

ACCEPTABILITY OF STEVIA AS NATURAL SWEETENER AND COCO CREAM AS STABILIZER FOR ICE CREAM

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ABSTRACT-

The main thrust of this study was to assess the acceptability of stevia as natural sweetener and coco cream as stabilizer for ice cream. Moreover, the utilization of stevia as natural sweetener and coco cream as stabilizer were tested in three different ice cream flavors namely: tableya, mango and avocado. This study employed the experimental design method through the aid of questionnaire using the 4-point Hedonic Scale conducted in Bohol Island State University- Main Campus. There were 100 respondents in the study. The respondents were students (70), faculty members or teaching staff (20) and support staff (10). The participants were selected through a purposive sampling. To determine the acceptability of the study, the data gathered were tabulated using the Weighted Mean to find out the respondents' perception towards its acceptability. The findings revealed that all ice cream flavors which uses stevia as natural sweetener and coco cream as stabilizer were rated "Like Very Much" in all aspects. Hence, it was concluded that all ice cream flavors utilizing stevia and coco cream was accepted by the respondents in all aspects and has very promising potential in the market.

It is recommended that ice cream products utilizing stevia as natural sweetener and coco cream as stabilizer be introduced in the university and put into income generation. Moreover, as part of the College of the Business and Management Extension program the study can be introduced to the Women's Association in Upper Dela Paz Cortes Bohol.

I. Rationale and Literature Background

Sweets are considered to be a luxurious element in a menu. It is known as the finishing touch when a person wants to experience the indulgence of a complete meal (Galendez, 2015). Hence, dining without dessert is incomplete. Desserts or sweets maybe segmented according to pastries, confectioneries, cold and hot but regardless with its segmentation it plays an important role to the person's dining experience. One of the most popular dessert or sweets is ice cream. Ice cream is a frozen food, typically eaten as a snack or dessert, usually made from dairy product, such as milk and cream and often combined with fruits or other ingredients and flavors.

Isabella Beeton said, ice cream is typically sweetened with sucrose, corn syrup, cane sugar, beet sugar, and other sweeteners (Sahoo, Prusty and Mohapatra, 2018). Thus, sugar is a main ingredient in making a delicious ice cream which most people crave to eat. Dr. Nichole Avena, a food addiction researcher and an assistant professor of neuroscience technology at Princeton University was quoted by Annie Hauser said that, "once you are in the habit of eating too much sugar, it becomes harder and harder to stop". Sugar addiction is a real phenomenon. Sugary food and drinks activate the "reward" centres of the brain, which lead to more craving for the sweet stuff which could lead to obesity and type 2 diabetes (Avena, Rada and Hoebl, 2009).

Having established the danger of too much sugar in a person's food intake an innovation is necessary especially with foods that are loved by most humans. Ice cream sales in the U.S. were 14.5 billion dollars in 2009. Innovation is the successful commercialization of new ideas or products. Innovation can be defined in different manner and in different form. One way of innovating is the use of a substitute of an ingredient or a raw material to enhance, improve and create a niche in a product (Go and Go; 2010).

As underscored by Galendez (2015), in his research he believed that behind the art of food innovation is the skill of the food innovator to manufacture quality product by careful planning and developing a recipe with the use of

quality ingredients, tools and equipment and using efficient methods of preparation. Food experts usually get into innovations of food items that are delicious, affordable and nutritious. Thus, Stevia as natural sweetener and coco cream as stabilizer for ice cream has been hypothesized.

II. Objectives

The main purpose of this study was to determine the acceptability of stevia as a natural sweetener and coco cream as stabilizer for ice cream among the respondents in Tagbilaran City Bohol for the academic year 2019.

Specifically, this investigation aimed to determine the following:

1. What is the profile of stevia as natural sweetener and coco cream as stabilizer for ice cream in terms of:
 - 1.1 preparation;
 - 1.2 tools;
 - 1.3 procedures; and
 - 1.4 shelf life?
2. What is the acceptability level of stevia as a natural sweetener and coco cream as stabilizer for ice cream in terms of:
 - 2.1 aroma;
 - 2.2 tastes;
 - 2.3 appearance;
 - 2.4 texture;
 - 2.5 palatability;
 - 2.6 packaging;
 - 2.7 costs; and
 - 2.8 General acceptability?
3. What action plan may be proposed based on the result of the study?

