DETAILED RESEARCH & DEVELOPMENT PROJECT

(1) Title/Leader/Gender/Agency/Address/Telephone/Fax/Email

Project Title:	Balakat NutriBar: One Local Nutrition Snack, One Healthy Community
Leader/Gender:	Frienchie Ann B. Yamauchi/ F
Agency/Address:	Mabalacat City College/ Institute of Arts and Sciences/ Brgy. Dolores, Mabalacat City, Pampanga
Telephone/Fax/Email	N/A

(2) Cooperating Agencies

City Health Office of Mabalacat
MCC Kayantabe

(3) MCC - Internalization Office

(4) Site of Implementation/Municipality/District/Province/Region
Mabalacat City/ 1st District/ Pampanga/
Central Luzon (III)

(5) Classification

Research:
_____ Biotechnology
_____ Alternative Energy
_____ICT
_____Environment
___x___Health Products/Pharmaceutical

(6) Mode of Implementation

___ Single Agency
_x_ Multi Agency

Development:

_____ Basic Research _x__ Applied Research

(7) Sector/Commodity

LGU/ Product-based Commodity

Mabalacat City College
Mabalacat City, Pampanga

BASIC INFORMATION

I. Project Title**:** **Balakat NutriBar: One Local Nutrition Snack, One Healthy Community**

II. Project Leader: Frienchie Ann B. Yamauchi
Science Society-Adviser
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III. IMPLEMENTING AGENCY:
Mabalacat City College
Mabalacat City, Pampanga

IV. FUNDING AGENCY:

C/O: OVPGROW

V. Duration: **2 Year Project**

VI. TOTAL BUDGET COST:

Background of the Study

The Philippines is amidst the campaign against poor nutrition. According to findings of the Nutritional Assessment and Monitoring Division (NAMD) headed by DOST-FNRI in 2019, the problem of undernutrition has made little headway, and now overnutrition has also become a major worry. According to the report, about four million children under the age of five suffer from stunting, which makes it unlikely that they will develop to their full mental and physical potential. Over the past 20 years, the percentage of adults who are overweight or obese has nearly doubled, greatly worsening public health issues. These nutritional dilemmas in turn affect the country's potential for social and economic progress (UNICEF, 2019; Gumaru, 2019).

The prevalence of nutritional dilemma among children in the Philippines is of "very high" public health concern. According to the 2015 national nutrition survey, a substantial portion of Filipinos continue to experience chronic malnutrition issues such as protein-energy malnutrition and micronutrient deficiencies, anemia, vitamin A insufficiency, and iodine-deficiency illnesses (Capanzana & Aguila, 2019). In addition, about 11% of adult women were deemed to be chronically underweight and energy deficient in 2015. Among young teenagers (18 to 20 years old), the prevalence of underweight was close to 28%, with notable variations across socioeconomic class. On another note, according to the strategic review of Briones et al. (2017), the prevalence of obesity has also become a health issue, which has increased from 1.1% in 1990 to as much as 5.1% in 2013. Although it decreased to 3.1% in 2016, this level of concern still exists.

The nutritional status of children is also strongly predicted by maternal height in addition to maternal undernutrition. Due to the mother's physical restrictions, which limit fetal growth in gestation, short maternal height is connected with low birthweight and eventually child stunting. Shorter mothers may also have lower macronutrient (protein) and energy storage as well as smaller reproductive organs, which could provide less capacity for fetal growth (Addo et al. 2013). Furthermore, stunting, which causes children to be underweight for their age, affected one in three children (29%) under the age of five in 2019.

In addition to under- and overnutrition, acute nutrient deficiencies are also a problem more pronounced in young children. The physical and intellectual development of young children, especially those under five, is affected by a number of conditions, including iron deficiency anemia (IDA). The frequency of anemia cases for instance, has significantly decreased over the past two decades across all age categories, but in 2013, the IDA levels for children under three, particularly infants, remained alarmingly high.

The determinants of poor nutrition fall into three categories: immediate, underlying, and basic. A child can experience undernutrition on an immediate level due to poor or improper nutritional intake, illness, or both—these two factors frequently interact negatively. These immediate risks result from inadequate care and feeding practices for women and children, insufficient access to health and environmental services, and deficiencies in household or community food security (Acayan, 2021).

Like many other regions in the country, problems in nutrition are also experienced by the residents of Pampanga. According to Cuyco (2020), five out of ten homes (51%) of households suffer acute food insecurity. This was particularly pronounced in lower-income households, while three out of ten (31.9%) households experienced chronic food insecurity. In the province, the prevalence of stunting was 21.2% among children under five and for underweight was 17.4% among infants and children aged 0 to 5 months. These problems with public health were substantially more prevalent in poor households than in non-poor households. According to the WHO cut-offs, 5.0% of wasting/thinness was considered poor. It should not be taken for granted that they will not be at risk for NCDs later in life because the prevalence of obesity was 6.7%, which is much higher in the province than the national estimate. Additionally, non-poor households have much greater rates of overweight than poor households. Anemia prevalence, on the other hand, was 8.0% in children aged 6 months to 5 years, which is regarded as a "mild" public health issue. With the rates being substantially lower than national predictions, malnutrition did not spare school-age children, who ranged in age from 5 to 10. In Pampanga, the prevalence of underweight is 18.8%, whilst the prevalence of stunting is 15.2%. The

ENNS showed that every two (2) out of ten school-age children were underweight (18.8%), stunted (15.2%), and wasted (9.2%), while only nine out of one hundred were. Children of school age who were underweight and wasted were more prevalent among males and in low-income homes.

