

# Turmeric and Ginger Ice Cream

*Evangeline H. Castro*<sup>1</sup>

<sup>1</sup>*Campus Coordinator for Quality Assurance & Accreditation, Department of Hospitality Management, Nueva Vizcaya State University, Bambang, Nueva Vizcaya, Philippines.*

*Corresponding Author: castroevangeline2528@gmail.com*

**Abstract:** - This study was conducted to develop a handmade ice cream with value-added flavor and nutrients derived from Turmeric and Ginger. Since it was an artisanal or homemade ice cream prepared in small batch production predominantly for health-conscious individuals who would like to replace their affection for an ice cream with amazing health benefits, unique preparation and process ensured uniqueness and high-quality production. Specifically, this study aimed to unveil the microbial analysis and nutritional content of ice cream enhanced with Turmeric and Ginger and to investigate on the shelf-life of the product which results handed in considerations for possible commercialization and other efficiency purposes. The researchers employed the experimental and developmental methods of research using the modified hedonic rating scale, microbial analysis, nutritional analysis, and observation as research instruments. Percentages and weighted means were used in the quantitative part of the study particularly the level of acceptability. The study revealed that the ice cream product had 0.06% ash, 48.42% carbohydrate, 5.45% crude fat, 0.35% crude protein, 45.75% moisture and 244 energies. Other contents were identified as 180 kcal/73g calories, 40 kcal/100g calories from fat, 36 kcal/73g from carbohydrates, 0 kcal/100g calories from protein, with a total calorie of 260 kcal/73g while the microbial analysis of the product identified 115CFU/g total coliform count and <10\*CFU/g E. coli count. Moreover, shelf life of the ice cream enhanced with Turmeric and Ginger is 2 months and 5 days based on the observation from the first day it was processed until the last day of observation.

**Key Words:** — *Artisanal, Ice Cream, Turmeric & Ginger.*

## I. INTRODUCTION

The global ice cream market is growing substantially due to several factors such as increasing demand for take-home ice creams, rising demand for private-label ice creams, availability of various flavors, innovative marketing activities, and technology enhancements. Ice cream is witnessing a status change from a traditional dessert to a snack. According to Akash, (2017) mentioned in the Technavio article that health-conscious consumers are highly inclined toward artisanal ice creams due to the healthy ingredients such as nuts and fruits, natural flavors, and organic products.

Small batch production is another driving factor for the growth of artisanal ice creams.

It ensures uniqueness and high quality of production. Retailers are giving shelf space to artisanal brands offering unique flavors and quality ingredients.

Turmeric and Ginger belong to the group of crops mostly cultivated by Novo Vizcayanos they serve as sources of income when harvested and sold in the market. Today, innovations or discoveries of the various uses the Turmeric and Ginger have been shared in different forms. Hence, this has led the researchers into the realization of utilizing those in making an ice cream that can be healthful and can satisfy cravings as well. It is an ice cream that can be enjoyed by everybody regardless of age. Moreover, ice cream that can also be a form of business most sought.

To establish the essence of the developed ice cream, enhance with turmeric and ginger, it has to benefit the consumer as to its microbial analysis and nutritive content. Moreover, for instruction, extension activities, entrepreneurial utilization as well as family consumption.