III. Methodology

Design- This study employed experimental design to determine the acceptability of stevia as a natural sweetener and coco cream as stabilizer for ice cream in terms of aroma, taste, appearance, texture, packaging, costs, general acceptability and marketability.

Environment and Participants- This study was conducted in the Bohol Island State University- Main Campus which includes its extension campus located in Bingag, Dauis Bohol.

The study was composed of seventy (70) college students, twenty (20) faculty or teaching staff and ten (10) support staff with a total of 100 respondents. These respondents were chosen to assess the product through sensory test evaluation, considering their likeness in eating ice cream and a possibility of being the consumer of the product. The respondents were chosen in purposive sampling to achieve the objective of the study.

Data Gathering- The researcher followed the different phases during the data generation.

Phase I. Seeking Permissions from School Administrators: The researchers sought the permission of the College of Business, Arts and Sciences to conduct the study.

Phase II. Administration of the Instrument and the Collection of Data: With the permission to conduct the study, the questionnaires were given to the respondents and after answering, the questionnaires were collected for consolidation and interpretation.

IV. Results and Discussion

1. Profile. In the preparation of the three treatments of the different flavour of stevia and coco cream-based ice cream, the researchers conducted six trials to come up with the final measurements of the ingredients.

In the first trial stevia ingredients measured 1 teaspoon for all treatments with equal measurement of ½ cup coco cream. 1 tablespoon of tableya was added to treatment 1 which is the Tableya Ice Cream, it resulted to a bitter taste flavour due to the amount of tableya in the ingredients. In the second trial, 1 teaspoon of stevia ingredients was added to cover the bitter flavour of tableya and the result was still a little bit bitterish and lack of sweetness for a standard ice cream. a little bit lack of sweetness for a standard ice cream. The measurement of coco cream gives mellowness texture to the body. In trial 3, ½ teaspoon of stevia was added to the mixture to achieve the desired taste. It was found out that it has a balanced flavour and have a smooth texture. In trial 4, the ice cream

has a grassy herbal taste because of the amount of stevia in the mixture. The result in trial 5 & 6 was almost similar to trial 3, the only difference is that in trial 5 tableya flavour become lighter due to the increased amount of the coco cream. In trial 6, it has almost an identical result but for convenience the researcher follows the measurement in trial 3.

Flat and thick texture of the Mango Ice Cream was noticed in the first trial due to the less amount of coco cream in the mixture. The sweetness is lacking for an ideal ice cream. The sweet taste of ice cream was perfect with the amount of stevia in trial 2, it added $\frac{1}{2}$ cup of coco cream which resulted to a rich taste ice cream and has fine smooth texture. In the third trial, it was an ideal ice cream when it comes to the body of the ice cream but the taste was little bit bitter due to the increase amount of stevia. Since, stevia by nature has a natural bitter taste characteristic. In trial 4, the taste was pleasant but the body become a little bit lighter due to the increase amount of coco cream in the mixture. In trial 5, the taste similar to trial 2, but in trial 2 the Mango Ice Cream is more distinguishable rich mango flavour. In trial 6, due to the large amount of mango in the ice cream the result is too concentrated.

