International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Formulation of Vegetable Noodles

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ABSTRACT

DIONIO, JAKIELYN B., March 2022 **"FORMULATION OF VEGETABLE NOODLES".** Master of Science in Education, Major in Technology and Livelihood Education. Ilocos Sur Polytechnic State College, Graduate School, Santa Maria, Ilocos Sur.

Adviser:**ADELA G. ESTRAŇERO, Ed. D.**

This research study aimed to test the sensory acceptability of the Formulation of Vegetable Noodles. It made use of four treatments including the control treatment. Specifically, it identified the microbial load of selected vegetable noodles and determined the level of sensory acceptability as to texture, appearance, color, aroma. It also determined difference between the treatments of the vegetable noodles, the proximate/ nutrient content of the best formulation, and the shelf life of the vegetable noodles. It also calculated the return of investment of the product.

The experimental method of research was used in this study. Purposive sampling was employed in the selection of 5 Panciteria restaurants in Bangued, Abra, 15 culinary students, and 10 TLE professionals. Data gathered were analyzed using mean, one-way analysis of variance and the Scheffe test. The microbial analysis, proximate analysis and shelf-life analysis were conducted in a laboratory.

The findings revealed that the absence of pathogens in the microbial load analysis of Vegetable noodles signifies a commendable standard of food safety and quality assurance. The Vegetable noodles meet consumer's expectations, making them a favorable choice in the market. The inclusion of 100 g of vegetable powder in the preparation of Vegetable noodles has resulted in a remarkably high level of acceptability and improves sensory appeal among consumers.

Keywords: Formulation of Vegetable Noodles, Eggplant, String beans, Squash

CHAPTER I
INTRODUCTION

Background of the Study

In the realm of culinary innovation, fusion cuisine stands as a testament to the creativity and adaptability of food culture. One such intriguing fusion is the combination of traditional Filipino flavors with contemporary culinary trends, giving rise to dishes that captivate both the palate and the imagination. Among these culinary creations, Pinakbet, a beloved Filipino vegetable stew, takes center stage for its rich cultural heritage and distinctive flavors.

Winter Squash is an annual fruit representing several squash species within the genus Cucurbita. Late-growing, less symmetrical, odd-shaped, rough or warty varieties, small to medium in size, but with long-keeping qualities and hard rinds, are usually called winter squash. They differ from summer squash in that they are harvested and eaten in the mature stage when their seeds within have matured fully and their skin has hardened into a tough rind. At this stage, most varieties of this vegetable can be stored for use during

the winter. Winter squash is generally cooked before being eaten, and the skin or rind is not usually eaten as it is with summer squash.

Cultivars of winter squash that are round and orange are called pumpkins. In New Zealand and Australian English, the term "pumpkin" generally refers to the broader category called "winter squash".

Although winter squashes are grown in many regions, they are relatively economically unimportant, with few exceptions. They are grown extensively in tropical America, Japan, Northern Italy, and certain areas of the United States. The calabazas of the West Indies and the forms grown by the people of Mexico and Central America are not uniform, pure varieties but extremely variable in size, shape, and color. Since these species are normally cross-pollinated, it is now difficult to keep a variety pure.

Chewy and flavorful yard long beans, also known as Chinese snake beans, are closely related to black-eyed peas. Its immature, tender, edible pods are one of the most popular pod-vegetables used in the Philippines and other East Asian cuisines. The beans are also grown on small scales in home gardens in the Southern United States, West-Indies as well as in the Mediterranean regions.

The yard-long pods are actually legumes belonging to the Fabaceae family. The beans were thought to have originated in southern Chinese Yunnan province. Scientific name: Vigna unguiculata, sub. sesquipedalis. Some of the common names include asparagus-bean, string-bean, or Chinese snake beans. The beans in general recognized by local names as bora (West Indies), dau gok (China), pole sitaw (Philippines), etc.

Eggplant (Solanum melongena), also known as aubergine or brinjal, is a cultivated crop with a mysterious but well-documented past. Eggplant is a member of the Solanaceae family, which includes its American cousins' potatoes, tomatoes, and peppers).

But unlike the American Solanaceae domesticates, eggplant is believed to have been domesticated in the Old World, likely India, China, Thailand, Burma or someplace else in southeast Asia. Today there are approximately 15-20 different varieties of eggplant, grown primarily in China.

