



Research Article

SENSORY ACCEPTABILITY OF SQUASH (CUCURBITA MAXIMA) IN BAKING CAKE

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ABSTRACT

This research study aimed to ascertain the sensory acceptability of squash (*Cucurbita Maxima*) of varied quantities in baking cake as to appearance, taste, color, texture and general acceptability. A panel of 20 evaluators, purposely picked, from the School of Hotel and Restaurant Services Technology of the West Visayas State University – Janiuay Campus, were utilized as respondents. Formulated in the study were four treatments– three of which used squash at various quantities while as the control variable, one treatment, which contained no squash at all, was used. A modified sensory evaluation score sheet anchored on Five-Point Hedonic Scale was used by the respondents to assess the finished products. Means, ANOVA and Scheffé Test were utilized as the statistical tools. As a whole, results disclosed that baked cakes with no grated squash and 120 grams grated squash were *moderately liked* by the respondents while those baked cakes with 240 grams grated squash and 380 grams grated squash were *liked very much* by the respondents. There were significant differences in the level of acceptability of the different treatments as to appearance, taste, color, texture as well as general acceptability.

KEYWORDS: Sensory, Acceptability, Squash, Cake

INTRODUCTION

One of the Filipinos' specialties is to prepare nutritious food because they put premium on nutritional value in order to furnish their body with adequate nourishment for growth, maintaining and repairing their cells and tissues.

The essential for good health is an outweighing factor in the selection of nutritionally adequate diet, and also an indication not only in the physical state of an individual but also in his general attitude towards work, play and life itself. Appropriate nourishment gives a feeling of well-being; hence, a variety type of menu makes an individual skilful in planning for such kind of menu [1]. Regarded as the best method of cooking to retain nutritive value of food

is baking. Baked products are not only rich in calories but also in protein, fats, minerals, and vitamins. Since they do not contain much cooking oil, baked products are digestible. They also have long keeping quality. It allows also the individual to be creative. The baker who enjoys his work tries out new recipes from time to time and consequently, improves the quality of his/her products [2].

Well-liked by Filipinos, young and old alike, are cakes of different flavours. Baking cake has been considered a product which results from the final test of a chef's art and expertise. Cakes are products that are plenty and oftentimes being served in the table as pastry of any celebration. Different flavours are made to suit individual taste and nutrients are added to further enhance the nutritional value of the cake and could add up to offer

benefits to the people [1], like the adding of squash to the cake as attempted in this study,.

History would tell that the early Egyptians made cakes using white flour in a leavened dough sweetened with honey and flavoured with spices. The ancient Romans served a leavened wedding cake from which the bride and groom shared one slice. They also prepared cakes to offer the gods. Cakes are popular during birthdays, weddings, Christmas and other special occasions. They are also served for snacks and dessert [1].

Cakes are well-liked in most small bakeries because a large variety of products can be designed from only a few basic cake, filling and icing formulas. They can be served as unembellished sheets in a high-volume cafeteria or as the intricate centerpiece of a wedding buffet. They are also famous because of their adaptability. Cake production requires an understanding of ingredients and mixing methods and need not be difficult or intimidating [2].

With the addition of eggs, flour, a raising agent, and other ingredients such as flavourings, fruits and nuts, most cake mixtures consist of a batter made from shortening (butter or cake margarine) and sugar. The mix may be baked in tins as steamed puddings, utilization as cake, or used as a topping for fruit sponge.

Regarded as essential in baking cake is the good aeration of the sugar, butter and egg batter. Curdling or breaking is most probably to happen if eggs are too cold. If this does not happen, a little portion of the flour should be added before all the eggs are mixed. All the ingredients should be at the same temperature, about 18°C. The shortening must not be melted. If it does, the volume and texture will be below standard. Equal weights of shortening, sugar, egg, and flour consist the basic mixture. Variation may be through the introduction of milk and baking powder, which allow an increase in the amount of flour. In all instances, the heaviness of shortening should be more than the weight of either the egg or the sugar. The weight of sugar should not be more than the weight of all liquids [3].

Squash, in Hiligaynon, *karbasa*; in Filipino, *kalabasa*, belongs to the family Cucurbitaceae of Gourd Family. It is a tender tendril-bearing and vine-like plant regarded as one of the most tasty vegetables. There have been studies made on baking cake with mixture of variety of ingredients, but not with squash. Reaching a length of 4 meters or more and flowering throughout the year, squash has a very course, prostrate or climbing annual, herbaceous vine. The fruits have markings with peduncle that is large, soft and corky on the surface while at maturity, they are large variable in shape, size, color [4].

