



SABUNGAI (GYNURA PROCUMBENS): A HIGH CALCIUM-LOW SUGAR ICE CREAM

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Abstract

The study was conducted to develop a new variety of ice cream from Sabungai (*Gynura Procumbens*), a medicinal plant. The purpose of this study was to determine the shelf life, sugar and calcium content. It used a descriptive research design to define the extent of its acceptance among the participants. The findings indicate that the developed Sabunga (*Gynura Procumbens*) Ice Cream contains low sugar and has a high calcium content. In terms of acceptability among adult participants, it gained a grand mean of 8.11, "LIKE VERY MUCH". In conclusion, the developed Sabungai (GP) ice cream is acceptable. Having a low sugar content implies that it is safe to eat and can be eaten by diabetic people, more so by health-conscious individuals who refrain from eating sweet desserts. It also contains high calcium, which may be a remedy to address the problem of the low calcium intake of mostly low-income Filipinos and is beneficial to women who experience premenstrual syndrome (PMS) as well as pregnant and lactating women. It is recommended to conduct further studies to fully claim that the product can be eaten by individuals with diabetes because of its low sugar content, and to the extent of introducing the product to the market, it is recommended to undergo time-series laboratory testing.

Keywords : food technology, innovation, entrepreneur/ business

Introduction

Earth grounds are rich with simple remedies that offers restoration of health. There are many simple yet unknown but not harmless herbs that can be used in place of a prescribed medicine. Notably, South East Asia like China, Indonesia, Malaysia, Thailand and Philippines, is rich from a plant called Sabungai or "Gynura Procumbens." It is also known as longevity spinach, anti-cholesterol, wonder plant, Bai Bing Cao (which means "100 ailments"), sabung nyawa, life extender, daun dewa, akar sebiak, or kelemai merah. Hence, it is used as a traditional medicine that treat different types of diseases. For instance, Indonesian used it to relieve kidney discomfort, while, Vietnamese used it to alleviate inflammation, rheumatism and medication of viral ailment (Wuart, 2006).

Furthermore, Shiphard (2010) highlighted that the leaves and shoots of Sabugai (*G. procumbens*) are eaten fresh in salads, which have a similar taste to raw green beans. It can be added as well to rice, noodle dishes, soups, and other savory meals by simply sautéing it with butter. Moreover, it can be used as a disease intervention, such as anti-hypertensive, lowering of glucose,

inflammatory and fever. Basically, it is a source of protein and peroxidase that lowers cholesterol, treats high blood pressure, and regulates blood sugar levels. It is an effective remedy against diabetes and it helps inhibit the growth of cancer cells.

Though this plant is promising, it is still considered unutilized and unknown to many. However, the researcher has found a few individuals in a particular barangay of Zamboanga City who eat the said herb for at least 2-3 raw leaves every morning as an alternative maintenance for diabetes due to its low sugar content. In the same manner, Sabungai (*G. procumbens*) contains high calcium content that is needed by the body to maintain strong bones and function well in daily activities. Fanous (2018) stressed that calcium is even more important for women to ease premenstrual syndrome (PMS). Essentially, a person aged 9–18 needs to consume 1,330 mg of calcium a day or more, especially pregnant and breastfeeding teens.

Having a realization of its nature and benefits, the researcher has conceptualized the use of Sabungai through ice cream production to maximize its beneficial effects on the health of individuals who need low sugar and high calcium content. Typically, in a serving of 100g of ice cream, it contains approximately 16–17% or approximately 169 mg more or less of calcium. With the Sabungai plant, as a frozen sweet dessert or ice cream containing a high calcium content needed by the body of an individual, nutrients can be maximized.

Thus, the researcher aimed to introduce this herb to the community through the production of a low-sugar, high-calcium ice cream using the leaves of this wonder plant called Sabungai (*Gynura Procumbens*) as its main component.

