much

of 3.80. This implies that the quantity of *A. ampeloprasum* affected the aroma of the beverage, which was liked very much by the research participants.

The tastes of the four formulations were liked very much by the research participants. Formulation numbers apple 311 and 616 received the same score of 4.60, followed by formulation 811 with a score of 4.3. In contrast, formulation number 712 received the lowest estimated score of 4.00. The appeal to the research participants of the beverage taste can be linked to the proportion of the main ingredient, which was not as dominant with the quantity of *A. ampeloprasum*.

The texture of the beverage was also acceptable to the research participants, as "like very much." The highest score of

4.80 was obtained for three formulations, which were formulation numbers 311, 616 and 712. Formulation number 811 obtained a score of 4.00, which was still rated as "like very much" by the respondents. The texture of the beverage, as evaluated by the respondents, was noted to be thin and slightly thick.

The acceptability of each formulation of *A. ampeloprasum* and the apple beverage was determined using the standard questionnaire-Hedonic Scale. Table 5 shows the degree of acceptability of the four formulations as evaluated by the research participants.

Formulation number 311 received the highest score of 8.10 with the description "like very much." It was followed by

Table 5: Level of acceptability of each formulation of *A. ampeloprasum*

Variation	Formulation No.	$\bar{X}$	Description
<i>A. ampeloprasum</i> with apple	Apple 311	8.1	Like very much
	Apple 616	7.5	Like very much
	Apple 712	7.3	Like moderately
	Apple 811	7.2	Like moderately
<i>A. ampeloprasum</i> with pineapple	Pineapple 311	7.8	Like very much
	Pineapple 616	6.4	Like slightly
	Pineapple 712	6.5	Like moderately
	Pineapple 811	6.0	Like slightly
<i>A. ampeloprasum</i> with lemon	Lemon 311	6.6	Like moderately
	Lemon 616	7.1	Like moderately
	Lemon 712	7.1	Like moderately
	Lemon 811	7.2	Like moderately

formulation number 616 with a score of 7.50, also with a description of "like very much", followed by the formulation number 712 with a score of 7.30. Formulation number 811 received the lowest score of 7.20 among the four formulations. The formulations which received the highest scores were the beverages with a ratio of 1:1 (100 g apple with 100 g *A. ampeloprasum*) and 1:1.5 (100 g apple with 150 g *A. ampeloprasum*). On the other hand, formulations with ratios of 1:2 (100 g apple with 20 g *A. ampeloprasum*) and 1:2.5 (100 g apple with 250 g *A. ampeloprasum*) were "liked moderately." These results imply that formulations with more *A. ampeloprasum* were least acceptable. These results may be linked to the intense flavor and aroma of *A. ampeloprasum*, which dominated these beverage mixtures and caused them to be least acceptable to the research participants.

Four formulations of *A. ampeloprasum* combined with a pineapple beverage with varying proportions of *A. ampeloprasum* were also evaluated. Each formulation of the *A. ampeloprasum* beverage was randomly coded. Formulations 311, 616, 712 and 811 had 100, 150, 200 and 250 g of *A. ampeloprasum*, respectively. Table 4 shows the characteristics of each formulation as evaluated by the research participants.

In terms of color, formulation numbers 712 and 811 obtained the highest score of 4.40, followed by formulation number 716 with a score of 4.30; the lowest score was received by formulation number 311 with a 4.20 score. In terms of the acceptability of the color, most of the scores had a description of "like moderately". These results imply that the research respondents somewhat liked the dark yellow color of all four formulations.

The aromas of the four formulations were also rated; formulation number 311 received the highest score of 3.90. Formulation number 712 followed with a 3.50 score, formulation number 811 with a score of 3.40 and formulation number 616 with the lowest score of 3.20. These results imply

that the quantity of *A. ampeloprasum* affects the aroma of the beverage, which was rated as "like moderately" by the research participants.

In terms of taste, formulation number 311 received the highest score of 4.60. It was followed by formulation number 616 with a 3.30 score and by formulation numbers 712 and 811 with 3.00 and 2.80 scores, respectively. For the level of acceptability for taste, the data show that respondents rated the beverage from "like slightly" to "like moderately." The taste of the drink can be linked with the proportion of the main ingredient, meaning that the lower the quantity of *A. ampeloprasum*, the higher its acceptability in terms of taste.

The textures of the beverages were also acceptable to the research participants, namely, "like moderately." The highest score of 4.90 was obtained by formulation numbers 711 and 712, then followed by a score of 4.60 for formulation number 311. The lowest score was 4.50 for formulation number 616. The textures of the beverages, as evaluated by the respondents, were thin and slightly thin. This result implies that, regardless of the quantity of *A. ampeloprasum* added to these drinks, the respondents did not perceive any differences.