Beyth, *et al.* [5], describes squash as a fleshy vegetable protected by hard rind. As part of the plant family that includes melons and cucumbers, it becomes a valuable source of Vitamins A and C as well as calcium and iron. Possessing very low calories, it becomes essential to be a component in one's diet plan. Likewise, the skin and rind of summer squash are also stuffed with the nutrient beta-carotene, but the fleshy portion of this vegetable is not.

Blanco [6], on the other hand, emphasized the widely used of squash as a vegetable in the Philippines, considered as green vegetable are its young shoots and flowers. It contains an excellent source of food nutrients like calcium, phosphorus, protein, iron, zinc and Vitamins A and B. Watson [7] further pointed out that it is a nourishing and healthful food emphasizing that it is a permissible part of nearly everyone's diet and can be safely consumed on a regular basis. Some people dislike taste of squash, but with mild flavour, the vegetable can be easily mixed into casseroles, blended vegetable serving, and other dishes. Butter and other oily topping should be added in moderation to maintain the nutritional value of squash.

The utilization of squash, which is readily available in and beyond the backyard to most Filipino family homes, could enhance the given variables of a cake, like the attempt in this study as well as a good source of nourishing substances. To use easily available and nutritive means to develop and enrich a product is the chief purpose of the researchers. Highly due to the nutritional value, affordability, availability and benefit of squash which is abundant in the locality, this study is put to fore.

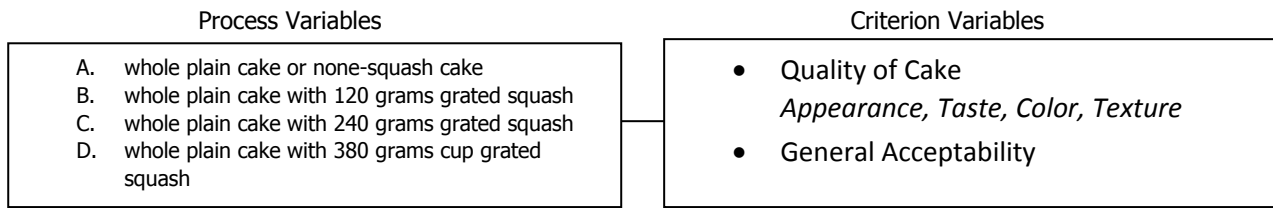
OBJECTIVES OF THE STUDY

This study aimed to ascertain the sensory acceptability of using different proportions of grated squash in baking cake. Specifically, it aimed to determine the level of sensory acceptability of grated squash in baking cake in terms of appearance, taste, color, texture and general acceptability; and find out the significant differences in the level of acceptability in four various quantities of grated squash in baking cake as to appearance, taste, color, texture and general acceptability.

Conceptual/Logical Framework

Schematic Diagram Illustrating the Framework of the Study

Figure 1: The sensory acceptability of utilizing grated squash when baking cake as to appearance, taste, color, texture as well as general acceptability.



MATERIALS AND METHODS

Research Design

This study utilized quasi-experimental research to determine the acceptability level of squash cake among respondents as to general acceptability, appearance, taste, color and texture. Quasi-experimental research is an experimental study used to estimate the causal impact of an intervention on its target population [8]. It is a form of research where the investigator has no control over the independent variable, but has power over how the dependent variable is measured [16]. It was designed in which evaluators manipulate and control one independent variable for the variation concomitant to the manipulation of the dependent variable [8]. In this study, the squash mixture was prepared and the amount of squash was added in different proportions as variations A- no squash, B- 120 grams grated squash, C- 240 grams grated squash and D- 380 grams grated squash.

Sampling Design

Purposive sampling was employed in selecting the individuals as samples according to the purposes of the researchers as their controls. It is a non-scientific sampling design by which an individual is selected as part of the sample due to good evidence that he is representative of the total population [9].

Evaluators of the Study

There were 20 evaluators composed of 10 members of the faculty, 6 members of the staff, and 4 students of the School of Hotel and Restaurant Services Technology, WVSU JC. They were purposely selected as panel of evaluators of the study because of their expertise and availability. They evaluated the finished products in terms of the variables of this experiment. The main sources of data were the responses of the evaluators which were indicated in the sensory evaluation score sheets that were used for product evaluation in terms of appearance, taste, color, texture as well as general acceptability.

