

Acceptability of Mango Puree Enriched with Malunggay (*Moringa oleifera*, Linn) Leaves Extract

Lea Peñaflorida and Nilo Masbaño

West Visayas State University- Janiuay Campus, Iloilo, PHILIPPINES
nickjohnsolar@gmail.com

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Abstract – *This study was conducted to determine the level of acceptability of commercial mango puree and mango puree with 0, 5, 10 and 15 ml of malunggay leaves extract in terms of appearance, taste, aroma and general acceptability. The respondents who were also the expert panel were the 35 randomly selected faculties from the School of Hotel and Restaurant Services Technology and School of Health Care Services. Mean and standard deviation were used as descriptive statistics and One-way ANOVA and Scheffe test as inferential statistics. As a whole, the results revealed that mango puree with no malunggay leaves extract was liked much by the respondents, mango puree with 5 and 10 ml. including the commercial mango puree was liked by the respondents while mango puree with 15 ml. malunggay leaves extract was disliked by the respondents. There were significant differences in the level of acceptability of the different mixtures in terms of appearance, taste, aroma, and general acceptability. Mango puree with 5 ml. of malunggay leaves extract was the most acceptable, being comparable to commercial mango puree and mango puree with no malunggay leaves extract which was liked much by the respondents because of its sensory characteristics and higher nutritive value.*

Keywords – *acceptability, enrich, puree*

INTRODUCTION

For many, mango is called "The King of fruits" due to its sweetness and richness in phytochemicals and nutrients. (De La Cruz, Medina, García, 2002). It is also known as "Super fruit" due to its potential health values. It is a non- seasonal fruit which is available in the market at any time of the year. This is one of the favorite fruits of the Filipinos. Mangoes beyond being delicious and rich in vitamins, minerals and anti-oxidants, contain an enzyme with stomach soothing properties similar to papain found in

papayas. It is an excellent source of Vitamins A and C, as well as a good source of Potassium and contains beta-carotene. Mangoes are high in fiber, but low in calories. It is a great prevention against constipation, piles and spastic colon and could replenish lost potassium.

The variety of processed mango products is endless (Chan, 1983). The manufacture of mango puree is a good example of a highly mechanized process. Mango puree is smooth paste of pulp of mango, usually yellow-orange in color. It is processed by many companies and sold readymade. It requires less labor and offers other advantages, such as that the process makes use of fruit not suitable for other products, and the product can be used in other products such as jams, beverages, and dairy products as a flavoring ingredient, or as a fruit filling in pastries. Such product diversity expands the market potential for mango puree.

Given the nutritional value of malunggay, it can also be used in fortifying other products including sauces, juices, milk, and bread (dela Cruz, 2007). Fortification of food is just one of the many marketing potentials of malunggay. Currently, the Philippines is still in the midst of developing the local market for malunggay and its various product lines with the help of DA's Biotechnology Program. Biofortification of food crops is one of the most promising new tools of science today to fight malnutrition and save lives.

Restaurants and food outlet owners should support the government's campaign against micronutrient malnutrition by including in their menus at least one dish containing the iron-rich malunggay, Flavier (1995). Also, he mentioned that innovation thru enriching recipes will help reduce the health deficiency of the country. Thus the study of Armada, et al (2009) on the Taste Acceptability of Orange Juice Enriched with

Malunggay Extract which revealed that orange juice with 5 ml of malunggay extract was the most acceptable to the respondents than mixing it with 10, 15 and 20 ml was very relevant.

Considering the abundance and health benefits derived from these two plants, the researchers were challenged to apply the principle of fortification by processing mango into puree and enriched it with malunggay leaves extract to improve its nutritive value, hence, this investigation.

This study aimed to determine the level of acceptability of commercial mango puree and mango puree enriched with 0, 5, 10, and 15 ml of malunggay leaves extract as to general acceptability, appearance, aroma and taste. Furthermore significant differences among the different mixtures of mango puree were ascertained.

