

## ACCEPTABILITY OF CANISTEL (*LACUMA NERVOSA* A.DC) FRUIT FLOUR IN MAKING COOKIES

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### ABSTRACT

*This experimental research determined the acceptability in terms of appearance, aroma, texture, flavor and general acceptability of canistel (*Lacuma nervosa* A. DC) fruit flour in different proportions in making cookies. This study was conducted in December 2011 at West Visayas State University – Calinog Campus, Calinog, Iloilo. Five treatments were used in the study – four of them utilized canistel fruit flour at various proportions and one treatment was used as the control group which utilized all purpose flour. The respondents of the study were the 15 faculty and staff, 15 Food Technology and BSHRM students of WVSU - Calinog Campus, and 15 housewives at Brgy. Simsiman, Calinog, Iloilo who were selected through purposive sampling. The respondents evaluated the finished products using a modified sensory evaluation score sheet based on Five Point Hedonic Scale. There were five treatments replicated three times. The statistical tools used were the means, standard deviation, One – Way Analysis of Variance, and the LSD. The .01 alpha level was used as the criterion for acceptance or rejection of the null hypotheses. The study revealed that cookies prepared using all treatments were “liked very much” in terms of appearance, aroma, texture, flavor and general acceptability. While cookies with 100% all - purpose flour were liked moderately by the evaluators.*

*These results led to the conclusion that there is a significant difference that existed in the level of acceptability of canistel fruit flour in making cookies in terms of aroma, texture, flavor and general acceptability, therefore the null hypothesis is rejected. However, no significant difference in the level of acceptability of canistel fruit flour in making cookies in terms of appearance, therefore the null hypothesis is accepted.*

**Keywords:** canistel; fruit; flour; and cookies

### I. INTRODUCTION

Fruits play an important role in the human diet by providing nutritionally essential nutrients such as vitamins, carbohydrates, protein and others. However, many fruits are highly seasonal. Hence, fruits preservation is highly helpful since the consuming public never grows tired of preserved fruits, especially when fresh ones are out of season. Various processing methods are being employed to prolong storage life of fruits since fruits are highly perishable foods and thereof have to be either consumed fresh or processed for future use.

The country is blessed with natural resources and there are a lot of indigenous fruits such as canistel which, if processed and utilized, can be used as main ingredient in the preparation of cookies as snack items as source of income for the family.

Canistel fruit as an indigenous fruits abundant in our place. For this reason, it is very cheap but its nutritive value is high. It is being abundant locally stimulated the researcher to think of ways as to how it could be utilized into food products which would be beneficial to consumers, producers, fruit farmers and other sectors.

Canistel fruit are quite neglected compared to other tropical fruits. Many do not eating ripe, fresh canistel fruit because their flesh is too dry and its stick to the gum and teeth. Also, it contains latex if the fruit is eaten when not fully ripe. By processing canistel fruit into flour another product will be developed, thus enhanced the flavor, the reason why this study was conducted.

### II. OBJECTIVES OF THE STUDY

This study was an attempt to determine the acceptability of canistel fruit flour in different proportions with all-purpose flour in making cookies. Specifically the study aimed to determine the level of acceptability in terms of appearance, aroma, texture, flavor and general acceptability of cookies made from different proportions of canistel fruit flour and all-purpose flour and to test the differences in the acceptability level in terms of appearance, aroma, texture, flavor and general

acceptability of cookies made from different proportions of canistel fruit flour and all-purpose flour.

### III. MATERIALS AND METHODS

#### Research Design

This study was an experimental research. Experimental research is the method or procedure involving the control or manipulation of conditions for the purpose of studying the relative effects of various treatments applied members of sample or of the same treatment applied to members of different samples (Good in Calderon, 1993). The experimental research was designed in which evaluators manipulates and controls one independent variable for the variation concomitant to the manipulation of the dependent variable (Caipang, 2004). In this study Randomized Complete Block Design (RCBD) was utilized. This is the most appropriate for experiment with homogenous experimental units were environmental effects could be easily controlled. In this study the cookies mixture was prepared and the amount of canistel fruit flour was added in different proportions as variations such as Proportion A – 100% canistel fruit flour; Proportion B – 75% canistel fruit flour and 25% all-purpose flour; Proportion C – 50% canistel fruit flour and 50% all-purpose flour; Proportion D – 25% canistel fruit flour and 75% all-purpose flour; and Proportion E – 100% all-purpose flour.

#### Sampling Design

Purposive sampling was employed in the selection of the respondents of this study. Purposive sampling as a non-scientific sampling design is based on selecting the individuals as samples according to the purposes of the researcher as his controls. An individual is selected as part of the sample due to good evidence that he is representative of the total population (Calmorin et al., 2007).