Related Literature and Studies

Characteristics Of Sabungai (*Gynura Procumbens*)

Shiphard, I. (2010) highlighted numerous Sabungai common names, such as Sambung, Sambung Nyawa which means "extending lives," Daun Dewa, Bai Bing Ca (Chinese), Akar Sebiak, Kelemai Merah, or *Gynura Procumbens*. Also, the sabungai plant grows during the year and is a bushy type of plant to illustrate the plant profile. It grows to a height of 30 cm to 100 cm, and can be propagated by cutting. Significantly, in South Asia, Sabungai is well known for its folklore medicinal uses in China, Indonesia, Malaysia and Thailand. The plant's leaves and shoots are eaten fresh in salads or added to soups, stir-fries, casseroles, sauces and condiments, rice dishes, and other savory dishes. Notably, the plant has been used for anti-viral, anti-inflammatory, anti-histamine, anti-pyretic, anti-oxidant, anti-cancer, anti-aging, anti-allergy, and blood washing, tonic, diuretic, and pain killing properties. Any of its applications include the prevention of migraines, dyspepsia, constipation, arthritis, rheumatism, diabetes, dysentery, fever, malaria, varicose veins, kidney stones, joint and back pain, broken bones and ligament strengthening, stroke and cardiovascular diseases, high cholesterol, lymphatic diseases, tumors, leukemia, hepatitis, detoxifier, coughs, colds, sore throats, halitosis, laryngitis

In the same way, because of its promising advantages, Wersja (2015) disclosed plant sabungai as God's leaves, it is also referred to as longevity spinach, Kamangi in Tagalog, Paetumpung in Thailand, Sambung or "Extending Life" in Indonesia, Deva raja, Kacham akar in Malaysia, Chi angkam in Cambodia, Kim That Tai, Cai Tieu Duong, Tiem Vinh in Vietnam, and finally, Man

san qui Cao, Lam Fei yip, Bai bing yip in Vietnam. In addition, for its medicinal and culinary principles, the plant sabungai was highly esteemed. It is renowned as an herb for its antidiabetic, anticancer, and hypotensive properties. Although outside those listed regions, this plant is promising but still mostly unknown.

Unique and Medicinal Properties of Sabungai

Phan (2016) cited sabungai (*G. procumbens*) as having unique properties that help the health of blood sugar, the health of blood pressure, cholesterol, immune health, and good weight control. It provides related and tangible evidence that supports the analysis. *Gynura Procumbens Blood Sugar Help* was one of the featured medicinal capsules. Other medicinal plants such as Gotu Kola and *Gymnema Sylvestre* Tea are also available which means this plant has something to prove.

Similarly, Mou and Dash (2016) examined the testified pharmacological properties such as anti-inflammatory, anticancer, antidiabetic, anti-herpes simplex virus, antiulcerogenic, vasorelaxant, toxicity, and some other activities. They collected collective knowledge about the isolated phytochemical constituents in Sabungai's leaves, and reveal that it can be used to treat various ailments. In order to treat inflammation, herpes simplex virus, rashes, fever, rheumatism, kidney disorders, migraines, diabetes mellitus, cancer and hypertension, the plant is also commonly used as a conventional medicine.

Consequently, Sabungai's many aids to various diseases, while other nations made use of Sabungai as medicinal herbs both stated that despite the variety of useful pharmacological properties it has, this plant is still found in an unused herb. (2015 in Wersja; 2016 in Mou et al.) In addition, Christensen (2018) argued that the Sabungai or "Sambung" historically has many medicinal uses and is thought to prolong life and named it "Leaves of the Gods" for some area. Typically, sabungai is packed with vitamins such as A, B1, B2, B3, B6, B9, C, E, K as well as calcium, iron, phosphorus, and potassium. Of course, 90 percent of Filipino households do not meet the average calcium requirements as seen in the most recent survey conducted by the Department of Science and Technology's Food and Nutrition Research Institute (FNRI-DOST) which is very troubling.

Besides, Fanous et.al (2018) detailed the need for calcium from our body to circulate blood, transfer muscles, and release hormones. For example, it helps to bring signals from your brain to other parts of the body and is also a big part of the protection of the tooth and bone. Also, it makes the bones thick and solid. For women it is even more important as it can relieve symptoms of premenstrual syndrome (PMS). Although our bones are the body's supply of calcium, our body does not generate the calcium it requires. The body can take it from the bones if one may not get enough calcium, which can lead to some deficiency. Sabungai, in particular, is one of those foods that contains calcium and can therefore provide a solution.

On the other hand, the appetite for a fresh, creative and tasty food had evolved well beyond what was anticipated, a trend is the desire of consumers for new foods that are tasty, indulgent and nutritious at the same time. Food producers have been involved in producing foods with decreased lipid and sugar content in the last few decades. (Taylor and Francis, 2019).

