

Formulation, analysis, and acceptability of veggie-based longganisa

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Abstract: Food security leading to healthy lifestyle is one of the pressing issues that needs to be addressed immediately. This experimental-developmental research was conducted to develop veggie-based longganisa and specifically it sought to describe the sensory qualities and general acceptability of a veggie-based longganisa in terms of appearance, aroma, taste and texture in three treatments. The product was evaluated by ten semitrained panelist for the sensory qualities and one hundred (100) consumers for its general acceptability. Mean, ANOVA and LSD for Post Hoc test were the statistical tools used. The study revealed that Treatment B Chicken veggie-based longganisa is most the preferred in terms of appearance and taste and described as “Very Much Appealing and very much delicious”. In terms of aroma and texture it was found out that treatment A Pork veggie-based longganisa is the most preferred by the consumer and described as “Very much Pleasant and Very Firm and Intact”. In the generally acceptability among treatments, Treatment B Chicken veggie-based longganisa was the most preferred by the consumer and described as “Liked Very Much”.

Keywords: Veggie-based Longganisa, Pork, Chicken, Fish

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INTRODUCTION

One of the urgent issues that requires immediate attention is the advancement of a healthy lifestyle through food security. Frozen and processed foods are preferred by both children and adult populations. Some of these include Longganisa, a traditional Filipino breakfast that is frequently served as part of the "Long-si-log" trio, which also includes fried rice (sinangag) and fried eggs (itlog). Ground pork is stuffed into hog casings to create this savory-sweet sausage, which is then seasoned with spices and seasonings (Manalo, 2023). Longganisa is a traditional pork sausage that has been transformed into a skinless version in the Philippines.

It has evolved to encompass a wide range of variations among various ethnolinguistic groups. Skinless longganisa is typically prepared from pork, but it can also be prepared from chicken, beef, or tuna. It can be encased in animal intestines or shaped in artificial casings (Ying 2016). Similar to other processed foods, sausages are easy to prepare and have an appealing flavor. However, there are instances in which vegetables are the healthier option than meat. Numerous studies have indicated that a healthy lifestyle is correlated with healthy intake. That is, consuming foods that are derived from vegetables.

Plant-based diets have gained popularity due to their health benefits and, its favorable environmental impact (Willett 2019). Additionally, the substantial energy density and nutritional value of vegetable-based foods have resulted in their widespread consumption worldwide. Their consumption has been on the rise as a result of numerous metabolic disorders that are associated with non-vegetarian diets. Several bioactive compounds found in plant diets have been demonstrated to have health-promoting properties (Samtiya, et al., 2021).

The world is currently experiencing rapid technological advancements. Technology has a significant impact on the lives of individuals. Occasionally, individuals choose to prepare a

self-made menu that is vegetable-based due to their hectic schedules and idleness, rather than investing time in the preparation of an easy-to-cook meal. The selection of foods by both children and adults is one of the numerous contributing factors. The appetite of certain family members is not stimulated when vegetables are presented on the table. They desire food that is both visually enticing and tasty.

Healthy diets are no longer the primary concern. Sufficient consumption of nutritious foods is crucial for the promotion of optimal growth and development. A healthy diet does not guarantee that one will be immune to diseases; rather, it fosters and develops a healthy body that can withstand illnesses such as diabetes mellitus, hypertension, arthritis, and more severe conditions. Falkner, Neumark-Sztainer, and Levin (2021) emphasized that diets that are high in fruits and vegetables have a lower energy density and a high fiber content. Consequently, they could be helpful in the prevention of overweight and obesity by reducing total energy intake and inducing fullness.

Additionally, studies have demonstrated that well-balanced vegetarian or vegan diets are protective and therapeutic for a variety of health conditions, including obesity, heart disease, high blood pressure, diabetes, cancer, and osteoporosis (Melina, et al. 2016). In remote regions of the Philippines, people typically prepare locally grown vegetables in a collective effort. Bitter melon, squash, string beans, okra, and eggplant are among the vegetables that are sautéed with pork and prawns.

While it is a frequently served dish in 3 Filipino households, it is reported to have an unpleasant flavor by some adults and children. This research presents a challenge to the researcher. Thus, the present study developed a veggie-based longganisa with various variants with the aim of meeting the challenge. The researcher prioritizes the preparation of nutritious and appetizing food products due to her expertise in Home Economics. Furthermore, the locality is abundant with a variety of vegetables, needing only a small amount of initiative to create a product that is vegetable-based and appealing to the consumer.

