Sensory Acceptability of Squash Yema Spread in Nueva Ecija University of Science and Technology, San Isidro Campus

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Abstract: This research study aimed to ascertain the sensory acceptability of squash (Cucurbita maxima) of varied quantities in yema spread as to appearance, taste, color, texture and general acceptability. The 50 evaluators, purposely picked, from the faculties (15), staffs (15) and students (20) of Nueva Ecija University of Science and Technology, San Isidro Campus were utilized as respondents. Formulated in the study were four treatments– three of which used evaporated milk at various quantities while as the control variable, one treatment, which contained no evaporated milk 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 T-Test were utilized as the statistical tools. As a whole, results disclosed that yema spread without evaporated milk were moderately liked while those squash yema spread with $\frac{1}{2}$ cup of evaporated milk, with 1 $\frac{1}{2}$ cup of evaporated milk and with 1 $\frac{1}{2}$ cup of evaporated milk 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. Also, there were significant relationships on the profile of the respondents to the different treatments of squash yema spread.

Keywords: sensory acceptability, squash yema spread

1. Introduction

Squash is a genus Cucurbita, genus of flowering plants in the gourd family (Cucurbitaceae), many of which are widely cultivated as vegetables and for livestock feeds. Squashes are native to the New World, where they were cultivated by native peoples before European settlement. The fruit of edible species is usually served as a cooked vegetable, and the seeds and blossoms may also be cooked and eaten. One of the most nutritious and appealing vegetables available throughout the world and beneficial in terms of health and medicine is squash [1].

The great thing about squash, besides its varieties, versatility and delicious flavor, is its nutritional content. Nutrients are what make a food healthful, and squash, regardless of variety, has plenty. The most important squash nutrients are vitamin A, vitamin C and potassium. Most squash varietals contain plenty of these three in a 1-cup serving, and they are all essential nutrients. Essential nutrients cannot be manufactured by our bodies [2]. Squash has a very rich nutritional profile that consists of various organic compounds, nutrients, vitamins, and minerals, which are responsible for providing all its impressive health benefits. This list includes a huge amount of vitamin A, as well as significant amounts of vitamin A, vitamin C, carotene, fibre and folate.

In terms of minerals, squash contains magnesium, potassium, manganese, copper, phosphorus, calcium, and iron. It is also a very good source of carotenoids and other

important anti-inflammatory and antioxidant compounds [3]. Fibre is good for your heart and your intestines and it helps keep you regular. Folate may keep your baby from having a spinal cord problem at birth. Fruits and veggies with lots of potassium help you have good blood pressure. Vitamin A keeps eyes and skin healthy and helps to protect against infections. Vitamin C helps heal cuts and wounds and keep teeth and gums healthy [4]. Carotenoids are plant pigments responsible for bright red, yellow and orange hues in many fruits and vegetables including squash. These pigments play an important role in plant health. People who eat foods containing carotenoids get protective health benefits as well [5].

When it comes to culinary applications, squash is really flexible. It can be added to a soup, use for salads, can be baked whole or sliced in half, steam and can used as substitute for other ingredients. Now, this study is presenting a Squash Yema Spread [6].

2. Objectives of the Study

This study aimed to ascertain the sensory acceptability of using different proportions of squash in making squash yema spread. Specifically, it aimed to determine the level of sensory acceptability of squash yema spread 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 proportion of evaporated milk in the production of yema spread as to appearance, taste, color, texture and general acceptability.

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3. 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 [7]. 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. In this study, the squash mixture was prepared, and the amount of evaporated milk was added in different proportions as variations A- no evaporated milk, B- with ½ cup of evaporated milk, C- with 1 cup evaporated milk and D- with 1 ½ cup of evaporated milk.

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.

Evaluators of the Study

The evaluators are the 15 teachers, 15 staffs and 20 students of Nueva Ecija University of Science and Technology, San Isidro Campus to determine the sensory acceptability of squash yema spread.