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## II. METHODOLOGY

This study employed the mixed design or qualitative-quantitative research design. On the quantitative aspect of this study employed the development of the product characterized by standard and innovated procedures. The researchers made used of the standard recipe, all ice cream samples were prepared using the soft ice cream method. Turmeric and Ginger ice cream were prepared by innovative processes using extracted rather than using powder as part of the finished product. The acceptability level of both extracted Turmeric and Ginger as a flavoring agent was tested on various percentage of 100% or 4 tablespoon, 75% or 3 tablespoon, 50% or 2 tablespoon and 25% or 1 tablespoon to the standardized recipe-soft ice cream for Turmeric and Ginger Ice Cream. Sensory evaluation of the Turmeric and Ginger Ice Cream was carried out on the basis of 5-point Hedonic test for the sensory qualities on appearance, aroma, texture, taste and general acceptability. The questionnaires were retrieved, tallied and analyzed from the 60 evaluators who were conveniently selected food technology experts, the 2<sup>nd</sup> year BSHM students, ice cream enthusiasts of the of the Nueva Vizcaya State University, Bambang Campus, Bambang, Nueva Vizcaya, and entrepreneurs of Bambang, Nueva Vizcaya, who served as the tasters of the developed product. The levels of acceptability are likewise indicated to facilitate interpretation.

Table.1. Concept of Boundary of Numerical of Hedonic Rating

Score	Range	Qualitative Description	Level of Acceptability
5	4.20-5.00	Like Extremely	Very Much Acceptable
4	3.40-4.19	Like Moderately	Much Acceptable
3	2.60-3.39	Neither Like or Dislike	Acceptable
2	1.80-2.59	Dislike	Moderately Acceptable
1	1.00-1.79	Dislike Extremely	Not at All Acceptable

Upon determining the level of acceptable Turmeric and Ginger ice cream it was subjected to microbial and nutritional analysis. Percentages were used to describe the portion through which a certain microbes and nutrients is ascertained, as well as the amount of time is considered to determine the shelf life of the product. Based on the results of nutritional analysis requested by the researchers from the Department of Science and Technology Cordillera Administrative Region, Regional Standards and Testing Laboratory, Benguet, issued on June 9,

2020, with Reference Number CAR-032020-CHE 0385 and also with the results of microbial analysis issued on August 23, 2019, with Reference Number CAR-082019-MIC-0527 and corresponding to the sample name: ice cream with Turmeric and Ginger. The nutritional content of the product was identified as to ash, carbohydrate, crude fat, crude protein, moisture, and energy, while for microbial analysis of the product was identified total coliform count and E.coli count.

On the other hand, the qualitative design was used in observing and describing the characteristics or physical attributes of the ice creams shelf-life of the artisanal ice cream with Turmeric and Ginger. It was kept in the fridge and was observed from January 7, 2020 to March 15, 2020. The process hence was carried out for ten (10) weeks and an additional five days to observe regularly or continually the appearance, aroma and texture of the product. With this procedure, the researchers and some other experts may suggest its shelf-life. Thus, weighted mean was employed to determine the degree of acceptability. In similar manner, Turmeric and Ginger Ice Cream was issued a certificate by the office of the Intellectual Property Right.

## III. RESULTS AND DISCUSSION

The acceptability level of extracted Turmeric and Ginger as a flavoring agent was tested on various percentage from the 60 respondents who evaluated the flavor of Turmeric and Ginger Ice Cream completing and using the 5-point Hedonic test for sensory qualities on appearance, aroma, texture, taste and general acceptability where in Code 022 or 75% has the highest mean of 4.58 described qualitatively as Like Extremely with very much acceptable followed by Code 011 or 100% with a mean of 4.08 qualitatively describe to be Like Moderately, Code 033 or 50% with a mean of 4.07 or Like Moderately and Code 044 or 25% with mean of 4.12 or Like Moderately with the same level of acceptability as much acceptable as shown in Table 2.

After issuance of the results of the microbial and nutritional analysis of the artisanal ice cream with Turmeric and Ginger and thorough observation of said product as to its shelf-life, substantial data were collected and analyzed. To reveal the microbial analysis and nutritional value of the developed ice cream, it was subjected to analysis. Based on the results of nutritional analysis requested by the researchers from the Department of Science and Technology Cordillera Administrative Region, Regional Standards and Testing Laboratory, Benguet, issued on June 9, 2020, with Reference

Table.2. Summary of Acceptable Level of Percentage of Respondents of the Ice Cream with Turmeric and Ginger (n=60)

