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The Development of Malunggay (Moringa oliefera) Molo Wrapper: Techno-Guide for Instruction, Community Extension, and Production

By

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Abstract

This experimental study was conducted to formulate a Molo Wrapper enhanced with Malunggay leaves in three (3) different treatments for three replications. The treatment formulations and composition were based on the standard and basic ingredients and procedures of making Molo Wrapper. There are three (3) levels of moringa powder added to the basic recipe. Treatment 1 (T1): one half (1/2) cup of moringa powder; Treatment 2 (T2): one (1) cup of moringa powder; and Treatment 3 (T3): two (2) cups of moringa powder. The sensory evaluation was performed using the researcher-made score sheet designed for the nine-point hedonic rating scale tests. The data were statistically analyzed. The findings revealed that T1 and T2 formulations containing a lesser amount of moringa powder have higher acceptable descriptions of like very much. Moringa powder is acceptable and can be used as an additive in developing Molo Wrapper as a new food product innovation derived from sensory analysis. Consumer panelists are more sensitive to the sensory quality that may have affected their general acceptability of the product than the experts because of the unusual color, appearance, and texture caused by Moringa powder. The developed acceptable treatment will be introduced as a techno-guide for instruction, extension services, and production.

Keywords: Malunggay Molo Wrapper, Food Product Development, Sensory Analysis, Techno-Guide

1. Introduction

Entrepreneurship This experimental research was designed to utilize Malunggay Leaves for food product development and innovation. Malunggay is an abundant local vegetable with numerous nutritional and health benefits, especially for lactating or breastfeeding mothers. Malunggay, also known as Moringa oliefera, is the automatic galactagogue, a food or drug that boosts breast milk supply. This research was designed to enhance the product's composition by developing new nutritious product innovation through utilizing indigenous vegetables. Pancit Molo is an Ilonggo cuisine considered a complete dish meal, especially for lactating and working mothers who prefer eating soup with a complete dish meal because it is easy to prepare and cook. Further, they believe that mothers consuming liquid foods soups can help boost their breast milk production.

The Philippine Constitution in Article XIV, section 10, stipulates that science and technology are essential for development and progress as such priority is given to research and development invention, innovation, and utilization. Furthermore, the state shall support indigenous, appropriate, and self-reliant scientific and technical capabilities and their

application to the country's production and national life. In response to the constitution, the researcher designed this study as a technological guide targeting instruction, extension, and production as bases to develop a development plan. This study was intended to aid its community to accelerate social growth, welfare, women empowerment, and economic development through this research finding, which among many, should aim to be product-oriented.

Further, the study results will be a reference as a techno-guide to the culinary and food

technology teachers in teaching modern food processing techniques. This food product innovation will also further promote Malunggay Leaves to meet consumers' acceptability and generate concern for food innovation and technology. As to extension and production, lactating mothers are the target beneficiaries and other community members engaged in food production and livelihood. Thus, improving their socio-economic status by engaging in small-scale businesses. Specifically, this study sought to determine the level of acceptability of the Malunggay Molo Wrapper using sensory analysis in terms of color, taste, flavor, and texture evaluated using the following treatments:

- Treatment 1: 1/2 cup of Malunggay Leaves Powder
- Treatment 2: 1 cup of Malunggay Leaves Powder
- Treatment 3: 2 cups of Malunggay Leaves Powder

Figure 1 below shows the study's conceptual framework presenting the input: Molo Wrapper incorporating Malunggay Leaf. The formulations of the treatment were based on the basic ingredients and procedures of making Molo wrapper. There are three (3) levels of moringa powder added to the basic recipe.

