

Sensory Characterization of Cupcakes Made of Sweet Potato (*Ipomoea batatas*) Flour with Turmeric (*Curcuma longa*) Powder

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Abstract – *This experimental study aimed to determine the sensory characteristics of sweet potato cupcakes enriched with 5, 10 and 15 grams of turmeric powder in terms of its outside characteristics such as shape, color, volume and crust and its inside characteristics such as color, grain, texture, taste and aroma. The level of acceptability as to appearance, taste, texture, aroma and general acceptability was also evaluated. The sensory characteristics were evaluated by selected panel of evaluators using a sensory evaluation score sheet based on the Six - Point Hedonic Scale.*

Findings revealed that the outside characteristics of sweet potato cupcakes enriched with 5 grams turmeric powder has a moderately rounded top, inside characteristic was yellow-orange in color. On the other hand, sweet potato cupcakes enriched with 10 grams and 15 grams turmeric powder have a perfectly rounded top, inside characteristic was yellow in color. While, outside characteristics such as yellow-orange in color, moderately light in weight in proportion to size and has a moderately shiny surface and inside characteristics such as thin-walled cells with no larger air spaces, moderately moist, moderately tender, moderately distinct sweet potato taste and have a moderately distinct sweet potato aroma were common to 5, 10 and 15 grams turmeric powder. Moreover, sweet potato cupcakes with 0 grams turmeric powder has perfectly rounded top, light brown in color, moderately light in weight in proportion to size and has a moderately shiny surface while the inside characteristics were light brown in color, moderately uniform, thin-walled cells with no larger air spaces, moderately moist, moderately tender, moderately distinct sweet potato taste and has a very distinct sweet potato aroma.

Sweet potato cupcakes with 5 grams turmeric powder was the most acceptable since it was very much liked by the group of evaluators as to its general acceptability and very comparable to all sensory characteristics.

Significant differences existed in the level of acceptability of sweet potato cupcakes enriched with turmeric powder in terms of taste, aroma and general acceptability.

No significant differences existed in the level of acceptability of sweet potato cupcakes enriched with turmeric powder in terms of appearance and texture as evaluated by pupils, high school students and housewives.

Keywords – *cupcakes, enriched, sweet potato, turmeric powder*

INTRODUCTION

One of the most trendiest, delicious and popular dessert are the cupcakes. Some people think cupcakes are just for kids, however they can be served in any occasion and to all kinds of people from all walks of life. They are even portable and easy to serve to a crowd. Well-known celebrities like Martha Stewart, Mrs. Beasley, who owns a popular bakery which sells gourmet cupcakes in Paris, Blake Lively, a star in a popular show and Gossip Girl are lovers of cupcakes.

Cupcake is mostly made of wheat flour infused with organic ingredients like native fruits, grains, nuts, herbs

and tubers. Due to higher cost of wheat the researcher found an interesting organic plant that could give higher content of starch. Sweet potato locally known as “kamote” is a cheap but excellent source of carbohydrates, Vitamin A, carotene, calcium and phosphorous. The ingenuity of the Filipinos lead to the development of cupcakes utilizing sweet potatoes realizing the comparability of sweet potato flour to a commercial flour used in making cupcakes.

Nutrient supplementation of food is the present thrust of our government because our simple diet based on staple food are often deficient in certain nutrients

hence, the government recognizes that food enrichment could be one of the strategies to improve the health of the people (Claudio, 2001) [1].

Turmeric, or *Curcuma longa*, is a spice native to India. Historically, turmeric has been used throughout India, China and Indonesia as a spice and medicinal agent. Turmeric is a mild spice that enhances the flavor of other spices and foods and is the base of most Indian curries. Traditionally, turmeric has been used topically to heal and reduce bleeding associated with bruises, sprains, leech bites and inflamed joints. It has also been used internally for liver and digestive complaints, menstrual insufficiency and cramping, jaundice, and as an anti-inflammatory agent. In the Ayurvedic tradition, turmeric, or “haldi” as it is known in Hindi, works well with all doshas, with its main action being to reduce mucus from the system.(de Jager, 2010) [2].

According to, Jurenka, 2009, the rhizome, or root, of Turmeric is the part used medicinally. Numerous constituents have been identified in turmeric. The main constituent group are polyphenolic curcuminoids which include: curcumin (diferuloylmethan), demethoxycurcumin, bisdemethoxycurcumin, and cyclocurcumin [3].