Rating Product: Turmeric & Ginger Ice Cream	Sensory Qualities					Total Weighted Mean	Level of Acceptability
	Appearance	Aroma	Texture	Taste	General Acceptability		
<b>Code 011: 100%</b>							
Mean	4.17	3.6	4.36	4.16	4.10	4.08	Much Acceptable
Qualitative Description	Like Moderately	Like Moderately	Like Extremely	Like Moderately	Like Moderately	Like Moderately	
<b>Code 022: 75%</b>							
Mean	4.64	4.25	4.92	4.5	4.36	4.88	Very Much Acceptable
Qualitative Description	Like Extremely	Like Extremely	Like Extremely	Like Moderately	Like Extremely	Like Extremely	
<b>Code 033: 50%</b>							
Mean	4.4	3.41	4.16	4.12	4.24	4.07	Much Acceptable
Qualitative Description	Like Extremely	Like Moderately	Like Moderately	Like Moderately	Like Extremely	Like Moderately	
<b>Code 044: 25%</b>							
Mean	4.13	3.37	4.28	4.12	4.04	3.99	Much Acceptable
Qualitative Description	Like Moderately	Neither Like or Dislike	Like Extremely	Like Moderately	Like Moderately	Like Moderately	

Number CAR-032020-CHE 0385 and corresponding to the sample name: ice cream with Turmeric and Ginger, the following nutritional content yielded as shown in table 3.

Table.3. Results of Nutritional Analysis of the Ice Cream with Turmeric and Ginger

Analysis Name	Result	Methodology
Ash	0.06%	Based on AOAC Official Methods, 20 <sup>th</sup> Edition, 2016
Carbohydrates	48.42%	Based on the Philippine Food Composition Tables, FNRI, DOST Handbook, 1997
Crude Fat	5.45%	Based on AOAC Official Methods, 20 <sup>th</sup> Edition, 2016
Crude Protein	0.35%	Based on AOAC Official Methods, 20 <sup>th</sup> Edition, 2016
Moisture	45.75%	Based on AOAC Official Methods, 20 <sup>th</sup> Edition, 2016
Energy	244 kcal	Based on the Philippine Food Composition Tables, FNRI, DOST Handbook, 1997

Table 3, it could be seen that the product had 0.06% ash, 48.42 carbohydrate, 5.45% crude fat, 0.35% crude protein, 45.75% moisture and 244 kcal energy. These contents were identified based on Association of Official Analytical Chemists (AOAC) Official Methods (2016) and on Philippine Food Composition Tables, FNRI, DOST Handbook, (1997).

As cited by Salehi et al. (2020) and stated by Tang et al. (1992) that ginger contains approximately 50% carbohydrates, 9% protein and free amino acids, 6-8 % fatty acids and triglycerides, 3-6% ash, and 3-6% crude fiber (on dry matter basis) depending on variety, geography, and climatic

conditions. While Prasad (2011) manifested the nutritional analysis that 100g of turmeric contains approximately 390 kcal energy, 10g total fat, 3g saturated fat, 0 mg cholesterol, 0.2g calcium, 0.26g phosphorous, 10mg sodium, 2500mg potassium, 47.5mg iron, 0.9mg thiamine, 0.19mg riboflavin, 4.8mg niacin, 50mg ascorbic acid, 69.9g total carbohydrates, 21g dietary fiber, 3g sugars, and 8g protein. Thus, turmeric is also a good source of the 3 fatty acid and linolenic acid.

In similar manner, dairy products, such as ice creams and yogurts, are considered nutritious foods and present a great potential to incorporate bioactives cited by Lima (2016) from Aboufazel et al. (2016). Several studies in the literature have shown that ice creams are ideal matrices for the incorporation of ingredients with functional properties, such as probiotics and dietary fibers.

