

Vegetarian Crackers from Flower of Squash and Blue Ternate

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Abstract

Nowadays, there is a growing global need for a more wholesome and nourishing snack. The demand for snack foods like crackers has soared, especially among children. However, certain foods include excessive amounts of sugar, salt, and fats, endangering the consumer's health. Due to the therapeutic and restorative qualities of certain veggies, crackers infused with these vegetables form a functional food. In order to make crackers, this study used squash and blue ternate flowers.

The goals of this study were to identify the level of sensory qualities of vegetarian crackers made from squash and blue ternate flowers in terms of appearance, aroma, color, taste, texture, and general acceptability; to identify the product that would be most popular; and to identify any significant differences between treatments in terms of appearance, aroma, color, taste, texture, and general acceptability.

The blue ternate and squash flowers were cleaned, weighed, cooked, and ground before being combined with other ingredients to make crackers. Treatment B (squash flower) and Treatment C (blue ternate flower) were the experimental groups, and the mixture was reproduced three (3) times. Treatment A was the control with no flower added.

Five members of the faculty who teach courses connected to food, five students majoring in food service management, and five consumers served as the evaluators. They used score cards with a nine-point Hedonic scale to conduct sensory evaluations of the finished product.

The study's findings showed that the product in Treatment B (the squash flower) was superior in terms of sensory qualities and more palatable, followed by that in Treatment C (the blue ternate flower), which is practically equivalent to Treatment A (the control/no flower added). Significant variations across treatments were observed for sensory attributes such as taste and color, favoring Treatment A.

In order to add nutritional value to the food product, culinary experts and developers may use locally accessible vegetable flowers like squash and blue ternate. Squash and blue ternate crackers from vegetable flowers have the potential to be commercially successful, especially with consumers who are health aware.

Keywords: crackers, squash, blue ternate, acceptability, and sensory qualities

Introduction

Heavily processed foods often include a healthy levels of added sugar, sodium and fat. These ingredients make the food taste better, but too much of them lead to serious health issues like obesity, heart disease, high blood pressure, and diabetes (Author, 2019).

Crackers are a type of snack that have long been popular worldwide for over 150 years. More than ever, consumers are seeking broader and more nutritive functions from their snacks as they become a bigger part of their daily diet. With the increasing demand of health-oriented products, crackers with healthy ingredients such as protein and dietary fiber have gained increasing interest. In the past decade, wheat flour was substituted with

various healthy ingredients from agricultural products and fishes (Maisont et al., 2021).

Many flowers especially the edible one has a varied health benefits that gives not only aesthetic beauty to the plant but also provides health benefits due to nutrients they possess. Some may contain micronutrients that helps strengthen the body's immune system. Edible flowers contain phytonutrients, flavonoids, and antioxidants, all of which can help lower the risk of certain health problems like cancer and heart disease. Antioxidants also protect the body from free-radical damage, linked to disease and ageing (Sridevi, 2018). Pumpkin plants produce both male and female flowers, both of which are notable for their large, funnel-shaped blossoms. These striking

blossoms take on either a vivid orange or yellow hue (Ajmera, 2022).

Blue Ternate (*Clitoria ternate* Linn.) is a potential source of phytochemicals with nutritional and helpful benefits. It contains nutritive and medicinal values (Dizon, 2014).

Butterfly pea herb has been proven as a safe herb and this has not any major side effect for mortality. It is used in enhancing memory and reducing stress. The flower extract of the plant has been proven scientifically to protect against free radical and is full of antioxidants. Furthermore, the levels of some non-enzymic antioxidant namely ascorbic acid, reduced glutathione and total carotenoids were estimated in flowers of butterfly pea (Venkateshwaran (2015).

The remedy to this ill in our society is just their in our surroundings provided by nature. Many types of flowers are edible and supply a wealth of key nutrients necessary for good health. Seeking out safe edible flowers is a good way to boost intake of certain nutrients. The utilization of vegetable flowers, which are due to the nutritional value, afford ability, availability and benefit which are abundant in the locality hence, this research study.

Materials and Methods

This study used the following ingredients: rice flour, warm water, all-purpose flour, lime solution, baking powder, black pepper, white pepper, chili powder, iodized salt, baking soda, blue ternate and squash flowers.

