



Development and Quality Evaluation of Butter Cookie Enriched with Native Bicol Pili (*Canarium ovatum*) and Sili Labuyo (*Capsicum frutescens*)

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Abstract: The development and quality evaluation of butter cookie enriched with native Bicol Pili (*Canarium ovatum*) and Sili-Labuyo (*Capsicum frutescens*) was laid out in Completely Randomized Design (CRD) with three treatments in replications. It was evaluated using the nine-point hedonic scale and employed weighted mean and ANOVA treatments to analyse the responses of the sample respondents. All-purpose flour, margarine, chicken (*Gallus gallus*) egg, and baking powder were the main ingredients of the formula. Native pili and sili-labuyo were added as functional ingredients in the development of the sample product and therefore evaluated. This experimental research revealed that among the three replicated treatments tested in the study, Treatment 1 is the most preferred cookie by the respondents as resulted in the survey. There were no dislike responses noted from the respondents. The developed cookie possesses a high level of likeness as to color, palatability, texture, aroma, appearance, and overall consumer acceptability. Moreover, the nutritional contents of the product particularly sili-labuyo contained high levels of vitamins and minerals such as iron, copper, potassium, vitamin A, C, and B-6. Thus, it is recommended that this cookie can be developed using the Treatment 1 formula and can be used as functional ingredients in order to meet the nutritional requirements of individuals with special dietary needs.

Index Terms – Bicol pili, butter cookie, product development, sensory quality evaluation, sili labuyo

I. INTRODUCTION

Cookies are convenience snack products popular to everyone. They are nutritive food produced from unpalatable paste that is transformed into appetizing product through the application of heat in an oven (Kure et al., 1998). They are ready-to-eat and inexpensive food product containing digestive and dietary principles of vital importance (Kulkarni, 1997). It is a rich source of fat and carbohydrate hence are energy giving food and a good source of protein and minerals. Its principal ingredients are commonly flour, fat, sugar and water while other ingredients include milk, salt, flavoring agent and aerating agent (Wade, 1998).

Furthermore, cookies are a form of confectionery product which offer a long shelf life and has been dried to a low moisture content which ensures that they are free from microbial spoilage (Wade, 1998; Okaka, 2009). Cookies, as snacks, are consumed extensively by consumers thus the production of this food product is highly in demand.

With the increased consumption of cookies, it poses a challenge to researchers to develop food products containing functional ingredients that will meet the individual's special dietary needs. Hence, the development of pili-labuyo cookie was made to create an innovative product in the market and likewise to blend in the promotion of the Region's local cuisine and food delicacies for its rich native Pili (*Canarium ovatum*) and Labuyo (*Capsicum frutescens*).

Partido area, one of the districts in the province of Camarines Sur, Bicol Region is abundant of the aforementioned resources that serve as one of livelihood opportunities among its local residents through production to selling of native delicacies derived from pili and labuyo. However, the production of local foods enriched with the said ingredients are limited to *pinangat*, *bicol express*, *ice cream*, *pili tart*, and *sugar-coated pili candy*. Thus, this experimental research is being developed to evaluate the sensory quality and consumer acceptance of the product. Moreover, this research also intends to address and shall contribute to the regional development plan for poverty reduction and creation of micro-business enterprises.

II. RESEARCH METHODOLOGY

This study employed Completely Randomized Design (CRD) with three replicated cookies samples. The experimental samples were formulated at the food laboratory of Partido State University - San Jose-Lagonoy Campus. After the ingredients were purchased from the local market of the place, proper food handling was observed during the food preparation and development.