The acceptability of each formulation of *A. ampeloprasum* and a pineapple beverage was determined using the standard questionnaire-Hedonic Scale. Table 5 shows the degree of acceptability of the four formulations as evaluated by the research participants.

The acceptability of the four formulations of *A. ampeloprasum* and the apple beverage was determined. Formulation number 311 received the highest score of 7.80 with the description "like very much". It was followed by formulation number 712 with a score of 6.50 and with a description "like slightly". It was then followed by formulation number 616 with a score of 6.40 and formulation number 811 received the lowest score of 6.00 among the four formulations with a description of "like slightly". For the pineapple variations, the formulation that achieved the highest score of

Table 6: Mean hedonic ratings from the overall acceptability tests

	Apple 311	Pineapple 712	Lemon 811
Mean	7.34	8.03	6.8
Standard deviation	1.29	1.07	1.64
Qualitative description	Like moderately	Like very much	Like moderately

"liking" was the beverage with a ratio of 1:1 (100 g pineapple with 100 g *A. ampeloprasmus*). On the other hand, a ratio of 1:2 (100 g pineapple with 200 g *A. ampeloprasmus*) was "liked moderately". This result indicates that formulations with more *A. ampeloprasmus* were least acceptable to the respondents. This result may also be linked to the intense flavor and aroma of *A. ampeloprasmus* with the same results as the apple variation in which sibujuing dominates the beverage mixture making it least acceptable to the research participants.

Another four formulations of *A. ampeloprasmus* and a lemon beverage with varying proportions of *A. ampeloprasmus* were made. Each formulation of *A. ampeloprasmus* was randomly coded. Formulation 311 had 100 g of *A. ampeloprasmus*, formulation 616 had 150 g, formulation 712 had 200 g and formulation 811 had 250 g of *A. ampeloprasmus*. Table 6 shows the characteristics of each formulation as evaluated by the research participants. The data show the characteristics and acceptability of each sensory attribute for each formulation for *A. ampeloprasmus* and the lemon beverage, as evaluated by the research respondents.

In terms of color, formulation number 811 received the highest score of 4.40 and was followed by formulation number 311 with a 4.20 score and formulation number 712 with a 3.90 score. The lowest rating was for formulation number 616 with a 3.80 score. Most of the scores received a description of "like moderately". These results imply that the research respondents "moderately liked" the colors of the four formulations.

The aromas of the four formulations were rated as "moderately pleasant" by the respondents. Formulation number 811 received the highest score of 4.1 and formulation number 712 received a score of 3.9. Following these two, formulation number 311 had a score of 3.6 and the lowest score of 3.40 was received by formulation number 616. This indicates that the quantity of *A. ampeloprasmus* affects the aroma of the beverage, which was liked very much by the research participants.

For the tastes of the four formulations of the lemon variety, the respondents rated the products from sour to slightly sweet. The highest score was 3.80 for formulation numbers 311 and 616, followed by formulation number 811 with a 3.2 score; the lowest score was received by formulation number 712 with a score of 3.1. These results reveal that the taste of the beverage was rated as "like moderately."

The textures of the beverages were also acceptable to the research participants, "like very much." The highest score of 5.0 was received for formulation numbers 311 and 616. Formulation number 712 received a score of 4.80. In contrast, formulation 811 with 100 g lemon, 250 g *A. ampeloprasmus*, 10 g of honey and 475 mL of water garnered a score of 4.7, which was still like ranked as "like very much" by the respondents. The textures of the beverages, as evaluated by the respondents, were thin among for four formulations.

The acceptability of each formulation of *A. ampeloprasmus* and a lemon beverage was also determined using the same standard questionnaire-Hedonic Scale. Table 5 presents the degree of acceptability of the four formulations as evaluated by the research participants.

The acceptabilities of the four formulations of *A. ampeloprasmus* and a lemon beverage were evaluated. All formulations produced the same result with a description of "like moderately." The formulation that received the highest scores was the beverage with a ratio of 1:2.5 (15 g of squeezed lemon with 250 g *A. ampeloprasmus*). Following this score were the formulations with 1:1.5 (15 g of squeezed lemon with 150 g *A. ampeloprasmus*) and 1:2 (15 g of squeezed lemon with 20 g *A. ampeloprasmus*). Last was the formulation with a ratio of 1:1 (15 g of squeezed lemon with 100 g *A. ampeloprasmus*) which was perceived as "like moderately" by the research respondents. This implies that higher contents of *A. ampeloprasmus* were more acceptable to the respondents. The lemon taste may have contributed to the differences in these results, in which more *A. ampeloprasmus* present in the formulation provided a less sour taste.