Infants and females are also highlighted in the nutritional crises of the province. Generally, in the case of infants, five out of every ten (53.8%) started nursing within an hour of birth. In 4 out of 10 of these situations (44.2%) infants were exclusively breastfed for the first six months of life. Only a tiny portion of young children (6-23 months) (6.8%) had a little amount of nutritional diversity (18.6%) in their diets. Among women of reproductive age (15 to 49 years old), over nutrition (40.0%) was a more common problem among non-pregnant/non-lactating women. Two in every 10 (23.0%) pregnant women were nutritionally-at-risk in Pampanga. Breastfeeding mothers in Pampanga were nutritionally at-risk or had Chronic Energy Deficiency at a rate of 13.3%, which had a "medium" impact on public health. Over nutrition (31.1%) was also a new issue for this population. Anemia was of ‘mild’ public health significance among non-pregnant/non-lactating women (11.5%) and lactating mothers (13.6%) in the province.

Currently, shifting to plant-based foods has become a global trend that has been mainly observed during the COVID-19 pandemic (NCC, 2022). Plant-based nutrition products promote environment friendly consumption and campaign for healthier eating lifestyles. This is due to the natural compounds, vitamins, minerals and also phytochemicals that supplement nutrition. Adoption of plant-bas also enhances the economic well-being in the sustainable food system since plants are everywhere and readily available.

Plant-based foods contain a lot of dietary fiber, protein, fatty acids, and phytochemicals that has been related to a lower incidence of chronic diseases and a changed gut microbiota makeup. In order to improve global human health and sustainable food systems, the EAT-Lancet Commission advises increasing the consumption of fruits and vegetables. Plant-based diets are also advised in order to lessen environmental harm from nitrification, climatic change, deforestation, 7 and other factors. According to the Cahiles-Magkilat (2023), the board of investment in the Philippines wants to establish an investment promotion in conducting an appraisal study to develop a Philippine plant-based food industry road map. Together with the University of the Philippines through the College of Home Economics Department of food Science and nutrition presented a series of webinars which presented the overview of the local and global plant-based food industry and the opportunities for its further development. They all agree that because of the pandemic people in the Philippines invest widely on plant-based products because of the health benefits they can provide. Furthermore, it also gives a forecast on the opportunities people can get in terms of business and economics in the plant-based products.

A 2021 survey by the Statista Research Department reveals that Filipinos said that they often consumed plant-based milk such as soy, rice and almond. The survey also found out that the majority consume plant-based food often times in a week. As of November 2021, 77% consumed plant-based milk (soy, rice, almond, oat milk, etc.), 51% had dairy product substitutes (vegan ice-cream, soy, yogurt, vegan cheese, etc.), 45% had plant-based meat alternatives (plant-based burgers, mock meats, plant-based 'chicken' nuggets, etc.), and 31% consumed egg substitutes and/or vegan 'egg'. In line with this, Filipinos are continuously urged by DENR to adopt a plant-based diet in order to lessen their impact on the environment and fight climate change. Reduced water use, factory farming, and greenhouse gas emissions can all be attributed to plant-based diets (Miguel, n.d.).

The main base that will be used in making the nutribar will be quinoa, wherein the recent study of Angeli et al. (2020) shows how quinoa is known to have hypoglycemic effect while being gluten free, together with its vibrant color, its physical characteristics can additionally be appealing to the eyes by being called the “golden grain.” In line with the nutribar, its nutritional value consists of having higher concentration of minerals, vitamins, dietary fibers, carbohydrates, essential amino acids; its protein content also higher than most cereals, and is used as an alternative to milk proteins supports the target benefits of the nutribar. As for the two additive raisins, and dried grapes, both of these fruits have showed prominent benefits that encapsulates the objectives of the nutribar; raisins for having

antioxidant capacity related to its phenolic content have exhibit cardiovascular health improvement, together with these bioactive compounds, grapes are similarly in the same catalog where it possesses wide range of activities in several diseases such as in heart diseases leading to it being a cardiac tonic (Ragni & Eapen, 2020; Olmo-Cunillera et al., 2019). Correspondingly, based on the study of Serafico et al. (2017), malunggay (*Moringa oleifera*) leaves demonstrated amelioration of health in malnourished individuals, especially in very young children as it contains various minerals, and vitamin A and B that supports improvement in their nutrition, and malunggay leaves having high hematological status further display improvement in the blood disorders diseases, resembling back to how grapes are considered to be cardiac tonic that answers most of the common illnesses that an individual might contract.

Ziziphus talanai with the common name of Balakat Tree, is an endemic plant found in Mabalacat City, Pampanga. The plant has been studied and found out to contain various phytochemicals such as flavonoids, tannins, phenols,and alkaloids which are associated with the plant's therapeutic properties (Reyes et al., 2016). These secondary metabolites are found to exhibit antibacterial, antifungal, and antioxidant properties (David, 2018; Aquino, 2018), as well as potentials for neuroprotection (Nolasco et al., 2022; Tejano, 2017), reproprotection (Reyes, 2016), and cardioprotection in mice models (Yamauchi, 2019).

This study aims to integrate the therapeutic potentials of the Balakat tree in a nutrition-packed snack bar to address the common nutritional problems experienced by the residents of Mabalacat City. The study is directed as a potential intervention to solve local nutrient crises in chosen barangays within the city.