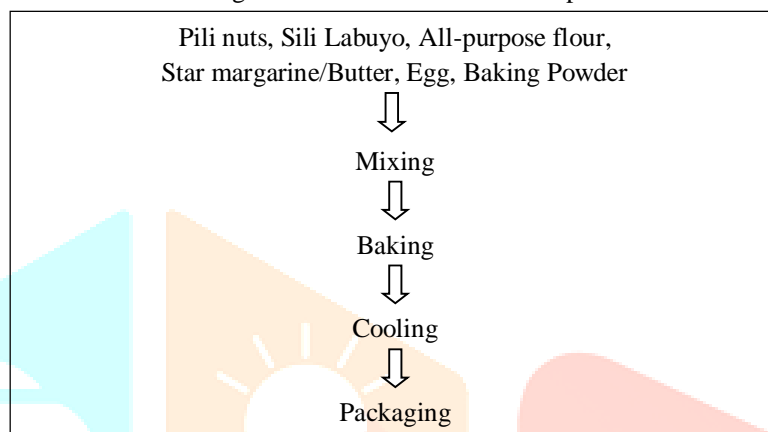
All-purpose flour, margarine, chicken (*Gallus gallus*) egg, and baking powder were the main ingredients from the commercial market. Pili nuts and labuyo were harvested from the backyard.

Table 1. Formulation of cookie

Ingredients	T ₁	T ₂	T ₃
Pili nuts	105 g	110 g	115 g
Sili Labuyo	2 g	3.5 g	5 g
All-purpose flour (2 nd class)	500 g	500 g	500 g
Star Margarine/Butter	250 g	250 g	250 g
Egg	111 g	111 g	111 g
Baking Powder	29 g	29 g	29 g

All ingredients were weighted using digital weighing scale (*see* Table 1) and mixed in an electric mixer to form dough. Shortening was creamed into the bowl added with sweeteners altogether with the refined sili labuyo. One egg was added at a time while beating. Gradually, flour mixture was added until all ingredients were mixed well. The cookie dough was placed in cookie press, decorated with pili nuts on top and baked in an oven at 320 °F for 7 to 10 minutes. Then, the cookies were cooled on cooling sheets for 30 minutes, packed and sealed in a polyethylene food grade bags and subjected to evaluation (*see* Figure 1).

Figure 1. Flow chart for cookies production



Physical properties of the cookie were determined through the use of Vernier caliper with 20 micron accuracy measurement for thickness (mm) and width (mm). Digital weighing scale was also used to determine the weight (g) of cookie (*see* Table 11). The analytical methods of such fat, and ash were determined using AOAC and Food Composition Table. The samples were also analysed for its nutritional property components (*see* Table 12).

The sensory quality attributes of the cookies were determined using the nine-point hedonic scale with ranging from 1-9. In the hedonic scale, 9 represents the highest score (like extremely), 8 (like very much), 7 (like moderately), 6 (like slightly), 5 (neither like nor dislike), 4 (dislike slightly), 3 (dislike moderately), 2 (dislike very much) and 1 (dislike extremely).

Color, palatability, texture, aroma, appearance, and overall consumer acceptability of the product were the attributes evaluated by the ten (10) panelists of food experts of PSU - San Jose Campus, and fifty (50) randomly selected respondents.

Prior to the day of the sensory evaluation, the panelists were given instruction in order to familiarize them with the test procedure and to ensure that they will give honest individual opinion. They were also reminded not to discuss with other panelists their findings during the period of evaluation. Furthermore, they were instructed to rinse their mouths with water after tasting each sample. The sensory evaluation took place by mid-morning usually around 10 AM to 12 PM. This is to ensure that the panelists are neither hungry nor full during the evaluation period. The samples were prepared and were served to the panelists using equal amounts of cookies and water, and presented in the same type and color of plates.

Below is range used in analyzing the acceptability of the proposed product and its verbal interpretation.

Nine-point Hedonic Scale

Verbal Interpretation	Range
9 Like extremely	8.20-9.00
8 Like very much	7.30-8.19
7 Like moderately	6.40-7.29
6 Like slightly	5.50-6.39
5 Neither like nor dislike	4.60-5.49
4 Dislike slightly	3.70-4.59
3 Dislike moderately	2.80-3.69
2 Dislike very much	1.90-2.79
1 Dislike extremely	1.00-1.89

Weighted mean was likewise used to analyze the responses on the quality sensory evaluation of the respondents according to Nine-Points Hedonic Scale (Jimenez et. al, 2014).

