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Sensory evaluation of squash (*Cucurbita maxima*)-fortified tart

[1]Galagar, M., [1]Dela Cruz, R. and [2,*]Minoza, J.

[1]*Cebu Technological University, Poblacion 8, Tuburan, Cebu, Philippines, 6043*
[2]*Cebu Technological University, Nangka, Consolacion, Cebu, Philippines, 6001*

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Abstract

Tart is one of the desserts that children want to eat as their snack, and is considered a famous dessert in the Philippines. Hence, this study aimed to develop tart enriched with squash (*Cucurbita maxima*) at CTU-Tabuelan Campus during the 2nd semester of academic year 2020-2021 as a basis for techno-guide. An experimental testing approach was used wherein the researchers manipulated one variable while controlling or randomizing the others. The recipe is based on the basic steps in the preparation and processing of a traditional tart recipe. A total of twenty-five expert panelists were Hotel and Restaurant Management Teachers and Baking Enthusiasts, and twenty-five non-expert panelists were Teachers from different Colleges of the Campus, who were considered sensory evaluators for the descriptive test and hedonic scale rating. They were randomly selected to prevent and avoid bias in the evaluation. In comparison, the preferred treatment in general was treatment 1. This generally implied that the more squash added to the tart, the more mouthwatering it looked, it tasted savory, it increased one's appetite, it had a golden shade of yellow, and its crunchiness was pleasantly crisp. Treatment 1 was the preferred treatment in terms of color, aroma, crunchiness, taste and general acceptability. It was recommended to have additional ingredients that make it healthy and to develop a tart molder.

1. Introduction

One of the major problems in the Philippines is malnutrition, and the major goal of the government is to eliminate this concern and provide a better future for the children. Different government agencies like the Department of Science and Technology (DOST) and the Food and Nutrition Research Institute (FNRI) keep on partnering with different schools and universities in innovating food that is delicious and nutritious.

Malnutrition is a severe concern for most schools in the country, since a lack of sufficient nutrition among pupils has a severe impact on the learning process. According to the World Health Organization (April 2015), the Philippines has a 30.3 percent prevalence of stunting (moderate and severe) and a rate of under-five mortality of 30 for every 1,000. Poor children are more likely to suffer from malnutrition because of a lack of food or a lack of the necessary kinds of diet. Rich children, on the other hand, may be malnourished if their parents do not have time to monitor their nutritional intake. Aside from that, the increase in consumerism and the development of fast-food franchises and ready-to-eat food contribute significantly to the growth in malnutrition.

Tart is one of the desserts that a child eats as their snack. Tart is a famous dessert in the Philippines. Tart is a baked dish consisting of a filling over a pastry base with an open top not covered with pastry. The pastry is usually short-crust pastry; the filling may be sweet or savory, though modern tarts are usually fruit-based, sometimes custard.

The extension team of the Department of Hospitality Management adopted a barangay in the Municipality of Tabuelan. The extension program of the department helps beneficiaries to learn new skills and ideas. Transfer of technology is not the only goal of this program; nevertheless, it also aims to eliminate poverty. This program helps the beneficiaries earn extra income that will support their day-to-day expenses, and they will not depend on their partners.

Squash is a tender, tendril-bearing and vine-like

*Corresponding author.
Email: *joemar.minoza@ctu.edu.ph*

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plant belonging to the family of Cucurbitaceae, of gourd family. Squash is a common year-round crop in the Philippines. With a production value of $43 441 and a volume of 247,759 metric tons, the Philippines ranked 16th in the world for squash, pumpkins, and gourds in 2009 (Bureau of Agricultural Statistics (BAS), 2009). The squash plant has a lot of benefits, not only the squash itself, but also the flowers and seeds of the squash. Squash is rich in Vitamin A, which supports growth, reproductive health and eye health. It helps lower your blood sugar, and contains vitamin C for bone and joint health, and a cofactor for generating collagen, catecholamine and carnitine.

Therefore, this squash tart is one of the solutions to some problems of our society. It is a snack that is delicious and at the same time nutritious. This product is not only for children but for all ages because of the nutrients that we can get from it. This kind of product is economically friendly since the ingredients are locally available and abundant.