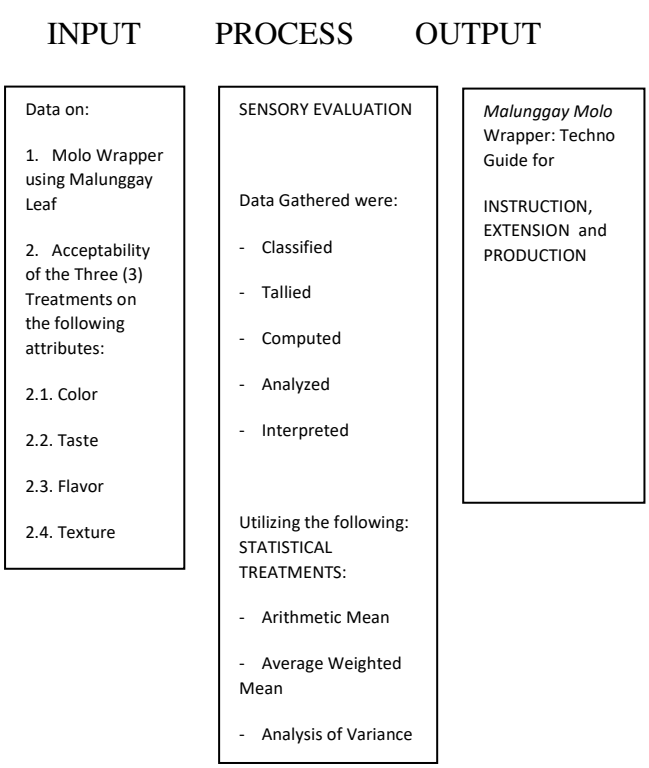

Figure 1. *The conceptual framework of the study utilizing the I.P.O Model.*

2. METHODOLOGY

The experimental method was employed in this study using the descriptive and statistical treatment in processing the data. This method sought to find out which of the three treatments using the different measurement of powdered Malunggay leaves will produce better quality as to color, taste, flavor, and texture that are acceptable to the consumers as represented by panelists.

There were three replications to come up with the evaluation. The evaluation for acceptability was evaluated by panelists who were experts or trained panelists and ordinary consumers through sensory evaluation. The data gathered were classified, tallied, computed, analyzed, and interpreted using statistical treatments. The output is the development of food product innovation as a techno guide for instruction, extension, and production.

The samples were labeled before sensory evaluation using 3-digit code numbers in the score sheet correspondingly to the disposable bowl' s code numbers. The four-digit code was designed to avoid biases or product formulation identification by the panelists. The acceptability evaluation will be conducted by trained panelists who were experts in food innovation and mothers belonging to the community ages through sensory evaluation. The nine-point Hedonic rating scale ratings were tallied and computed to determine the mean average per product sensory attribute in the application.

2.1 Instrumentation

The three treatments were subjected to sensory evaluation by the panelists using the Hedonic Scale. In the study, the evaluation sheet is the main instrument in gathering data. The treatments were distributed to the panel of evaluators. They were given ample time to ensure the products' reliable results regarding color, taste, flavor, and texture. An organoleptic test with the use of a nine-point Hedonic scale was used in evaluating the products. The instrument used was self-made by the researcher. A dry run was conducted before the final sensory evaluation. An orientation in using the score sheet was given to the panelists to fully understand the meaning of the Hedonic-rating scale's qualitative interpretation as reflected in the instrument.

2.2 Data Analysis

The data gathered from the sensory evaluation conducted by both the experts and consumers were statistically analyzed employing the following formula: 1) The Arithmetic Mean; 2) Average Weighted Mean; and 3) Analysis of Variance (ANOVA). The significant differences among the three formulated recipes were determined using the ANOVA formula.

3. RESULTS AND DISCUSSIONS

3.1 Different Levels of Malunggay Molo Wrapper

Treatment One (T1) - One half (1/2) cup of Moringa powder added. Color acceptability was light olive green. The taste of expert panelists test recorded a very pleasant moringa, but the consumer panelists perceived it as slightly pleasant. Both panelists found the flavor was very desirable. The texture of both groups of evaluators perceived the product slightly less smooth and al dente.

Treatment Two (T2) – One (1) cup of Moringa powder added. Both panelists perceived the product with medium-low olive-green color. The moringa taste is very pleasant, and the

flavor is found very desirable. The texture is slightly smooth and al dente.

Treatment Three (T3) - Two (2) cups of Moringa powder added. Both groups of panelists described it as color medium-dark olive green. The taste of mother panelists test recorded a slightly pleasant moringa, but the child panelists perceived it as neither pleasant nor pleasant. The mother panelists found the flavor was slightly desirable, while child panelists perceived it neither like nor dislike. The texture of both groups of evaluators perceived the product slightly less smooth and al dente.

All treatments have a very slight difference in smoothness and firmness (al dente). In terms of color, shades of olive green differ due to the amount of moringa added to the mixture. The pleasant taste of moringa also varies as the amount of moringa powder is increased. The more moringa added to the mixture, the darker is the hue of its color. Generally, the more quantity of moringa is added to the mix, the treatments were seemingly disliked. Hence, the smaller quantity of Moringa powder added to the mixture, the higher the evaluators' acceptability scores were.

3.2 General Acceptability

Treatment One (T1)-One half (1/2) cup of Moringa powder. Color acceptability was light olive green. Both panelists described the product as light olive green. The taste of expert panelists test recorded a very pleasant moringa, but the consumer panelists perceived it slightly pleasant. Both panelists found the flavor was very desirable. The texture of both groups of evaluators perceived the product slightly less smooth and al dente with a description of like very much (7.80 /7.90) rating in overall sensory acceptability of the product to both groups of panelists.