Materials, Tools and Equipment

In the conduct of this study, squash was grated (varies in proportion for each treatment). Other ingredients included the following: 1200 ml of condensed milk,1 ¹/₂ cups of evaporated milk, 2 tablespoons of butter and 1 kilograms of grated and blended squash. The tools, utensils and other equipment used were container, measuring cups, measuring spoons, grater, blender, cooking pan, wooden spoon, knife, rubber scraper, chopping board, strainer and gas stove.

Instrument

Basing on the Five-Point Hedonic Scale, a modified sensory evaluation score sheet was utilized to retrieve data. 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. 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.

Procedure

Perform Mise'en place. Peel off the squash and cut it into parallel forms. Grate the squash into very small pieces, squeeze it hardly till the puree comes out and blend it with evaporated milk. Cooking: Pre-heat the pan. In the cooking pan, place 2 table spoons of butter, let it melt. Put 2 cups of condensed milk. Put the evaporated-blended squash and let it simmer then add the remaining 2 cups of evaporated milk. Cook it thoroughly until the color becomes mustard yellow.

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Fable 1: Ru	bric for	Evaluating	Squash	Yema	Spread

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	5	4 3		2	1		
Criteria	Liked Very Much	Liked Moderately	Liked Slightly	Disliked	Disliked Very Much		
Appearance	Looks very palatable that	Looks pleasing in its	Looks slightly plassing	Disliked the appearance and	Very disliked		
Appearance	captures one's attention	appearance	LOOKS Slightly pleasing	can't capture one's appetite	appearance		
Testa	It tastes savory with quality	It tastes partially	It tastes not that good or	Disliked taste cause of too	Very disliked taste		
Taste	and increases one's appetite	good	bad	savory or it lacks something			
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	Vory much accortable	Moderately	Slightly Accortable	Not Accortable Very Much	Not Accortable		
Acceptability	bility Very much acceptable Acceptable Slightly Acceptable		Not Acceptable Very Much	Not Acceptable			

After the sensory evaluation of the treatment, the score sheets were 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) and T Test to determine whether significant differences existed in the level of acceptability of squash yema spread. Computation was done using the Microsoft Excel and Statistical Package for Social Science (SPSS).

4. Results and Discussion

Table 2 shows the sensory acceptability level of squash yema spread enriched with different proportions of evaporated milk as to appearance among the respondents. All the treatments were liked moderately.

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

Treatment	Weighted	Interpretation
	Mean	
No evaporated milk	3.94	Liked Moderately
With ¹ / ₂ cup evaporated milk	4.18	Liked Moderately
With 1 cup of evaporated milk	4.04	Liked Moderately
With 1 ¹ / ₂ cup of evaporated milk	4.16	Liked Moderately

Table 3 shows that there is no significant difference existed in the level of squash yema spread in different treatments as to appearance. This implies that the appearance of different

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treatments was the same or there were no variations as evaluated by the respondents.

Table 4 shows that all the treatments were not significant to each other. This means that these paired treatments were comparable in appearance. This implies that the addition of evaporated milk does not affect the appearance of squash yema spread.
 Table 3: ANOVA Table for Appearance of Squash Yema

 Spread in Different Treatments

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.62	3	0.54	0.735204	0.53217	2.650677
Within Groups	143.96	196	0.73449			
Total	145.58	199				

Table 4: T test for the Appearance of Squash Yema Spread in Different Treatments

Treatments	Treatment	df	t Stat	P value	t Critical two-tail	Verbal Interpretation
	Treatment B	90	-1.441436	0.15	1.986674541	Not Significant
Treatment A	Treatment C	96	-1.022398	0.31	1.984984312	Not Significant
	Treatment D	98	-0.950084	0.34	1.984467455	Not Significant
	Treatment A	90	-1.441436	0.15	1.986674541	Not Significant
Treatment B	Treatment C	96	0.3967918	0.69	1.984984312	Not Significant
	Treatment D	90	0.360094	0.72	1.986674541	Not Significant
	Treatment A	96	-1.022398	0.31	1.984984312	Not Significant
Treatment C	Treatment B	96	0.3967918	0.69	1.984984312	Not Significant
	Treatment D	96	0	1	1.984984312	Not Significant
	Treatment A	98	-0.950084	0.34	1.984467455	Not Significant
Treatment D	Treatment B	90	0.360094	0.72	1.986674541	Not Significant
	Treatment C	96	0	1	1.984984312	Not Significant

The mean difference is significant at the 0.05 level

Table 5 shows the sensory acceptability level of squash yema spread enriched with different proportions of evaporated milk as to taste among the respondents. Treatment A, C and D were liked moderately while Treatment B was liked very much.