This study utilized the experimental research to determine the sensory qualities and general acceptability of vegetable flower crackers as to general acceptability, appearance, aroma, color, taste, and texture.

The experimental design used in the study was the single factor experiment with Completely Randomized Design (CRD) in which blue ternate and squash flowers were studied. In this study, the blue ternate and squash flowers were added in making crackers. Treatment A – control, Treatment B – squash flower, and Treatment C –blue ternate.

Experimental Procedures

Step 1. Procedure in preparing blue ternate and squash flowers. The fresh blue ternate and squash flowers were washed, cleaned thoroughly, and drain. It was steamed until soft for about 3 - 5

minutes. It was then set aside until cool and weighed for each flower. It was grounded using a food processor until mixture become smooth.

Step 2. Procedure in making the product Crackers

The needed tools, equipment and materials were prepared. The ground rice was mixed with a warm water and set aside for about an hour. The all-purpose flour was mixed with the other remaining dry ingredients. It was then mixed to the grounded rice. The flower mixture was added gradually stirring until desired consistency was achieved. One – half teaspoon of mixture was poured to each molder then, it was steamed for almost 20 – 25 minutes until dry and tender. The next step was sun-drying until it becomes brittle, it now ready for deep – frying under low fire. The finished product is the vegetarian crackers from flowers of blue ternate and squash.

In this study, the different sensory qualities such as appearance, aroma, color, texture, and taste of the product were scored, given weighed and categorized. In the sensory qualities, each quality was assigned with adjectival description and for acceptability, it was assigned with qualitative description.

The arithmetic mean and Analysis of Variance (ANOVA) were the statistical tools used in analyzing and interpreting the data. Using SPSS for data processing and analysis. The mean was used to determine the appearance, aroma, color, texture, and taste of the different product. The ANOVA set at 0.05 alpha level was used to determine the significant differences on the sensory qualities of the products among treatments.

Results and Discussions

Acceptability Level of Vegetarian Crackers from Flowers of

Squash and Blue Ternate in terms of Different Sensory

Attributes and General Acceptability

Acceptability level of the product in terms of appearance

Appearance is the act of appealing as to the eyes or mind before the public; the sensory or phenomenal aspect of existence to the observer (Borro and Gemora, 2016).

Table 2 shows the sensory acceptability level of vegetarian crackers from flowers of squash

and blue ternate in terms of appearance among the respondents. Treatment B (Vegetarian crackers from flower of squash) was found to be “Liked Very Much” with the mean of 7.73; Treatment C

(Vegetarian crackers from flower of blue ternate) and Treatment A (No mixture added) were “Liked Moderately” as revealed by their means of 7.15 and 7.00 respectively.

Table 1. Sensory acceptability level of vegetarian crackers from flowers of squash and blue ternate in terms of appearance.

APPEARANCE	MEAN	DESCRIPTION
Treatment A	7.00	Liked Moderately
Treatment B	7.73	Liked Very Much
Treatment C	7.15	Liked Moderately

Acceptability level of the product 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 (Borro and Gemora, 2016).

As shown in Table 2, Treatment B was interpreted as “very much authentic” while Treatment A and C were found to be very authentic as perceived by the respondents.

Table 2. Sensory acceptability level of vegetarian crackers from flowers of squash and blue ternate in terms of color.

COLOR	MEAN	DESCRIPTION
Treatment A	6.88	Very Authentic
Treatment B	7.42	Very Much Authentic
Treatment C	6.97	Very Authentic

Acceptability level of the product in terms of aroma

Table 3 reveals that in terms of aroma, product in Treatment B was very much pleasant (M=7.24)

while Treatment A and B were very pleasant (M=7.00 and 6.85) respectively among respondents.

Table 3. Sensory acceptability level of vegetarian crackers from flowers of squash and blue ternate in terms of aroma.

COLOR	MEAN	DESCRIPTION
Treatment A	7.00	Very Pleasant
Treatment B	7.24	Very Much Pleasant
Treatment C	6.85	Very Pleasant

Acceptability level of the product 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 (Borro and Gemora, 2016).

Table 4 shows the sensory acceptability level of the product in terms of texture. The respondents found the product to be very much crispy in Treatment A, B, and C (M=7.97 and 7.52) respectively.