### Evaluators of the Study

In this experimental study, a group of 45 evaluators composed of fifteen (15) faculty and staff, fifteen (15) Food Technology and BSHRM students of West Visayas State University-Calinog Campus and fifteen (15) housewives at Brgy. Simsiman, Calinog, Iloilo acted as respondents of this study. They evaluated the finished products in terms of the variables of this experiment. They were selected purposively for this study, considering their expertise and availability. The main sources of data were the responses of the evaluators which were indicated in the sensory evaluation score sheets that were used for evaluating the products in terms of appearance, aroma, texture, flavor and general acceptability of canistel.

### Materials, Tools and Equipment

In the conduct of the study, canistel fruit were cut into chips, dried and grinded. Other ingredients like all-purpose flour, margarine, eggs, sugar vanilla and baking powder were purchased from the supermarket. The tools, utensils and other equipment used were measuring cups, measuring spoons, sifter, peeler, grater, utility tray, plates, fork, weighing scale, knife, mixing bowl, working table and oven used in baking.

### Instrument

The modified sensory evaluation score sheet based on Five-Point Hedonic Scale was used to gather data (Gatchalian, 1989: 240). Each replication of the five treatments was evaluated with the following scores and their description: five (5) as liked extremely; four (4) as liked very much; three (3) as liked moderately; two (2) as liked slightly; and one (1) as disliked. These scores were assigned for evaluating the products as to appearance, aroma, texture, flavor and general acceptability.

### Procedure

The experimental procedure was divided into four phases: the processing of canistel fruit into flour, testing and re-testing of the recipe, standardization of the recipe and evaluation by the panel of evaluators.

#### Phase I – Preparation of Canistel Fruit Flour

Process Flow for Canistel Fruit Flour

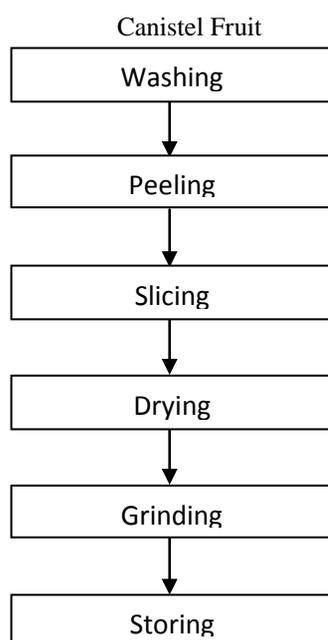


Figure 1. Steps in the preparation of canistel fruit flour

The first step was washing of the canistel fruits. The canistel fruits were washed thoroughly for hygienic and sanitary purposes. Then, the same were peeled using a knife or vegetable peeler. The fruits were then sliced into chips. The fourth step was drying of the canistel chips under the heat of the sun to free them from any moisture. Grinding was done through the use of an electric grinding machine until fine texture had been obtained. The sixth step was storing. The canistel fruit flour was placed in a clean jar with cover to avoid contamination.

#### Phase II – Preparation of Ingredients, Materials, Tools and Equipments

The ingredients used in this study were canistel fruit flour, margarine, oil, all-purpose flour, sugar, vanilla, eggs and baking powder. Tools and utensils used were casserole, measuring cups, spoons, ladle, knife, sifter, tray, grater, wooden spoon, chopping board, grinder, spoon and oven for baking.

#### Phase III – Testing and re-testing of the Recipe

The following proportions and procedure were followed in trying of the recipes.

Ingredients	A	B	C	D	E
Canistel fruit flour	3 c	2 ¼ c	1 ½ c	¾ c	
All-purpose flour		¾ c	1 ½ c	2 ¼ c	3 c
Eggs	1 pc.				
Baking powder	1 tsp.				
Margarine	1 c	1 c	1 c	1 c	1 c
Vanilla	1 tsp.				
Sugar	1 c	1 c	1 c	1 c	1 c

Legend:

A – 100% canistel fruit flour

B – 75% canistel fruit flour and 25% all-purpose flour

C – 50% canistel fruit flour and 50% all-purpose flour

D – 25% canistel fruit flour and 75% all-purpose flour

E – 100% all-purpose flour

Procedure:

Prepare all necessary ingredients and materials needed. Soften the margarine and add sugar gradually. This process is known as creaming. Add egg. Shift the flour and the baking powder combining them along the process. Add the flour mixture gradually and continue creaming until well blended. Drop the flour mixture by spoonfuls into greased baking sheets. Bake until done. Allow the cookies to cool before packing them.