Table 6 shows that there is no significant difference existed in the level of squash yema spread in different treatments as to taste. This implies that the taste of different treatments was the same or there were no variations as evaluated by the respondents.

Table 5: Mean	Ratings o	f Squash	Yema	Spread of	of Different
	Treatr	nents as t	o Taste	e	

Treatment	Weighted Mean	Interpretation
No evaporated milk	3.8	Liked Moderately
With ¹ / ₂ cup evaporated milk	4.24	Liked Very Much
With 1 cup of evaporated milk	4.14	Liked Moderately
With 1 ¹ / ₂ cup of evaporated milk	4.2	Liked Moderately

 Table 6: ANOVA Table for Taste of Squash Yema Spread

 in Different Treatments

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	5.695	3	1.898333	2.444956	0.065229	2.65067
Within Groups	152.18	196	0.776429			
Total	157.875	199				

Table 7: T test for the Taste of Squash Yema Spread in Different Treatmen	ts
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Treatments	Treatment	df	t Stat	P value	t Critical two-tail	Verbal Interpretation
	Treatment B	87	-2.422869	0.02	1.987608282	Significant
Treatment A	Treatment C	93	-1.891798	0.06	1.985801814	Not Significant
	Treatment D	95	-1.753606	0.08	1.985251004	Not Significant
	Treatment A	87	-2.422869	0.02	1.987608282	Significant
Treatment B	Treatment C	96	0.510867	0.61	1.984984312	Not Significant
	Treatment D	95	0.621345	0.55	1.985251004	Not Significant
	Treatment A	93	-1.891798	0.06	1.985801814	Not Significant
Treatment C	Treatment B	96	0.510867	0.61	1.984984312	Not Significant
	Treatment D	98	0.117172	0.91	1.984467455	Not Significant
	Treatment A	95	-1.753606	0.08	1.984984312	Not Significant
Treatment D	Treatment B	95	0.621345	0.55	1.985251004	Not Significant
	Treatment C	98	0.117172	0.91	1.984467455	Not Significant

The mean difference is significant at the 0.05 level

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

Treatment	Weighted Mean	Interpretation
No evaporated milk	3.76	Liked Moderately
With ¹ / ₂ cup evaporated milk	4.02	Liked Moderately
With 1 cup of evaporated milk	4	Liked Moderately
With 1 ¹ / ₂ cup of evaporated milk	4.14	Liked Moderately

Table 7 shows the T Test revealed that Treatment A and B has significant difference while the rest of the treatments have no significant difference. This means that $\frac{1}{2}$ cup of evaporated makes a difference in terms of the taste of the squash yema spread. However, more than $\frac{1}{2}$ cup of evaporated milk affects the taste of the yema spread since it has no difference on the taste of the yema spread that has no evaporated milk. The sweet taste of evaporated milk (which is actually an assurance of proper sterilization, and therefore safety) is something some people still find a new experience in food [8].

Table 8 shows the sensory acceptability level of squash yema spread enriched with different proportions of evaporated milk as to color among the respondents. All the treatments were liked moderately.

Table 9: ANOVA Table for Color of Squash Yema Spread	
in Different Treatments	

Source of Variation	SS	df	MS	F	P-value	F crit				
Between Groups	4.76	3	1.586667	2.206831	0.088578	2.650677				
Within Groups	140.92	196	0.71898							
Total	145.68	199								

Table 9 shows that there is no significant difference existed in the level of squash yema spread in different treatments as to color. This implies that the color of different treatments was the same or there were no variations as evaluated by the respondents.