Table 4. Sensory acceptability level of vegetarian crackers from flowers of squash and blue ternate in terms of texture.

COLOR	MEAN	DESCRIPTION
Treatment A	7.52	Very Much Crispy
Treatment B	7.97	Very Much Crispy
Treatment C	7.52	Very Much Crispy

Acceptability level of the product 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 (Borro and Gemora, 2016).

Sensory acceptability level of product in terms of taste was revealed in Table 5. Product in Treatment B (M=7.76) was found to be very much delicious among respondents. Product in Treatment C (M=7.36) and Treatment A (M=6.94) were perceived by the respondents as very delicious.

Table 5. Sensory acceptability level of vegetarian crackers from flowers of squash and blue ternate in terms of taste.

COLOR	MEAN	DESCRIPTION
Treatment A	6.94	Very Delicious
Treatment B	7.76	Very Much Delicious
Treatment C	7.36	Very Much Delicious

Acceptability level of the product in terms of general acceptability

Table 6 shows the data on general acceptability of the product. Treatment B with the mean rating of 7.76 and Treatment C (M=7.36) were found to be

very much acceptable by the respondents while product in Treatment A (M=7.21) was very acceptable among respondents.

Table 6. Sensory acceptability level of vegetarian crackers from flowers of squash and blue ternate in terms of general acceptability.

COLOR	MEAN	DESCRIPTION
Treatment A	7.21	Very Acceptable
Treatment B	7.76	Very Much Acceptable
Treatment C	7.36	Very Much Acceptable

Differences in the Acceptability of Vegetarian Crackers from Flowers of Squash and Blue Ternate in terms of Sensory Attributes

Differences in the acceptability of the product in terms of sensory attributes

Table 7 shows the result of Friedman’s test on the differences in the acceptability of the product in terms of appearance. The data reveal

that there is no significant difference among treatments in terms of appearance (P-value =0.068, >0.05). Therefore, the null hypothesis stating no significant difference existed among treatments in terms of appearance was accepted.

It can be implied that the sensory acceptability of the product in terms of appearance were the same in treatment A, B, and C.

Table 7. Differences in the sensory acceptability of vegetarian crackers from flowers of squash and blue ternate in terms of appearance.

Sensory Attributes	DF	Chi-square	P-value	Interpretation
Appearance	2	5.389	0.068	NS

NS – Not Significant

As shown in Table 8, there was a significant difference in the sensory acceptability of the product in terms of color ((P-value =0.046, <0.05). Hence, the null hypothesis stating no significant difference among treatments in terms of color was rejected. Based on their means, vegetarian crackers from flower of squash got the highest mean rating in terms of color. It can be said that product in treatment B was the best among other product in

terms of this sensory attributes. It can be implied that treatment B had the most authentic color of a crackers compared to its counterparts.

This is in consonance with the findings of Garayo and Moreira (2022) that vacuum frying could produce chips having lower oil content and with good color.

Table 8. Differences in the sensory acceptability of vegetarian crackers from flowers of squash and blue ternate in terms of color.

Sensory Attributes	DF	Chi-square	P-value	Interpretation
Color	2	6.171	0.046	S

S – Significant at 5%

Data in Table 9 show no significant difference existed among products in different treatments in terms of aroma (P-value =0.529, >0.05). Therefore, it fails to reject the null hypothesis stating no

significant difference among treatments in terms of aroma.

It can be said that aroma of the products in Treatment A, B, and C were statistically the same regardless of the variants of flowers used.

Table 9. Differences in the sensory acceptability of vegetarian crackers from flowers of squash and blue ternate in terms of aroma.

Sensory Attributes	DF	Chi-square	P-value	Interpretation
Aroma	2	1.273	0.529	NS

NS – Not Significant

Difference in the sensory acceptability of the product was presented in Table 10. The P-value of 0.165 which is higher than 0.05 shows no significant difference among treatments in terms of texture. Hence, it fails to reject the null hypothesis stating no significant difference among treatments in

terms of texture. It can be implied that texture of the product among treatments were not statistically differ. Implying further that the crispiness of the product were the same in all treatments even replicated three times

Table 10. Differences in the sensory acceptability of vegetarian crackers from flowers of squash and blue ternate in terms of texture.