Statement of the problem

The study generally aimed to develop a veggie-based longganisa using different proportions of mixed vegetables and meat or fish. Specifically, it aimed to determine the general acceptability of a veggie-based longganisa among treatments in terms of sensory qualities.

LITERATURE REVIEW

Longganisa

Longganisa typically consists of sausages seasoned with local spices and flavors. In the Philippines, each region or province has its unique variations of longganisa, showcasing the diverse culinary traditions found throughout the country. Longganisa product is famous in the Philippines specifically in Cabanatuan City, Nueva Ecija in Central Luzon. These longganisa varieties include garlic, spicy, sweet or hamonado, and batutay flavors.

The production of Longganisa serves as a means of livelihood for numerous meat processors and vendors in Cabanatuan, supporting their daily sustenance and financial needs (Mercado, 2023). Sausage represents one of the oldest forms of processed food that predate Roman times. The primary economic purpose of these products is to present relatively large proportions of fat in palatable ways. Sausages are defined in the United Kingdom as cylindrical products with hemispherical ends Keenan (2016). The Philippines has sausages and it is called longganisa. Like most European countries, the Philippines has several varieties which differs depending on the region. The term longganisa is derived from the Spanish term “longaniza” which is a type of Spanish 14 sausage like the Chorizo. Some

regions in the Philippines refer to their sausages with the Spanish name chorizo and others call them Longganisa (Raymund, 2021).

Longganisa and sausage are used interchangeably depending on the region. But paying homage to its Spanish counterpart, longaniza makes use of black pepper in its ingredients while chorizo substitutes this with paprika. The Philippine one comes in varieties other than pork, say tuna, beef, and chicken—all mixed with different spices. The plastic-like casing is cleaned-out and boiled pig intestines (Balido, 2016). Skeletal muscle and a variety of meat, including liver and heart, are the basic materials used in the production of sausages.

Additionally, sausage production necessitates fat tissue as a primary basic material. The quality, taste, and flavor of sausage are significantly influenced by nonmeat constituents. The quality, taste, and flavor of sausage are significantly influenced by nonmeat constituents. Spices, flavorings, and antioxidants are additional critical non-meat components. The flavor of the sausage is significantly impacted by these compounds (Lonergan et al., 2016). In modern sausage production, animal and vegetable proteins are used to replace expensive raw meat. Plasma proteins, soy and lentil proteins, casein, caseinates, proteins made from collagen-containing raw materials, and whey protein concentrates can be used as substitutes. Both vegetable and animal proteins can be balanced in amino acid composition to be close to the reference protein (Khramova, et al., 2015).

Veggie-based food product

Veggie-based or plant-based diet pertains to the food intake of a person wherein he eats mostly whole grains, fresh fruits and vegetables, legumes (beans, peas, and lentils), unsalted nuts, and healthy oils like olive oil. Meat, fish, poultry, and other animal products are allowed; however, in a small amount and less often. People who choose a plant-based diet usually do it for health reasons rather than cultural, or ethical concerns. Plant-based diets have been shown to have many health benefits, especially for heart health (Kubala and Richter, 2023).

Nutrient composition and product healthfulness are important factors for consumers when making food choices and there are growing concerns and rising confusion among consumers regarding the nutrient density and health benefits of plant-based foods. Several groups have raised concerns as to whether products are nutritious alternatives to traditional animal versions of the same foods (Tso, 2021). The primary motivation for the development of plant-based products is to provide consumers with tasty and nutritious alternatives to conventional animal products.

This shift to plant-based alternatives has been motivated by a desire to reduce the environmental impact of food supply and improve the sustainability of agricultural food production (Nolde, 2023). Graca et al. (2019) found that familiarity and convenience are among the key factors that enable people to reduce their meat consumption and follow a more plant-based diet. This would suggest that plant-based products with meat-related names would be more effective at reducing meat consumption, providing consumers with immediate information about how those products should be cooked or served.

Okra

Magnesium, folate, fiber, antioxidants, and vitamins C, K1, and A are abundant in okra. It has the potential to promote heart health, blood sugar, and sound pregnancy. It may even possess anticancer properties. It is a flowering plant that is renowned for its edible seed clusters. It is grown in regions with mild, tropical climates, including South Asia and Africa. Okra is occasionally referred to as “lady’s finger” and is available in two colors: red and green.

The red variety undergoes a transformation to green when prepared, and both varieties possess identical flavors. Okra is typically treated as a vegetable in the kitchen, despite its biological classification as a fruit. Okra is an exceptional source of vitamins C and K1 in terms of its dietary health benefits. Vitamin K1 is a fat-soluble vitamin that is recognized for its involvement in blood coagulation, while vitamin C is a water-soluble nutrient that contributes to overall immune function.