Researches have proven that most of the turmeric activities of the turmeric are due to curcumin. It has various useful properties with antioxidant activities and is useful in conditions such as inflammation, ulcer and cancer. It also has antifungal, antimicrobial renal and hepatoprotective activities. Therefore, it has the potential against various cancer, diabetes, allergies, arthritis, Alzheimer’s disease and other chronic and hard curable diseases.(Nazri, et al, 2014) [4]. Furthermore, Labban, 2014, added that Studies showed that oral administration of curcumin in instances of diabetes, cancers, gastrointestinal disorders and neurological diseases. Curcumin may also be applied topically to counteract inflammation and irritation associated with inflammatory skin conditions and allergies. Curcumin’s ability to inhibit carcinogenesis at three stages: tumor promotion, angiogenesis, and tumor growth [5]. Clinically, curcumin has already been used to reduce post-operative inflammation. Safety evaluation studies indicate that both turmeric and curcumin are well tolerated at a very high dose without any toxic effects. Thus, both turmeric and curcumin have the potential for the development of modern medicine for the treatment of various diseases. (Chattopadhyay, 2004) [6].

Principal component analysis classified the sweet potato varieties into three varietal groups

among the group, the white variety exhibited rich fiber, ash, and protein contents and may be recommended for infant foods formulations (Sanoussi A. F., 2016)[7]. However, according to Jenkin, M., 2015, chronic vitamin A deficiency affects both women and children in Mozambique and populations worldwide and cannot be addressed through supplementation alone. Food-based approaches encouraging the consumption of vitamin A-rich foods, such as the orange-fleshed sweet potato (OFSP), have the potential to positively affect vitamin A status [8].

Eating sweet potato cupcakes enriched with turmeric powder will help in providing our school children with nutritious foods. This will facilitate the proper implementation of Department of Education Order No. 17 s.2008 which bans junk foods in all Public Elementary and High School canteens. The order calls that only fortified foods will be served to pupils and students to curb malnutrition [9].

Utilizing the abundance of sweet potato and turmeric and their benefits, it is important to maximize their usefulness by making a product that is available, economical and enrichment to sweet potato cupcake was the focus of this study.

OBJECTIVES OF THE STUDY

This study aims to determine the sensory characteristics of sweet potato cupcakes enriched with 5, 10 and 15 grams of turmeric powder in terms of its outside characteristics such as shape, color, volume and crust; and its inside characteristics such as color, grain, texture, taste, and aroma; determine the level of acceptability of sweet potato cupcakes enriched with 5, 10 and 15 grams of turmeric powder in making cupcakes in terms of appearance, taste, texture, aroma and general acceptability; test the significant difference in the level of acceptability of sweet potato cupcakes added with 5, 10 and 15 grams of turmeric powder when evaluated as to appearance, taste, texture, aroma and general acceptability and determine the cost per piece of the cupcake enriched with turmeric powder.

MATERIALS AND METHODS

Research Design

This study used an experimental research. The experimental research is designed in such a way that evaluators manipulate and control one independent variable for the variations concomitant to the manipulation of the dependent variable. (Caipang, 2004) [10].

The researcher will be using the experimental method of research because this type of research has at least one or more independent variables which are deliberately manipulated to produce an effect. This is considered the most sophisticated method for testing hypothesis involving cause – effect relationship (Biton, 2009) [11].

The main purpose of this study is to discover if which among the treatment is most acceptable.

Treatment A represented the sweet potato cupcakes with 5 grams turmeric powder, Treatment B represented the sweet potato cupcakes with 10 grams turmeric powder, Treatment C represented the sweet potato cupcakes with 15 grams turmeric powder, Treatment D represented the sweet potato cupcakes with no turmeric powder.

Evaluators of the Study

There were 30 evaluators composed of 15 food technologist and home economist and 15 bakers and cooks for sensory characteristics and 60 evaluators composed of 20 pupils in Home Economics, 20 high school students in Home Economics and 20 housewives for the level of acceptability who were selected purposely for the study. They were purposely chosen as evaluators of the finished products because of their expertise and availability.

Sources of Data

The evaluators rated the sensory characteristic in terms of its outside characteristics as to shape, color, volume, crust and its inside characteristics as color, grain, texture, taste and aroma and the level of acceptability of the cupcakes as to appearance, color, aroma, texture and general acceptability.