The data in Table 1 showed the proportions of the ingredients in the try-out recipe of the canistel cookies. Along the process of making canistel cookies, the searcher observed the following; 1) consistency as well as texture, color, and aroma changed when heat was applied, 2) odor became aromatic. The different groups of evaluators suggested the following for the first try-out of canistel cookies: 1) The taste was good but needed to be modified, 2) add more eggs, and 3) reduce the sugar.

After all comments and suggestions were followed the second and third try-outs were found out to be acceptable. The final recipe was prepared. This was considered to be the standardized recipe after it went through modifications and refinements.

#### Part IV – Standardized Recipe of Canistel Cookies

After thorough try-out and revisions of the recipe, the standardized recipe was finalized. The standardized recipe of

the five proportions of canistel cookies and its procedure are presented below.

Table 2

standardized recipe for Canistel fruit flour cookies					
Ingredients	A	B	C	D	E
Canistel fruit flour	3 c	2 ¼ c	1 ½ c	¾ c	
All-purpose flour		¾ c	1 ½ c	2 ¼ c	3 c
Eggs	2 pc.				
Baking powder	1 tsp.				
Margarine	1 c	1 c	1 c	1 c	1 c
Vanilla	1 tsp.				
Sugar	1/2 c				

Procedure:

Prepare all ingredients and utensils needed. Measure all ingredients accurately. Shift together flour and baking powder. Cream margarine until soft and fluffy. Add sugar gradually by teaspoon and continue creaming. Add sugar one at a time and vanilla, continue creaming until well blended. Add egg one at a time and vanilla. Add flour mixture. Drop by spoonful unto greased baking sheet. Bake until done. Cool and serve.

#### Phase V – Evaluation of Canistel Fruit Flour Cookies in Different Proportions

After the different proportions had been formulated and standardized, the final product was prepared for final evaluation. These replications of canistel cookies were evaluated by HRM and Food Technology instructors, students and faculty and staff of WVSU-CC in terms of appearance, aroma, texture, flavor and general acceptability. The criteria were discussed and instructions were given to the members of the evaluation panel. The evaluators were instructed to rinse their mouth after every testing of the product.

#### Data Processing Techniques

After the evaluation of the finished products, the score sheets were gathered; scores were tallied, summarized and prepared for computation. The mean was used in determining the level of acceptability of the product as to appearance, aroma, texture, flavor and general acceptability. The following scale of means will be used in the interpretation of data:

4.20 - 5.00	-	Liked extremely
3.4 - 4.19	-	Liked very much
2.6 - 3.39	-	Liked moderately
1.8 - 2.59	-	Liked slightly
1.0 - 1.79	-	Disliked very much

To determine whether a significant difference existed in the perception among the three groups of evaluators, the One-Way Analysis of Variance was computed set at .01 alpha.

## IV. RESULTS AND DISCUSSION

### Acceptability of Canistel Fruit Flour Cookies in Terms of Appearance

Appearance is the act of appearing as to the eyes or mind before the public; the sensory or phenomenal aspect of existence to the observer (Flexner, 1993). It is also the outward aspects of anything (Webster, 1996).

Table 3 presents the summary of the mean ratings in terms of appearance of cookies using various proportions of canistel fruit flour and all-purpose flour.

Table 3  
Mean ratings for the acceptability of Canistel Fruit Flour Cookies in terms of appearance

Proportions	Mean	Interpretation
A – 100% canistel fruit flour	4.13	Liked very much
B – 75% canistel fruit flour and 25% all-purpose flour	4.00	Liked very much
C – 50% canistel fruit flour and 50% all-purpose flour	4.18	Liked very much
D – 25% canistel fruit flour and 75% all-purpose flour	4.11	Liked very much
E – 100% all-purpose flour	3.93	Liked very much

As shown in Table 3, the obtained mean of Proportion A (100% canistel fruit flour) was 4.13; Proportion B (75% canistel fruit flour and 25% all-purpose flour) was 4.00; proportion C (50% canistel fruit flour and 50% all-purpose flour) was 4.18; Proportion D (25% canistel fruit flour and 75% all-purpose flour) was 4.11; and Proportion E (100% all-purpose flour) was 3.93. This means that Proportions A, B, C, D, and E as to appearance were liked very much by the respondents. Proportion C obtained the highest mean and was rated by the respondents as “liked very much”, due to appealing color, uniform shape and pleasing to the eyes that made the product more acceptable to the respondents.

The present study which is cookies prepared in different proportions of canistel fruit flour were all acceptable up to 100%. The natural color of canistel fruit which is yellow gives an attractive appearance to the canistel cookies making it acceptable to the respondents.