Furthermore, okra is low in calories and carbohydrates, and it contains a small amount of protein and fiber. Okra is somewhat distinctive in that it lacks protein, which is a characteristic of many fruits and vegetables. Consuming an adequate amount of protein is linked to advantages in the areas of weight management, blood sugar regulation, bone structure, and muscle mass (Rizzo, 2023). String Beans Strong beans, which are also referred to as sitaw, are long edible legumes that are similar to Baguio beans. It is covered in a green, crunchy exterior that contains small, edible seeds.

In numerous Filipino savory dishes, including kare-kare, sinigang, ginataangsitaw at kalabasa, ginisangsitaw, and pochero, sitaw is employed. *Phaseolus vulgaris* is the common term for both snap beans and string beans. These beans are technically classified as fruits, similar to other varieties of green beans. They are truly unripe fruits, as they originate from the plant's flower and contain seeds.

However, what sets them apart as fruits is that they are typically utilized in cuisine with their outer shells intact and prior to reaching full maturity. Greens are an essential component of a well-balanced diet; they are even comparable to okra in terms of their nutritional advantages. These legumes are classified 17 as low-fodmap foods. Fodmaps are carbohydrates that remain undigested in the gut, resulting in constipation, diarrhea, gas, and abdominal discomfort.

These are low in fodmap, which means that they will not cause any digestive issues and can be relished by a wide range of individuals, including those with chronic digestive issues. The long, green, brittle beans, which are low in calories, are a simple, crispy, and delectable way to incorporate nutrition into your diet.

The following are some of the health benefits of string beans: (1) they reduce the risk of cancer by increasing the amount of chlorophyll in the bloodstream, which boosts antioxidants in the bloodstream, creating more red blood cells, healing damaged skin, and neutralizing toxins. (2) string beans are rich in fiber, which is beneficial for the gut and the digestive system, as well as lowering bad cholesterol levels. (3) string beans aid in pregnancy, as one cup of beans is equivalent to the daily folate intake required by the body. It is beneficial for the development of unborn infants and reduces the incidence of birth defects; (4) it safeguards the bones; and (5) it contains a significant amount of calcium and Vitamin K.

Squash

Cucurbita moschata (*C. moschata*) is one of the vegetables used in healthy diets as well as in traditional medicine in many countries because of the nutritional and health benefits of the bioactive compounds obtainable from its seeds and fruits. A study conducted to investigate the biochemical and nutritional properties of *C. moschata* extracts from its pulp, fibers, and seeds found that the highest carbohydrate content was established in the pulp of *C. moschata* with 222.2 mg/g DW and the lowest content in fiber.

Moreover, proteins and lipids contents showed a significant variation between plant parts, and the 18 highest amounts were found in the pulp with 165.3 mg/g DW and 240.75 mg/g DW, respectively. The seeds are also rich in proteins (66.7 mg/g DW) (Enneb,et al., 2020).

According to Sommer (2023), squash brings the best of both produce worlds when it comes to health benefits. “They’re all relatively low in carbs, high in fiber and nutrient-dense. For instance, winter and summer squash are low in calories and fat, and both are excellent sources of vitamin C. They also contain fiber, B vitamins, and important minerals such as potassium and magnesium. Squash contains antioxidants, which prevent cellular damage caused by free radicals. It is rich in minerals, including calcium. Calcium helps build and maintain healthy bones and teeth. The vitamins A and C in squash also help keep bones healthy.

Eggplant

Eggplant (*Solanum melongena* L.) is a nonwoody annual plant with purple to white flowers along with enlarged lobed leaves with bushy foliage. Eggplant is mainly grown for vegetables and medicinal purposes. The phytochemical analysis of eggplant shows that it is a rich source of various essential compounds aspartic acid, tropane, flavonoids, lanosterol, gramisterol, steroid alkaloids, glycoalkaloids, histidine, nasunin, oxalic acid, solasodine, ascorbic acid, and tryptophan that are present in fruits and leaves.

It also contains low calories and high moisture contents. These compounds were found helpful in the cure of various diseases like cancer, anti-inflammatory, anti-asthmatic, anti-platelet hypo-lipidemic, hypotensive, etc. Today most modern scientific techniques are available to cure different various health problems but still majority of the population across the globe depends upon traditional herbal medicines and practices (Naeem and Ugur, 2019).