In treatment 3 is the Avocado Ice Cream. In trial 1, the ice cream lacks the sweetness due to the less amount of stevia. Ice crystal was apparent in the mouth because avocado holds non sweet moisture that causes ice crystal formation. In treatment 2, the stevia powder was increased to give more sweetness to the bland avocado flavour but still the desired taste was not achieved since the amount of stevia in the second trial can't cover the body of the ice cream the desired sweetness. However ice crystal reduces due to the addition of $\frac{1}{2}$ cup coco cream in the mixture. In trial 3 the mixture was added with $\frac{1}{2}$ teaspoon of stevia but still the product has a little bit lack of sweetness. $\frac{1}{2}$ cup of coco cream was added and the result it becomes smooth with the absence of ice crystal. In trial 4, 3 tablespoons of stevia gives a desired taste of sweetness to the ice cream and the same amount of coco cream gives smooth texture in the avocado ice cream. In trial 5 coco cream was increased and ideal taste was achieved, however the body becomes lighter. In trial 6, $\frac{1}{4}$ mashed avocado was added to resolve

the lightness body of the ice cream and the result was almost identical to trial 4.

1.1 Preparation.

**Table 1 Tasting of the different trials of stevia and coco cream based-ice cream
(T- 1 Tableya Ice Cream, T-2 Mango Ice Cream, T- 3 Avocado Ice Cream**

Ingredients	Unit	Trial 1			Trial 2			Trial 3		
		T- 1	T- 2	T- 3	T- 1	T- 2	T- 3	T- 1	T- 2	T- 3
Stevia	Teaspoon	1	1	1	2	2	2	2 ½	2 ½	2 ½
Coconut Cream	Cup	½	½	½	1	1	1	1	1	1 ½
Tableya	Tablespoon	1			1			1		
Mango	Cup		½			¾			¾	
Avocado	Cup			½			¾			¾
Ingredients	Unit	Trial 4			Trial 5			Trial 6		
		T- 1	T- 2	T- 3	T- 1	T- 2	T- 3	T- 1	T- 2	T- 3
Stevia	Teaspoon	3	2 ½	3	3	2 ½	3	3	2 ½	3 ½
Coconut Cream	Cup	1	1 ½	1 ½	1 ½	1 ½	2	1 ½	1 ½	2
Tableya	Tablespoon	1			1			1 ½		
Mango	Cup		¾			1			1 ¼	
Avocado	Cup			¾			¾			1

Table 2 Observation of different trials

Products	Trial 1	Trial 2	Trial 3
T- 1	bitter taste dominance	a little bit lack of sweetness, mellow texture	balance in flavor with mellow texture
T- 2	flat and thick, a little bit lack of sweetness	rich taste ice cream, having smooth texture	ideal one but has a little bit bitter taste
T- 3	lack of sweetness, icy texture	still lack of sweetness, ice crystal reduces	a little bit lack of sweetness, smooth texture

Products	Trial 4	Trial 5	Trial 6
T- 1	too sweet, stevia grassy flavor appears in the taste buds.	the result is similar to trial 3 but tableya flavor become lighter	almost identical in trial 3 when it comes to flavor, aroma and texture.
T- 2	taste good, the body	the taste is similar to	too concentrated

	become little bit lighter	trial 2 but trial 2 has a distinguish rich mango flavored ice cream	
T- 3	the taste is balance and has smooth texture	the body and taste are lighter	the taste is almost identical in trial 4

1.2

Table 3 Tableya, Mango and Avocado Ice Cream Tools and Equipment

Item No.	Quantity	Unit	Materials, Tools and Equipment
1	1	set	dry measuring cup
2	1	set	liquid measuring cup
3	1	set	measuring spoons
4	1	pc	double boiler
5	2	pcs	spoon
6	2	pcs	rubber scrapper (small)
7	3	pcs	mixing bowl
8	2	pcs	ice cream container
9	1	unit	refrigerator
10	1	pc	weighing scale
11	1	pc	ice cream scoop
12	1	pc	cheese cloth

1.3 Procedures in making Tableya Ice Cream

1. Prepare all the ingredients, tools and equipment to be used.
2. Squeeze the grated coconut using the cheese cloth and set aside in the chiller.
3. Melt the tableya in a small amount of water over hot water bath if double boiler is not available.
4. Mixed the finely crushed dry leaves of stevia in the mixture until it blends well.
5. Stir the mixture ensuring that the tableya melts evenly without overheating until it is thoroughly dissolved and smoothened. Let it cool for a few minutes.
6. In the blender mix the tableya mixture and coco cream until it blends well.
7. Pour it in a prepared ice cream container and freeze it

overnight.