Program/project leader

Project Leader

Name: **Frienchie Ann B. Yamauchi**
Field of Specialization: Biology
Designation/Position: Instructor 1
Contact Address: MCC, Mabalacat City, Pampanga

Percentage Time for Research: 50%

Implementing Agency
Mabalacat City College, Mabalacat City, Pampanga

Cooperating Agency
City Health Office, Mabalacat City, Pampanga

Significance of the proposal

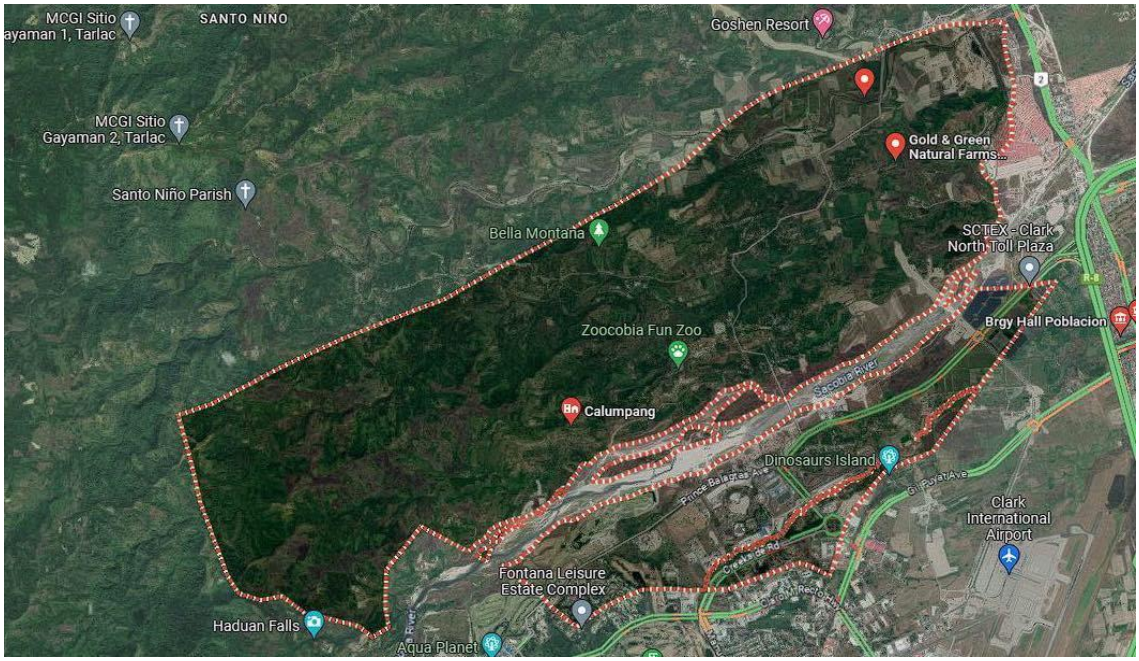
This research proposal targets to address four SDG goals to provide affordable and nutritious food for the community. This will serve as a potential essential source of nutrients to promote good health for the inhabitants in the chosen communities. Specifically, these are **SDG Nos: 2 (Zero Hunger), 3 (Good Health and Well Being), 12 (Responsible Consumption and Production), and 17 (Partnerships for the Goals).**

The significance of this study is to provide a nutritious snack to address the nutritional deficiencies for the communities of Calumpang, Marcos Village, and Macapagal Village. The product of this research aims to address the lack of essential nutrients to communities that lack basic health care and food supply.

Various approaches are enforced in order to develop the Balakat NutriBar. Foremost, the identification of the target communities to aid must be determined through gathering health data and information. The NutriBar is formulated by following safety and health protocols to ensure quality, and additives of powderized Balakat leaves are also incorporated to give additional flavors to the products. Nutrient labels of the product must also be listed to provide transparency to its content.

Study Areas

The targeted areas of the study are the Marcos Village, Macapagal Village, and Calumpang Villages. All areas are located in Clark Freeport, Mabalacat, Pampanga. As a result of the locations' proximity to Clark, only a small number of vehicles are permitted entry, making driving to the mentioned



locations difficult.

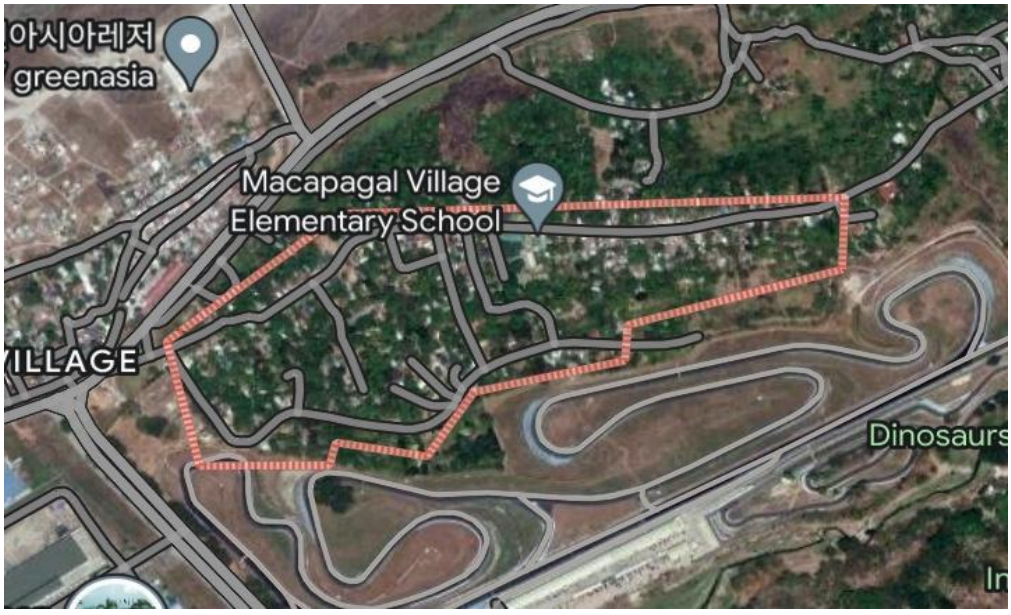
Barangay Calumpang. Courtesy: Google Maps