As cited by Aikwad, et al. (2012) administered a study to find out the acceptability of ice cream using coconut powder at different levels. Ice cream was prepared using different levels of coconut powder I1 (5%), I2 (7%), I3 (9%) and I4 (11%). Result in the study, revealed sample I2 was accepted and appreciated due to its smooth and uniform texture with pleasant mouth feel. The addition of coconut powder does not only enhance the flavor but also helped increase melting resistance power of ice cream.

A study conducted by Moreno (2015) on Sensory Acceptability of Squash cited Parsons et al. (1985) on the acceptability of ice cream using dry sweet whey, whey protein concentrate, and sodium caseinate to replace the nonfat dry milk in ice cream since whey protein concentrate, a blend of whey protein concentrate and dry sweet whey, or a blend of dry sweet whey and sodium caseinate replaces the milk solids-not-fat at 50 or 100 percent.

Many studies have measured sensory properties of ice cream to examine the relationship among various ingredients and sensory characteristics such as flavor and texture. Related study of Thompson, et al. (2009) found out that the nature of vanilla flavoring affects flavor perception and that modifying fat distribution influences flavor release. Replacement of milk fat with tapioca dextrin or potato maltodextrin also has significant effects on textural properties; increasing coarseness and wateriness and decreasing creaminess.

The addition of fat in ice cream increases the buttery and creamy notes as well as mouthcoating, absorb and retain the aromas while it increases in sugar levels affect sweetness, caramel and vanillin attributes which was mentioned by

Guinard, et al. (1997) demonstrating that sugar to a lesser extent or fat serves as key determinants of ice cream acceptability and ice cream quality.

In consonant, to the study on the effect of fat content on the physical properties and consumer acceptability of vanilla ice cream revealed by Rolon et.al. (2017) determined that higher fat content affects overall sensory quality of ice cream.

Nevertheless, only a few studies have discussed the application of natural antioxidants, like curcuminoids and carotenoids. Consequently, it is important to explore the possibility of improving the nutritional attributes of ice cream using ingredients with established health benefits like natural antioxidants, natural colorants, flavours and others stated by Sun-Waterhouse et al,(2013) thus, using Turmeric and Ginger not only as a spice for various food and beverages.

Turmeric and Ginger were common food adjuncts that impart color, flavor and aroma. The active ingredient in turmeric was curcumin and that in ginger are gingerol and hexahydrocurcumin1-3 both compounds prevent oxidation of oils and fats. As these spices are added as flavoring agents to food preparations as crushed paste or dry powder, extracted and cooked at high temperature develops food products such as Ice Cream.

The favorite choice for the term "ice cream" by Fatsecret (2018) revealed that 1/2 cup of ice cream has about 2 grams of protein. The amount of protein in a regular cream hence is 5.45% which is less than the amount of protein in the ice cream with Turmeric and Ginger which is 0.35%. Preference over the developed ice cream be made since it is more nutritious when it comes to its protein component.

Another nutritional value that could be derived from the ice cream is fat which is one of the three main macronutrients, along with carbohydrate and protein exhibited by the McKinley Health Center, (2014). Fat if taken in appropriate amount is an important foodstuff for many forms of life, and fats serve both structural and metabolic functions. Necessary part of the diet of most heterotrophs (including humans) and are the most energy dense, thus the most efficient form of energy storage.

According to Ipatenco (2018), an article in relation to eating habits that half-cup serving of ice cream contains about 7 grams of fat, of which 4.5 grams are unhealthy saturated fats. If a half-

serving of a regular ice cream is estimated to be 31 grams, the computed fat content is 22.40% which is much higher than the fat content of the ice cream with Turmeric and Ginger at 5.45%. Hence, the developed ice cream is healthier in terms of fat composition.

Carbohydrates are also found in the product enhanced by Turmeric and Ginger. Carbohydrates as divulged by Szalay (2017) are an important food group and part of a healthy diet such as sugars, starches and fibers found in fruits, grains, vegetables and milk products. Though often maligned in trendy diets, carbohydrates — thus, the developed ice cream has the greatest amount of nutritional content of 48.42 since carbohydrates are macronutrients, meaning it is one of the three main ways the body obtains energy, or calories.