Sabungai as One of the Philippine's Medicinal Plants

In the Philippines few people appreciated Sabungai 's advantages and used it as an alternative medicine. Santiago (2020) has contributed a list of the commonly used medicinal herbs in the Philippine Medicinal Plants and one of them is the sabungai. It further shows that the leaves of the plant are high in protein. Sabungai 's properties, such as anti-hyperlipidemic and anti-inflammatory antihypertensive, glucose-lowering, antioxidant, antiulcerogenic, wound healing, antiproliferative, chemo preventive, anti-melanogenesis, antiherpetic, antitumor properties have also been shown.

The sabungai plant is filled with calcium, which is an essential mineral required by the body, in addition to proteins. As reported in the MANILA, Philippines is that Filipinos' calcium intake is insufficient because they do not consume and drink enough milk and milk products. Nearly 90 percent of Filipino households do not meet the average calcium requirements (Vila, 2014), according to the latest survey by the Food and Nutrition Research Institute of the Department of Science and Technology (FNRI-DOST).

A calcium intake assessment of young children in the Philippines was carried out by Agdeppa et.al (2016). Accordingly, the mean one-day calcium intake of young children is equal to 291 mg, which is much lower compared to the normal calcium requirements of our body. It indicates that the highest intake of calcium in young children came from an elite population, while calcium intake was very low in groups belonging to the poorest population.

Similarly, another study on daily calcium intake among urban Filipino women living on low incomes was conducted in the Davao region. The investigation found their calcium consumption was well below the national average. Tiny fish and plant foods were the only source of calcium. (Shoko Miura, Magsayo Nakamori, Masumi Yagi, Ophelia L. Saavedra, Shinji Ikemoto, and Shigeru Yamamoto, 2009)

Methodology

The first step in designing a new product, the design phase in the product life cycle, is basically research and development. It is therefore an act of discovering completely new science that can be used to produce new goods (Starver, 2018).

The researcher took the initiative to create a frozen dessert or ice cream product made from a Sabungai (*Gynura Procumbens*) herbal plant. It also conducted food analysis, a discipline dealing with designing, applying, and researching analytical procedures for characterization of the properties of foods and their constituents (McClements, 2003). For examination, the sugar and calcium content of the sample were brought to a laboratory.

Relatively, a descriptive research design was used by the study to define the extent of its acceptance among the participants. In terms of aroma, color, taste, and texture, the shelf life and the aesthetic characteristics of the Sabungai ice cream have also been determined.

Product Development

With Sabungai (*Gynura Procumbens*) as the key ingredient, the researcher produced a low-sugar, high-calcium ice cream. Different stages were carried out to produce this product. Step 1 is represented below.

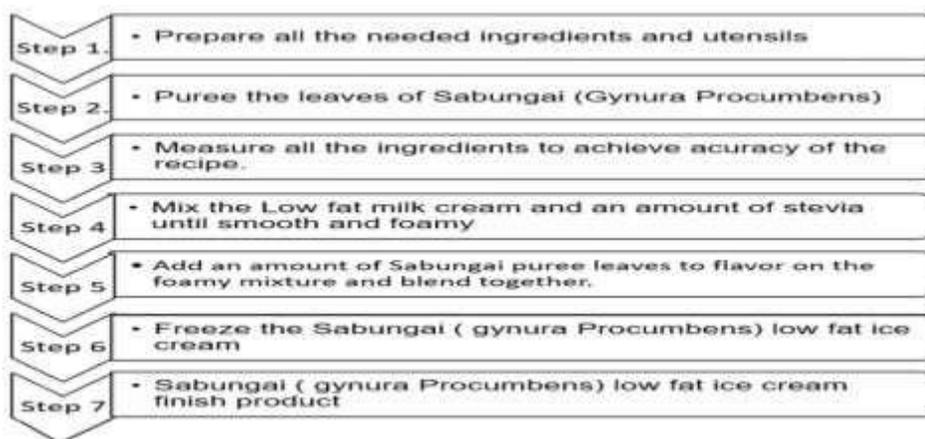


Figure 2. Flowchart on the Production of Sabungai (Gynura Procumbens) Ice Cream

Stage 2: Laboratory Testing

Stage 2 is the process in which the Sabungai Ice Cream product is submitted to the Department of Science and Technology (DOST) for laboratory testing, particularly its sugar and calcium content. This further aimed to determine the amount of sugar and calcium present in a typical serving of the Sabungai ice cream product.

Stage 3: determining the level of acceptability in terms of aesthetic qualities

Stage 3 addresses the level of acceptability among the participants in terms of aesthetic characteristics such as scent, taste, and texture. The participants sampled the Sabungai (Gynura Procumbens) Ice Cream on the basis of their desire to use their senses in smelling, seeing, and tasting.