Treatment two (T2)-This treatment contains one (1) cup of Moringa powder added to the mixture. Both panelists perceived the product with medium-low olive-green color with the taste of very pleasant. The flavor is found very desirable. The texture is slightly smooth and al dente with a verbal description of like moderately (6.93 / 7.20) in the overall acceptability of the product's quality of the product for both panelists of evaluators.

Treatment three (T3)-Two (2) cups of Moringa powder added. Both groups of panelists described it as color medium-dark olive green. The taste of expert panelists test recorded a slightly pleasant moringa, but the consumer panelists perceived it as neither pleasant nor pleasant. The expert panelists found the flavor was slightly desirable, while consumer panelists perceived it neither like nor dislikes. The trained panelists recorded a verbal description of like slightly (5.53) while the students' group revealed a verbal description of neither like nor dislike (5.17).

Thus, consumer panelists were more sensitive to the sensory quality that may have affected their general acceptability of the product than the trained panelists because of the manifestation of vegetable appearance caused by Moringa powder. Generally, consumers prefer the original color of the Molo wrapper.

Figure 3. *The General Acceptability Level in Terms of Color, Taste, Flavor, and Texture among Expert Panelists*

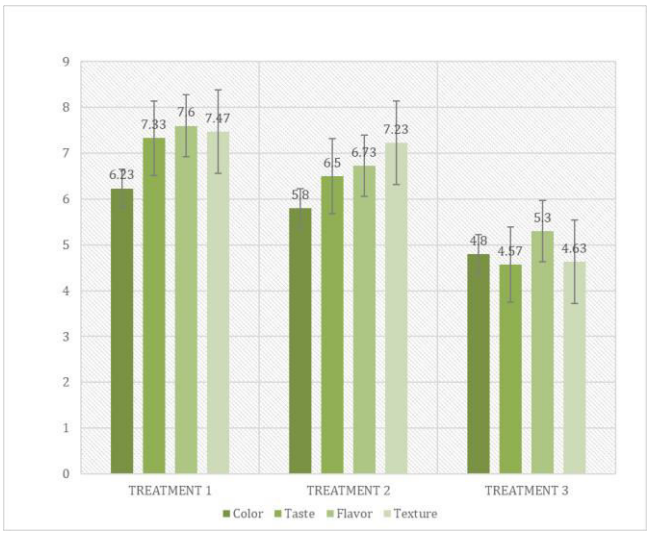

Figure 4. *The General Acceptability Level in Terms of Color, Taste, Flavor, and Texture among Consumer Panelists*

3.3 Significant Differences among the Treatments

The data were treated using One-way Analysis of Variance and Two-way Analysis of Variance to determine the significant difference and inferences among treatments. One-way Analysis of Variance was used to measure and analyze the significant effects of one factor. The two-way variance was tested to measure the effects of two factors simultaneously and whether there is an interaction between the two parameters. In a One-way Analysis of Variance, the results revealed that there are no significant differences among treatments in the products' sensory characteristics. Hence, the null hypothesis is accepted, and there are no significant mean differences in all sensory attributes among treatments. However, the Two-way Analysis of Variance revealed that squares' sum has gone from 1101.25 to the lower value of 572.40. This means that there was a slightly significant difference occurred among treatments.

3.4 Sensory Attributes Analyses

3.4.1 Color Attributes Analysis

Table 1 is the Hedonic mean acceptability score as to color acceptability preferred by the panelists. In the experts' evaluation, the Hedonic mean scores of T1 (7.93), and T2 (7.97) had an interpretation of like very much, and T3 (5.57) is like very much. As to consumers' evaluation, the hedonic mean scores of T1 (6.23) and T2 (5.80) had an interpretation of like slightly and T3 (4.80) neither like nor dislike. This result implies that the trained panelists liked the product, which color is low light olive green. The treatment with the most quantity of moringa is rated the least. Thus, there is a certain level of moringa powder to keep the product acceptable, as revealed by the expert panelists. The same pattern was observed from the mean scores obtained by consumer panelists.