Barangay Calumpang is a village in Mabalacat City Pampanga. As of the 2020 Census, the total population of this barangay is 2,017. This accounted for 0.69% of Mabalacat's whole population. It has a latitude of 15.2135 degrees (15° 13' North) and a longitude of 120.5231 degrees (120° 31' East) with an estimated elevation of 184.4 meters (605.0 feet).

Marcos Village.

Courtesy: Google Maps

The Barangay Marcos Village is located in the City of Mabalacat, Pampanga. There were approximately 4,957 residents as of the 2020 Census. About 1.69% of Mabalacat entire population is comprised of the villagers. It is located at a latitude of 15.2089, and longitude of 120.5309, about 15° 13' North and 120° 32' East. It is located at an elevation of 167.5 meters, or 549.5 feet, above mean sea level.



Macapagal Village. Courtesy: Google Maps

Macapagal Village is a village that is located in the Mabalacat City, Pampanga. According to 2020 census of Macapagal Village has 4,202 population that represents the 1.43% of the total population of the whole Mabalacat City population. It has estimated elevation 169.3meters that is 555.1 in feet. The coordinates are 15.2112° (15° 13’ North) latitude and 120.3376° (120° 32’ East) longitude.

Objectives

This project aims to create a nutritional bar with the Balakat tree leaves as primary ingredient to help address the nutritional problems of selected barangays in Mabalacat.
Specifically, this project targets to meet the following objectives:

PHASE 1

1. What are the organoleptic values of the nutribars in terms of:
    a. Texture profile analysis
    b. Color profile analysis
    c. Appearance
    d. Taste, and
    e. Aroma?

2. What are the physical analysis values of the Balakat Nutribar in terms of:
    a. Weight (g)
    b. Length (cm)
    c. Width (cm)
    d. Thickness (cm), and
    e. Density (g/cm^3)?

PHASE 2

3. What is the proximate composition of Balakat Nutribar in terms of:
    a. Moisture content
    b. Crude fiber
    c. Crude protein
    d. Crude lipid
    e. Calorific Value, and
    f. Ash content?

4. What are the hydration properties of the Balakat Nutribar in terms of:
    a. Swelling capacity (SWC)
    b. Water holding capacity (WHC), and
    c. Oil Holding Capacity (OHC)?

5. Are there antioxidant capacities present in the Balakat Nutribar using DPPH assay?

PHASE 3

6. Are there any significant differences between the baseline and 2-week consumption anthropometric measurements of the respondents from the selected barangays in terms of:
    a. Height
    b. Weight
    c. MUAC
    d. Skinfold
    e. Systolic blood pressure (mmHg)
    f. Diastolic blood pressure (mmHg)

g. Waist circumference, and
h. Hunger score?

7. Are there any significant differences between the baseline and 2-week consumption biochemical measures of the respondents from the selected barangays in terms of:
a. Lipids,
b. hsCRP, and
c. glucose metabolism?

(12) End-users/target beneficiaries

The community residents of Calumpang, Marcos Village, and Macapagal Village will benefit on the production and distribution of the Balakat Nutribar. The product targets not only addressing nutrition crisis, but also aims to promote the proliferation of Balakat tress and sustainable food production.

(13) Program/project duration

This project will be conducted for a period of 2 years.