Results and Discussions

This chapter presents the laboratory test results and other data that were processed, analyzed, and interpreted to justify the formulated statements.

Problem Statement Number 1. What is the sugar and calcium content of the product?

Table 1. Sabungai (GP) Ice Cream Sugar Content (approx. 20g)

Sample Sabungai (GP) Ice Cream (approx. 20 g)	Parameter	Department of Science & Technology (DOST) Result
<i>Sugar</i>	Total Sugar, g/100g	1.66 g

Table 1 shows the result of the sugar content of the sample Sabungai (gp) Ice cream from the Department of Science and Technology (DOST). It reveals that in an approximately twenty (20) grams of sample product contains only a 1.66 g of sugar. This implies that it is safe to eat and can be eaten by diabetic persons more so with health-conscious individual who hinder themselves eating sweet desserts.

As supported by (Wersja, 2015) and (Christensen, 2018). The plant itself is called God's leaves and is renowned for its antidiabetic contribution. Apart from having an anti-diabetic property it is

also known for its anticancer and hypotensive assets as well as packed with vitamins such as A, B1, B2, B3, B6, B9, C, E, K as well as calcium, iron, phosphorus, and potassium.

Top 4 Known Ice Cream Brand Code	Sugar content per 100ml
A	11 g
B	10 g
C	13 g
D	9 g

Table 2. Sugar Content of Top four (4) known Ice Cream Brand

Table 2 display the four (4) known ice cream brand in the market and its sugar content per 100 ml of serving as surveyed by the researcher. First, brand A contains 11 g of sugar per 100 ml of serving. Second, brand B contains 10 g of sugar in a 100 ml serving. Third, brand C has 13 g of sugar per 100 ml serving. Fourth, brand D contains 9 g of sugar per 100 ml serving. Lastly, the develop Sabungai (g.p) ice cream contains 8 g of sugar per 100 ml of serving.

This discloses that the product sabungai (gp) ice cream has a promising market if commercialized considering it has low sugar content as compared to the few known commercial ice cream brand as shown in table 2.

Because of its low sugar content along with its other benefits this may deviate numerous ailments including obesity, type 2 diabetes, heart disease, and many forms of cancer which may contribute to a healthier life. (Gunnars, 2019).

Table 3. Calcium Content per approx. 20g Sabungai (GP) Ice Cream

Sample Sabungai (GP) Ice Cream (approx. 20 g)	Parameter	Department of Science & Technology (DOST) Result
<i>Calcium</i>	Calcium mg/100g	36.6 mg

Table 3 displays the Department of Science and Technology (DOST) laboratory result on the amount of calcium the developed sabungai (g.p) ice cream has. Result shows that in an approximated 20 g of Sabungai (g.p) Ice Cream has a 36.6 mg of calcium content, a far higher as compared to the calcium content of the other commercial ice creams brand in the market.

Data disclose that the sabungai (g.p) ice cream evidently has high calcium content that is good for teeth and bones formation and are needed by the body in order to circulate blood, move muscles, and release hormones. This as well is beneficial to women who experience premenstrual syndrome (PMS). (Fanous et.al,2018)

Dietary Allowance (RDA) for adult is equivalent to 1,000 mg up to 2,500 mg upper limit. With the result given by the Department of Science and Technology with the calcium content of sabungai (gp) ice cream this can be a remedy to address the problem in the low calcium intake of Filipinos. (Vila, 2014)

Ice Cream Brand, (profile for 100g serving)	Calcium Content per 100g
A	169 mg
B	161 mg
C	160 mg
D	159 mg
Sabungai (Gynura Procumbens) Ice Cream	183 mg

Table 4. Calcium content of Top four (4) known Ice Cream brand (per 100g)

Table 4 illustrate the calcium content among the top four (4) ice cream based from the Ice cream list, calcium content per 100g. First, Ice cream A contains 169 mg of calcium in every 100g of ice cream. Second, Ice cream B has an amount of 161 mg of calcium in every 100 g. Third, ice cream C has 160 mg of calcium in every 100 g of ice cream. Fourth, ice cream D has 159 mg of calcium and fifth, lastly the developed sabungai (g.p) ice cream contains an approximately 183 mg of calcium in every 100 g of ice cream which is far higher as compared to the top four (4) ice cream. This give a strong foundation of being patronized in the market once commercialized. Using sabungai with low sugar property, this may give an opportunity to meet the needed calcium intake a day by patronizing the plant alone or the developed sabungai (gp) ice cream which is affordable and can be planted anywhere.