MATERIALS AND METHODS

Research Design

This study utilized the survey type of research to find out the level of acceptability of mango puree enriched with malunggay leaves extract as to general acceptability, appearance, aroma and taste. Mango puree was prepared and the amount malunggay leaves extract was added in different proportions such as Mixture A- 0 ml or no malunggay leaves extract, Mixture B- 5 ml malunggay leaves extract, Mixture C- 10 ml malunggay leaves extract, Mixture D- 15 ml malunggay leaves extract and E- Commercial Mango Puree.

Respondents

The respondents who served as the expert taste panel were 35 randomly selected members of the faculty from the School of Hotel and Restaurant Services Technology and School of Health Care Services. The level of acceptability of mango puree enriched with different levels of malunggay leaves extract as to the general acceptability, appearance, aroma, and taste were evaluated by the respondents using the Four-Point Scale.

Data Gathering Procedure

The study is divided into three phases. Phase I is preparation of Mango Puree, Phase II, extraction of malunggay leaves and Phase III, preparation of experimental set-up and evaluation of the respondents.

Phase I. Mango Puree Preparation

Ripe mangoes were purchased at the local markets. The processing of the mangoes was done manually by the researchers using the following ingredients and procedure.

Ingredients:

2 kilos ripe mangoes
1/2 cup brown sugar

Utensils:

stainless knife
graduated cylinder
measuring cup
plastic basin
strainer
blender

Procedure:

1. Wash ripe fresh mangoes to remove dirt.
2. Slice and scoop out flesh from the cheek halves.
3. Peel and scrape the remaining flesh from the seed.
4. Liquefy flesh in a blender for 2-3 minutes. Strain.
5. Set aside in a clean container and cover.

Phase II. Preparation and Extraction of Malunggay Leaves Extract

Malunggay was collected early in the morning to retain its freshness prior for the extraction. First to the fifth stalks from the tip of malunggay tree were preferred. The extraction of juice was done using the following procedure:

1. Blanch malunggay leaves in lukewarm water enough to kill bacteria present.
2. Pound 3 cups of malunggay leaves using the mortar and pestle until become juicy.
3. Place the pounded leaves in a cheese cloth and squeeze to obtain the extract.
4. Place the extract in a clean container and cover.

Phase III. Preparation of Experimental Set Up

Prepare 5 glasses with 1/2 cup of mango puree. Glass A for pure mango puree, B for mango puree with 5 ml. of malunggay leaves extract, C mixed with 10 ml, D with 15 ml. of malunggay leaves extract and glass E for pure commercial mango Del Monte brand.

The different preparations were evaluated by the respondents in terms of general acceptability, appearance, aroma and taste using the following rubric.

Table 1. Rubric for Evaluating Mango Puree Enriched with Malunggay Leaves Extract

| Criteria | 4 Liked much | 3 Liked | 2 Disliked | 1 Disliked much |
|-----------------------|--|---|--|--|
| Appearance | Looks very rich and the color is yellow. | Looks rich, and the color is very light yellow. | Disliked the looks and the color is yellow green. | Disliked much the looks and the color is very dark yellow green. |
| Taste | Very much sweet and pleasing | Sweet and pleasing | Disliked the sweetness and the taste is unpleasant | Disliked much the sweetness, and the taste is very much unpleasant |
| Aroma | Very much agreeable malunggay odor | Agreeable malunggay odor. | Unpleasant malunggay odor. | very unpleasant malunggay odor |
| General Acceptability | Mango Puree is very much acceptable | Mango Puree is acceptable | Mango Puree is disliked | Mango Puree is much disliked |

After the sensory evaluation of the mixtures, the score sheets was gathered, recorded, tallied, summarized and prepared for computation. Arithmetic mean was used in determining the level of acceptability of its appearance, aroma, taste, and general acceptability. The following scale and description was used:

3.26 - 4.00 – Liked much

2.51 – 3.25 – Liked

1.76 - 2.50 – Disliked

1.00-1.75 – Disliked much

To determine whether significant differences existed in the level of acceptability of mango puree enriched with different proportions of malunggay leaves extract and commercial mango puree, One-Way Analysis of Variance at .01 level of significance was used. Scheffe test was used as post hoc test.