Table 10: T test for the Color of Squash Yema Spread in Different Treatments

Treatments	Treatment	df	t Stat	P value	t Critical two-tail	Verbal Interpretation	
	Treatment B	92	-1.950819	0.05	1.986086317	Significant	
Treatment A	Treatment C	95	-1.675982	0.09	1.985251004	Not Significant	
	Treatment D	96	-2.199887	0.03	1.984984312	Significant	
	Treatment A	92	-1.950819	0.05	1.986086317	Significant	
Treatment B	Treatment C	98	0.2557744	0.79	1.984467455	Not Significant	
	Treatment D	97	-0.3759	0.7	1.984723186	Not Significant	
	Treatment A	95	-1.675982	0.09	1.985251004	Not Significant	
Treatment C	Treatment B	98	0.2557744	0.79	1.984467455	Not Significant	
	Treatment D	98	-0.606976	0.55	1.984467455	Not Significant	
	Treatment A	96	-2.199887	0.03	1.984984312	Significant	
Treatment D	Treatment B	97	-0.3759	0.7	1.984723186	Not Significant	
	Treatment C	98	-0.606976	0.55	1.984467455	Not Significant	

The mean difference is significant at the 0.05 level

 Table 11: Mean Ratings of Squash Yema Spread of

 Different Treatments as to Texture

Treatment	Weighted Mean	Interpretation
No evaporated milk	3.8	Liked Moderately
With ¹ / ₂ cup evaporated milk	4.36	Liked Very Much
With 1 cup of evaporated milk	4.26	Liked Very Much
With 1 ¹ / ₂ cup of evaporated milk	4.2	Liked Moderately

Table 10 shows the T Test revealed that Treatment A and B and Treatment A and D has significant difference while the rest of the treatments have no significant difference. This means that some of the proportion (½ cup and 1 ½ cup) of evaporated milk makes a difference in terms of the color compare to the squash yema spread without evaporated milk. Lactose and proteins in the evaporated milk react with other sugars during baking or cooking. The Maillard reaction gives a desirable brownish colouration and a caramel flavouring to all kinds of confectionery and desserts [9].

Table 11 shows the sensory acceptability level of squash yema spread enriched with different proportions of evaporated milk as to texture among the respondents. Treatment A and D were liked moderately while Treatment B and C were liked very much.

 Table 12: ANOVA Table for Texture of Squash Yema

 Spread in Different Treatments

Spreud in Different Treatments									
Source of Variation	SS	df	MS	F	P-value	F crit			
Between Groups	8.28	3	2.76	4.106893	0.007455	2.650677			
Within Groups	131.72	196	0.672041						
Total	140	199							

 Table 13: T test for the Texture of Squash Yema Spread in Different Treatments

Treatments	Treatment	df	t Stat	P value	t Critical two-tail	Verbal Interpretation
	Treatment B	86	-2.915986	0.004	1.987934206	Significant
Treatment A	Treatment C	86	-2.26691	0.02	1.987934206	Significant
	Treatment D	81	-2.218591	0.02	1.989686323	Significant
	Treatment A	86	-2.915986	0.004	1.987934206	Significant
Treatment B	Treatment C	98	0.8230548	0.21	1.984467455	Not Significant
	Treatment D	97	1.0041911	0.32	1.984723186	Not Significant
Treatment C	Treatment A	86	-2.26691	0.02	1.987934206	Significant

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International Journal of Science and Research (IJSR) ISSN: 2319-7064 ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

	Treatment B	98	0.8230548	0.21	1.984467455	Not Significant
	Treatment D	97	0.1433355	0.89	1.984723186	Not Significant
	Treatment A	81	-2.218591	0.02	1.989686323	Significant
Treatment D	Treatment B	97	1.0041911	0.32	1.984723186	Not Significant
	Treatment C	97	0.1433355	0.89	1.984723186	Not Significant

The mean difference is significant at the 0.05 level

Table 12 shows that there is a significant difference existed in the level of squash yema spread in different treatments as to texture. This implies that the taste of different treatments was not the same evaluated by the respondents.