Materials, Tools and Equipment

In the conduct of this study, squash was grated (varies in proportion for each treatment). Other ingredients included the following: 520 grams all-purpose flour, 240 grams butter, 5 pieces egg, 360 grams refined sugar, 120 ml. water, 5 ml. vanilla, 2 grams salt, and 15 grams baking powder. The tools, utensils and other equipment used were mixing bowl, measuring cups, electrical mixer, blender, baking pan, wooden spoon, measuring spoon, weighing scale, glass measuring cup, peeling knife, rubber scraper and oven.

Instrument

Basing on the Five-Point Hedonic Scale, a modified sensory evaluation score sheet was utilized to retrieve data [10]. Each replication of the four (4) treatments was evaluated with the following scores and their descriptions: Five (5) as Liked Very Much; Four (4) as Liked Moderately; Three (3) as Liked Slightly; Two (2) as Disliked; and One (1) as Disliked Very Much. These scores were assigned for the evaluation of the products as to appearance, taste, color, texture and general acceptability.

Procedure

Pre-heat the oven to 250 F. Shift all-purpose flour and baking powder. Blend the grated squash and add water and set aside. Cream the butter and add the sugar. Add the egg one at a time, then beat well after each addition. Add the grated squash, pour in a grease pan and bake for 25 – 30 minutes. Preparation and cooking time: 60 minutes

The different preparations were evaluated by respondents as to appearance, taste, color, texture as well as general acceptability, using the following rubric on Table 1.



Table 1: Rubric for Evaluating Squash Cake

CRITERIA	5 LIKED VERY MUCH	4 LIKED MODERATELY	3 LIKED SLIGHTLY	2 DISLIKED	1 DISLIKED VERY MUCH
Appearance	Looks very palatable that captures one's attention	Looks pleasing in its appearance	Looks slightly pleasing	Disliked the appearance and can't capture one's appetite	Very disliked appearance
Taste	It tastes savory with quality and increases one's appetite	It tastes partially good	It tastes not that good or bad	Disliked taste cause of too savory or it lacks something	Very disliked taste
Color	Golden Brown	Brown	Yellow	Light yellow	Light
Texture	Very soft and moist	Soft and moist	Slightly soft and moist	Hard and lacks moisture	Very hard
General Acceptability	Very much acceptable	Moderately Acceptable	Slightly Acceptable	Not Acceptable	Very Much Not Acceptable

After the sensory evaluation of the treatment, the score sheets were gathered, recorded, tallied, summarized and prepared for computation. Mean was used in determining the level of acceptability of its appearance, taste, color, texture, and general acceptability. The following scale and descriptions were used:

4.21 - 5.00 – Liked Very Much

3.41 - 4.20 – Liked Moderately

2.16- 3.40 – Liked Slightly

1.81-2.15 – Disliked

1.00- 1.80 – Disliked Very Much

Other statistical tools were the One-way Analysis of Variance (ANOVA) to determine whether significant differences existed in the level of acceptability of squash cake. The hypothesis was set at 0.05 level of significance. Scheffe Test was also used as post hoc test.

RESULTS AND DISCUSSION

Acceptability of Squash Cake 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 [11].

Table 2 shows the sensory acceptability level of cake enriched with different proportions of grated squash as to appearance among the respondents. Treatments A and B were **liked moderately** ($M_s = 3.65$ and 3.95) while treatments C and D were **liked very much** ($M_s = 4.30$ and 4.75).

Table 2: Mean Ratings of Squash Cake of Different Treatments as to Appearance

Treatment	Mean	Interpretation
A – No Squash	3.65	Liked Moderately
B – 120 grams Squash	3.95	Liked Moderately
C – 240 grams Squash	4.30	Liked Very Much
D – 380 grams Squash	4.75	Liked Very Much
Overall Mean	4.16	Like Moderately

Differences in the Acceptability of Squash Cake in Different Treatments in Terms of Appearance

Table 3 shows that a significant difference existed in the level of acceptability of squash cake in different treatments as to appearance. This implies that the appearance of different treatments was not the same or there were variations as evaluated by the respondents.