III. RESULTS AND DISCUSSION

Table 2. Mean rating of Mango Puree with Malunggay Leaves Extract Different Proportions as to Taste

| Proportions | Mean | Interpretation |
|------------------------------------|------|----------------|
| A – 0 ml malunggay leaves extract | 3.41 | Liked much |
| B – 5 ml malunggay leaves extract | 3.10 | Liked |
| C – 10 ml malunggay leaves extract | 2.86 | Liked |
| D – 15 ml malunggay leaves extract | 2.65 | Liked |
| E - Commercial Mango Puree | 2.37 | Disliked |

Based on the mean rating, mixture A was liked much by the respondents, mixtures B, C, and D were liked while mixture E was disliked by the respondents.

As shown in the table, Mixture A (0 ml malunggay leaves extract) had a mean rating of 3.41. this means that the respondents “liked much” the taste of the mango puree. This result implies that the taste of mango puree enriched with 0 ml malunngay leaves extract is “very good”

Mixture B (5 ml malunggay leaves extract) had a mean rating of 3.10. This means that the respondents “liked” the taste of the mango puree. This further implies that the taste of mango puree enriched with 5 ml malunggay leaves extract is “good”

Mixture C (10 ml malunggay leaves extract) had a mean rating of 2.86. This means that the respondents “liked” the taste of the mango puree. This result also implies that the taste of mango puree enriched with 10 ml malunggay leaves extract is “good”.

Mixture D (15 ml malunggay leaves extract) had a mean rating of 2.65. This means that the respondents “liked” the taste of the mango puree. This further implies that the taste of mango puree enriched with 15 ml malunggay leaves extract is also “good”.

Mixture E (commercial mango puree) had a mean rating of 2.37. This means that the respondents “liked” the taste of the mango puree. This further implies that the taste of commercial mango puree leaves extract is “fair”.

The result showed that there was a significant difference in the level of acceptability of mango puree with malunggay leaves extract in different proportions in terms of taste. This implies that the taste of different mixtures is not the same as evaluated by the respondents.

Table 3. Taste of Mango Puree with Malunggay Leaves Extract in Different Proportions

| Source of Variance | Sum of Squares | Df | Mean Sum of Squares | F Value | P Value |
|--------------------|----------------|-----|---------------------|---------|---------|
| Between Groups | 13,988 | 4 | 3.497 | 8.431 | .000 |
| Within Groups | 60.148 | 145 | .415 | | |
| Total | 74.136 | 149 | | | |

P < .01

Table 4. Presents the Scheffe test for the taste of Mango Puree with Malunggay Leaves Extract in different proportions.

| (I) Mixture | (J) Mixture | Mean Difference (I-J) | Std. Error | Significance | Interpretation |
|------------------------|------------------------|-----------------------|------------|--------------|-----------------|
| 0 ml | 5 ml | .3110 | .17505 | .534 | Not Significant |
| | 10 ml | .5440 | .17505 | .052 | Not Significant |
| | 15 ml | .7567* | .17505 | .001 | Significant |
| | Commercial Mango Puree | .0340* | .17505 | .000 | Significant |
| 5 ml | 0 ml | .3110 | .17505 | .534 | Not Significant |
| | 10 ml | .2330 | .17505 | .777 | Not Significant |
| | 15 ml | .4457 | .17505 | .172 | Not Significant |
| | Commercial Mango Puree | .7230* | .17505 | .003 | Significant |
| 10 ml | 0 ml | .5440 | .17505 | .052 | Not Significant |
| | 5ml | .2330 | .17505 | .777 | Not Significant |
| | 15 ml | .2127 | .17505 | .830 | Not Significant |
| | Commercial Mango Puree | .4900 | .17505 | .104 | Not Significant |
| 15 ml | 0 ml | .7567* | .17505 | .001 | Significant |
| | 5 ml | .4457 | .17505 | .172 | Not Significant |
| | 10 ml | .2127 | .17505 | .830 | Not Significant |
| | Commercial Mango Puree | .2773 | .17505 | .644 | Not Significant |
| Commercial Mango Puree | 0 ml | 1.0340* | .17505 | .000 | Significant |
| | 5 ml | .7230* | .17505 | .003 | Significant |
| | 10 ml | .4900 | .17505 | .104 | Not Significant |
| | 15 ml | .2773 | .17505 | .664 | Not Significant |