Materials, Tools and Equipment

In the conduct of the study, the researcher got the sweet potato and turmeric from their farm in Leon, Iloilo. Other ingredients in making cupcakes such as baking powder, salt, refined sugar, eggs and vanilla were purchased in the market.

The tools, utensils and equipment needed for making cupcakes were the mixing bowl, wooden spoon, spatula, rubber scraper, measuring cups, measuring spoon, flour sifter, paper cups and oven.

Data Gathering Instrument

Sensory evaluation score sheet were used in gathering the data. It has a direction and criteria which the evaluators followed in rating the finished products.

The research instrument was based on the Six-Point Hedonic Scale. Included in the instrument were the title of the study, direction evaluating the product according to the sensory characteristics in terms of its outside characteristics as to shape, color, volume, crust and its inside characteristics as color, grain, texture, taste and aroma and the level of acceptability of sweet potato cupcakes with turmeric powder as to appearance, color, texture, aroma and general acceptability. The levels of acceptability were rated 6-very much liked; 5-moderately liked; 4-slightly liked; 3-slightly disliked; 2-moderately disliked and 1-very much disliked.

Data Gathering Procedure

The experiment was divided into five phases: *Phase 1 – Preparation of Sweet Potato Flour and Turmeric Powder; Phase 2 – Try – out of the Recipes; Phase 3 – Standardization of Recipe.*

After the try-out and revision of the recipe, the panel of evaluators were asked to give suggestions and opinions for the improvement of the recipes.

Phase 4 – Evaluation

The finished product were subjected to sensory evaluation by the group of respondents to determine the sensory evaluation in terms of its outside characteristics as to shape, color, volume, crust and its inside characteristics as color, grain, texture, taste and aroma and the level of acceptability of sweet potato cupcakes with turmeric powder in terms of appearance, taste, texture, aroma and general acceptability. The evaluators were instructed on how to evaluate the cupcakes. Each evaluator was advised to drink water after every testing of the product to rinse their mouth so that assessment of the taste was more accurate.

Phase 5 – Costing

After the sensory evaluation of the finished product, it is now time to give the appropriate price per piece to the finished product which is the sweet potato cupcakes with turmeric powder.

Data Processing Technique

After the sensory evaluation of the finished products, the scoresheets were gathered; responses were recorded, tallied, summarized and prepared for computations. The arbitrary scale was used for data interpretation of the mean: 5.50 – 6.00: Very Much Liked; 4.50 – 5.49: Moderately Liked; 3.50 – 4.49: Slightly Liked; 2.50 – 3.49: Slightly Disliked; 1.50 –

2.49: Moderately Disliked; 1.00 – 1.49: Very Much Disliked.

To determine whether a significant difference existed in the level of acceptability of sweet potato cupcakes with turmeric powder, the One-Way Analysis of Variance at 0.01 level of significance was used.

RESULTS AND DISCUSSION

Outside characteristics of sweet potato cupcakes enriched with turmeric powder as to shape

The result showed that the shape of cupcakes with 10 grams of turmeric powder (Product B = 50%), 15 grams of turmeric powder (Product C=40%) and 0 gram of turmeric powder (Product D = 33.33%) were described as “perfectly rounded top” while cupcakes with 5grams of turmeric powder (Product A=63.33%) was described as “moderately rounded top”.

Among the experimental products, Product A (sweet potato cup cakes with 5 grams turmeric powder) was evaluated by majority (63.33%) of the evaluators as moderately rounded top. This means that only cupcakes with 10 and 15 grams of turmeric powder were comparable to the control. This results could be attributed to the amount of turmeric powder added that properly blends with sweet potato and other ingredients that created a more perfect shape.

The result of the present study revealed that sweet potato was mixed properly and proper baking time was observed. Likewise, sweet potato flour has less protein hence it can be easily handled and have a better chance of having moderately rounded top.

Outside Sensory Characteristics of Sweet Potato Cupcakes Enriched with Turmeric Powder as to Color

The result showed that the color of cupcakes with 5 grams of turmeric powder (Product A = 40%), 10 grams of turmeric powder (Product B = 40%) and 15 grams of turmeric powder (Product C=46.67%) were described as “yellow-orange” while cupcakes with 0 gram of turmeric powder (Product D = 53.33%) was described as “light brown”.