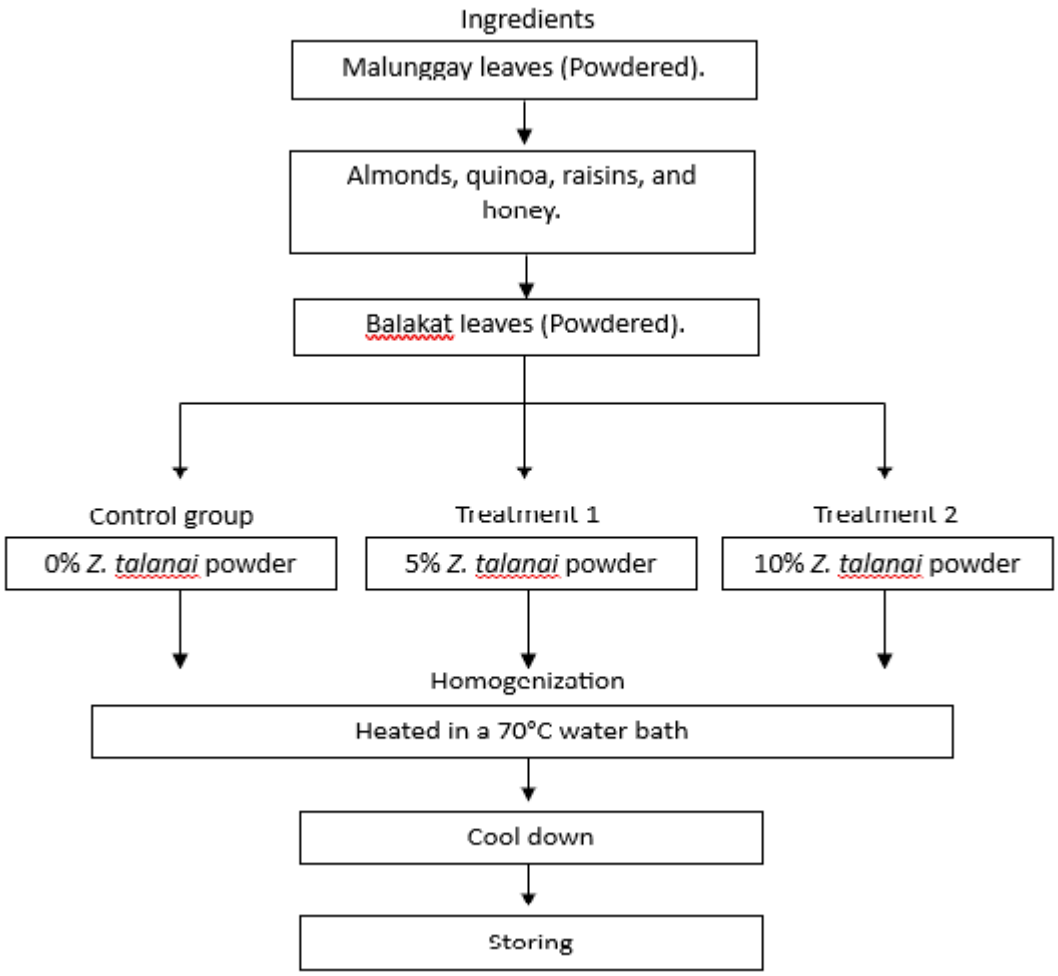
Methodology

The following outlines the general methodology of the study:

A. Collection and Processing of Z. talanai leaves
A total of 10kg of mature *Z. talanai* leaves will be manually collected at Xevera, Tabun, Mabalacat City, Pampanga. The leaves will be thoroughly washed with clean water, and sun dried inside of paper bags for protection of the leaves from random environmental factors; to be done within 5 – 10 days depending on the weather conditions (Bagunu et al., 2020). The dried leaves will then be pulverized using a mechanical blender and sieved to remove large and unwanted particles. The powdered plant material will then be stored in air tight glass container until further use (Udayangani et al., 2019; Reyes et al., 2016).

B. Processing methods and preparation of NutriBar
The protocol for making the Nutribar is based from the studies of Abdalem-salam et al. (2020) and Udayangani et al. (2019). For a 100g nutribar, a base will be made of quinoa which will be roasted at 150°C, together with the almonds that will be further crushed into bits after roasting. As for the process of drying the grapes, the fruit must be washed and removed of its stem before putting into a 15 minutes pre-heated oven to be baked at 107 °C. The baking sheet must be greased with oil where the grapes are evenly spread out to avoid sticking as it bakes. Once the grapes are dried, they must be refrigerated to maintain its freshness that could be stored for about 3 weeks, while other raw materials mentioned such as the oil used for baking sheet, and raisins are obtained from the local supermarket. The control group will have 0% *Z. talanai* powder, while treatments 1 and 2 will have 5% and 10% of the plant powder respectively. After incorporating all ingredients, homogenization will be done by heating the mixture in a water bath for 70°C; this in return allow the batter to acquire the right consistency and thickness (Ananthan, Sharma & Semwal, 2021). After the mixture has been cooled down, it will be stored in the refrigerator for further tests.

Figure 1. Flow chart of the process in making Nutribar.



C. Proximate and Hydration Analysis

The analysis will be performed to determine the bars' calorifc value, fiber, protein, lipid, vitamin, and mineral constituents. Aside from this, the calorific value, moisture content, and ash content will also be tested. Swelling capacity (SWC), water holding capacity (WHC), and oil holding capacity (OHC) will also be determined. All parameters will be quantified by the Department of Science and Technology, Taguig.

D. Physical Analysis

The weight of all samples will be measured in grams using a digital balance. The length, width, and thickness will all be measured in centimeters using a ruler. For the bulk density in g/ml, a graduated cylinder will be used to determine the displacement, following also the formula of mass/volume (Wandhekar et al., 2020).

E. Organoleptic Analysis

Organoleptic analysis for the bars will utilize a hedonic scale to determine the texture and color profiles, as well as the appearance, taste, and aroma. A 9-point scale will be used to evaluate each characteristic. A total of 25 respondents with food critic experiences will be asked to respond to the evaluation for each control and treated groups (Udayangani et al., 2019).

F. Study Cohort and Intervention

Twenty-five individuals will be identified from the selected barangays and will be asked to participate in the study. The individuals will have their anthropometric measures be evaluated before and after the two-weeks trial of nutribar consumption. Specifically, the subjects will take the bars twice each day, and will be advise to discontinue the consumption of all nutraceuticals and supplements for the time being. Upon eating the bar each at noon, and in the evening, the subjects will be advised to take 250ml of water together with it. Self-report hunger scores prior and 20 minutes after eating the bar will also be collected. Participants with infectious diseases, hypertension, diabetes, and dyslipidemia are all excluded. A consent form will also be signed by all respondents prior to their participation in the study (Mietus-Snyder et al., 2012).