The researchers were inspired to make nutritionally appealing and economical snacks utilizing squash as the primary ingredient because of their technological research. Food that is nutritious, tasty, and affordable gives sustenance, supports health and growth, and is agreeable to the palate at a fair price. The New Product Development (NPD) process was used as a model in this study. Hence, this study aimed to develop tart enriched with squash at CTU-Tabuelan Campus during the 2nd semester of academic year 2020-2021 as a basis for techno-guide.

2. Materials and methods

2.1 Research design

An experimental testing approach was used in this review. The word "experimental analysis" refers to a form of study in which the researchers manipulate one variable while controlling or randomizing the others. This method was used in this research to create a tart enriched with squash. The recipe is based on the basic steps in the preparation and processing of a traditional tart recipe.

2.2 Participants

The research participants are the twenty-five (25) expert panelists who are Hotel and Restaurant Management Teachers and Baking Enthusiasts, and twenty-five (25) non-expert panelists are Teachers from different Colleges of the Campus, who are considered sensory evaluators for descriptive test and hedonic scale rating. They are randomly selected to prevent and avoid bias in the evaluation. Prior to the conduct of the actual sensory evaluation, an orientation of panelists was conducted to provide a common understanding of the concept of sensory testing procedures and to have a common perception of the technical description of the product with respect to the sensory characteristics being tested.

2.3 Instrument

Formulated products needed evaluation to determine their sensory quality. The researcher provided an instrument, using the 5-point hedonic scale for the following aspects: Appearance/Color, Aroma, Texture/ Crunchiness, Taste and General Acceptability.

2.4 Procedure

In the preliminary preparation, the researcher writes a request letter to the Campus Director of the Cebu Technological University – Tabuelan Campus asking permission to conduct a study of Tart enriched with squash. Likewise, the researcher requested to utilize some faculty members be utilised as panelists during the sensory evaluation.

Secondly, three treatments of the Squash-Fortified Tart were formulated based on the following formulations:

T1: 1 cup confectioner sugar; 3 cups all-purpose flour; 1 dash vanilla extract; 2/3 cups white sugar; 1 ½ cup water; 1 cup evaporated milk; 1 cup butter; 10 pieces eggs; 5 g squash

T2: 1 cup confectioner sugar; 3 cups all-purpose flour; 1 dash vanilla extract; 2/3 cups white sugar; 1½ cup water; 1 cup evaporated milk; 1 cup butter; 10 pieces eggs; 10 g squash

T3: 1 cup confectioner sugar; 3 cups all-purpose flour; 1 dash vanilla extract; 2/3 cups white sugar; 1½ cup water; 1 cup evaporated milk; 1 cup butter; 10 pieces eggs; 15 g squash

A control sample (current formulation of tart) was not included, as this study emphasized the addition of squash. Moreover, the current formulation has already been accepted and even commercialized.

Lastly, the prescribed procedure in evaluating the formulated recipes as described above was undertaken. The results of the evaluation were consolidated, tabulated, analyzed statistically and interpreted. From the findings, a proposed technology guide was prepared.

2.5 Statistical data analysis

The panelist assesses the sensory characteristics of tart enriched with squash in terms of color, aroma,

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texture, taste, and general acceptability using the Sensory Evaluation Test and the five-point hedonic scale to ascertain the product's acceptability. The score sheets were collected, and the scores were tallied by treatments based on the product's general characteristics. Hence, the panelists' sensory evaluation on color, aroma, texture, taste, and general acceptability determined the product's sensory acceptability. Moreover, to determine the most preferred formulation, Weighted Mean is used. The statistical treatments employed are the following: (1) The Weighted Mean, (2) Analysis of Variance (ANOVA), and the F-test at the .05 level and .01 level of significance.

3. Results and discussion

This portion presents the evaluation and construction of the data gathering through the experimentation done by the researchers on the acceptability of Tart Fortified with Squash.

3.1 Perception as to the acceptability level in terms of the following attributes

The tart fortified with squash, as to the sensory attributes of the respondents on the most acceptable formulation, was characterized according to color, aroma, crunchiness, taste, and general acceptability, which is presented in a tabular form.

3.1.1 Color

The criterion of human optic concept is determined through color classification. As revealed in Table 1, Treatment 1 gained a weighted mean of 3.40 (for experts), which has a verbal interpretation of high pale golden shade of yellow, while 3.41 for non-experts, which has a verbal interpretation of high pale golden shade of yellow. In treatment 2, it got a weighted mean of 2.64 (for expert), which has a verbal interpretation of medium pale golden shade of yellow, while for non-expert, it got a weighted mean of 2.78, which has a verbal interpretation of medium pale golden shade of yellow. In the last treatment, it obtained a weighted mean of 3.41, which has a verbal interpretation of high pale golden shade of yellow, while for the non-expert, it obtained a weighted mean of 2.81, which has a verbal interpretation of medium pale golden shade of yellow.