Certainly, the result of the study may answer the assessment carried out by (Agdeppa et.al, 2016), regarding the very low calcium intake of the groups belonging to the poorest population. In addition to, the result may hint at that the sabungai (gp) ice cream contribute to aid bone deficiency an may relieve symptoms of premenstrual syndrome (PMS) specially to women more so become the solution to the insufficient calcium intake of nearly 90 percent of Filipino households. (Vila, 2014).

Problem Statement Number 2. What is the shelf-life of the product?

Sample	Manner of Observation	Past Printed Date	Remark
Freezer			
A	Unopened	3 months & 22 days	Edible however its texture becomes icy
B	Opened	1 month and ½	It started to shows formation of darker color green in the lid of the container
Room temp.			
C	Unopened	At least 48 HRS	Edible however it texture becomes watery
D	Opened	24 hours	Has a very tiny ice shards forming on top of the ice

cream and under the lid of the container which is a common indicator that the Ice Cream is no longer edible

Table 5. Shelf-Life of Sabungai (gp) Ice Cream

Table 5 shows the average shelf life of the Sabungai Ice Cream using a time series approach or method. The Sabungai (GP) Ice Cream product, upon development, was placed in the freezer. There were four samples that had been observed. Sample A is unopened, and Sample B is opened inside the freezer. The other two (2) samples were left at room temperature, sample C unopened and sample D open.

The sample A lasted for about three (3) months and twenty-two (22) days in the freezer unopened (January 29, 2019) and lasted until May 20, 2019. Sample B was left open inside the freezer and lasted for at least one and a half months (1 & 1/2), more or less. Technically, if the ice cream is stored safely, it will last for up to three to four months. (Williams, 2020). While sample C was left at room temperature, which lasted for at least 48 hours. More so, sample D left open at room temperature only lasted for a day.

As per observation, the two samples under room temperature started to have a tiny bubble form on top of the ice cream, and under the lid of the container was a paste like residue, which is a common indicator that the ice cream is no longer edible.

Problem Statement Number 3. What is the aesthetic characteristic of the product in terms of its aroma, appearance, taste & texture?

3.1 Aroma

Majority of the participants agreed that the aroma of the developed product Sabungai (g.p) ice cream is evident. Few of the participants mentioned that they did not notice the distinct aroma of sabungai in the development ice cream. However, one of the participants suggested the researcher to lessen the amount of sabungai, because of its strong scent which do not meet his/her preference. The result shows that every individual has an extensive difference between every participant in how they sense odors. This has something to do with the olfactory receptor in the nose that encode information about the properties of odors even before it is transmitted in the brain. (Mainland and Trimmer, 2019)

3.2 Appearance

Some of the participants described the appearance of the developed product as having a light green color. Similar to other participants, they described it as having an avocado ice cream like appearance. This has something to do with the perceived ice cream appearance seen by the subject, leading him to immediately conclude the appearance of the developed product. The eye alone cannot make sight possible without the brain. (eSchooltoday, 2020)

3.3 Taste

Five (5) participants simply concluded that the developed product is delicious. Others were more detailed in giving their impressions on the product, wherein ten (10) participants claimed that it was "not too sweet," two (2) participants mentioned that it tastes like guava, and another two (2)

commented that the distinct taste of Sabungai (*Gynura Procumbens*) is missing. Additionally, two (2) participants state that there is a little bitter aftertaste. In contrast, one (1) participant expressed that the developed product has no aftertaste.

FONA's Director of Sensory Services gives a clear view of having multiple perceptions of the results, particularly the taste. The taste perception of the participants varies according to age, since taste discrimination tends to decrease with age. Also, the meal they ate prior to the taste test may have come into contact with chemical compounds that greatly decrease the taste bud's ability to register salty, sweet, sour, and bitter tastes. (Lori Walker, 2015).

3.4 Texture

On these aspects, the majority of the participants answered that the developed product is creamy and easily melts in the mouth. One (1) participant answered that the texture is foamy.

Overall, the developed ice cream has its own distinct aroma, as claimed by the majority of the participants. On the basis of appearance, participants immediately identify the light green color and say it is similar to avocado ice cream. For its taste, almost all of the participants concluded that it was delicious, while the texture of the developed ice cream was defined as creamy and melting easily in the mouth.