As shown on Table 4, there were no significant differences in terms of taste for mixture with 0 ml and 5 ml, 0 ml and 10 ml. There were no significant differences also in terms of taste for mixture with 5 ml and 0 ml, 5 ml and 10 ml 5 ml and 15 ml. It is explained further that there is no significant differences in terms of taste for mixture with 10 ml and 0 ml, 10 ml and 5 ml, 10 ml and 15 ml, and 10 ml and commercial mango puree. The result of 15 ml mixture and 5 ml, 15 ml mixture and 10 ml, and 15 ml mixture and commercial mango puree is also not significant. On the hand, the paired mixture of commercial mango puree with 10 ml and 15 ml was found out to be not significant.

Therefore, the null hypothesis stating that there is no significant difference in the level of acceptability of Mango Puree with Malunggay Leaves Extract in different proportions was rejected.

Table 3 shows the obtained F-value of 8.43 with the significance value of .000 lesser than the alpha level of .01. This means that there is a significance difference in the level of acceptability of the mango puree with malunggay leaves extract in different proportions in terms of taste. This further implies that the taste of the products were not the same.

Appearance

The mean ratings showed that mixtures A, B, C, and E were liked by the respondents however mixture D was disliked by the respondents.

Table 5. Mean Rating of Mango Puree with Malunggay Leaves Extract in Different Proportions as to Appearance.

| Proportion | Mean | Interpretation |
|------------------------------------|------|----------------|
| A – 0 ml Malunggay Leaves Extract | 3.15 | Liked |
| B – 5 ml Malunggay Leaves Extract | 2.79 | Liked |
| C – 10 ml Malunggay Leaves Extract | 2.64 | Liked |
| D– 15 ml Malunggay Leaves Extract | 2.46 | Disliked |
| E– Commercial Mango Puree | 3.06 | Liked |

As shown in the table, Mixture A (0 ml malunggay leaves extract) had a mean rating of 3.15. this means that the respondents “liked” the appearance of the mango puree. This implies that the

appearance of mango puree enriched with 0 ml malunggay leaves extract is “good”.

Mixture B (5 ml malunggay leaves extract) had a mean rating of 2.79. This means that the respondents “liked” the appearance of the mango puree. This implies that the appearance of mango puree enriched with 5 ml malunggay leaves extract is “good”.

Mixture C (10 ml malunggay leaves extract) had a mean rating of 2.64. This means that the respondents “liked” the appearance of the mango puree. This also implies that the appearance of mango puree enriched with 10 ml malunggay leaves extract is “good”.

Mixture D (15 ml malunggay leaves extract) had a mean rating of 2.46. This means that the respondents “disliked” the appearance of the mango puree. This further implies that the appearance of mango puree enriched with 15 ml malunggay leaves extract is “fair”.

Mixture E (commercial mango puree) had a mean rating of 3.06. This means that the respondents “liked” the appearance of the mango puree. This implies that the appearance of commercial mango puree leaves extract is “fair”.

The result showed that there was a significant difference in the level of acceptability of mango puree with malunggay leaves extract in different proportions in terms of appearance. This implies that the

appearance of different mixtures is not the same as evaluated by the respondents.