Table 1. *Hedonic Mean Acceptability Score as to Color*

Treatments	**Replications**			**Statistical Treatment**		**Hedonic Interpretation**
	1	**2**	**3**	**Total**	**Mean**	
	Expert Panelists					
Treatment 1	8	8.3	7.5	23.8	7.93	Like Very Much
Treatment 2	8.3	8.4	7.2	23.9	7.97	Like Very Much
Treatment 3	5.5	5.2	6	16.7	5.57	Like Slightly
Total	21.8	21.9	20.7	64.4	21.47	
	Consumer Panelists					
Treatment 1	6	6.2	6.5	18.7	6.23	Like Slightly
Treatment 2	5.2	6.2	6	17.4	5.80	Like Slightly
Treatment 3	5	4.9	4.5	14.4	4.80	Neither Like nor Dislike
Total	16.2	17.3	17	50.5	16.83	
Grand Total	38	39.2	37.7	114.9	38.3	

The treatment with the most quantity of moringa is rated the least. Thus, there is a certain level of moringa powder to keep the product acceptable, as revealed by the expert panelists. The same pattern was observed from the mean scores obtained by consumer panelists.

3.4.2 Taste Attributes Analysis

Taste acceptability referred to one of the four types: sweet, sour, bitter, and salty. As can be seen in Table 2 below, the expert panelists rated Treatment 1 (7.83) and 2 (8.10) the highest rating scale of like very much, and treatment 3 (5.83) recorded the descriptive rating with like slightly group. The taste acceptability of the product treatment with 1 cup moringa powder was the most acceptable to them. It implies that the experts' panelists' level limits its moringa level of addition at 1/2 cup of powdered Moringa leaves. A certain level of moringa powder is added to the mixture that needs to be observed in terms of taste acceptability because it can alter its acceptability level, as shown in the expert panelists' results. The consumers' evaluation results showed that the T1 and T2 treatments were rated categorically with like very much to like moderately description, respectively. The third treatment got the least descriptive rating with neither like nor dislike. It can be noted that the consumer evaluators are quite particular in their sensory analysis when it comes to the taste of a vegetable compared to experts. This means that if the product with a high quantity of Moringa powder is introduced to children, they are less likely to be preferred and consumed.

Table 2. Hedonic Mean Acceptability Score as to Taste

Treatments	**Replications**			**Statistical Treatment**		**Hedonic Interpretation**
	1	**2**	**3**	**Total**	**Mean**	
	Expert Panelists					
Treatments 1	7.5	8.1	7.9	23.5	7.83	Like Very Much
Treatments 2	8.3	7.5	8.5	24.3	8.10	Like Very Much
Treatments 3	5.4	6	6.1	17.5	5.83	Like Slightly
Total	21.2	21.6	22.5	65.3	21.77	
	Consumer Panelists					
Treatments 1	7.3	7.5	7.2	22	7.33	Like Very Much
Treatments 2	6.1	6.5	6.9	19.5	6.50	Like Moderately
Treatments 3	4.3	4.5	4.9	13.7	4.57	Neither Like Nor Dislike
Total	17.7	18.5	19	55.2	18.4	
Grand Total	38.9	40.1	41.5	120.5	40.17	

3.4.3 Flavor Attributes Analysis

Flavor refers to savor and essence; however, in this study, it means the blend of taste and aroma in the Molo product. The results shown in Table 3 below revealed that Treatments 1 and 2 obtained categorical descriptive ratings, like very much, and Treatment 3 fall obtained a rating of like slightly. One-half cup of moringa powder makes up the most acceptable flavor to the product for the expert panelists. Still, the amount of a half to one cup Moringa powder added to the mixture alters their flavor acceptability level. Therefore, the most acceptable limit for Moringa powder addition to the mixture is one cup, but acceptability is affected beyond this flavor. However, they rated Treatment 1 like very much for the consumer panelists; Treatment 2 is like moderately and Treatment 3 with neither like nor dislike. Thus, in every increase of one-half cup to one cup of Moringa powder to the mixture, the less acceptable the product is to them as to the flavor.

Table 3. *Hedonic Mean Acceptability Score as to Flavor*

Treatments	**Replications**			**Statistical Treatment**		**Hedonic Interpretation**
	1	**2**	**3**	**Total**	**Mean**	
	Expert Panelists					
Treatment 1	7.5	8.5	8	24	8	Like Very Much
Treatment 2	7.8	8	7.9	23.7	7.90	Like Very Much
Treatment 3	5.2	5.8	6	17	5.67	Like Slightly
Total	20.5	22.3	21.9	64.7	21.57	
	Consumer Panelists					
Treatment 1	7.2	8.1	7.5	22.8	7.60	Like Very Much
Treatment 2	6.9	6.8	6.5	20.2	6.73	Like Moderately
Treatment 3	5.2	5.5	5.2	15.9	5.30	Neither Like nor Dislike
Total	19.3	20.4	19.2	58.9	19.64	
Grand Total	39.8	42.7	41.1	123.6	41.2	

3.4.4. Texture Attributes

The texture ability of the product in this study refers to the outer appearance of the product. Table 4 presents the data on this analysis.