The greatest amount of nutritional content found in the product is energy with 244 kcal based on Based on Association of Official Analytical Chemists (AOAC) Official Methods (2016). Similarly with ice cream is rich in carbohydrates, with about 15 grams in a one-half-cup serving. A serving also contains about 7 grams of fat and 2 grams of protein, making it an energy-dense food which is a good choice when pursuing to gain weight.

The development of the ice cream with Turmeric and Ginger on the result of nutritional content in terms of moisture has 45.75% based on Association of Official Analytical Chemists (AOAC) Official Methods (2016). Food moisture analysis involves the whole coverage of the food items in the world because foods are comprising a considerable amount of water rather than other ingredients. Foods are vital components which are consumed by the people at each and every moment for the surviving in the world.

Basically, there are several kinds of foods available for the consumption as raw foods, processed foods and modified foods in the market. Moisture content of the food material, according to Isengard (2001), is important to consider the food is suitable before the consumption, because moisture content affects the physical, chemical aspects of food which relates with the freshness and stability for the storage of the food for a long period of time and the moisture content determine the actual quality of the food before consumption and to the subsequent processing in the food sector by the food producers.

As to microbial analysis the developed ice cream was subjected to analysis. Based on the results of microbial analysis requested



from DOST CAR Regional Standard and Testing Laboratory issued on August 23, 2019, with Laboratory no. CAR-082019-MIC-0527 corresponding to the sample name: Turmeric and Ginger Ice Cream as shown in Table 2.

Table.4. Results of Microbial Analysis of the Ice Cream with Turmeric and Ginger

Analysis Name	Result	Methodology
Total Coliform Count	115 CFU/g	Based on AOAC Official Methods, 20 <sup>th</sup> Edition, 2016
Escherichia coli	<10*CFU/g	Based on AOAC Official Methods, 20 <sup>th</sup> Edition, 2016

In Table 3, it could be seen that the sample product had 115CFU/g total coliform count and <10\*CFU/g E.Coli. These contents were identified based on Association of Official Analytical Chemist (AOAC) Official Methods (2016). This reveals that total coliforms include species that may inhibit the intestines of warm-blooded animals or occur naturally in soil, vegetation and water. For *Escherichia coli* (E. coli), one species of the coliform group, is always found in feces and is, therefore, a more direct indicator of fecal contamination and the possible presence of enteric pathogens. To reveal the microbial result, the researchers subjected ginger and turmeric to antibacterial assay from Saint Mary's University, CNS Research Laboratory, Bayombong, Nueva Vizcaya issued on December 11, 2019 with CNS Lab Form No. 5 that the Lichen crude extract (10mb/L) were tested for their inhibitory activities against the following bacteria: 7.93mm *Staphylococcus aureus* and 6mm *Escherichia coli*. This means that the zone of inhibition which determines if the bacteria is resistant or susceptible to the extracts. According to the study of Ike, et.al.(2019) that the zone of inhibition ranged from 9-13 mm for the ginger and turmeric while the values ranged 6-7.93mm that the test bacteria showed susceptibility to all extracts.

To gather empirical data on the shelf-life of the developed ice cream with Turmeric and Ginger, the product was prepared and kept at as cold a temperature as possible - 0-degree Fahrenheit or less in a grocery store or a home freezer (Gruber, 2017). The ideal serving temperature for most packaged, scoopable ice cream is 5–10 degrees Fahrenheit.

As the product was kept in the fridge, the researchers noted weekly of qualitative descriptions of the ice cream as to its appearance, aroma and texture. With such thorough and long process, the shelf-life of the product was identified.