The result of the study is similar to the findings of Dativas (2008), the right blending of natural color of mango which is yellow and the natural color of tomato which is red gave the tart an appearance that is pleasing to the eyes. This makes the product more acceptable to the respondents who rated all proportions as liked very much.

On the present study, cookies prepared in different proportions of canistel fruit flour were all acceptable up to 100%. The natural color of canistel fruit flour which is egg yellow gives an attractive appearance to the canistel cookies making it acceptable to the respondents. This means that the attractive appearance of the color plays an important factor in the acceptability of the product. The natural color of the canistel fruit flour which is egg yellow that is present in the canistel cookies influenced how the canistel cookies were rated as “liked very much” by the respondents. As discussed by the Hussain et al (2006) color is very important parameter in judging properly baked cookies. It doesn't only reflect the suitable raw materials used for the preparation but also provides information about the formulation and quality of the product.

This implies that the natural color of canistel fruit flour which is egg yellow gives an attractive appearance to the canistel cookies making it acceptable to the respondents.

### Differences in the Acceptability of Canistel Fruit Flour cookies in Different Proportions in Terms of Appearance

Table 4 presents the One-Way Analysis of Variance results for the acceptability levels in terms of appearance of canistel fruit flour cookies in different proportions.

The ANOVA results in Table 4 shows no significant differences in the acceptability levels in terms of appearance of the cookies made from different proportions of canistel fruit flour and all-purpose flour. This was shown by the p-value of .754 which is greater than .01 alpha level. This means that despite the numerical differences in means of the five proportions, their acceptability levels in terms of appearance are the same.

Table 4  
ANOVA Results for the Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of Appearance

Source of Variance	Sum of Squares	df	Mean Sum of Squares	F Value	p-Value
Between Groups	1.840	4	.460	.475	.754
Within Groups	213.022	220	.968		
Total	214.862	224			

\*p < .01 significant at .01 alpha level

This result of the present study was similar with the findings of Dolletes' (1996) which showed that there was no significant difference on the perceptions of the group of evaluators as to the appearance of Pastillas de Nangka. This implies that appearance as determined by the color, shape, size and the general arrangement of the food does not differ from one product to another product and that the color of the food greatly contributes to its aesthetic appreciation (De Leon, 1999).

Therefore, the null hypothesis stating no significant differences in the acceptability levels of cookies made from different proportions of canistel fruit flour is accepted.

#### Acceptability of Canistel Fruit Flour Cookies in Terms of Aroma

Table 5 presents the mean ratings in terms of aroma of cookies made from different proportions of canistel fruit flour and all-purpose flour.

Table 5  
Mean ratings for the Acceptability of Canistel Fruit Flour Cookies in Terms of Aroma

Proportions	Mean	Interpretation
A – 100% canistel fruit flour	4.20	Liked extremely
B – 75% canistel fruit flour 25% all-purpose flour	4.13	Liked very much
C – 50% canistel fruit flour 50% all-purpose flour	3.71	Liked very much
D – 25% canistel fruit flour 75% all-purpose flour	3.76	Liked very much
E – 100% all-purpose flour	3.11	Liked moderately

Aroma is an odor arising from spices, plants, cooking, etc., especially an agreeable scent; fragrance (Flexner, 1993). As shown in Table 5, Proportion A (100% canistel fruit flour) obtained the highest mean with 4.20; Proportion B (75% canistel fruit flour and 25% all-purpose flour) had 4.13; Proportion C (50% canistel fruit flour and 50% all-purpose flour) had 3.71; Proportion D (25% canistel fruit flour and 75% all-purpose flour) had 3.76; and Proportion E (100% all-purpose flour) had 3.11. The aroma of the cookies in Proportion A was liked extremely, Proportions B, C and D were liked very much and Proportion E was liked moderately by the respondents.

These findings were consistent with those of Baroques (1992) whose study revealed the possibility in the preparation of the ten recipes made out of squash. Findings showed that squash can be made into flour and that all ten recipes can be prepared successfully out of squash flour. The results of the study revealed that as to aroma, the squash yema have the highest mean rating of 7.41 which means that it was liked very much by the respondents.

In the present study, cookies prepared in different proportions of canistel fruit flour revealed that the aroma was liked very much by the respondents. The natural odor of canistel fruit flour plays a very important role in the acceptance or rejection of a certain product. This means that the

pleasantness of odor of canistel cookies plays an important factor in the acceptability of the product. Specific foods are associated with specific odors (De Leon, 1999).

#### Differences in the Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of Aroma

Table 6 presents the ANOVA results for the differences in the acceptability levels in terms of aroma of cookies made from different proportions of canistel fruit flour and all-purpose flour.