There was a significant difference in the level of acceptability of mango puree with malunggay leaves extract in different mixtures as to appearance.

Table 6. ANOVA Table for appearance of Mango Puree with Malunggay Leaves Extract in Different Proportions

| Source of Variance | Sum of Squares | Df | Mean Sum of Squares | F Value | P Value |
|--------------------|----------------|-----|---------------------|---------|---------|
| Between Groups | 9.860 | 4 | 2.465 | 6.399 | .000 |
| Within Groups | 55.859 | 145 | .385 | | |
| Total | 65.718 | 149 | | | |

$P < .01$

Table 6 shows the obtained F-value of 6.399 with the significance value of .000 lesser than the alpha level of 0.01. This means that there is a significance difference in the level of acceptability of the mango puree with malunggay leaves extract in different proportions in terms of appearance. This further implies that the taset of the products were not the same.

Table 7. Scheffe test for the appearance of Mango Puree with Malunggay Leaves Extract in different proportions.

| (I) Mixture | (J) Mixture | Mean Difference (I-J) | Std. Error | Significance | Interpretation |
|------------------------|------------------------|-----------------------|------------|--------------|-----------------|
| 0 ml | 5 ml | .3560 | .16026 | .299 | Not Significant |
| | 10 ml | .5110 | .16026 | .042 | Not Significant |
| | 15 ml | .6883* | .16026 | .002 | Significant |
| | Commercial Mango Puree | .0893 | .16026 | .989 | Not Significant |
| 5 ml | 0 ml | .3560 | .16026 | .299 | Not Significant |
| | 10 ml | .1550 | .16026 | .919 | Not Significant |
| | 15 ml | .3323 | .16026 | .371 | Not Significant |
| | Commercial Mango Puree | .2667 | .16026 | .598 | Not Significant |
| 10 ml | 0 ml | .5110 | .16026 | .042 | Not Significant |
| | 5 ml | .1550 | .16026 | .919 | Not Significant |
| | 15 ml | .1773 | .16026 | .874 | Not Significant |
| | Commercial Mango Puree | .4217 | .16026 | .146 | Not Significant |
| 15 ml | 0 ml | .6883* | .16026 | .002 | Significant |
| | 5 ml | .3323 | .16026 | .371 | Not Significant |
| | 10 ml | .1773 | .16026 | .874 | Not Significant |
| | Commercial Mango Puree | .5990 | .16026 | .009 | Significant |
| Commercial Mango Puree | 0 ml | .0893 | .16026 | .989 | Not Significant |
| | 5 ml | .2667 | .16026 | .598 | Not Significant |
| | 10 ml | .4217 | .16026 | .146 | Not Significant |
| | 15 ml | .5990* | .16026 | .009 | Significant |

The post hoc revealed that paired mixtures 0 ml and 5 ml, 0 and 10 ml, 0 ml and commercial mango puree, 5 ml and 10 ml, 5 ml and 15 ml, 5 ml and commercial mango puree, 10 ml and 15 ml, 10 ml and commercial mango puree and 15 ml and 15 ml and commercial mango puree were not significant. This means that these paired mixtures are comparable in appearance. The paired mixtures with 0 ml and 15 ml and 15 ml with commercial mango puree have significant differences. This implies that the more malunggay leaves extract added to the mango puree the more darker the color will produce.

As shown on Table 7, there were no significant differences in terms of appearance for mixture with 0 ml and 5 ml, 0 ml and 10 ml and 0 ml and commercial mango puree. There were no significant differences also in terms of appearance for mixture with 5 ml and 0 ml, 5 ml and 10 ml, 5 ml and 15 ml and 5 ml and commercial mango puree. It is explained further that there is no significant differences in terms of appearance for mixture with 10 ml and 0 ml, 10 ml and 5 ml, 10 ml and 15 ml, and 10 ml and commercial mango puree. The result of 15 ml mixture and 5 ml, and 15 ml mixture and 10 ml, is also not significant. On the hand, the paired mixture of commercial mango puree with 0 ml, 5 ml, and 10 ml was found out to be not significant.