G. Statistical Analysis

The experimentation will be performed in triplicate. All data will be presented in mean and standard deviation, and will be analyzed using One-way ANOVA for the determination of significant differences at $p<0.5$, followed by Tukey's Multiple Comparisons test. Graphpad Prism Ver. 9.5.1.

-Work plan schedule

Below is the chronological order of each activity to be undertaken throughout the course of the project:

Activities/Conduction	Year 1				Year 2			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Inception Meeting and MOA Signing								
Search for sponsorship/funds								
Preliminary assessment of data from CHO								
Plant material collection and processing								
Creating the product Nutribar								
Biochemical tests								
Presentation of Data								
Intervention								
Assessment of data								
Presentation of Data/Publication								

(16) **Ethical/biosafety clearance**

Ethical/biosafety clearances will be secured from concerned agencies as deemed before the start of any experiment.

(17) Research utilization

To ensure that the project's findings would be helpful in resolving some health issues and promoting the proliferation of local flora and sustainable food production, research results will

be shared with concerned agencies, researchers and health workers, academics involved in related projects, and policy makers. Additionally, information can be disseminated through publishing outputs and presenting results in forums. When additional funding support is provided as the study moves forward, the findings will be incorporated and arranged in a sourcebook for publication.

(18) Estimated budgetary requirements

Specifics to be followed.

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PHASE 1 RESULTS AND DISCUSSION

This section presents the findings of the project under PHASE 1, i.e., the formulation and physical assessment of the Balakat Nutribar.

Physical Parameters of the Balakat Nutribar

Physical parameters of the Balakat Nutribar were characterized by weight, length, width, thickness, and density. The physical characteristics of the Balacat Nutribar were studied and results obtained are presented in Table 1.

Sample	Weight	Length	Width	Thickness	Density
Control	100g	8cm	8cm	2cm	4g/cm^3
T1	106g	8.5cm	10cm	2cm	4.24g/cm^3
T2	104g	8.3cm	9.8cm	1cm	4.16g/cm^3

Table 1: Physical Parameters of the Balakat Nutribar

It can be observed from the above table that the weights of the three different samples were slightly different from one another. The weight of the sample control, T1 and T2 ranges from 100-106 g. The length of the sample control, T1 and T2 were found, 8cm, 8.5cm and 8.3cm respectively. The width of the sample control, T1 and T2 were found to be 8 cm, 8.5 cm, and 8.3 cm respectively. The width is 8 cm, 10 cm, and 9.8 cm respectively. As for the thickness of the sample control, T1 and T2 were found as, 2 cm, 2 cm, and 1 cm respectively, and the density of the sample control, T1 and T2 were found as 25 ml.

The physical parameters of this Balakat Nutribar is very significant because this characteristic gives the uniqueness and variety of the samples (Sarkar, 1978). Albeit there are small differences between the parameter values, it is important to note that all bars formulated are almost identical to one another. These indicators are important in maintaining product consistency. Maintaining uniformity is part of standard quality control, which also influences

consumer preferences (Bansal *et al.,* 2022). In addition, physical characteristics are related to product components. Density, in particular, can help in determining the amount of product consumed. This can also be relative to the treatment effects on the ingredients such as temperature and moisture content (Kaur et al., 2018). Observing these features in turn, can provide ideas on the overall acceptability of the nutribars (Pravalika *et al.,* 2021; Meng *et al.,* 2019).

Organoleptic Analysis of the Balakat Nutribar

Organoleptic evaluation of the prepared Balacat Nutribar was carried out using a 9-point hedonic scale and the mean for each characteristic. Various parameters such as texture, colour, appearance, taste, and aroma were used.