Table 6  
ANOVA Results for the Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of Aroma

Source of Variance	Sum of Squares	df	Mean Sum of Squares	F Value	P Value
Between Groups	33.929	4	8.482	9.406	.000*
Within Groups	198.400	220	.902		
Total	232.329	224			

\*P < .01 significant at .01 alpha level

Table 6 reveals significant differences in the acceptability levels in terms of aroma of the cookies made from different proportions of canistel fruit flour and all purpose flour. This is shown by the p-value of .000\* which is less than .001. This led to the rejection of the null hypothesis which states that there is no significant difference in the acceptability levels in terms of aroma of cookies made from the different proportions of canistel fruit flour and all-purpose flour.

Table 7 presents the multiple comparison test LSD for the significant ANOVA results in Table 6 as to aroma.

Table 7  
Post Hoc (LSD) Test Results for the Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of Aroma

Compared Proportions	Mean Diff.	p-value	Decisions
A B	.0667	.739	Accept Ho
A C	.4889	.015	Accept Ho
A D	.4444	.027	Accept Ho
A E*	1.0889	.000	Reject Ho
B C	.4222	.036	Accept Ho
B D	.3778	.060	Accept Ho
B E*	1.0222*	.000	Reject Ho
C D	-	.825	Accept Ho
C E*	.0444	.003	Reject Ho
D E*	.6000*		
D E*	.6444	.001	Reject Ho

\* The mean difference is significant at the .01 alpha level.

Table 7 presents the Multiple Comparison Test (LSD) for the significant ANOVA results in Table 6. It shows that Proportions A, B, C and D does not significantly differ from one another in terms of aroma. This means that, despite the numerical differences, the acceptability levels in terms of aroma of the aforementioned proportions are the same. On the other hand, the acceptability level in terms of aroma of Proportion E significantly differs from those of the other proportions.

### Acceptability of Canistel Fruit Flour in Terms of Texture

Texture is the visual or tactile surface characteristics and appearance of something; a basic scheme or structure (Mish 2003). Table 8 presents the summary of the mean ratings for the acceptability in terms of texture of cookies made from different proportions of canistel fruit flour and all-purpose flour.

Table 8  
Mean Ratings for the Acceptability of Canistel Fruit Flour Cookies in Terms of Texture

Proportions	Mean	Interpretation
A – 100% canistel fruit flour	3.44	Liked very much
B – 75% canistel fruit flour 25% all-purpose flour	3.80	Liked very much
C – 50% canistel fruit flour 50% all-purpose flour	4.07	Liked very much
D – 25% canistel fruit flour 75% all-purpose flour	4.04	Liked very much
E – 100% all-purpose flour	3.64	Liked very much

Table 8 shows that the cookies in all proportions were “liked very much” by the respondents. The cookies in Proportion A (100% canistel fruit flour) obtained a mean rating of 3.44; Proportion B (75% canistel fruit flour and 25% all-purpose flour) had 3.80; Proportion C (50% canistel fruit flour and 50% all-purpose flour) had 4.07; Proportion D (25% canistel fruit flour and 75% all-purpose flour) had 4.04; and Proportion E (100% all-purpose flour) had 3.64. This implies that the texture was appropriate – not too soft nor too hard.

These findings agree with the study of Valeros (2000) that the texture in terms of tenderness and flavor of doughnuts from 50% wheat flour and 50% langka seeds were as desirable as the doughnuts from pure wheat flour. This implies that the greater the amount of potato flour the better the texture of potato cookies becomes and the coarser and harder they become.

In the present study, canistel cookies made from 50% commercial wheat flour obtained the highest mean due to the tenderness and crispiness of the canistel cookies which consequently influenced how the canistel cookies were rated as “liked very much” by the respondents. This means that the crispiness to be significant must be affected by blend proportions but not by temperature and interaction. Crispiness, which is related to the formation of the spongy-like structure of the cookies, is dependent on the moisture content. Crispiness, fundamentally, is important in determining the consumer acceptability of cookies (Pareyt and Delcom, 2008). In cookies, loss of moisture from the interior is required to produce the desired crispy texture (Fellows, 2000).

### Differences in the Acceptability of Canistel Cookies in Different Proportions in Terms of Texture

Table 9 presents the ANOVA results for the differences in the acceptability levels in terms of texture of the cookies made from different proportions of canistel fruit flour and all-purpose flour.

Table 9  
ANOVA results for the Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of Texture.