The formula was:

$$\mu = \frac{\sum fx}{N}$$

Where:

$$\mu = \text{Weighted mean}$$

f = frequency or number of respondents

x = scores of respondents

N = total number of respondent

Furthermore, ANOVA was used to determine if there is any significant difference between the three treatments.

The formulas are as follows:

Source of variation	Sum of square	Df	Mean square	F
Between	SSB	$df_B = k - 1$	$MSB = \frac{SSB}{df_B}$	$f = \frac{MSB}{MSW}$
Within	SSW	$df_W = N - K$	$MSW = \frac{SSW}{df_W}$	
Total	TSS	$df_T = N - 1$		

Where:

N = sample size

K = number of columns

X = observed value

n = no. of rows

III. RESULTS

3.1. Formulation of Butter Cookie Enriched with native Bicol Pili and Sili Labuyo

The three treatments underwent a standard procedure of product development. Table 2, shows the summary of the results on the acceptability of the formula used in the development of cookie. Findings revealed that the three treatments were varied from each other. Treatment 1 has a highest weighted mean of 8.13 with a verbal interpretation of "Like Very Much". Therefore, the best formula in the development of butter cookie enriched with native bicol pili and sili labuyo was using Treatment 1.

Table 2. Formulation of butter cookie enriched with native Bicol pili and labuyo

Ingredients	Treatment 1	Treatment 2	Treatment 3
Pili	105 gms	110 gms	115 gms
Sili labuyo	2 gms	3.5 gms	5 gms
All -purpose flour (2 nd Class)	500 gms	500 gms	500 gms
Star Margarine/Butter	250 gms	250 gms	250 gms
Eggs	111gms	111 gms	111 gms
Baking powder	29 gms	29 gms	29 gms
Weighted Mean	8.13	8.07	7.97

3.2. Sensory Quality Evaluation of Cookies

The sensory quality of the product was evaluated through its color, palatability, texture, aroma, appearance, and overall consumer acceptance.

Table 3, revealed that Treatment 1 was the most preferred color which gained a total weighted mean of 8.20 and interpreted as "Like Extremely"; this was followed by Treatment 2 of 8.07 weighted mean and Treatment 3 for a weighted mean of 8.00 both were interpreted as "Like Very Much".

In terms of palatability, table 4 shows that Treatment 1 received the highest weighted mean of 8.05 and interpreted as "Like Very Much" by the respondents; while Treatment 3 gained a total weighted mean of 7.62 with the same interpretation to Treatment 1.

Table 3. Color of cookie

Scale Point Description	Assigned Value	Frequency of Responses		
		Treatment 1	Treatment 2	Treatment 3
Like Extremely	9	25	20	22
Like Very Much	8	23	26	20
Like Moderately	7	11	12	14
Like Slightly	6	1	2	4
Neither Like Nor Dislike	5			
Dislike Slightly	4			
Dislike Moderately	3			
Dislike Very Much	2			
Dislike Extremely	1			
Total Responses		60	60	60
Mean Rating		8.20	8.07	8.00
Percentage “Dislike” responses		0%	0%	0%

Table 4. Palatability of cookie

Scale Point Description	Assigned Value	Frequency of Responses		
		Treatment 1	Treatment 2	Treatment 3
Like Extremely	9	18	12	18
Like Very Much	8	29	28	16
Like Moderately	7	11	16	11
Like Slightly	6	2	4	15
Neither Like Nor Dislike	5			
Dislike Slightly	4			
Dislike Moderately	3			
Dislike Very Much	2			
Dislike Extremely	1			
Total Responses		60	60	60
Mean Rating		8.05	7.80	7.62
Percentage “Dislike” responses		0%	0%	0%

When it comes to texture, Table 5 revealed that Treatment 1 earned the highest weighted mean of 8.18 interpreted as “Like Very Much”; and Treatment 2 and 3 the same interpreted as “Like Very Much” with a weighted mean of 8.15.