Bitter melon

Bitter Melon (*Momordica charantia*) is a member of the squash family and is very popular in Asia, Africa, the Caribbean, India, and Middle Eastern countries. Bitter Melon has a bumpy skin and ranges from light to dark yellowish green in color and oblong in shape as the bitter melon matures and ripens it turns yellow-orange. As the fruit ripens, it becomes tougher and very bitter. The two major varieties are the Chinese (smooth skin) and the Indian (bumpy skin) (Gayathry and John (2022).

Interestingly, bitter melon is also called karela in India, nigauri in Japan, goya in Okinawa, ampalaya in the Philippines, and ku-gua throughout China. *Momordica charantia* likely originated in eastern India or southern China. It favors hot and humid climates with plenty of sunshine and regular water access. Today, bitter gourd can be found growing in fields across Asia, though it has also become popular in the Caribbean and South America (Mikstas, 2022). Bitter melon is a beneficial source of calcium, magnesium, potassium, vitamin A, vitamin C, and zinc, according to the U.S. Department of Agriculture (USDA). A mineral known as calcium is indispensable for the maintenance of the strength of the bones and teeth.

Additionally, it is essential for numerous bodily functions, including nerve signaling, blood coagulation, and muscle movement. Conversely, magnesium facilitates the conversion of food into energy, regulates the nervous system, and synthesizes new proteins. Additionally, it is responsible for the production of protein, bone, and DNA, as well as the regulation of blood pressure and blood sugar. Potassium, an additional vitamin found in bitter melon, serves the primary purpose of reducing blood pressure and assisting the kidneys in the excretion of excess sodium, rather than its retention. Furthermore, bitter 20 melon contains vitamin A, which is essential for the preservation and maintenance of vision. Additionally, it fortifies the immune system by nourishing the mucus membranes in the lungs, intestines, and urinary tract, as well as white blood cells.

Ascorbic acid, also known as vitamin C, is a potent antioxidant that aids in the body's defense against cell injury. It is also crucial for the growth and development of tissues, the repair of wounds, and the maintenance of a robust immune system. Finally, zinc is essential for the production of immune system cells that are capable of combating pathogens. Research indicates that the risk of advanced age-related macular degeneration (AMD) and vision loss can be reduced by 25% by consuming 80 milligrams (mg) of a zinc supplement in conjunction with other micronutrients for eye health. If the disease advances, individuals with AMD are at risk of losing their vision.

METHODOLOGY

Research design

The experimental-developmental research was utilized in this study. It is experimental in nature, as it investigated the production of a veggie-based longganisa using locally available vegetables, as well as pork, chicken, and fish variants. It was also developmental research as it introduced a technology for producing a more nutritious food product.

Ingredients and tools

The ingredients used in the conduct of the study were: 100 grams ground pork, 100 grams ground chicken, 100 grams groundfish, 30 grams okra, 30 grams string beans, 30 grams eggplant, 30 grams squash, 30 grams bitter melon, 10 grams salt, 20 grams onion, 20 grams garlic, 10 grams black pepper, 20 grams vegetable oil, 20 grams soy sauce, 20 grams pineapple juice, 70 grams cornstarch, and 20 grams sugar.

Experimental treatments

The experiment was carried out in three (3) treatments namely: Treatment A (pork- veggie-based longganisa, Treatment B (chicken-veggie-based longganisa; and Treatment C (fish-veggie-based longganisa). Moreover, each treatment was enhanced with other ingredients to improve its taste and to become a more nutritious veggie-based longganisa. In this study, the researcher used the same amount of pork (TA), chicken (TB), and fish (TC). Likewise, the amount of other ingredients remained the same. Vegetables used were okra, string beans, eggplant, squash, and bitter melon. The seasonings were: salt, onion, garlic, black pepper, vegetable oil, soy sauce, pineapple juice, cornstarch, and sugar.

Data gathering procedure

To collect the data, the evaluation sheet was used. There were 100 evaluators composed of 50 students and 50 teachers. Prior to the final making of the products, these were presented to the faculty members of a state university who are Food Technology specialists. Samples of the three treatments with three trials were presented to them for evaluation. Their comments and suggestions for the improvement of the product were incorporated into the final preparation of the product. The final product was presented to the semi-trained panelist. During the product testing, evaluation sheets were given for them to accomplish. Prior to the distribution of evaluation sheets, they were instructed to check the number that corresponds to the description of the product they evaluated according to the product's sensory qualities namely appearance, aroma, texture, and taste. The researcher gathered the evaluation sheets after these were accomplished by the evaluators. Data were immediately tabulated, analyzed, and interpreted.