Source of Variance	Sum of Squares	Df	Mean Sum of Squares	F Value	P Value
Between Groups	12.667	4	3.167	3.328	.011
Within Groups	209.333	220	.952		
Total	222.00	224			

\* P < .01 significant at .01 alpha level

Table 9 shows that there are no significant differences in the acceptability levels in terms of texture of cookies made from different proportions of canistel fruit flour and all-purpose flour. This was shown by the p-value of .011 which is greater than .01. This means that despite the numerical differences in means, the acceptability levels of the cookies in all proportions are the same. This led to the acceptance of the null hypothesis which states that there is no significant difference in the acceptability levels in terms of texture of cookies made from different proportions of canistel fruit flour and all-purpose flour.

On the other hand, these findings conformed to the study of Ortigas (1999) on “The Effect of Sugar Substitute on the Sensory Quality of Tiesa Candy Bar.” The results showed that significant differences in terms of texture in Formation H2 with 50% honey and 50% sucrose and formulation G2 with 50% glucose and 50% existed.

### Acceptability of Canistel Fruit Flour Cookies in Terms of Flavor

Flavor is the taste, especially the distinctive taste of something as it is experienced in the mouth. A substance or extract that provide a particular taste (Flexner, 1993: 732).

Table 10 presents the summary of the mean ratings for the acceptability in terms of flavor of cookies made from different proportions of canistel fruit flour and all-purpose flour.

Table 10  
Mean ratings for the Acceptability of Canistel Fruit Flour Cookies in Terms of Flavor

Proportions	Mean	Interpretation
A – 100% canistel fruit flour	3.80	Liked very much
B – 75% canistel fruit flour 25% all-purpose flour	4.13	Liked very much
C – 50% canistel fruit flour 50% all-purpose flour	3.96	Liked very much
D – 25% canistel fruit flour 75% all-purpose flour	3.93	Liked very much
E – 100% all-purpose flour	3.27	Liked moderately

Table 10 shows that the cookies in Proportion A (100% canistel fruit flour) obtained a mean rating of 3.80; Proportion B (75% canistel fruit flour and 25% all-purpose flour) had 4.13; Proportion C (50% canistel fruit flour and 50% all-purpose flour) had 3.96; Proportion D (25% canistel fruit flour and 75% all-purpose flour) had 3.93; and Proportion E (100% all-purpose flour) had 3.27. The table further shows that the cookies in Proportions A to D were “liked very much” by the respondents while Proportion E was liked moderately. The findings contradicted the initial impression given by some evaluators that they did not like canistel fruit. However, when it was baked as cookies they liked them very much. This implies that the flavor of canistel cookies was appropriate, not too bland nor too sweet. The flavor of the cookies was found to decrease with an increase in proportion of taro flour which was opposite to canistel cookies. The cookies with no canistel obtained the lowest rating.

The findings in the present study on cookies prepared in different proportions of canistel fruit flour and all-purpose flour revealed that, as to favor, they were liked very much by the respondents. The natural flavor of the canistel fruit flour which is sweet influenced how the canistel cookies were rated by the respondents.

### Differences in the Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of Flavor

Table 11 presents the ANOVA results for the differences in the acceptability levels in terms of flavor of the cookies made

from different proportions of canistel fruit flour and all-purpose flour.

Table 11  
ANOVA Results for the Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of Flavor

Source of Variance	Sum of Squares	df	Mean Sum of Squares	F Value	p-value
Between Groups	19.618	4	4.904	4.906	.001
Within Groups	219.911	220	1.000		
Total	239.529	224			

\*p < .01 significant at .01 alpha level

Table 11 shows that there are significant differences in the acceptability levels in terms of flavor of the cookies made from different proportions of canistel fruit flour and all-purpose flour. This was shown by the p-value of .001 which is less than .01. Therefore, the null hypothesis which states that there are no significant differences in the acceptability levels in terms of flavor of the cookies made from different proportions of canistel fruit flour and all-purpose flour is not accepted.

Flavor is perceived through the combination of odor and taste. There are important attributes of food products which greatly determine their acceptance or rejection. These findings did not conform to the research results reported by Tapang and Del Rosario (1997) on the suitability of sweet potato flour as wheat flour substitute in pandesal formation. This implies that the lesser the amount of potato flour to all-purpose flour the more pleasing the favor becomes and the more acceptable the taste is.

In this new study which is acceptability of canistel fruit flour, it contradicts to the research results reported by Tapang and Del Rosario (1997). The present study implied that more amount of canistel fruit flour added to all-purpose flour, the more pleasing the favor becomes and the more acceptable the taste is.

Table 12 presents the post-hoc results for significant ANOVA results in Table 11. The multiple comparison results in Table 12 shows that there are no significant differences among the acceptability levels in terms of flavor among Proportions A, B, C, and D.