Table 5. Texture of cookie

Scale Point Description	Assigned Value	Frequency of Responses		
		Treatment 1	Treatment 2	Treatment 3
Like Extremely	9	27	24	23
Like Very Much	8	20	23	25
Like Moderately	7	10	11	10
Like Slightly	6	3	2	2
Neither Like Nor Dislike	5			
Dislike Slightly	4			
Dislike Moderately	3			
Dislike Very Much	2			
Dislike Extremely	1			
Total Responses		60	60	60
Mean Rating		8.18	8.15	8.15
Percentage “Dislike” responses		0%	0%	0%

Table 6, presents the evaluation for aroma of the respondents. It clearly shows that Treatment 1 gained the highest weighted mean of 8.18 interpreted as “Like Very Much”; and Treatment 2 and 3 got the same weighted mean of both 8.15 and interpreted as “Like Very Much”.

Table 6. Aroma of cookie

Scale Point Description	Assigned Value	Frequency of Responses		
		Treatment 1	Treatment 2	Treatment 3
Like Extremely	9	27	24	22
Like Very Much	8	20	22	27
Like Moderately	7	8	11	7
Like Slightly	6	5	3	4
Neither Like Nor Dislike	5			
Dislike Slightly	4			
Dislike Moderately	3			
Dislike Very Much	2			
Dislike Extremely	1			
Total Responses		60	60	60
Mean Rating		8.18	8.15	8.15
Percentage “Dislike” responses		0%	0%	0%

In terms of appearance of the cookie, Table 7 revealed that respondents “Like Extremely” the Treatment 1 which earned a highest weighted mean of 8.35; while “Like Very Much” was received by Treatment 3 with the lowest weighted mean of 8.12.

Table 7. Appearance of cookie

Scale Point Description	Assigned Value	Frequency of Responses		
		Treatment 1	Treatment 2	Treatment 3
Like Extremely	9	32	26	25
Like Very Much	8	21	25	20
Like Moderately	7	5	8	12
Like Slightly	6	2	1	3
Neither Like Nor Dislike	5			
Dislike Slightly	4			
Dislike Moderately	3			
Dislike Very Much	2			
Dislike Extremely	1			
Total Responses		60	60	60
Mean Rating		8.35	8.27	8.12
Percentage “Dislike” responses		0%	0%	0%

The over-all consumer acceptability of the product was revealed in table 8. Treatment 1 gained a highest weighted mean of 8.35 with a verbal interpretation of “Like Extremely”; whilst Treatment 3 was interpreted as “Like Very Much” by the respondents with its total weighted mean of 8.12.

Table 8. Over- all consumer acceptability

Scale Point Description	Assigned Value	Frequency of Responses		
		Treatment 1	Treatment 2	Treatment 3
Like Extremely	9	32	26	25
Like Very Much	8	21	25	20
Like Moderately	7	5	8	12
Like Slightly	6	2	1	3
Neither Like Nor Dislike	5			
Dislike Slightly	4			
Dislike Moderately	3			
Dislike Very Much	2			
Dislike Extremely	1			
Total Responses		60	60	60
Mean Rating		8.35	8.27	8.12
Percentage “Dislike” responses		0%	0%	0%

3.3. Summary Results on the Development and Quality Evaluation of Butter Cookie Enriched with Native Bicol Pili and Sili-Labuyo