Therefore, the null hypothesis stating that there is no significant difference in the level of acceptability of Mango Puree with Malunggay Leaves Extract in different proportions was rejected.

Table 8. Mean Rating of Mango Puree with Malunggay Leaves Extract in Different Proportions as to aroma.

| Proportion | WM | VI |
|------------------------------------|------|----------|
| A – 0 ml Malunggay Leaves Extract | 3.22 | Liked |
| B – 5 ml Malunggay Leaves Extract | 2.60 | Liked |
| C – 10 ml Malunggay Leaves Extract | 2.53 | Liked |
| D– 15 ml Malunggay Leaves Extract | 2.30 | Disliked |
| E– Commercial Mango Puree | 2.71 | Liked |

As shown in the table, Mixture A (0 ml malunggay leaves extract) had a mean rating of 3.22. this means that the respondents “liked” the aroma of the mango puree. This implies that the aroma of mango puree enriched with 0 ml malunggay leaves extract is “good”

Mixture B (5 ml malunggay leaves extract) had a mean rating of 2.60. This means that the respondents

“liked” the aroma of the mango puree. This implies that the aroma of mango puree enriched with 5 ml malunggay leaves extract is “good”.

Mixture C (10 ml malunggay leaves extract) had a mean rating of 2.53. This means that the respondents “liked” the aroma of the mango puree. This also implies that the aroma of mango puree enriched with 10 ml malunggay leaves extract is “good”

Treatment D (15 ml malunggay leaves extract) had a mean rating of 2.30. This means that the respondents “disliked” the aroma of the mango puree. This further implies that the aroma of mango puree enriched with 15 ml malunggay leaves extract is “fair”.

Treatment E (commercial mango puree) had a mean rating of 2.71. This means that the respondents “liked” the aroma of the mango puree. This implies that the aroma of commercial mango puree leaves extract is “fair”.

There was a significant difference in the level of acceptability of mango puree with malunggay leaves extract in different mixtures as to aroma.

Table 9. Aroma of Mango Puree with Malunggay Leaves Extract in Different Proportions.

| Source of Variance | Sum of Squares | Df | Mean Sum of Squares | F Value | P Value |
|--------------------|----------------|-----|---------------------|---------|---------|
| Between Groups | 13,988 | 4 | 3.497 | 8.431 | .000 |
| Within Groups | 60.148 | 145 | .415 | | |
| Total | 74.136 | 149 | | | |

$P > .01$

Table 9 shows the obtained F-value of 8.431 with the significance value of .000 lesser than the alpha level of .01. This means that there is a significance difference in the level of acceptability of the mango puree with malunggay leaves extract in different proportions in terms of aroma. This further implies that the aroma of the products were not the same.

Scheffe test revealed that paired mixtures 0 ml and commercial mango puree, 5 ml and 10 ml, 5 ml and 15 ml, 5 ml and commercial mango puree, 10 ml and 15 ml, 10 ml and commercial mango puree, 15 ml and commercial mango puree showed no significant differences. This means that they have a comparable aroma. Paired mixtures 0 ml and 5 ml, 0 and 10 ml, 0 and 15 ml have significant difference in terms of aroma. This means that they are not comparable in terms of aroma as evaluated by the respondents.