Table 12  
Post Hoc (LSD) Test Results for the Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of Flavor

Compared Proportions	Mean Diff.	p-value	Decisions
A B	-.3333	.115	Accept Ho
A C	-.1556	.461	Accept Ho
A D	-.3333	.528	Accept Ho
A E*	.5333	.012	Reject Ho
B C	.1778	.400	Accept Ho
B D	.2000	.344	Accept Ho
B E*	.8667*	.000	Reject Ho
C D	.0222	.916	Accept Ho
C E*	.6889*	.001	Reject Ho
D E*	.6667	.002	Reject Ho

\* The mean difference is significant at the .01 alpha level.

This means that despite the numerical differences in their mean ratings the acceptability levels of the four proportions are statistically the same. On the other hand, Proportion B, C, and D had significantly higher acceptability levels in terms of flavor than Proportion E, with p-values of .000, .001 and .002, respectively, which are all lower than .01.

### Acceptability of Canistel Fruit Flour Cookies in Terms of General Acceptability

General acceptability is the quality or state of being agreeable aspect of a thing as a whole. Table 13 presents the summary of the mean ratings for the general acceptability of cookies made from different proportions of canistel fruit flour and all-purpose flour.

Table 13  
Mean Ratings for the Acceptability of Canistel Fruit Flour Cookies in Terms of General Acceptability

Proportions	Mean	Interpretation
A – 100% canistel fruit flour	3.89	Liked very much
B – 75% canistel fruit flour 25% all-purpose flour	4.02	Liked very much
C – 50% canistel fruit flour 50% all-purpose flour	3.98	Liked very much
D – 25% canistel fruit flour 75% all-purpose flour	3.96	Liked very much
E – 100% all-purpose flour	3.45	Liked very much

Table 13 shows the mean ratings of the general acceptability levels of cookies made from different proportions of canistel fruit flour in making cookies. The results show that Proportion B (75% canistel fruit flour and 25% all-purpose flour) obtained the highest mean, with 4.02; followed by Proportion C 50% canistel fruit flour and 50% all-purpose flour) with a mean of 3.98; Proportion D (25% canistel fruit flour and 75% all-purpose flour) with the mean of 3.96, Proportion A (100% canistel fruit flour) got the mean of 3.89; and Proportion E (100% all-purpose flour) got the least of 3.45. All the five proportions were “liked very much” by the respondents. This result is the same with the report of Roldan (2003). Her study revealed that Proportion B (50:50) is the most acceptable among the four proportions as to general acceptability. The findings further showed that there is a significant difference between Proportions A and Proportion C (75% squash and 25% all-purpose flour) in terms of general acceptability.

Sinobens’ (2004) study on “pandesal enriched with carrot puree” was affirmed by this present investigation. The result of the study showed that Treatment A, B, and C of pandesal enriched with carrot puree were liked very much and were acceptable to the students, teachers and housewives in terms of color, volume, crust, flavor, aroma and general acceptability.

In the present study, the result showed that Treatment A (100% canistel fruit flour), Treatment B (75% canistel fruit flour and 25% all-purpose flour), Treatment C (50% canistel fruit flour and 50% all-purpose flour, Treatment D (25% canistel fruit flour and 75% all-purpose flour), Treatment B (100% all-purpose flour) were liked very much by the students, faculty and staff and housewives in terms of color, aroma, texture, flavor and general acceptability. This implies that canistel fruit flour in different proportions can be utilized as a main ingredient in making cookies. The color of cookies was presentable and pleasing to the sight; they were aromatic and pleasing to the sense of smell; its crunchiness was acceptable as well as its crispiness and tenderness and its taste was not so sweet with some canistel taste.

### Differences in the Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of General acceptability

Table 14 presents the ANOVA results for the significance of the differences in the general acceptability levels of cookies made from various proportions of canistel fruit flour and all-purpose flour.

Table 14  
Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of General Acceptability

Source of Variance	Sum of Squares	Df	Mean Sum of Squares	F Value	p Value
Between Groups	8.624	4	2.107	3.418	.010*
Within Groups	135.578	220	.616		
Total	144.004	224			

\*p < .01 significant at .01 alpha level

Table 14 shows that there are significant differences among the general acceptability levels of the various proportions of canistel cookies with a p-value of .010 which is equal to .01. Therefore, the null hypothesis which states that there are no significant differences among the general acceptability levels of cookies made from different proportions of canistel fruit flour and all-purpose flour is rejected. This means that variations in the proportions of canistel fruit flour and all-purpose flour cause significant variations in the general acceptability levels of the cookies.