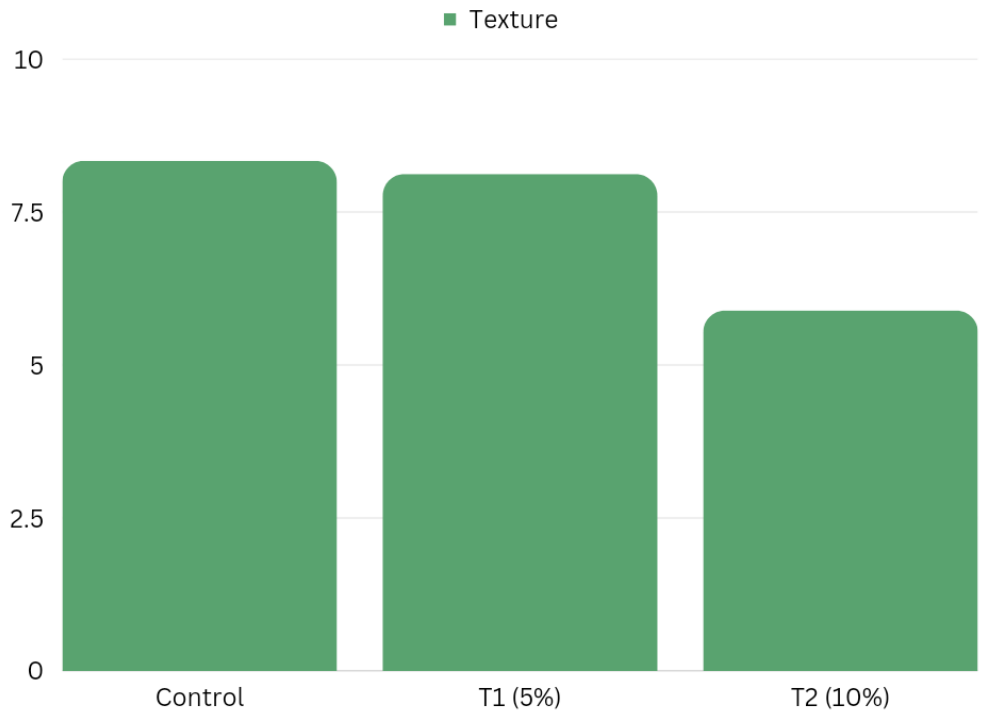

Figure 1: Texture Evaluation of the Nutribar

Based on the graph above, the control sample gained the highest score of 8.33, the T1 sample got 8.11 and the T2 sample got 5.88. Therefore, it is concluded that the respondents liked the texture of the control sample, next to the T1 sample, and the T3 sample got the lowest score. Texture in food is one of the most significant determining factors in eating quality foods and has a strong influence on food intake and nutrition. In addition, it is also related to the structure and composition of the food that is why texture is a very significant parameter in food (Kilcast & Lewis, 1990; Kaur et al., 2018).

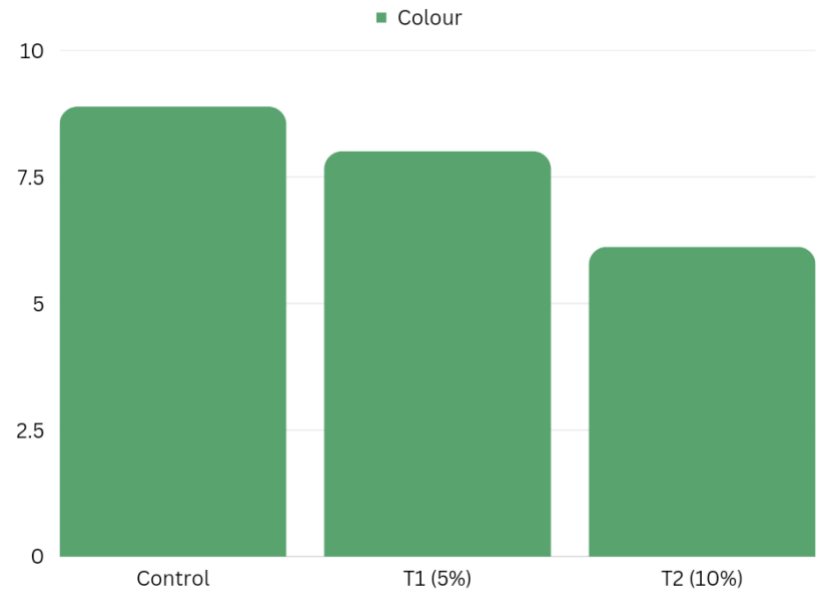

Figure 2: Color Evaluation of the Nutribar

As it was presented on the graph above, the control sample got the highest score of 8.88 and then the T1 sample got a score of 8 and the T3 sample got 6.11. Color plays an important role in sensory aspects of food and drink. As it indicates the freshness and flavor of the food. It can also influence the consumer choice and enjoyment of the product (Hall, 2020).

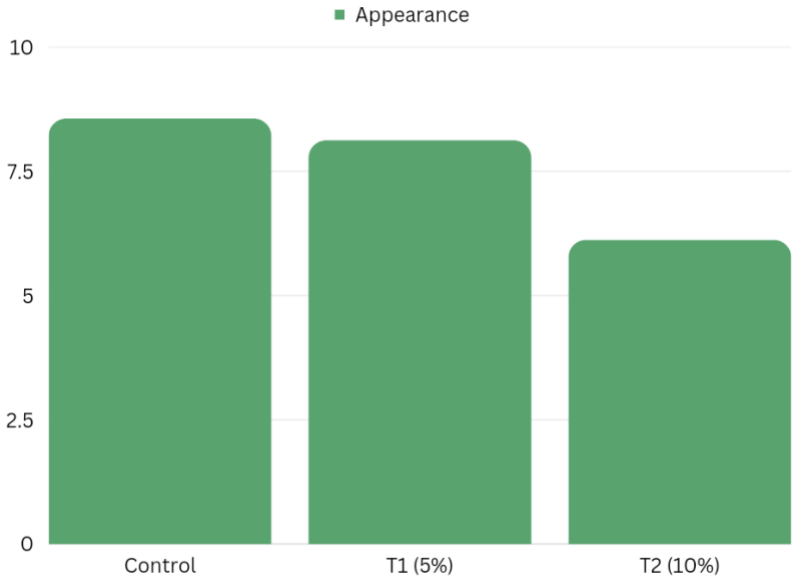

Figure 3: Appearance Evaluation of the Nutribar

Based on the graph representation above, the control sample got the highest score of 8.55, while T1 sample got 8.11 and T2 got 6.11 score. Food appearance determines the first impression of consumers about the food they ate. It gives the overall expectation and influence whether the consumer will eat the food or not (Kong & Singh, 2011).