Table 3: ANOVA Table for Appearance of Squash Cake in Different Treatments

Source of Variance	Sum of Squares	df	Mean Sum of Squares	F Value	P Value
Between Groups	13.438	3	4.479	10.824	.000
Within Groups	31.450	76	.414		
Overall	44.888	79			

*p<.01 significant at .01 alpha level

The post hoc revealed that treatments A and B, treatments B and C, treatments C and A were not significant while the rest paired treatments were significant in terms of appearance. This means that these paired treatments were comparable in appearance. This implies that the more squash added to cake, it must have looked very appetizing that it captured one’s attention.



Table 4: Scheffe Test for the Appearance of Squash Cake in Different Treatments

(I)Treatments	(J)Treatments	Mean Difference (I-J)	Std.Error	Significance	Interpretation
Treatment A	Treatment B	- .3000	.20342	.540	Not Significant
	Treatment C	- .6500*	.20342	.022	Significant
	Treatment D	- 1.1000*	.20342	.000	Significant
Treatment B	Treatment A	.3000	.20342	.540	Not Significant
	Treatment C	- .3500	.20342	.404	Not Significant
	Treatment D	- .8000*	.20342	.003	Significant
Treatment C	Treatment A	.6500*	.20342	.022	Significant
	Treatment B	.3500	.20342	.404	Not Significant
	Treatment D	- .4500	.20342	.189	Not Significant
Treatment D	Treatment A	1.1000*	.20342	.000	Significant
	Treatment B	.8000*	.20342	.003	Significant
	Treatment C	- .3500	.20342	.404	Not Significant

*The mean difference is significant at the 0.05 level.

Acceptability of Squash Cake in Terms of Taste

Taste, a sensation produced when a small quantity of something eaten, drunk or sampled to assess its effect on the sensory receptors or when a substance in the mouth reacts chemically with taste receptor cells, is located on taste buds in the oral cavity, mostly on the tongue. Along with smell (olfaction) and trigeminal nerve stimulation (registering texture, pain, and temperature), taste determines flavors of food or other substances [12, 13].

Based on the mean ratings on Table 5, treatments A and B were **liked moderately** by the respondents while treatments C and D were **liked very much** by the respondents.

Table 5: Mean Ratings of Squash Cake of Different Treatment as to Taste

Treatment	Mean	Interpretation
A No Squash	3.85	Liked Moderately
B 120 grams Squash	4.20	Liked Moderately
C 240 grams Squash	4.65	Liked Very Much
D 380 grams Squash	4.80	Liked Very Much
Overall Mean	4.38	Liked Very Much

Differences in the Acceptability of Squash Cake in Different Treatments in Terms of Taste

Table 6 shows a significant difference existed in the level of acceptability of squash cake as to different treatments in terms of taste. This implies that the taste of different treatments was not the same or there were variations as evaluated by the respondents.

Table 6: ANOVA Table for Taste of Squash Cake in Different Treatments

Source of Variance	Sum of Squares	df	Mean Sum of Squares	F Value	P Value
Between Groups	11.250	3	3.750	11.176	.000
Within Groups	25.500	76	.336		
Overall	3.750	79			

*p<.01 significant at .01 alpha level

The post hoc revealed that treatments A and B, treatments B and C, treatments C and D, treatments D and A were not significant while the rest paired treatments were significant in terms of taste. This means that these paired were comparable in taste. This implies that the squash added to cake made its taste savoury and contributed to the increase of the appetite of the respondents.

Table 7: ScheffeTest for the Taste of Squash Cake in Different Treatments

*The mean difference is significant at the 0.05 level.

(I) Treatments	(J) Treatments	Mean Difference (I-J)	Std. Error	Significance	Interpretation
Treatment A	Treatment B	-.3500	.18317	.309	Not Significant
	Treatment C	-.8000*	.18317	.001	Significant
	Treatment D	-.95000*	.18317	.000	Significant
Treatment B	Treatment A	.3500	.18317	.309	Not Significant
	Treatment C	-.4500	.18317	.119	Not Significant
	Treatment D	-.6000*	.18317	.018	Significant
Treatment C	Treatment A	.8000*	.18317	.001	Significant
	Treatment B	.4500	.18317	.119	Significant
	Treatment D	-.1500	.18317	.880	Not Significant
Treatment D	Treatment A	.9500*	.18317	.000	Not Significant
	Treatment B	.6000*	.18317	.018	Significant
	Treatment C	.1500	.18317	.880	Significant

Acceptability of Squash Cake in Terms of Color

Color is a property causing visual sensation that depends on the light that they reflect and is perceived as red, blue, green and other shades. Categories and physical specifications of color are also supplementary with objects or materials based on their physical possessions such as light absorption, reflection, or emission spectra [14].