Sensory Attributes	DF	Chi-square	P-value	Interpretation
Texture	2	3.600	0.165	NS

NS – Not Significant

Shown in Table 11 the result of Friedman’s test on the sensory acceptability of the product among treatments. It was revealed that there was a significant difference among treatments in terms of

taste (P-value =0.000, <0.05). Therefore, the null hypothesis was rejected. It can be said that product in different treatments were not statistically the same in terms of its taste

Table 11. Friedman’s test on the differences in the sensory acceptability of vegetarian crackers from flowers of squash and blue ternate in terms of taste.

Sensory Attributes	DF	Chi-square	P-value	Interpretation
Taste	2	15.548	0.000	S

S – Significant at 5%

Table 12 show a post hoc test among treatments in terms of taste. A Wilcoxon signed test revealed that a significant difference existed between Treatment A and Treatment C, Z=-2.041, p=0.031; Treatment B and Treatment C, Z=-2.226, p=0.026. Considering

their means, Treatment B got the highest mean score. It can be implied that cracker from flowers of squash was the best product compared to others in terms of their taste. This result negates that findings of Moreno (2015) in his study revealed that

the presence of the different proportions of mashed squash in the treatments did not affect the level of their acceptability in terms of taste.

Table 12. Post-hoc test on significant differences among treatments in terms of taste.

Compared Variables	Z	Sig.
Treatment A – Treatment B	-1.863	0.063
Treatment A – Treatment C	-2.041*	0.041
Treatment B – Treatment C	-2.226*	0.026

*P <0.05

It was revealed in Table 13 the Friedman’s test on the differences in the sensory acceptability of vegetarian crackers from flowers of squash and blue ternate in terms of general acceptability. Data show a significant difference among treatments in terms of general acceptability (p-value =0.003 <0.05). Hence, it fails to reject the null hypothesis

stating no significant difference among treatments in terms of general acceptability. It can be implied that general acceptability of the product in different treatments varies as revealed by the respondents.

Table 13. Friedman’s test on the differences in the sensory acceptability of vegetarian crackers from flowers of squash and blue ternate in terms of general acceptability.

Sensory Attributes	DF	Chi-square	P-value	Interpretation
General Acceptability	2	11.371	0.003	S

S – Significant at 5%

Table 14 reveals a post hoc test using Wilcoxon signed test on the difference among treatments in terms of general acceptability. A significant difference existed between Treatment A and Treatment B, Z=-2.673, p=0.008; Treatment B and Treatment C, Z=-2.154, p=0.031. This means that

Treatment A and Treatment B and Treatment B and Treatment C were not the same in terms of general acceptability. Based on their means, it can be said that Treatment B was the most acceptable product among respondents.

Table 14. Post hoc test on the differences among treatments in terms of general acceptability.

Compared Variables	Z	Sig.
Treatment A – Treatment B	-2.673*	0.008
Treatment A – Treatment C	-1.340	0.180
Treatment B – Treatment C	-2.154*	0.031

*P <0.05

Conclusions

Based on the findings of the study, the following conclusion were forwarded:

The sensory acceptability level of vegetarian crackers from flowers of squash and blue ternate in terms of appearance of Treatment B was very much liked while treatment A and C were liked. While color of treatment B was very much authentic while treatment C and A were very authentic. The aroma of treatment B was very much pleasant while treatment A and C were very pleasant. In terms of texture, treatment A, B and C were very much crispy. The taste of treatment B and C were very much delicious, while treatment A was very delicious. For the general acceptability, treatment A and C were very much acceptable, while treatment A was very acceptable.

There is a significant difference in the acceptability of vegetarian crackers from flowers of squash and blue ternate in terms of color, taste and general acceptability. Treatment B got the highest acceptability level in all sensory attributes followed by treatment C.

Recommendations

The following are the recommendation based on the conclusions of the study: Squash, especially the male flower which is rich in nutrients and abundant in the locality, could be utilized in making nutritious crackers.

The inclusion of squash flower in making crackers since, it enhance the color, taste and it is very much acceptable add on the nutritional value it can give to the consumer. To develop recipes using male flower of squash to augment malnutrition at reasonable price.

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