The data shown in the table, treatments 1, 2, and 3 were rated with the same descriptive category, like moderately. Moringa powder variations from one half to one cup do not alter the expert panelists' texture acceptability. On the other hand, the consumer panelists did not see any difference in the texture between Treatments 2 and 3 in the test results. However, Treatment 3 obtained neither like nor dislike.

Table 4. *Hedonic Mean Acceptability Score for Texture by the Panelists*

Treatments	**Replications**			**Statistical Treatment**		**Hedonic Interpretation**
	1	**2**	**3**	**Total**	**Mean**	
	Expert Panelists					
Treatment 1	6.2	6.4	7.2	19.8	6.60	Like Moderately
Treatment 2	6.6	7.9	7	21.5	7.17	Like Moderately
Treatment 3	5.2	6.9	7.8	19.9	6.63	Like Moderately
Total	18	21.2	22	61.2	20.4	
	Consumer Panelists					
Treatment 1	7.5	7.9	7	22.4	7.47	Like Very Much
Treatment 2	7.2	7	7.5	21.7	7.23	Like Very Much
Treatment 3	4.5	4.9	4.5	13.9	4.63	Neither Like nor Dislike
Total	19.2	19.8	19	58	19.33	
Grand Total	37.2	41	41	119.2	39.73	

4. CONCLUSIONS

After the analytical procedures performed and conducted on the experimental study of Malunggay Molo Wrapper, the following conclusions were formulated:

For the Treatment One (T1)- One half (1/2) cup of Moringa powder added. Color acceptability was light olive green. The taste of expert panelists test recorded a very pleasant taste, but the consumer panelists perceived it slightly pleasant. Both panelists found the flavor was very desirable. The texture of both groups of evaluators perceived the product slightly less smooth and al dente with description of like very much.

For Treatment Two (T2) – This treatment contains one (1) cup of Moringa powder added to the mixture. Both panelists perceived the product with medium-low olive-green color with the taste of very pleasant. The flavor is found very desirable. The texture is slightly smooth and al dente with a verbal description of like moderately in the general acceptability of the product's quality of the product for both panelists of evaluators.

For Treatment Three (T3) - Two (2) cups of Moringa powder added. Both groups of panelists described it as a color medium-dark olive green. The taste of expert panelists test recorded a slightly pleasant moringa, but the consumer panelists perceived it as neither pleasant nor pleasant. The expert panelists found the flavor was slightly desirable, while consumer panelists perceived it neither like nor dislikes. The expert group of evaluators recorded a verbal description of like slightly while the consumer group revealed a verbal description of neither like nor dislike.

Hence, moringa powder's addition in the mixture affected its color, taste, flavor, and texture attributes acceptability as dictated from the two-way analysis results. The level or amount of moringa powder added to the mixture with an acceptable high level should follow the experimental limit of one half (½) cup of moringa powder per treatment. However, statistically, there is no significant difference among all treatments considering all sensory attributes being studied. Therefore, although a slight reduction of acceptability level can be noticed with a higher amount of moringa addition to the mixture, any formulation can be used. Based on the findings, Moringa powder is acceptable and can be used as an additive in developing Molo Wrapper as a new food product innovation derived from sensory analysis. Consumer panelists are more sensitive to the sensory quality that may have affected their general acceptability of the product than the experts because of the unusual color, appearance, and texture caused by Moringa powder.

The developed acceptable treatment will be introduced as a techno-guide for instruction, extension services, and production targeting to help our neighboring community and other declared beneficiaries adopt this product innovation. For instruction, the study results will reference the culinary and food technology professors in introducing modern techniques to students in food processing, development, and innovation using sensory analysis as to acceptability approach. This will also further promote Malunggay leaves' utilization that will meet consumers' acceptability and help generate concern of food innovation and technology. For community extension and production, lactating mothers are the target beneficiaries and other community members who are engaged in small-scale food businesses and livelihood. The proximate and nutritional analysis was highly recommended to analyze the acceptable product's macromolecules and nutritional value. There is a need to implement regular health monitoring to track potential progress using various scientific tools to obtain accurate results to introduce nutrition to the target beneficiaries. Malunggay is nutritionally rich. It is now one

of the indigenous vegetables and products widely used in many recipes for research and food product development, and innovation purposes. This is to help the children consumers appreciate and consume regularly. For production, seeking funding support from different relevant agencies both (government and non-government) in the country is highly recommended for this research initiative to optimize its potential for economic growth and social welfare and enhance the product. As a result, any programs on the introduction of this product can widen the implementation scope once the program for this techno-guide is ready for the next level.

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