Procedures in making Mango Ice Cream

1. Prepare all the ingredients, tools and equipment to be used.
2. Squeeze the grated coconut using the cheese cloth and set aside in the chiller.
3. Roast or boil the finely crushed dry stevia in a very small amount of water and set aside until it cool.
4. Using an electric blender, blend the mango, stevia and coco cream together until smoothen.
5. Pour it in a prepare ice cream container and let it freeze overnight.

Procedures in making Avocado Ice Cream

1. Prepare all the ingredients, tools and equipment to be used.
2. Squeeze the grated coconut using the cheese cloth and Set aside in the refrigerator.
3. Roast or boil the finely crushed dry stevia in a very small amount of water and set aside until it cool.
4. Put the coco cream in the blender, add the avocado and the stevia blend together until the mixture become smooth.
5. Pour it in a prepare ice cream container and freeze it overnight.

1.6 Shelf Life

Table 4 shows the shelf life of Tableya, Mango and Avocado Ice Cream under refrigeration.

On the first week until the fourth week under refrigeration condition the ice cream products maintain its quality and there were no changes observed in all aspects of sensory attributes.

Table 4 Shelf Life of Tableya, Mango and Avocado Ice cream

Number of Days	Stored in the Freezer			
	Taste	Aroma	Appearance	Texture
First Week	✓	✓	✓	✓

Second Week	✓	✓	✓	✓
Third Week	✓	✓	✓	✓
Fourth Week	✓	✓	✓	✓
Legend: ✓ = maintain its quality - = changes observed x = spoiled				

Coco cream is highly perishable like the dairy products it really needs an extra care, proper hygiene and food safety techniques in handling the ingredient. Commonly, ice cream could last up to 3 months under freezing condition (www.eatbydate.com/dairy/ice-cream-shelf-life-expiration-date). Ice formation in the ice cream was evident after three months. It shapes the texture of the ice cream to ice crystal that makes it less of a pleasure to eat.

2. Acceptability of Stevia as Natural Sweetener and Coco Cream as Stabilizer

Table 5, 6 and 7 shows the acceptability of Stevia as Natural Sweetener and Coco Cream as Stabilizer for Ice Cream in various flavour: Tableya, Mango and Avocado in terms of aroma, taste, appearance, texture, palatability, packaging, cost, and general acceptability. Aroma is one of the essential characteristics in tasting the desirability and quality of the food product. The Aroma of Tablea Ice Cream got an average of 3.52, the respondents rated 3.76 for Mango Ice Cream, while Avocado Ice Cream got 3.52 rating. Tableya Ice Cream and Avocado Ice Cream have equal rating by the respondents. Mango Ice Cream is most preferred by the respondents in terms of aroma. The three ice cream products were described as "Like Very Much" by the respondents. This implied that the product has desirability and quality of aroma in the respondents' perception.

The natural grassy green aroma of avocado blends well with nutty aroma of coco cream. The sweetener stevia reflects its after taste grassy herbal aroma on the body of the ice cream. Sweet taste is the heart of ice cream. It is one of the five tastes that a human tongue can detect, and sweetness is a defying quality of ice creams. Sweeteners play an important

role in any ice cream. Stevia with a scientific name *stevia rebaudiana* use as a sweetening agent in making the ice cream in this study, and it gives right complement sweetener to the product when the respondents rated 3.36 for Tableya Ice Cream, 3.88 for Mango Ice Cream and 3.36 for Avocado Ice Cream. The three ice cream products described as "Like Very Much". This means that the taste of stevia sweetened ice cream is highly acceptable to the respondents.