The first use of eggplant was probably medicinal rather than culinary: its flesh still has a bitter after-taste if it is not treated properly, despite centuries of domestication experimentation. Some of the earliest written evidence for the use of eggplant is from the Charaka and Sushruta Samhitas, Ayurvedic texts written about 100 BC that describe the health benefits of eggplant.

The domestication process increased the fruit size and weight of eggplants and altered the prickliness, flavor, and flesh and peel color, a centuries-long process which is carefully documented in ancient Chinese literature. The earliest domestic relatives of eggplant described in Chinese documents had small, round, green fruits, while today's cultivars feature an incredible range of colors.

The prickliness of the wild eggplant is an adaptation to protect itself from herbivores; the domesticated versions have few or no prickles, a trait selected by humans so that we omnivores can pluck them safely.

Pinakbet, also known as pakbet or pinak bet, is a traditional vegetable stew hailing from the Northern regions of the Philippines. It embodies a harmonious blend of indigenous ingredients such as squash, bitter melon, and eggplant, flavored with fermented shrimp paste or bagoong. This dish does not only showcase the abundance of locally sourced produce but also reflects the cultural diversity and culinary ingenuity of Filipino cuisine (Hofilena, 2016).

Noodle is one of the food products popular anywhere in the world (Triwara et al., 2023). Noodles are especially popular because they are easy to cook, considerably cheap, and can be stored for a long time. Additionally, they are popular because of their practicality. However, they pose health issues. Most of the noodles sold in the market do not meet the balanced nutritional needs of the body. Similarly, noodles are

consumed worldwide, but instant noodles are often unhealthy (Ko et al., 2022). This condition opens up opportunities to make healthier noodles.

In recent years, the culinary landscape has witnessed a proliferation of fusion cuisine, where traditional recipes are reimagined to cater to evolving palates and dining preferences. One intriguing adaptation is the fusion of Pinakbet with noodles, offering a contemporary twist to this beloved Filipino classic. This culinary fusion not only preserves the essence of Pinakbet but also introduces a novel sensory experience for diners (Lizada et al., 2019). The Philippines is renowned for its rich culinary heritage. It presents a melting pot of flavors and textures that inspire culinary innovation. Among the myriad of Filipino dishes, Pinakbet stands out as a quintessential representation of the country's vibrant food culture.

Northern Philippines continues to serve as a veritable cornucopia of agricultural treasures, the need to conduct a rigorous study on Pinakbet vegetables becomes increasingly evident. By delving into their nutritional profiles, culinary applications, and socio-cultural significance, researchers can shed light on these vibrant vegetables' multifaceted contributions to human health, culinary traditions, and agricultural sustainability. Embracing this research imperative paves, the way for a deeper appreciation of the Northern Philippines' agricultural heritage and the invaluable bounty it offers to local communities and global audiences alike.

Despite the growing popularity of Pinakbet, there remains a significant gap in understanding the acceptability of fusion dishes of Pinakbet vegetables among consumers. Vegetables noodles remain relatively understudied in the realm of nutritional science and public health. Sensory acceptability, encompassing factors such as taste, aroma, texture, and visual appeal, plays a pivotal role in shaping consumers' dining experiences and preferences (Lawless & Heymann, 2013). Therefore, it is imperative to conduct a comprehensive investigation on the utilization of these vegetables to evaluate the sensory attributes and consumer perceptions of Vegetable noodles.

This study seeks to bridge this gap by undertaking a thorough exploration of the sensory acceptability of Vegetable noodles. By conducting sensory evaluations and gathering consumer feedback, this study aims to elucidate the nuances of flavor profiles, textural preferences, and visual presentation that influence the overall dining experience. Through this endeavor, it can gain valuable insights into the sensory dimensions of Vegetable noodles and identify potential areas for enhancement and refinement.

Furthermore, this research endeavors to contribute to the broader discourse on culinary innovation and cultural adaptation. By delving into the sensory dimensions of Vegetable noodles, it shed light on the dynamic interplay between tradition and modernity in the culinary landscape. Through this lens, this study explores and gains deeper insights into the evolving gastronomic preferences of contemporary consumers and the enduring resonance of Filipino culinary heritage.