Among the experimental products, Product C (sweet potato cupcakes with 15 grams turmeric powder) was evaluated by majority (46.67%) of the evaluators as yellow orange. This means that turmeric powder when added to the cake mixture makes the products become yellow-orange.

In the present study, the natural color of turmeric powder gives an attractive color to the cupcakes. Likewise the natural color of sweet potato flour enhance

the appearance of cupcakes and gave an attractive color to the cupcakes that attracts the evaluators.

Outside Sensory Characteristic of Sweet Potato Cupcakes Enriched with Turmeric Powder as to Volume

The result showed that the volume of cupcakes with 5 grams of turmeric powder (Product A = 53.33%, 10 grams of turmeric powder (Product B = 76.67%), 15 grams of turmeric powder (Product C=60%) and 0 gram of turmeric powder (Product D = 60%) were described as “moderately light in weight in proportion to size”.

Among the experimental products, Product B (sweet potato cup cakes with 10 grams turmeric powder) was evaluated by majority (76.67%) of the evaluators as moderately light in weight in proportion to size. However, Product A and C were almost similar with the Product D (control). They were evaluated as moderately light in weight in proportion to size. This results could be attributed to the presence of wheat flour used in cupcake mixture because of its gluten content that makes the weight of the cupcakes light.

In the present study, when sweet potato flour and turmeric powder added to the cupcakes mixture makes the product moderately light in weight.

Outside Sensory Characteristic of Sweet Potato Cupcakes Enriched with Turmeric Powder as to Crust

The result showed that the crust of cupcakes with 5 grams of turmeric powder (Product A = 43.33%), 10 grams of turmeric powder (Product B = 70%), 15 grams of turmeric powder (Product C=46.67%) and 0 gram of turmeric powder (Product D = 40%) were described as “moderately shiny surface”.

Among the experimental products, Product B (sweet potato cup cakes with 10 grams turmeric powder) was evaluated by majority (70%) of the evaluators as moderately shiny surface. This implies that the sweet potato cup cakes with 10 grams turmeric powder has a moderately shiny surface. However, Product A, B and C were almost comparable with the Product D (control). This means that sweet potato cupcakes with 5, 10 and 15 grams of turmeric powder were comparable to the control. Findings revealed that the presence of sweet potato flour and turmeric powder produced a product that have a moderately shiny surface. This is also because the researcher has a control oven temperature and the observed the proper baking time.

Inside Sensory Characteristic of Sweet Potato Cupcakes Enriched with Turmeric Powder

The result showed that the color of cupcakes with 5 grams of turmeric powder (Product A = 36.67%) and 15 grams of turmeric powder (Product C=63.33%) were described as “yellow-orange” while cupcakes with 10 grams of turmeric powder (Product B = 53.33%) was described as “yellow” and cupcakes with 0 gram of turmeric powder (Product D = 56.67%) was described as “light brown”.

Among the experimental products, Product C (sweet potato cup cakes with 15 grams turmeric powder) was evaluated by majority (63.33%) of the evaluators as yellow-orange. Results showed that sweet potato cupcakes with turmeric powder have a yellow and yellow-orange color. This is due to the yellow-orange color of turmeric powder added to the cupcake mixture. This implies that the cupcakes without turmeric powder resulted to light brown color, while the cupcakes with turmeric powder was yellow to yellow-orange in color.

Inside Sensory Characteristics of Sweet Potato Cupcakes Enriched with Turmeric Powder as to Grain

The result showed that the crust of cupcakes with 5 grams of turmeric powder (Product A = 66.67%), 10 grams of turmeric powder (Product B = 66.67%), 15 grams of turmeric powder (Product C=56.67%) and 0 gram of turmeric powder (Product D = 46.67%) were described as “moderately uniform, thin-walled cells with no large air spaces”.

Among the experimental products, Product A (sweet potato cup cakes with 5 grams turmeric powder) and Product B(sweet potato cup cakes with 10 grams turmeric powder) were evaluated by majority (66.67%) of the evaluators as moderately uniform, thin-walled cells with no larger air spaces. On the other hand, sweet potato cupcakes with 5, 10 and 15 grams of turmeric powder were comparable to the control. This further implies that the grain of sweet potato cupcakes was not affected by the amount of turmeric powder added to cupcake mixture.