Table 9. Sensory quality evaluation of cookies

Acceptability Indicators	T1		T2		T3	
	MEAN	VI	MEAN	VI	MEAN	VI
Color	8.20	LE	8.07	LVM	8.00	LVM
Palatability	8.05	LVM	7.80	LVM	7.62	LVM
Texture	8.18	LE	8.15	LE	8.15	LE
Aroma	8.15	LE	8.12	LE	8.12	LE
Appearance	8.38	LE	8.27	LE	8.12	LE
Over-All Consumer Acceptability	7.80	LVM	8.00	LVM	7.80	LVM
Average Weighted Mean	8.13		8.07		7.97	
Verbal Interpretation	LVM		LVM		LVM	
Percentage "Dislike" responses	0%		0%		0%	

In general, the highest sensory evaluation of the product in terms of color, palatability, texture, aroma, appearance, and overall consumer acceptability was attributed to Treatment 1 which received the highest weighted mean of 8.13 and interpreted as "Like Very Much" by the samples respondents; and a lowest 7.97 weighted mean was earned by Treatment 3.

These findings implied that among the three replicated treatments used in the study, Treatment 1 is the most preferred cookie by the respondents as resulted in the survey and presented in table 9. Furthermore, there was no dislike responses noted from the respondents.

Table 10. ANOVA Table.

Source of Variation	SS	df	MS	F Value	Tabular F
Between Groups	0.076944	2	0.038472	1.064926	Alpha Level at 0.05 = 3.68232
Within Groups	0.5419	15	0.036127		

Decision:

Ho = is rejected

Ha = is accepted

The three treatments used in the study of the Development and Quality Evaluation of Butter Cookie Enriched with Native Bicol Pili and Sili Labuyo indicates that there is no significant difference between the three replicated samples since the computed F Value (1.064926) is less than the tabular F Value at Alpha level at 0.05 (3.68232).

3.4. Physical and Nutritional Property Components of Cookies

Table 11 shows the record of thickness (mm) and weight (g) of each sample cookies. Treatment 1, has an 8.0 mm. thickness and 6 g. of weight; Treatment 2 measures 8.5 mm. with 6.5 g. weight; while Treatment 3 was 9.0 mm. in thickness and 7 g. in weight

Table 11. Cookies physical measurement

Treatment	Thickness (mm)	Weight (g)
T ₁	8.0 mm	6 g
T ₂	8.5 mm	6.5 g
T ₃	9.0 mm	7 g

Table 12 presents the nutritional property components of the cookies enrich with native pili and sili-labuyo. The computation was based on the food composition table (for cookies with Pili Nut, per 100 grams Edible Portion).

Table 12. Nutritional property components

Nutritional Value	Content
Water	1.5 g
Energy	532 kcal
Protein	6.6 g
Fat	28.3 g
Carbohydrates	62.6 g
Ash	1.0 g
Calcium	12.2 mg
Phosphorus	111 mg
Iron	2.4 mg
Thiamine	0.16 mg
Riboflavin	0.27 mg
Niacin	0.6 mg
Ascorbic acid (Vit.C)	240%
Vitamin B-6 (Pyridoxide)	39%
Vitamin A	32%
Iron	13%
Copper	14%
Potassium	7%

IV. FINDINGS

This experimental research revealed that among the three replicated treatments used in the study, Treatment 1 is the most preferred cookie by the respondents as resulted in the survey. Further, there was no dislike responses noted from the respondents. There is also no significant difference among the sample cookies as reflected in the aforementioned findings.

V. CONCLUSION

The development and quality evaluation of Butter Cookie enriched with native Bicol Pili and Sili Labuyo possesses a high level of likeness as to color, palatability, texture, aroma, appearance, and overall consumer acceptability. Moreover, the nutritional contents of the product are comparable to other commercialized cookies and may also be introduced to teenagers/adults and elderly groups.

VI. RECOMMENDATION

Cookies can be developed using the above tested formula (Treatment 1). The Pili and Sili Labuyo can be used as functional ingredients on the dietary needs and can enhance the quality of the product. Likewise, the product can also be introduced in the local commercial market.

VII. ACKNOWLEDGMENT

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