In comparison, the preferred treatment in terms of color is treatment 1. This implies that when less squash is added to the tart, the color becomes a more pale golden shade of yellow. This is opposite to the study of Borro and Gemora (2016) states that when more squash is added to the cake, the color becomes golden brown.

3.1.2 Aroma

It is an odor or fragrance, or it is commonly known as smell, and it is determined by the receptors in the nose. As presented in Table 2, Treatment 1 gained a weighted mean of 3.49 (for expert), which has a verbal interpretation of very good, while 4.21 for non-experts, which has a verbal interpretation of excellent. In treatment 2, it got a weighted mean of 2.18 (for expert), which has a verbal interpretation of fair, while for non-expert, it got a weighted mean of 2.19, which has a verbal interpretation of fair. In the last treatment, it obtained a weighted mean of 2.72, which has a verbal interpretation of good, while for the non-expert, it obtained a weighted mean of 2.87, which has a verbal interpretation of good. In comparison, the preferred treatment in terms of aroma is treatment 1.

This implies that the aroma in treatment 1 is more preferred. The less the squash is added to the tart, the more pleasant the smell is. In other studies, related to tart, the study of Quipe *et al.* (2020) mentioned that Pineapple-cucumber tart has no aftertaste of sourness and has an appetizing aroma. Also, Canet *et al.* (2021) showed the acceptability of Palapat Tart in terms of aroma, which means that tart can be mixed with other ingredients like Palapat fruit (Mangrove Apple) without affecting its smell.

3.1.3 Crunchiness

The sensation of the muffled grinding of a good stuff. As divulged in Table 3, Treatment 1 gained a weighted mean of 3.41 (for experts), which has a verbal interpretation of very crunchy, while 3.80 for non-experts, which has a verbal interpretation of very munchy crunchy. In treatment 2, it got a weighted mean of 1.69 (for expert), which has a verbal interpretation of poorly crunchy, while for non-expert, it got a weighted mean of 1.90, which has a verbal interpretation of fairly crunchy. In the last treatment, it obtained a weighted mean of 2.99, which has a verbal interpretation of moderately crunchy, while for the non-expert, it obtained a weighted mean of 2.87, which has a verbal

Table 1. Color of tart fortified with squash.

Treatment	Weighted mean		Interpretation	
	Expert	Non-expert	Expert	Non-expert
1	3.40	3.41	High pale golden shade of yellow	High pale golden shade of yellow
2	2.64	2.78	Medium pale golden shade of yellow	Medium pale golden shade of yellow
3	3.41	2.81	High pale golden shade of yellow	Medium pale golden shade of yellow

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Table 2. Aroma of tart fortified with squash.

Treatment	Weighted mean		Interpretation	
	Expert	Non-expert	Expert	Non-expert
1	3.49	4.21	Very good	Excellent
2	2.18	2.19	Fair	Fair
3	2.72	2.87	Good	Good

Table 3. Crunchiness of tart fortified with squash.

Treatment	Weighted mean		Interpretation	
	Expert	Non-expert	Expert	Non-expert
1	3.41	3.80	Very much crunchy	Very much crunchy
2	1.69	1.90	Poorly crunchy	Fairly crunchy
3	2.99	3.40	Moderately crunchy	Moderately crunchy

interpretation of good.

In comparison, the preferred treatment in terms of crunchiness is treatment 1. This implies that the less squash and the less liquid ingredients, the crunchier it is. The respondents found treatment 1 to a crunchy one to have a light and thin texture. Tunick *et al*. (2013) said that the consumer characterization of a crisp food as one that snaps easily, with snap being a very sudden, clean, and total fracture. This description implies a single sound event, which Chauvin et al. further described as high-pitched. Tunick (2012) specified that Varela *et al.* (2012) found that the perception of crispness and crunchiness depends on the background of the consumer.