Table 10. Scheffe test for the aroma of Mango Puree with Malunggay Leaves Extract in different proportions.

| (I) Mixture | (J) Mixture | Mean Difference (I-J) | Std. Error | Significance | Interpretation |
|------------------------|------------------------|-----------------------|------------|--------------|-----------------|
| 0 ml | 5 ml | .6217* | .16630 | .009 | Significant |
| | 10 ml | .6877* | .16630 | .003 | Significant |
| | 15 ml | .9217* | .16630 | .000 | Significant |
| | Commercial Mango Puree | .5103 | .16630 | .057 | Not Significant |
| 5 ml | 0 ml | -.6217* | .16630 | .009 | Significant |
| | 10 ml | .0660 | .16630 | .997 | Not Significant |
| | 15 ml | .3000 | .16630 | .518 | Not Significant |
| | Commercial Mango Puree | -.1113 | .16630 | .978 | Not Significant |
| 10 ml | 0 ml | -.6877* | .16630 | .003 | Significant |
| | 5 ml | -.0660 | .16630 | .997 | Not Significant |
| | 15 ml | .2340 | .16630 | .739 | Not Significant |
| | Commercial Mango Puree | -.1773 | .16630 | .888 | Not Significant |
| 15 ml | 0 ml | -.9217* | .16630 | .000 | Significant |
| | 5 ml | -.3000 | .16630 | .518 | Not Significant |
| | 10 ml | -.2340 | .16630 | .739 | Not Significant |
| | Commercial Mango Puree | -.4113 | .16630 | .197 | Not Significant |
| Commercial Mango Puree | 0 ml | -.5103 | .16630 | .057 | Not Significant |
| | 5 ml | .1113 | .16630 | .978 | Not Significant |
| | 10 ml | .1773 | .16630 | .888 | Not Significant |
| | 15 ml | .4113 | .16630 | .197 | Not Significant |

General acceptability

Generally mango puree with no malunggay leaves extract was liked much by the respondents while with 5 ml, 10 ml and commercial mango puree were liked by the respondents. Mixture D with 15 ml malunggay leaves extract was disliked by the respondents.

Table 11. Mean rating of Mango Puree with Malunggay Leaves Extract in Different Proportions as to General Acceptability.

| Proportion | Mean | VI |
|------------------------------------|------|------------|
| A – 0 ml Malunggay Leaves Extract | 3.26 | Liked much |
| B – 5 ml Malunggay Leaves Extract | 2.83 | Liked |
| C – 10 ml Malunggay Leaves Extract | 2.68 | Liked |
| D– 15 ml Malunggay Leaves Extract | 2.47 | Disliked |
| E– Commercial Mango Puree | 2.71 | Liked |

As shown in the table, Mixture A (0 ml malunggay leaves extract) had a mean rating of 3.26. This means that the respondents “liked much” the general acceptability of the mango puree. This implies that the general acceptability of mango puree enriched with 0 ml malunggay leaves extract is “very good”.

Mixture B (5 ml malunggay leaves extract) had a mean rating of 2.83. This means that the respondents “liked” the general acceptability of the mango puree. This implies that the general acceptability of mango puree enriched with 5 ml malunggay leaves extract is “good”.

Mixture C (10 ml malunggay leaves extract) had a mean rating of 2.68. This means that the respondents “liked” the general acceptability of the mango puree. This also implies that the general acceptability of mango puree enriched with 10 ml malunggay leaves extract is “good”.

Treatment D (15 ml malunggay leaves extract) had a mean rating of 2.47. This means that the respondents “disliked” the general acceptability of the

mango puree. This further implies that the general acceptability of mango puree enriched with 15 ml malunggay leaves extract is “fair”.

Treatment E (commercial mango puree) had a mean rating of 2.71. This means that the respondents “liked” the general acceptability of the mango puree. This implies that the general acceptability of commercial mango puree leaves extract is “fair”.

There was a significant difference in the level of acceptability of mango puree with malunggay leaves extract in different mixtures as to aroma.

To find out if there is a significant difference among Mixtures A, B, C, D, and E as to its general acceptability, ANOVA was computed at 0.01 level of significance.

Table 12 shows the obtained F-value of 10.036 with the significance value of .000 lesser than the alpha level of .01.