Table 13 shows that Treatment A and B, Treatment A and C and Treatment A and D has significant difference while the rest of the treatments have no significant difference. This means that the addition of evaporated milk regardless of the proportion affects the texture of the squash yema spread. According to [9] "one of the property of evaporated milk is its hydration or water-binding property wherein its mode of action was its water retention capacity produces better texture in food products and help to maintain their keeping qualities and shelf life.

Table 14: Mean Ratings of Squash Yema Spread ofDifferent Treatments as to Texture

Treatment	Weighted Mean	Interpretation
No evaporated milk	3.8	Liked Moderately
With 1/2 cup evaporated milk	4.36	Liked Very Much
With 1 cup of evaporated milk	4.26	Liked Very Much
With 1 ¹ / ₂ cup of evaporated milk	4.2	Liked Moderately

 Table 15: ANOVA Table for Texture of Squash Yema

 Spread in Different Treatments

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	8.28	3	2.76	4.106893	0.007455	2.650677
Within Groups	131.72	196	0.672041			
Total	140	199				

Table 14 shows the sensory acceptability level of squash yema spread enriched with different proportions of evaporated milk as to acceptability among the respondents. Treatment A was liked moderately while Treatment B, C and D were liked very much.

Table 15 shows that there is a significant difference existed in the level of squash yema spread in different treatments as to acceptability. This implies that the taste of different treatments was not the sameor there were variations as evaluated by the respondents.

Table 16: T test for the Texture of Sq	uash Yema Spread in Different Treatments
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Treatments	Treatment	df	t Stat	P value	t Critical two-tail	Verbal Interpretation
	Treatment B	86	-2.915986	0.004	1.987934206	Significant
Treatment A	Treatment C	86	-2.26691	0.02	1.987934206	Significant
	Treatment D	81	-2.218591	0.02	1.989686323	Significant
	Treatment A	86	-2.915986	0.004	1.987934206	Significant
Treatment B	Treatment C	98	0.8230548	0.21	1.984467455	Not Significant
	Treatment D	97	1.0041911	0.32	1.984723186	Not Significant
	Treatment A	86	-2.26691	0.02	1.987934206	Significant
Treatment C	Treatment B	98	0.8230548	0.21	1.984467455	Not Significant
	Treatment D	97	0.1433355	0.89	1.984723186	Not Significant
	Treatment A	81	-2.218591	0.02	1.989686323	Significant
Treatment D	Treatment B	97	1.0041911	0.32	1.984723186	Not Significant
	Treatment C	97	0.1433355	0.89	1.984723186	Not Significant

The mean difference is significant at the 0.05 level

 Table 17: ANOVA Table for the Overall Acceptability of Squash Yema Spread in Different Treatments

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	35.056	19	1.845053	2.603305	0.000205	1.597147
Within Groups	694.56	980	0.708735			
Total	729.616	999				

Table 16 revealed that Treatment A and B and Treatment A and D has significant difference while the rest of the treatments have no significant difference. This means that the addition of evaporated milk affects the acceptability of the squash yema spread. This implies that squash yema spread with evaporated milk were more liked by the respondents than the squash yema spread with no evaporated milk. [9] state that evaporated milk fat possesses a unique flavour which is widely exploited in the manufacture of products known for their richness and quality in taste and texture, which cannot be achieved with other fats.

Table 17 shows that there is a significant difference existed in the level of squash yema spread in different treatments as to the overall acceptability. This implies that the different treatments were differs to each other.

5. Conclusion

This study aimed to ascertain the sensory acceptability of using different proportions of squash in making squash yema spread. The result showed that all treatments were liked moderately and its appearance was comparable. However,

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International Journal of Science and Research (IJSR) ISSN: 2319-7064 ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

the results revealed that evaporated milk affects the taste, color, texture and taste of the different treatments. Evaporated milk give sweet taste [8], gives desirable brownish colouration and unique flavor and its waterbinding property produces better texture in food products [9]. With this, the overall acceptability of the different treatments of squash yema spread was not comparable. [10] stated that being innovative teachers ventured on different approaches in teaching, the researchers has to be innovative to find alternative ways to encourage everybody to eat nutritious vegetable like the squash.

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