The present investigation showed that the grain of the sweet potato cupcakes was not affected by the amount of turmeric powder added to the cake mixture.

Inside Sensory Characteristic of Sweet Potato Cupcakes Enriched with Turmeric Powder as to Texture (handfeel)

The result showed that the texture (handfeel) of cupcakes with 5 grams of turmeric powder (Product A = 53.33%), 10 grams of turmeric powder (Product B = 50%), 15 grams of turmeric powder (Product C=40%)

and 0 gram of turmeric powder (Product D = 40%) were described as “moderately moist.”

Among the experimental products, Product A (sweet potato cup cakes with 5 grams turmeric powder) was evaluated by majority (53.33%) of the evaluators as moderately moist. On the other hand, sweet potato cupcakes with 5, 10 and 15 grams of turmeric powder were comparable to the control. This further implies that the texture (handfeel) of sweet potato cupcakes was moderately moist.

In the present study, the sweet potato cupcakes was not affected by the turmeric powder added to the mixture.

Inside Sensory Characteristic of Sweet Potato Cupcakes Enriched with Turmeric Powder as to Texture (mouthfeel)

The result showed that the texture (mouthfeel) of cupcakes with 5 grams of turmeric powder (Product A = 60%), 10 grams of turmeric powder (Product B = 56.67%), 15 grams of turmeric powder (Product C=60%) and 0 gram of turmeric powder (Product D = 40%) were described as “moderately tender”.

Among the experimental products, both Product A (sweet potato cup cakes with 5 grams turmeric powder) and Product C (sweet potato cup cakes with 15 grams turmeric powder) were evaluated by majority (60%) of the evaluators as moderately tender. Likewise, sweet potato cupcakes with 5, 10 and 15 grams of turmeric powder were comparable to the control. Results showed that regardless to the amount of turmeric added to the cake mixture, the texture was almost the same.

Inside Sensory Characteristic of Sweet Potato Cupcakes Enriched with Turmeric Powder as to Taste

The result showed that the taste of cupcakes with 5 grams of turmeric powder (Product A = 43.33%), 10 grams of turmeric powder (Product B = 66.67%), 15 grams of turmeric powder (Product C=36.67%) and 0 gram of turmeric powder (Product D = 43.33%) were described as “moderately distinct sweet potato taste.”

Among the experimental products, Product B (sweet potato cup cakes with 10 grams turmeric powder) was evaluated by majority (66.67%)of the evaluators as moderately distinct sweet potato taste. However, Product A, B and C were comparable with the Product D (control). They were evaluated with moderately distinct sweet potato taste.

Inside Sensory Characteristic of Sweet Potato Cupcakes Enriched with Turmeric Powder as to Aroma

The result showed that the aroma of cupcakes with 5 grams of turmeric powder (Product A = 36.67%) and 0 gram of turmeric powder (Product D = 33.33%) were described as “very distinct sweet potato aroma and moderately distinct sweet potato aroma, while 10 grams of turmeric powder (Product B = 46.67%) and 15 grams of turmeric powder (Product C = 36.67%) were described as “moderately distinct sweet potato aroma”.

Among the experimental products, Product B (sweet potato cup cakes with 10 grams turmeric powder) was evaluated by majority (46.67%) of the evaluators as moderately distinct sweet potato aroma. However, Product A was comparable with the Product D (control). They were evaluated as very distinct sweet potato aroma. This further implies that the aroma of sweet potato cupcakes was not affected with the addition of turmeric powder.

Level of Acceptability of Sweet Potato Cupcakes Enriched with Turmeric Powder

The result showed that the obtained mean of cupcakes with 10 grams of turmeric powder (Product B = 5.40), 15 grams of turmeric powder (Product C = 5.18) and 0 gram of turmeric powder (Product D = 5.37) were described as “moderately liked” while cupcakes with 5 grams of turmeric powder (Product A = 5.65) was described as “very much liked”.

However, among the experimental products, Product A (sweet potato cupcakes with 5 grams turmeric powder) obtained the highest mean, which means very acceptable. This implies that the appearance were very much liked because they were more evenly shaped and more appealing with its yellow orange color. Findings further implies that the sweet potato and turmeric were properly blended with other ingredients because of even shape, appealing color and glossy.

To find out if there was a significant difference among proportions A, B, C, and D as to appearance; ANOVA was computed at 0.01 level of significance.