Problem Statement Number 4. What is the level of acceptability of the Sabungai: A Low Sugar-High Calcium Ice Cream among the participants in terms of; Aroma, Appearance, Taste and texture?

Table 6. Level of acceptability of Sabungai: A Production of Low Sugar-High Calcium Ice Cream

Variable	\bar{X} Mean	Description
Aroma	7.97	Like Very Much
Appearance	8.12	Like Very Much
Taste	7.95	Like Very Much
Texture	8.4	Like Very Much
Grand Mean	8.11	Like Very Much

Legend:

Dislike extremely: (1-1.95), Dislike very much: (1.96-2.91), Dislike moderately: (2.92-3.87), Dislike slightly (3.88-4.83), neither like nor dislike: (4.84- 5.79), Like slightly: (5.80- 6.75), Like moderately: (6.76- 7.71), Like very much: (7.72- 8.67), Like Extremely; (8.68-9.0)

Table 6 shows the summary of the level of acceptability of the Sabungai (*Gynura Procumbens*): A Low Sugar, High Calcium Ice Cream, among forty (40) adult participants using the Hedonic Scale. The result shows that the level of acceptability in terms of its aroma gained a **7.97**, meaning that it is under a numerical description of "LIKE VERY MUCH". More so, the appearance gained an average mean of **8.12**, which also indicates a numeral description of "LIKE VERY MUCH". On the other hand, the results show that the average mean of **7.95** for the

acceptability of taste was also under the category of "LIKE VERY MUCH" and the acceptability level of texture shows an average mean of **8.4**, which is also categorized as "LIKE VERY MUCH". The study gained a grand mean of 8.11 "LIKE VERY MUCH" in terms of its aroma, appearance, taste, and texture. This points toward the acceptability of the developed Sabungai (gp) Ice Cream regardless of status and health preference, with a promising profit once out in the market.

Summary of Findings

This study was conceived with the objectives of determining the sugar and calcium content as well as the level of acceptability in terms of aroma, appearance, taste and texture of the Sabungai (*Gynura Procumbens*) Ice Cream as well as the developed product shelf-life. On the whole the developed Sabungai (gp) Ice Cream based from the result of the Department of Science and Technology (DOST) it has a low sugar content technically implies that it is safe to eat and can be eaten by diabetic persons more so with health-conscious individual who hinder themselves eating sweet desserts.

The developed product has a huge advantage in the market considering it has low sugar content as compared to the few known commercial ice cream brand along with its other benefits this may halt numerous ailments including obesity, type 2 diabetes, heart disease, and many forms of cancer. Gunnars (2019). At the same time, the sabungai (g.p) ice cream based from the DOST result evidently has high calcium content. Calcium is good for teeth and bones and are needed by the body in order to circulate blood, move muscles, and release hormones. This as well is beneficial to women who experience premenstrual syndrome (PMS) more so with lactating women, (Fanous et.al (2018).

In particular the recommended Dietary Allowance (RDA) for adult is equivalent to 1,000 mg up to 2,500 mg upper limit. With the result given by the Department of Science and Technology (DOST) with the calcium content of sabungai (gp) ice cream this can be a remedy to address the problem in the low calcium intake specially to the low earner Filipinos, (Vila, 2014).

Moreover, the shelf life of Sabungai (*Gynura Procumbens*) Ice Cream product lasted three (3) months and twenty-two (22) days unopened in the freezer, if opened and kept refrigerated, it lasted up-to 1 month and 1/2. If left in a room temperature unopened the product lasted at least 48 hours, while opened and left in a room temperature the developed product only lasted for a day (24 hours).

In the level of acceptability of the Sabungai (*Gynura Procumbens*) Ice Cream among the forty (40) adult respondent's results show that in terms of its aroma gained a 7.97 mean that falls under a numerical description of "LIKE VERY MUCH". More so, the appearance gained an average mean of 8.12 which also indicates a numeral description of "LIKE VERY MUCH". On the other hand, result shows that the average mean of 7.95 for the acceptability of Taste was also under the category of "LIKE VERY MUCH" and the acceptability level of Texture shows the average mean of 8.4 which as well categorize as "LIKE VERY MUCH". The study gained a grand mean of 8.11 "LIKE VERY MUCH" in terms of its aroma, appearance, taste and texture. Which means the developed Sabungai (GP) Ice Cream is acceptable regardless of status and

health preference. This implies the sabungai (gp) ice cream is having a promising profit once out in the market.

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