Data analyses procedure

Mean and Analysis of variance (ANOVA) were the statistical tools used in the analysis and interpretation of the data gathered. Mean was used to describe the sensory qualities and to determine the general acceptability of veggie-based longganisa using three treatments. On the other hand, ANOVA set at 0.01 level of significance was used to determine if significant differences existed among treatments in terms of appearance, aroma, texture, and taste. Least Square Difference (LSD) was used to identify which treatments differ in the sensory qualities. The data was analyzed using the Statistical Package for Social Sciences (SPSS).

FINDINGS AND DISCUSSION

General acceptability of veggie-based longganisa in terms of appearance, aroma, taste, and texture

The data shows the general acceptability of Veggie-based longganisa. Data show that the three treatments' mean scores are described as "Liked Very Much". However, Chicken veggie-based longganisa (TB) has the highest mean of 7.70 compared with veggie-based Pork longganisa (TA) with a mean of 7.55 and Fish veggie-based longganisa (TC) with a mean of 7.43

These indicate that Chicken veggie-based longganisa (TB) has a distinct qualities making it the most acceptable among other veggie-based longganisa variants. The data on the table presented implies that Treatment B (Chicken Veggie-Based Longganisa) consistently scored highest in almost all quality attributes (Appearance, Aroma, Taste, and General Acceptability) except for Texture where it came second.

This suggests that chicken might be the preferred meat base for veggie-based longganisa among the options tested. Furthermore, there was a need for potential improvement for fish veggie-based longganisa wherein Treatment C (Fish Veggie-Based Longganisa) scored the lowest in all quality attributes compared to the other treatments. This indicates a need for recipe improvement or further experimentation to enhance its acceptability. The consistent positive feedback across all treatments shows that despite the differences in scores, all treatments fall within the "Like Very Much" category for every quality attribute.

This suggests that veggie-based longganisa, regardless of the meat base, is generally well-received. The present study obviously has meat substitute to its vegetable compositions purposely to produce variants of longganisa. This is in similar to the study of Kenijz1, et al (2020) wherein they use vegetable proteins in summer sausage production. Based on their findings that substitution of raw meat with lentil proteins is optimal in an amount of up to 20%.

Findings of the study did not conform with the report of Jakobsen et al. (2014). In their study on the likings of consumers to a sausage with Rye bran sausage (RBS) and Wheat Flour Sausage (WBS) with two Danish target groups. It turns out that they were similar with regard to their sensory descriptive attributes, but the structure of these sausages was coarser and the color was browner than the other sausages. RBS was similar to the 59 commercial 10% with regard to several sensory attributes and liking, whereas WBS was the least juicy, had a higher intensity of cereal odor and flavor, and had the lowest liking.

The findings of the present study conform the results of Negowetti (2020), who investigated the consumer acceptance of veggie-based burger patties compared to beef patties. The study found that while aroma and taste were slightly different between the two variants,

the overall acceptability of the veggie-based patties was high, indicating a potential market for plant-based alternatives.

CONCLUSIONS AND RECOMMENDATION

Based on the findings of the study, several conclusions were drawn. All three types of veggie-based longganisa (Pork, Chicken, Fish) were generally well-received in terms of sensory qualities. Among them, chicken veggie-based longganisa scored the highest in appearance, while pork-based longganisa scored highest in texture. The sensory qualities were consistently rated in the "Like Very Much" category across all treatments, indicating high general acceptability with no substantial differences among them. This suggests that consumers found all treatments to be generally acceptable, with a slight preference for the chicken veggie-based longganisa.

Based on the findings and conclusions of the study, several recommendations are proposed. Since appearance was the only sensory quality with significant differences, efforts should focus on enhancing the visual appeal of the pork and fish variants to match the high rating of the chicken variant. This can be achieved by ensuring uniform color, shape, and packaging aesthetics. Maintaining consistency in aroma, taste, and texture is crucial, as no significant differences were noted among the treatments. Regular quality checks can help ensure this consistency.

Broader consumer taste tests should be conducted to confirm the findings and gather more data on preferences. This will help fine-tune recipes and address any minor issues. Given the high acceptability of all variants, it is recommended to continue offering multiple options (Pork, Chicken, Fish) to cater to diverse consumer preferences. Standardizing the appearance of all variants is important, which may involve adjusting cooking methods, ingredients, or presentation techniques. Regular monitoring and evaluation of aroma, taste, and texture will ensure consistency across different batches and variants.

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