Stevia has a little bitter taste flavour that contributes to the appetizing bitterness of tableya while the coco cream act as neutralizer to lessen the bitterness flavour of the product and stevia gives natural sweetness to the product with an after taste of grassy herbal flavour ice cream. The sweet candy leaf of Stevia blends well with the whetting natural sweet fruit syrup like of mango fruit, the result is splendid taste mango ice cream with the nutty flavour of coco cream that enhances the flavour of ice cream. Avocado has neutral, delicate and slightly sweet taste characteristics that relies on other ingredients its palatability, when mixed with coco cream it gives milky-avocado flavor but the stevia gives the sweetness of the mixture with a little bit bitter due to the large amount of stevia in the mixture. The ice cream mixture identifies the dominance taste of avocado with a little background of stevia bitter taste swirl in the tongue.

Appearance is one of the most important factors in evaluating the quality of the product and the first aspect to influence customer. Its attractiveness tells the palatability of the product, it has been made to look delicious.

Coconut cream is the major factor of holding good appearance of the ice cream. It is the stabilizer and emulsifier that give the body to the product. Creamy coconut inhibits the formation of ice crystal results into a smooth creamy appearance ice cream. Flavouring ingredients emphasize the colour and flavour of the product. It tells how sensational the quality of the ice cream that has a psychological effect on acceptability of the product.

As reflected on the table in terms of appearance, Tableya Ice Cream got the rating of 3.44. Tableya needs to melt over hot water bath in order to achieve the desired smoothness that when mixed with coco cream, it perfectly blends well

that result into shiny, jelly-creamy appearance ice cream which described as "Like Very Much" by the respondents. The appearance of Tableya Ice Cream based on the result is acceptable to the respondents.

Palatability means appetizing with pleasant agreeable taste. Mango Ice Cream got the highest rating of 3.84, followed by Avocado Ice Cream with the rating of 3.52 and lastly the Tableya Ice Cream with the rating of 3.40. This means that the three different flavoured ice cream is acceptable to the respondents its palatability however Mango Ice Cream is more preferred by the respondents.

**Table 5 Acceptability of Tableya Ice Cream
N=100**

Attributes	Treatment 1	
	Tablea Ice Cream	
	Weighted Mean	Descriptive Rating
Aroma	3.72	Like Very Much
Taste	3.36	Like Very Much
Appearance	3.44	Like Very Much
Texture	3.56	Like Very Much
Palatability	3.40	Like Very Much
Average Weighted Mean	3.49	Like Very Much

**Table 6 Acceptability of Mango Ice Cream
N=100**

Attributes	Treatment 2	
	Mango Ice Cream	
	Weighted Mean	Descriptive Rating
Aroma	3.76	Like Very Much
Taste	3.88	Like Very Much
Appearance	3.76	Like Very Much
Texture	3.84	Like Very Much
Palatability	3.84	Like Very Much
Average Weighted Mean	3.81	Like Very Much

**Table 7 Acceptability of Avocado Ice Cream
N=100**

Attributes	Treatment 3	
	Avocado Ice Cream	

	Weighted Mean	Descriptive Rating
Aroma	3.52	Like Very Much
Taste	3.36	Like Very Much
Appearance	3.60	Like Very Much
Texture	3.68	Like Very Much
Palatability	3.52	Like Very Much
Average Weighted Mean	3.54	Like Very Much

V. Conclusions

Based on the data, the following conclusions were drawn:

The stevia and coco cream-based ice cream products namely: Tableya Ice Cream, Mango Ice Cream and Avocado Ice Cream are all acceptable to the respondents in all aspects such as aroma, taste, appearance, texture, palatability. Mango flavoured Ice Cream is the most preferred in all aspects among the stevia and coco cream-based ice cream variants.

VI. Recommendations

The researchers came up with the following recommendations:

BISU-MC may introduce the several variants of ice cream products enriched with natural sweetener – stevia which potentially be a source of university's income generating undertaking. The concept of stevia's marketability may be introduced to the general community as alternative source of livelihood. The concept of stevia's viability as natural sweetener may be introduced to the Women's Association of Upper Dela Paz, Cortes, Bohol. The study utilizes the college expertise giving it back to one of the university's stakeholder – the community specifically the Women of Upper Dela Paz Cortes thru practical application in the field of ice-cream making. The study may be used as a guide in conducting related studies using stevia as a natural sweetener.

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