Table 12. ANOVA for the General Acceptability of Mango Puree with Malunggay Leaves Extract in Different Proportion.

| Source of Variance | Sum of Squares | Df | Mean Sum of Squares | F Value | P Value |
|--------------------|----------------|-----|---------------------|---------|---------|
| Between Groups | 10.266 | 4 | 2.566 | 10.036 | .000 |
| Within Groups | 37.080 | 145 | .256 | | |
| Total | 47.346 | 149 | | | |

P < 0.01

This means that there is a significant difference in the level of general acceptability of the mango puree with malunggay leaves extract in different proportions in terms of general acceptability. This further implies that the general acceptability of the products were not the same.

Table 13. Scheffe Test for the General Acceptability of Mango Puree with Malunggay Leaves Extract in Different Proportions.

| (I) Mixture | (J) Mixture | Mean Difference(I-J) | Std. Error | Significance | Interpretation |
|------------------------|------------------------|----------------------|------------|--------------|-----------------|
| 0 ml | 5 ml | .4287 | .13057 | .033 | Not Significant |
| | 10 ml | .5807* | .13057 | .001 | Not Significant |
| | 15 ml | .7893* | .13057 | .000 | Significant |
| | Commercial Mango Puree | .5433* | .13057 | .002 | Significant |
| 5 ml | 0 ml | .4287 | .13057 | .033 | Not Significant |
| | 10 ml | .1520 | .13057 | .851 | Not Significant |
| | 15 ml | .3607 | .13057 | .112 | Not Significant |
| | Commercial Mango Puree | .1147 | .13057 | .942 | Significant |
| 10 ml | 0 ml | .5807* | .13057 | .001 | Not Significant |
| | 5 ml | .1520 | .13057 | .851 | Not Significant |
| | 15 ml | .2087 | .13057 | .636 | Not Significant |
| | Commercial Mango Puree | .0373 | .13057 | .999 | Not Significant |
| 15 ml | 0 ml | .7893* | .13057 | .000 | Significant |
| | 5 ml | .3607 | .13057 | .112 | Not Significant |
| | 10 ml | .2087 | .13057 | .636 | Not Significant |
| | Commercial Mango Puree | .2460 | .13057 | .473 | Not Significant |
| Commercial Mango Puree | 0 ml | .5433* | .13057 | .002 | Significant |
| | 5 ml | .1147 | .13057 | .942 | Significant |
| | 10 ml | .0373 | .13057 | .999 | Not Significant |
| | 15 ml | .2400 | .13057 | .473 | Not Significant |

The post hoc results revealed that 0 ml and 5 ml, 5 ml and 10 ml, 5 ml and 15 ml, 5 ml and commercial mango puree, 10 ml and 15 ml, 10 ml and commercial mango puree, 15 ml and commercial mango puree were not significant while the rest paired mixtures were significant.

CONCLUSION AND RECOMMENDATION

Based on the findings of the study the researchers concluded that there were no significant differences in the level of acceptability of mango puree in different mixtures in terms of taste, appearance, aroma and general acceptability, therefore the panel of evaluators decided to null hypothesis and it was rejected. Mango puree with 5 ml and 10 ml of malunggay leaves extract was the most acceptable because of its sensory characteristics and nutritional value. Adding more than 5 ml of malunggay leaves extract at a given amount of mango puree will reduce its general acceptability because of its adverse effect on its appearance, taste and aroma.

It is therefore recommended that the results of this study be disseminated to encourage them to enrich 5 ml malunggay leaves extract per $\frac{1}{2}$ cup preparation of mango puree to increase its acceptability and nutritive value. Further studies be conducted especially on the packaging, proximate analysis and improving the shelf life of this product. Since mango puree on different mixture were acceptable on consumers were encourage to prepare and serve mango puree with malunggay extract as beverage item for family, friends and relatives on different occasions. Since mixtures B and C were liked in terms of taste, appearance, aroma and general acceptability it is highly recommended among home economics and hotel and restaurants educators for further information dissemination on lecture-demonstration lesson. For future researchers, determining the packaging innovations and its nutritional analysis is

recommended. More researches along this line must be conducted using other variables and process.

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