Based on the mean ratings on Table 8, treatments A and B were **liked moderately** by the respondents while treatments C and D were **liked very much** by the respondents.



Table 8: Mean Ratings of Squash Cake of Different Treatments as to Color

Treatment	Mean	Interpretation
A – No Squash	4.00	Liked Moderately
B – 120 grams Squash	4.05	Liked Moderately
C – 240 grams Squash	4.70	Liked Very Much
D – 380 grams Squash	4.90	Liked Very Much
Overall Mean	4.41	Liked Very Much

Differences in the Acceptability of Squash Cake in Different Treatments in Terms of Color

Table 9 shows that a significant difference existed in the level of acceptability of squash cake as to different treatments in terms of color. This implies that the color of the different treatments was not the same or showed variations as evaluated by the respondents.

Table 9: ANOVA Table for Color of Squash Cake in Different Treatments

Source of Variance	Sum of Squares	df	Mean Sum of Squares	F Value	P Value
Between Groups	12.438	3	4.146	10.884	.000
Within Groups	28.950	76	.381		
Overall	41.388	79			

*p<.01 significant at .01 alpha level

The post hoc on Table 10 revealed that treatments A and B, treatments C and D, were not significant while the rest paired treatments were significant in terms of color. This means that these paired treatments were closely comparable in color. This implies that when more squash is added to the cake, the color becomes golden brown.

Table 10: Scheffe Test for the Color of Squash Cake in Different Treatments

(I) Treatments	(J) Treatments	Mean Difference (I-J)	Std. Error	Significance	Interpretation
Treatment A	Treatment B	-.05000	.19517	.996	Not Significant
	Treatment C	-.70000	.19517	.008	Significant
	Treatment D	-.90000	.19517	.000	Significant
Treatment B	Treatment A	.05000	.19517	.996	Not Significant
	Treatment C	-.65000	.19517	.015	Significant
	Treatment D	-.85000	.19517	.001	Significant
Treatment C	Treatment A	.70000	.19517	.008	Significant
	Treatment B	.65000	.19517	.015	Significant
	Treatment D	-.20000	.19517	.789	Not Significant
Treatment D	Treatment A	.90000	.19517	.000	Significant
	Treatment B	.85000	.19517	.001	Significant
	Treatment C	.20000	.19517	.789	Not Significant

*The mean difference is significant at the 0.05 level.

Acceptability of Squash Cake in Terms of Texture

Texture refers to the feel and appearance of a surface, its roughness or smoothness. In food, it is the structure of the substance when felt, touched or chewed. Mouthfeel, on the other hand, is the substance’s physical and chemical interaction in the mouth, an aspect of food rheology, covers many areas related to the testing and evaluating of foodstuffs from initial perception on the palate, to first bite, through mastication to swallowing and aftertaste. Some food enthusiasts, however, use the traditional term texture [15].

Based on the mean ratings on Table 11, treatments A and B were **liked moderately** by the respondents while treatments C and D were **liked very much** by the respondents.

Table 11: Mean Ratings of Squash Cake of Different Treatments as to Texture

Treatment	Mean	Interpretation
A – No Squash	4.10	Liked Moderately
B 120 grams Squash	4.20	Liked Moderately
C 240 grams Squash	4.50	Liked Very Much
D 380 grams Squash	4.85	Liked Very Much
Overall Mean	4.38	Liked Moderately



Differences in the Acceptability of Squash Cake in Different Treatments in Terms of Texture

Table 12 shows that a significant difference existed in the level of acceptability of squash cake in the different treatments as to texture. This implies that the texture of the different treatments was not similar or it showed variations as evaluated by the respondents.

Table 12: ANOVA Table for Texture of Squash Cake in Different Treatments

Source of Variance	Sum of Squares	df	Mean Sum of Squares	F Value	P Value
Between Groups	8.237	3	2.746	7.801	.000
Within Groups	26.750	76	.352		
Overall	38.987	79			

*p<.01 significant at .01 alpha level

The post hoc on Table 13 revealed that treatments A and B, treatments B and C, treatments C and A, treatments D and C were not significant while the rest paired treatments were significant in terms of texture. This means that there were paired treatments closely comparable in texture. This implies that the more squash was added to the cake, it must have a very soft and moist mouthfeel.