Table 15 presents the post-hoc test for significant ANOVA results in Table 14. The multiple comparison test results in Table 15 shows that there are no significant differences among the general acceptability levels of Proportions A, B, C and D. On the other hand, the results revealed that Proportions B, C and D have significantly difference in terms of the acceptability level.

Table 15  
Post Hoc (LSD) Test Results for the Acceptability of Canistel Fruit Flour Cookies in Different Proportions in Terms of General Acceptability

Compared Proportions	Mean Diff.	p-value	Decisions
A B	-.1222	.461	Accept Ho
A C	-.0833	.615	Accept Ho
A D	-.0667	.687	Accept Ho
A E*	.4056	.015	Accept Ho
B C	.389	.814	Accept Ho
B D	.0556	.737	Accept Ho
B E*	.5278	.002	Reject Ho
C D	.0167	.920	Accept Ho
C E*	.4889	.003	Reject Ho
D E*	.4722	.005	Reject Ho

\* The mean difference is significant at the .01 alpha level.

In the findings of Tekle (2009), the LSD analysis of the means revealed that the overall acceptability of 33.33% taro flour cookies was not significantly different from the control. The average mean score of overall acceptability of 33.33% taro flour cookie was above 7 (liked moderately) suggesting that it was well above minimum acceptable score. Therefore, the supplementation of taro flour up to 33% was observed to have no significant difference with wheat flour snapped cookies (control) with respect to overall acceptability.

#### Cost Analysis of Raw Ingredients

Table 16 shows the cost analysis of the raw ingredients.

Table 16  
Cost Analysis of Raw Materials

Ingredients	PROPORTION									
	A		B		C		D		E	
	Qty.	Cost	Qty.	Cost	Qty.	Cost	Qty.	Cost	Qty.	Cost
Canistel flour	240g	20.00	180g	17.50	120g	15.00	60g	5.00		
All-purpose flour			60g	9.38	120g	18.75	180g	23.13	240g	37.50
Eggs	2 pcs.	10.00	2 pcs.	10.00	2 pcs.	10.00	2 pcs.	10.00	2 pcs.	10.00
Baking powder	5g	1.00	5g	1.00	5g	1.00	5g	1.00	5g	1.00
Margarine	240g	15.00	240g	15.00	240g	15.00	240g	15.00	240g	15.00
Vanilla	5g	0.05	5g	0.05	5g	0.05	5g	0.05	5g	0.05
Sugar	240g	10.00	240g	10.00	240g	10.00	240g	10.00	240g	10.00
Total Cost		56.05		62.93		69.80		69.18		73.55
No. of Yield		64 pcs.		55pcs.		56 pcs.		54 pcs.		57 pcs.
Cost per piece serving		P 0.88		P 1.14		P 1.25		P 1.28		P 1.29

The result showed that among the various preparations of canistel cookies Proportion A entailed the least cost per serving, with 0.88 pesos. Table further shows that 100% all-purpose flour has the total cost of 73.55 which is the highest total cost while 100% canistel fruit flour has the total cost of 56.05 pesos, 25% canistel fruit flour and 75% all-purpose flour have the total cost of 69.18 pesos, 50% canistel fruit flour and 50% all-purpose flour have the total cost of 69.80 pesos and 75% canistel fruit flour and 25% all-purpose flour have the total cost of 62.93 pesos.

As to number of servings, cookies prepared with 100% canistel fruit flour yielded 64 servings which means that cookies made of 100% canistel fruit flour have the highest number of servings while 25% canistel fruit flour with 75% all-purpose flour has the lowest number of servings. As to the cost per serving, 100% all-purpose flour is the most expensive compared to other proportions using canistel fruit flour and with less all-purpose flour.

#### V. CONCLUSION AND RECOMMENDATION

Variations in the proportions of canistel fruit flour and all-purpose flour cause significant variations in the acceptability of the cookies in terms of aroma, flavor and general acceptability; however, the acceptability levels of their appearance are statistically the same regardless of variations in proportion. Canistel fruit flour in different proportions can be utilized as main ingredient and can even be substituted to all-purpose flour in making cookies.

Since the canistel cookies proved to be very acceptable, wide dissemination of the result of this investigation is encouraged in the form of training seminars, research for a workshop. Canistel fruit flour, being cheap and is locally abundant, should be maximized as a main ingredient in making cookies. For economic reasons, canistel fruit flour should be encouraged among food manufacturers since it can be substituted to all-purpose flour which is expensive and sometimes not readily available. Further studies utilizing other sets of respondents and other variables are encouraged to

validate the results of this study. A follow-up study to determine the shelf-life of the products is also recommended.

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