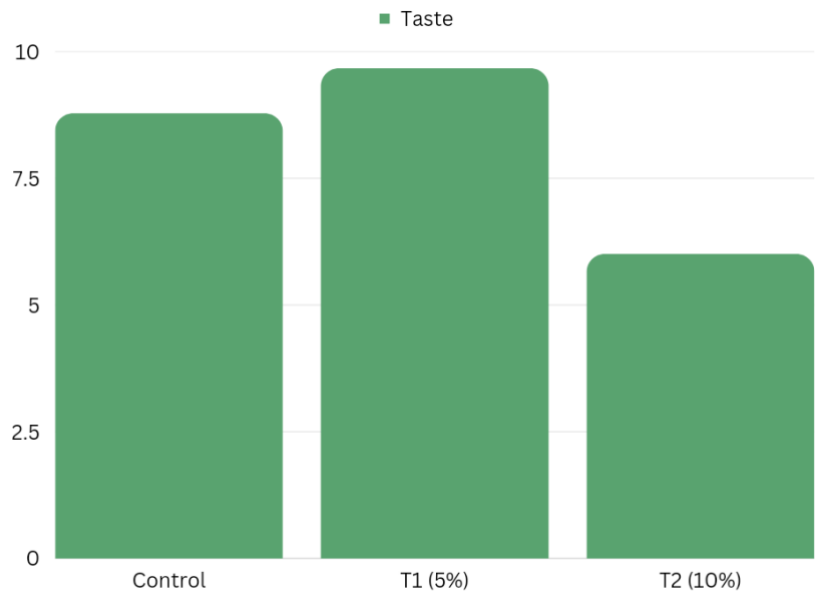

Figure 4: Taste Evaluation of Nutribar

Based on the graph above, the control group got an 8.77 score, the T1 sample got a score of 9.66, and the T2 sample got a score of 6. The graph shows that the T1 sample got the highest score, which signifies the respondents enjoyed the taste of T1 among the samples. Taste plays a significant part in determining what meals are chosen, and a deeper comprehension of the relationships between food flavors, personal preferences for flavor, food selections, and dietary intakes may help us understand why certain people might choose and consume unhealthy foods (Liem & Russell, 2019).

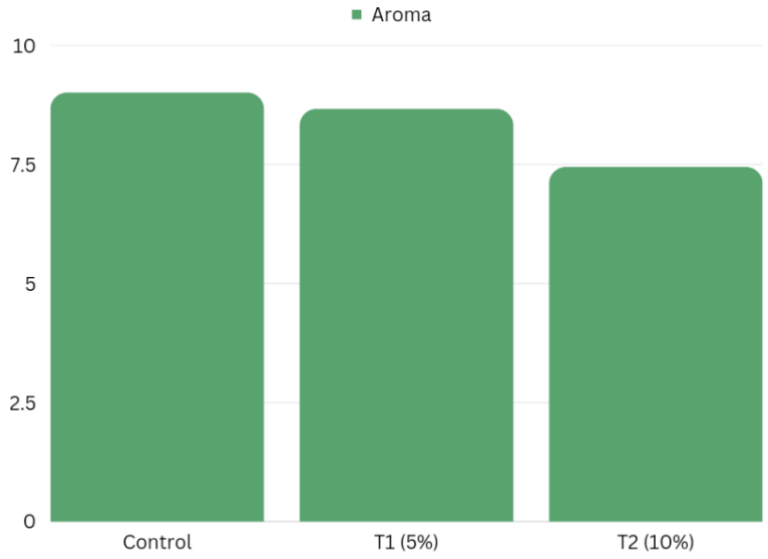

Figure 5: Aroma Evaluation of the Nutribar

In reference to the graph above, the control group got 9 score, the T1 sample got a score of 8.66, and the T2 sample got a score of 7.44. As shown in the graph, the control sample got the highest score of 9, which means the respondents appreciate the aroma of the control sample among the samples. Food's aroma and flavor are interdependent traits; changing one affects the other. The most exacting testing methods are necessary for this influence, and the most advanced instrument is the one that each consumer owns—the human being (Anthony, 2007)

Sample	Texture	Color	Appearance	Taste	Aroma	Overall Acceptability
Control	8.33	8.88	8.55	8.77	9.00	8.71
T1	8.11	8.00	8.11	9.66	8.66	8.51
T2	5.88	6.11	6.11	6.00	7.44	6.31

Table 2: Organoleptic Mean value result

The table above represents the results of the Organoleptic Analysis of the Balakat Nutribar from the Control sample, the T1 sample with 5% powdered Balakat leaves and the T2 sample with 10% powdered Balakat leaves. Food is one of the basic necessities where people obtain nutritious substances to be healthy. However, different people have different taste buds that need to be satisfied. The texture of the foods is for determining the quality of the food, to make sure that it is edible and healthy. The color and appearance of the food play an important role as it sets the impression of the consumer. The taste of the food also plays an important role in the taste buds of the consumers, if the respondents will be able to ingest the product. Lastly, the aroma

sets the perception of the food making it more delicious to the consumers. Aroma enhances the product's presentation.

According to Sorensen (2022), sensory pleasures from the taste of foods are a primary driver of food intake. The fullness is influenced by a food's taste, smell, texture, warmth, color, and appearance in addition to its nutritional content, which contributes to the sensory-specific satisfaction that is assigned to specific foods. These parameters are important indicators that reflect the ingredients used, and the delivery of nutrition within snacks like nutri-bars (Hein et al., 2023; Farooqui et al., 2018).

Conclusion

In conclusion, the present findings indicate that there are minimal variations in the Balakat Nutribar dimensions. Although present in small amounts, adjustments on the sizes and density must be performed as part of quality control, and to maintain consistency. On the other hand, the organoleptic evaluation shows that consumers generally prefer the control group, closely followed by the Nutribar with 5%, then 10% Balakat leaves. Although interestingly, the 5% concentration of Balakat leaves had the highest value in terms of taste. These assessments are important in creating adjustments for the Nutribars which are needed for Phase 2 (chemical and nutritional assessment), and Phase 3 (intervention) of the ISIP Project.

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