Table 13: ScheffeTest for the Texture of Squash Cake in Different Treatments

(I) Treatments	(J) Treatments	Mean Difference (I-J)	Std. Error	Significance	Interpretation
Treatment A	Treatment B	-.20000	.18761	.996	Not Significant
	Treatment C	-.50000	.18761	.008	Significant
	Treatment D	-.85000	.18761	.000	Significant
Treatment B	Treatment A	.20000	.18761	.769	Not Significant
	Treatment C	-.30000	.18761	.470	Not Significant
	Treatment D	-.65000	.18761	.011	Significant
Treatment C	Treatment A	.50000	.18761	.077	Not Significant
	Treatment B	.30000	.18761	.470	Not Significant
	Treatment D	-.35000	.18761	.331	Not Significant
Treatment D	Treatment A	.85000	.18761	.000	Significant
	Treatment B	.65000	.18761	.011	Significant
	Treatment C	.35000	.18761	.331	Not Significant

*The mean difference is significant at the 0.05 level.

General Acceptability of Squash Cake

Generally, squash cake with treatment A or no squash, treatment B or 120 grams squash were **liked moderately** by the respondents. On the other hand, treatment C or 240 grams squash, treatment D or 380 grams squash were **liked very much** by the respondents.

Table 14: Mean Ratings of Squash Cake of Different Treatments

Treatment	Mean	Interpretation
A No Squash	3.88	Liked Moderately
B 120 grams Squash	4.10	Liked Moderately
C 240 grams Squash	4.54	Liked Very Much
D 380 grams Squash	4.83	Liked Very Much
Overall Mean	4.33	Liked Very Much

Differences on the General Acceptability of Squash Cake

Table 15 shows that a significant difference existed in the level of acceptability of squash cake with different treatments as to general acceptability.

Table 15: ANOVA for the General Acceptability of Squash Cake with Different Treatments

Source of Variance	Sum of Squares	Df	Mean Sum of Squares	F Value	P Value
Between Groups	10.96	3	3.66	19.96	.000
Within Groups	13.91	76	.18		
Overall	24.87	79			

*p<.01 significant at .01 alpha level

The post hoc results on Table 16 revealed that treatments A and B, treatments C and D treatments D and C were not significantly different, while the rest paired treatments were significant. This generally implies that the more squash was added to cake, it looked very appetizing, it tasted savory, it increased ones appetite, it looked golden brown in color, and its texture was very soft and moist. This means that they were closely comparable in terms of general acceptability.



Table 16: Scheffe Test for the General Acceptability of Squash Cake in Different Treatments

(I) Treatments	(J) Treatments	Mean Difference (I-J)	Std. Error	Significance	Interpretation
Treatment A	Treatment B	-.22500	.13528	.434	Not Significant
	Treatment C	-.66250	.13528	.000	Significant
	Treatment D	-.95000	.13528	.000	Significant
Treatment B	Treatment A	.22500	.13528	.434	Not Significant
	Treatment C	-.43750	.13528	.020	Significant
	Treatment D	-.72500	.13528	.000	Significant
Treatment C	Treatment A	.66250	.13528	.000	Significant
	Treatment B	.43750	.13528	.020	Significant
	Treatment D	-.28750	.13528	.220	Not Significant
Treatment D	Treatment A	.95000	.13528	.000	Significant
	Treatment B	.72500	.13528	.000	Significant
	Treatment C	.28750	.13528	.220	Not Significant

*. The mean difference is significant at the 0.05 level.

CONCLUSION AND RECOMMENDATION

Variations in the proportion of squash in baking cake resulted in significant differences in its general sensory acceptability and in terms of appearance, taste, color and texture; hence the null hypothesis was rejected. Squash, being cheap, very nutritious and is locally abundant, should be maximized as a key ingredient in baking a cake. Since the use of squash in baking a cake is proved to be very acceptable, wide dissemination of the result of this study is encouraged in venues like trainings and workshops as product of research for community knowledge enhancement.

For commercial reasons, bakers who produce cakes may consider using squash as one of the flavours or ingredients to promote healthy pastries. It should also highlight that the cake product be sold at an affordable price. This research study may be replicated by other researchers who might be interested to further look into the essentials of baking a cake with squash as main ingredient utilizing other sets of respondents and variables that would further validate the results of this study. A further investigation to determine the shelf-life of the produce is also recommended.

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