#### Level of acceptability of each highest-rated formulation from the evaluations of experienced panelists and next evaluated by consumer-type evaluators:

The overall acceptabilities of the three formulations are shown in Table 6. Formulation pineapple number 712 received the highest score of 8.03 with a description of "like very much." It was followed by formulation apple number 311 with a score of 7.34 with a description of "like moderately." These two formulations were followed by formulation lemon number 811, which received the lowest score of 6.80 among the three formulations evaluated and received a description of "like moderately." These results show that the most acceptable formulation for the 100 respondents was the pineapple variation because the

pineapple juice blended better with the *A. ampeloprasum*. The strong taste of *A. ampeloprasum* reinforces the sharpness of pineapple. Lesser amounts *A. ampeloprasum* gained higher acceptability. This may be linked to the intense flavor and aroma of *A. ampeloprasum*, which dominated the beverage mixture, thus making it least acceptable to the research participants. *A. ampeloprasum* complemented the right amount of pineapple and was highly acceptable.

**Cost-benefit analysis of the product with the highest acceptability:** Cost-benefit analysis, also known as benefit-cost analysis is a review of all of the positive effects or benefits and of the adverse effects or costs of a project. The cost-benefit is qualified and valued in monetary terms to a degree that uses peoples' opinions and their willingness to pay for these effects<sup>19</sup>. In this study, this analysis is used to help entrepreneurs identify the highest return on investment based on the costs, resources and risks involved based on the study. A bill of materials, tools, equipment and projected sales were identified to perform the calculations to identify if the new product would be feasible.

A bill of materials and the total cost of the ingredients and materials used by the product were projected. A single recipe can yield three 150 mL servings of the *A. ampeloprasum* and pineapple beverage. Each serving is projected to cost from Php 17.00-23.00 at a 30% mark-up. This price range is less expensive when compared to other commercially available healthy beverages on the market.

The items, specifications, quantities, units and total cost for tools and equipment needed for production were determined. The total cost for tools and materials is Php 1,943.00, which is used for the development of the *A. ampeloprasum* and pineapple beverage. The tools and equipment are considered assets for beverage production. Over 12 months, these tools and equipment are considered to be used in production as part of the costs. Thus, Php 1,943.00 will be deducted from the gross income for the entire year.

To determine if the product is feasible, the projected sales or revenues were also estimated. The calculated cost-benefit ratio is 1.44. Based on these results, the total possible cost is Php 166,202.84 and represents the total costs as the sum of ingredient expenses, materials used and the total cost of tools and equipment over 12 months. The total benefit is Php 239,750.00 and over 12 months, the total was derived from the possible total amount of product sales. Based on the calculated data, estimates of the benefits are subjective and there is a degree of uncertainty associated with the anticipated sales increase. Since the cost-benefit ratio is

positive, it can be concluded that the new product developed is "feasible" given the extent to which the benefits outweigh the costs within the first year.

## CONCLUSION AND RECOMMENDATION

The various combinations of fruit and *A. ampeloprasum* resulted in different levels of acceptability. The perfect combination was not just about the fruit and *A. ampeloprasum* but was also related to the ideal fruit volume (mL) and the ideal volume (mL) of *A. ampeloprasum* added. The three formulations presented for consumer acceptability were all desirable as they received acceptability scores of 8.03, 7.34 and 6.80 on a 9-point Hedonic scale. Based on these results, it can be concluded that the ratio of the main ingredient to obtain the ideal result is 1:1, i.e., 100 g *A. ampeloprasum* to 100 g pineapple. Consequently, it is concluded that there is a need to improve or revise the procedure to make the product highly acceptable to the consumer. Furthermore, the results of the cost-benefit analysis revealed that the new product developed is feasible given that the benefits outweigh the costs within the first year of production. Thus, it can be concluded that the product developed would provide a product acceptable to consumers.

It is recommended to use the results of this study when pursuing further studies utilizing *A. ampeloprasum*. Moreover, it is also recommended to conduct a synergistic analysis of *A. ampeloprasum* with pineapple, apple and lemon as one to determine the synergy for the combined beverage.

## SIGNIFICANCE STATEMENT

This study reveals the acceptability of *A. ampeloprasum* when combined with each juice: apple, lemon and pineapple, which are combinations that can be beneficial as potential beverages to be offered in addition to the usual drinks on the market. This new product can also serve as a signature drink not only for the Asian market but specifically for the Filipino market as well. This study will help researchers to uncover critical areas for developing new flavored beverages that many researchers have not been able to explore. Thus a new theory on the process of production may be utilized.

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