Table 1 presents the One-Way Analysis of Variance as to the level of acceptability of sweet potato cupcakes enriched with turmeric powder as to appearance.

The result showed that there was no significant difference on the level of acceptability of the sweet potato cupcakes with turmeric powder as to appearance of the four products ($F(3,76) = 2.581, p = .06$). This implies that in terms of appearance the sweet potato cupcakes with turmeric powder, were almost the same. Considering the color property of sweet potato flour which is white the color of turmeric which is yellow orange when added with sweet potato flour

made the color of the four products almost similar from each other.

Therefore the null hypothesis which states that there was no significant difference in the level of acceptability of sweet potato cupcakes with turmeric powder as to the appearance was accepted.

Acceptability of Sweet Potato Cupcakes enriched with Turmeric Powder as to Taste

The result showed that the obtained mean of cupcakes with 10 grams of turmeric powder (Product B = 5.35), 15 grams of turmeric powder (Product C = 5.07) and 0 gram of turmeric powder (Product D = 5.40) were described as “moderately liked” while cupcakes with 5 grams of turmeric powder (Product A = 5.73) was described as “very much liked”.

However, among the experimental products, Proportion A (sweet potato cupcakes with 5 grams turmeric powder) obtained the highest mean, which means very acceptable. This implies that sweet potato, turmeric and other ingredients are blended well, it had a sweet and pleasant sweet potato taste. According to Lai (2012), starch is the major carbohydrates found in sweet potato, that when it is baked it turned to form monosaccharide and disaccharides or sugars. That is why sugar content of sweet potato increased significantly because of maltose formation. Maltose is dramatically increased after baking and became the major component of sugar content of sweet potato. Sweet potato increased its natural sugar content that enhanced the taste of cupcakes that is why the fresh taste of sweet potato rootcrop is not distinct or apparent.

To find out if there was a significant difference among proportions A, B, C, and D as to taste; ANOVA was computed at 0.01 level of significance.

One-Way Analysis of Variance of sweet potato cupcakes with turmeric powder as to taste

The result showed that there was a significant difference on the level of acceptability of the sweet potato cupcakes with turmeric powder as to taste of the four products ($F(3,76) = 5.06, p = .003$). This further implies that the taste of the products as determined and perceived differ from one another.

Therefore the null hypothesis which states that there was no significant difference in the level of acceptability of sweet potato cupcakes with turmeric powder as to the appearance was rejected.

To find out the treatments that have a significant differences, Scheffe test was computed.

Post Hoc test using Scheffe on sweet potato cupcakes enriched with turmeric powder as to taste

The result showed that there were no significant differences in terms of taste for Products A and B, A and D, B and C, B and D and, C and D. Therefore, the sweet potato cupcakes with turmeric powder on the paired treatments were similar in terms of taste.

On the other hand A and C, revealed that the significant value is 0.003 and is lesser than the alpha level of 0.01 which hand, paired Treatments is significant. This further means that the taste of the product for paired Treatments A and C differ from each other. This is due to the smaller amount of turmeric powder in Treatment A while Treatment C contains greater amount of turmeric powder. This implies that the greater amount of turmeric powder added to the mixture, the greater the difference in the taste of the product when compared to the sweet potato cupcakes with less amount of turmeric powder.

Therefore, the null hypothesis which states that there is no significant difference in the level of acceptability of sweet potato cupcakes enriched with turmeric powder in terms of taste as evaluated by the respondents at 0.01 level of significance was not accepted.

Summary of the obtained means of sweet potato cupcakes enriched with turmeric powder as perceived by the group of respondents as to its texture

The result showed that the obtained mean of cupcakes with 10 grams of turmeric powder (Product B = 5.37), 15 grams of turmeric powder (Product C = 5.15) and 0 gram of turmeric powder (Product D = 5.24) were described as “moderately liked” while cupcakes with 5 grams of turmeric powder (Product A=5.59) was described as “very much liked”.

However, among the experimental products, Proportion A (sweet potato cupcakes with 5 grams turmeric powder) obtained the highest mean, which means very acceptable. This means that cupcakes with 5 grams of turmeric powder was very much liked by the group of evaluators. This further showed that the texture of the cupcakes was tender, soft moist and pleasing. The lesser amount of turmeric powder produced a product that is acceptable in texture. Proportion B, and C implies that regardless of the amount of turmeric powder (10 and 15 grams) added to sweet potato cupcakes, the texture of the products was all acceptable to the evaluators. This further showed that the texture of the cupcakes was tender, soft moist and pleasing.