The observations made by the researchers on the shelf-life of the developed ice cream with Turmeric and Ginger in terms of appearance, aroma and texture. The hedonic quality as to appearance was observed in the ice cream by looking into its color, size, shape, turbidity, conformation, dullness and gloss.

In the process, the researchers observed that the product maintained its color, until the 9<sup>th</sup> week and even during the five additional days. Its appetizing look and creaminess were maintained until the 8<sup>th</sup> week while it started to lose its original form on the 7<sup>th</sup> week but still it looked pleasant. During the the eighth week, it started to form ice shards or crystals, eventually affecting its pleasantness. During the last days of observation, its form has become less desirable because of loosened edges on its container but its color and pleasant looks were moderate but still acceptable.

Moreover, on the observation made by the researchers on the shelf-life of the developed ice cream with Turmeric and Ginger in terms of aroma, an evident of its fragrant and delectable scent, an aroma smells that never stinks since the aroma of turmeric and ginger were turmerone, arturmerone and zingiberene.

At the start of the observation, the product exuded a sweet and attractive scent that is mouth-watering. The sweet aroma continued until its 6<sup>th</sup> week until it started decreasing its fresh and clean aroma on the 7<sup>th</sup> week alongside its smoothness and creaminess. During the last days of observation, it was sweet but no longer aromatic, hence it was less smooth and less creamy.

Furthermore, observations made by the researchers on the shelf-life of the developed ice cream with Turmeric and Ginger in terms of texture was observed in the ice cream or the inside characteristics of the finished product according to its recipe includes observation of its firmness, smoothness, creaminess, richness, crunchiness, flakiness, moist. Otherwise, observation of these qualities are absent, sandiness, being powdery and formation of ice shards.

At the onset of the observation, the product was firm and smooth, pleasant, creamy and had a rich after taste of Turmeric and Ginger with the desired smoothness, chewiness and creaminess stayed until the 5<sup>th</sup> week. On the succeeding week, it started to create a rough texture once scooped and was slightly soft. Among the three observed hedonic qualities, texture could be considered to be the element which diminished the soonest.

With the above observations, the recommended shelf-life or rather best before date of the ice cream with ginger and turmeric

is two (2) months and five (5) days based on the observation from the first day it was processed until the last day of observation in order to maintain its keeping and eating quality.

This finding runs parallel with the contention of Williams (2018) and as cited by Abalos (2019) who asserted that ice cream shelf-life for a tub that has not been opened can last up to two-three months for optimal taste when it is safely stored in the freezer at 0 degrees Fahrenheit. Technically, it is still eaten safely for up to three to four months, but after that it is no longer safe hence, when it is opened, it has to be eaten two to three weeks.

An ice cream manufacturer sets a specific shelf life on its own, and it does not exceed six months at a storage temperature of -18 ° C. It also pays attention to the technology of production such as artisanal, composition, packaging and storage conditions during marking of the products.

The storage time is also affected by such characteristics as fat content and flavors. Moreover, rich creamy ice cream with fat content 15-20%, just like the developed ice cream through this study, can store the longest. But a variety of flavors on the contrary reduce the shelf life. Shelf life can be increased with the help of preservatives, but it is prohibited. Packaging of sweet treat withstand the temperature to -40 ° C and be harmless. Its task is to prevent the entry of microorganisms into the product. A large packaging container for public catering establishments reduces the shelf life, in contrast to small packaging.

#### IV. CONCLUSION

With the salient findings of the study presented in the foregoing section, the acceptability level of Turmeric and Ginger Ice Cream 75% with the highest mean of 4.58 as Like Extremely and very much acceptable. The developed ice cream product is very rich with carbohydrates, fats, and proteins, which are all, needed for our bodies to produce energy and boost immunity along with the added value flavor turmeric and ginger and the test bacteria showed susceptibility to all extracts. The shelf life or best before date of the ice cream with turmeric and ginger is two (2) months and five (5) days. Thus, giving the retailers shelf space to artisanal brands offering unique flavors and quality ingredients.

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