3.1.4 Taste

It pertains to what is determined by the taste cells, wherein the receptor cells are in front and back of the tongue. As exposed in Table 4, Treatment 1 gained a weighted mean of 3.4 (for experts), which has a verbal interpretation of very good in flavor while 3.49 for non-experts, which has a verbal interpretation of very good in flavor. In treatment 2, it got a weighted mean of 1.69 (for expert), which has a verbal interpretation of poor in flavor while for non-expert, it got a weighted mean of 2.03, which has a verbal interpretation of fairly in favor. In the last treatment, it obtained a weighted mean of 2.65, which has a verbal interpretation of fairly in favor while for the non-expert, it obtained a weighted mean of 2.78, which has a verbal interpretation of good in flavor.

In comparison, the preferred treatment in terms of taste is treatment 1. This implies that the less the squash is added, the more tasteful it is. Correspondingly, Valencerina (2019), the taste of the squash tart is very much liked by the panel of evaluators. The crust is flaky and tender, which is a desirable characteristic of a pie crust.

3.1.5 General acceptability

It is approved by everybody. It is appealing and satisfactory to a particular group as well as to everyone associated with the identified sensory characteristics. As presented in Table 5, Treatment 1 gained a weighted mean of 3.51 (for experts), which has a verbal interpretation of moderately all right, while 3.67 for non-experts, which has a verbal interpretation of very all right. In treatment 2, it got a weighted mean of 1.80 (for expert), which has a verbal interpretation of slightly all right, while for non-expert, it got a weighted mean of 1.87, which has a verbal interpretation of slightly all right. In the last treatment, it obtained a weighted mean of 2.13, which has a verbal interpretation of slightly all right, while for the non-expert, it obtained a weighted mean of 2.72, which has a verbal interpretation of slightly all right.

In comparison, the preferred treatment in general is treatment 1. This generally implies that the more squash added was added to tart it looked, it tasted savory, it increased one's appetite, it looked a golden shade of yellow, and its crunchiness was pleasantly crisp.

Overall, the sensory evaluation revealed that the preferred treatment in terms of color, aroma, crunchiness, taste and general acceptability is Treatment 1. The process and formulation of treatment 1 is illustrated in Figure 1.

Table 4. Taste of tart fortified with squash.

Treatment	Weighted mean		Interpretation	
	Expert	Non-expert	Expert	Non-expert
1	3.42	3.49	Very good in flavor	Very Good in Flavor
2	1.69	2.03	Poor in flavor	Fairly in flavor
3	2.65	2.78	Fairly in Flavor	Good in flavor

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Table 5. General acceptability of tart fortified with squash.

Treatment	Weighted mean		Interpretation	
	Expert	Non-expert	Expert	Non-expert
1	3.51	3.67	Moderately all right	Very all right
2	1.80	1.87	Slightly all Right	Slightly all right
3	2.13	2.72	Slightly all right	Slightly all right

4. Conclusion

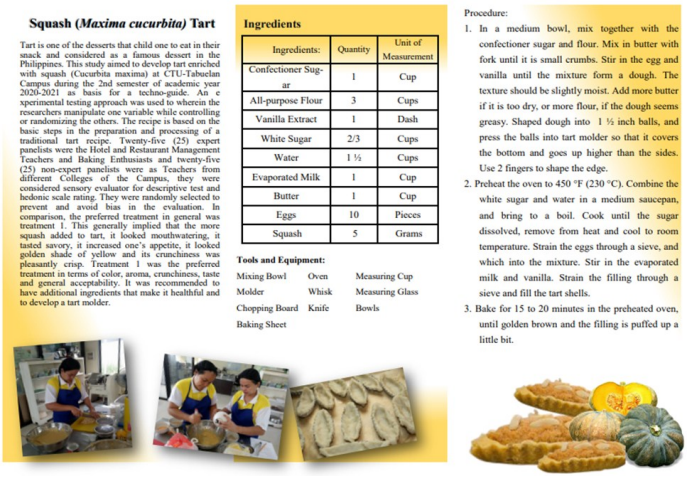


Figure 1. Squash tart T1 ingredients and procedures.

Based on the findings, treatment 1 is the preferred treatment in terms of color, aroma, crunchiness, taste and general acceptability. The acceptability of treatment 1 provides another variety of food that contributes to food innovation industries by adding nutritious and economical snacks that may address malnutrition-related problems in the Philippines. Furthermore, this may alleviate poverty, as this can be considered a commercial product for aspiring entrepreneurs.

Conflict of interest

The authors declare no conflict of interest.

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