To find out if there was a significant difference among proportions A, B, C, and D as to texture; ANOVA was computed at 0.01 level of significance.

One-Way Analysis of Variance for the acceptability of sweet potato cupcakes enriched with turmeric powder as to texture

The result showed that there was no significant difference on the level of acceptability of the sweet potato cupcakes with turmeric powder as to texture of the four products ($F(3,76) = 2.435$, $p = .71$). This implies that in terms of texture, the sweet potato cupcakes with turmeric powder, were almost the same.

Therefore the null hypothesis which states that there was no significant difference in the level of acceptability of sweet potato cupcakes with turmeric powder as to the texture was accepted

Acceptability of Sweet Potato Cupcakes enriched with Turmeric Powder as to Aroma.

The result showed that the obtained mean of cupcakes with 10 grams of turmeric powder (Product B = 5.42), 15 grams of turmeric powder (Product C = 5.10) and 0 gram of turmeric powder (Product D = 5.42) were described as “moderately liked” while cupcakes with 5 grams of turmeric powder (Product A=5.74) was described as “very much liked”.

This means that cupcakes with 5 grams of turmeric powder was very much liked by the group of evaluators since it has a highest mean. This further showed that the aroma of the sweet potato cupcakes was very distinct sweet potato smell. The study revealed that when sweet potato is baked it creates a pleasing aroma that blends with turmeric and other ingredients.

To find out if there was a significant difference among proportions A, B, C, and D as to taste; ANOVA was computed at 0.01 level of significance.

One-Way Analysis of Variance of sweet potato cupcakes enriched with turmeric powder as to aroma

The result showed that there was a significant difference on the level of acceptability of the sweet potato cupcakes with turmeric powder as to aroma of the four products ($F(3,76) = 5.78$, $p = 0.001$). This implies that in terms of aroma the sweet potato cupcakes with turmeric powder were not similar.

Therefore the null hypothesis which states that there was no significant difference in the level of acceptability of sweet potato cupcakes with turmeric powder as to the appearance was rejected.

Post Hoc Test using Scheffe on sweet potato cupcakes enriched with turmeric powder as to aroma

The result showed that there were no significant differences in terms of aroma for Products A and B, A and D, B and C, B and D and, C and D. Therefore, the sweet potato cupcakes with turmeric powder on the paired treatments were similar in terms of smell.

On the other hand, paired Treatments A and C, revealed that the significant value is 0.001 and is lesser than the alpha level of 0.01 which is significant. This further means that the aroma of the product for paired Treatments A and C differ from each other. This is due to the amount of turmeric powder in Treatment A which is 5 grams while Treatment C contains greater amount of turmeric powder (15 grams). This implies that the greater amount of turmeric powder added to the mixture, the greater the difference in the aroma of the product when compared to the sweet potato cupcakes with less amount of turmeric powder.

Therefore, the null hypothesis which states that there is no significant difference in the level of acceptability of sweet potato cupcakes enriched with turmeric powder in terms of aroma as evaluated by the respondents at 0.01 level of significance was not accepted.

General Acceptability of Sweet Potato Cupcakes enriched with Turmeric Powder

The result showed that the obtained mean of cupcakes with 10 grams of turmeric powder (Product B = 5.39), 15 grams of turmeric powder (Product C = 5.13) and 0 gram of turmeric powder (Product D = 5.35) were described as “moderately liked” while cupcakes with 5 grams of turmeric powder (Product A = 5.68) was described as “very much liked”.

However, among the experimental products, Proportion A, sweet potato cupcakes with 5 grams turmeric powder obtained the highest mean, which means very acceptable. This further showed that the sweet potato cupcakes with turmeric powder has perfectly rounded top, yellow orange in color, moderately light in weight and proportion to size, moderately shiny surface, with distinct sweet potato taste and aroma and moderately tender and moist.

To find out if there was a significant difference among proportions A, B, C, and D as to taste; ANOVA was computed at 0.01 level of significance.

One-Way Analysis of Variance of sweet potato cupcakes with turmeric powder as to general acceptability

The result showed that there was a significant difference on the level of acceptability of the sweet potato cupcakes with turmeric powder as to aroma of the four products ($F(3,76) = 4.41, p = 0.006$). This

implies that in terms of general acceptability the sweet potato cupcakes with turmeric powder, were not similar. This further implies that the sweet potato cupcakes with turmeric powder differ from each other in terms of appearance, aroma, flavor and texture.

Therefore the null hypothesis which states that there was no significant difference in the level of acceptability of sweet potato cupcakes with turmeric powder as to the general acceptability was rejected.

Post Hoc Test using Scheffe on sweet potato cupcakes enriched with turmeric powder as to general acceptability

The result showed that there were no significant differences in terms of aroma for Products A and B, A and D, B and C, B and D and, C and D. Therefore, the sweet potato cupcakes with turmeric powder on the paired treatments were similar in terms of general acceptability.

On the other hand, paired Treatments A and C, revealed that the significant value is 0.007 and is lesser than the alpha level of 0.01 which is significant. This further means that the general acceptability of the product for paired Treatments A and C differ from each other. This is due to less (5 grams) amount of turmeric powder in Treatment A while Treatment C contains greater amount of turmeric powder (15 grams). This implies that the greater amount of turmeric powder added to the mixture, the greater the difference in the general acceptability of the product when compared to the sweet potato cupcakes with less amount of turmeric powder.

Therefore, the null hypothesis which states that there is no significant difference in the level of acceptability of sweet potato cupcakes enriched with turmeric powder in terms of its general acceptability as evaluated by the respondents at 0.01 level of significance was not accepted.

Cost Analysis of Raw Ingredients

The result show that Product A (sweet potato cupcakes with 5 grams turmeric powder) costs PhP 109.25 and the cost per piece of the cupcakes is PhP3.03. Product B (sweet potato cupcakes with 10 grams turmeric powder) costs PhP109.50 and the cost per piece of the cupcakes is PhP 3.04, Product C (sweet potato cupcakes with 15 grams turmeric powder) costs PhP 109.75 and the cost per piece of the cupcakes is PhP3.05 and Product D (sweet potato cupcakes with no turmeric powder) costs PhP 109.00 and the cost per piece of the cupcakes is PhP 3.03.

Among the treatment, Product A (sweet potato

cupcakes with 5 grams turmeric powder) entailed the least cost of PhP 109.25 while Product C (sweet potato cupcakes with 15 grams turmeric powder) had PhP 109.75 which considered as the greater cost among the treatment. This means that the less turmeric powder added to the product, the less cost and it becomes cheaper.

CONCLUSION AND RECOMMENDATION

Sweet potato cupcakes enriched with turmeric powder was generally acceptable as snacks and dessert. Evaluators rated as very much liked the sweet potato cupcakes with 5 grams of turmeric powder since it had a better appearance, taste, texture, aroma and general acceptability. There was a significant difference in the level of acceptability of sweet potato cupcakes enriched with turmeric powder in terms of taste, aroma and general acceptability therefore, the hypothesis was not accepted. There was no significant difference in the level of acceptability of sweet potato cupcakes enriched with turmeric powder in terms of appearance and texture, therefore, the hypothesis was accepted. The cost of the most acceptable sweet potato cupcakes enriched with turmeric powder was PhP 3.035 per piece. It costs more than PhP 0.012 compared to cupcakes with no turmeric powder.

Since sweet potato cupcakes enriched with turmeric powder in different treatment were all acceptable, it is recommended that Home Economics teachers should disseminate the information to the public through lecture demonstration, livelihood training and food exhibits as part of their advocacy to answer the call of DepEd's campaign to prepare healthy food snack for school children.

Since Product A (sweet potato cupcakes with 5 grams turmeric powder) was very much liked, it is recommended that HE teachers, lunch counter teachers and housewives will prepare and sell sweet potato cupcakes with turmeric powder as snacks items of school children and for the family.

Students and pupils are encouraged to eat sweet potato cupcakes with turmeric powder because of the nutrients that may get from the said herbaceous plants rather than junk foods.

A follow up study be conducted to further investigate the usefulness of sweet potato flour and turmeric powder or improve the study.

More researches along this line may be conducted using other variables, respondents and test the proximate nutritive value and shelf life.

Further study should be done to determine further the amount of turmeric to its effectivity level.

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