In conclusion, this study ventures into uncharted culinary territory, probing the sensory acceptability of Vegetable noodles as a testament to the vibrancy and adaptability of Filipino cuisine. By unraveling the sensory intricacies of this dish, this undertaking aspires to enrich the culinary literature and inspire future innovations that recognize tradition while embracing innovation. Thus, this study is conducted.

Objectives of the Problem

This study determined the level of sensory acceptability of the formulation of Vegetable Noodles.

Specifically, it sought to determine:

1. the microbial load content of the vegetable noodles;
2. the level of acceptability of the vegetable noodles terms of:

a. texture;
b. appearance;
c. aroma; and
d. color.
3. the significant differences in the level of acceptability of the vegetable noodles in terms of the above-mentioned variables;
4. the proximate content of vegetable noodles;
5. the shelf life of vegetable noodles; and
6. the return of investment of the vegetable noodles.

Importance of the Study

The study is important to the following:

Students. Analyzing the sensory acceptability of vegetable noodles allows students to apply their theoretical knowledge in real-world scenarios, fostering a deeper understanding of food product development and consumer preferences.

Consumers. Vegetable noodles represent a fusion of traditional Filipino cuisine with a modern twist, offering consumers a novel and potentially healthier option compared to conventional noodles. Understanding the sensory acceptability among consumers provides valuable insights into their preferences, aiding food manufacturers in producing products that cater to consumer tastes and preferences. This can lead to increased market acceptance and ultimately higher sales.

Food Technology Instructors. The study on vegetable noodles offers an excellent educational opportunity to teach students about sensory evaluation techniques, product development, and consumer preferences. By incorporating real-world examples like this study into their curriculum, teachers can enhance students' understanding of how sensory analysis influences food product design and marketing strategies. Furthermore, discussing the significance of this study can stimulate critical thinking and encourage students to explore innovative approaches to food product development in their future careers.

Researchers. The study on the sensory acceptability of vegetable noodles holds significant importance for the researcher, offering opportunities for knowledge generation, product innovation, cultural preservation, and professional development. By conducting rigorous sensory evaluations, the researcher contributes to our understanding of consumer preferences and behaviors, ultimately shaping the future of the food industry.

Noodle Makers. understanding the sensory acceptability of vegetable noodles provides crucial insights into diversifying their product offerings. By incorporating local flavors and ingredients like those found in pinakbet, they can cater to regional tastes and preferences, potentially expanding their customer base. Moreover, if the study indicates positive sensory acceptability, noodle makers can optimize their production processes to efficiently manufacture this new variant, enhancing product quality and consistency.

Farmers. It opens up new market opportunities for farmers, potentially increasing demand for their produce. Additionally, if the study reveals positive sensory acceptability, it could encourage farmers to diversify their crops, leading to improved agricultural sustainability and economic stability for farming communities.

Future Researchers. The study serves as a foundation for future research endeavors in the fields of food science, sensory analysis, and consumer behavior. Researchers can build upon the findings of this study

to delve deeper into understanding the factors influencing sensory acceptability, such as ingredient proportions, cooking methods, or cultural influences. Moreover, it may inspire further exploration into the development of innovative food products that bridge tradition with modernity, catering to evolving consumer preferences and dietary trends.

Time and Place of the Study

From March 2023 through July 2023, this study will be carried out at the Abra State Institute of Sciences and Technology's Bangued Campus. It utilized five Panciteria restaurants in Bangued, Abra, 15 culinary students, and 10 TLE professionals.

Definition of Terms

For a clearer understanding, the following terms are defined as they were used in the study.

Vegetable Powder. It served as the study's key component. a powder made from string beans, eggplant, and squash.

Vegetable Noodles. It is a different product that was created as a result of the study and is classified as a type of stripped noodles made from powdered veggies.

Microbial Load Content. It refers to the method or laboratory analysis used in the study to determine the microorganisms or pathogens present in the study.

Acceptability. It speaks to the degree to which the product's following attributes satisfied the evaluators' senses using the following parameters.

Texture. It refers to how soft or smooth the products were made using the sense of touch.

Appearance. It refers to how vegetable noodles are appealing to the evaluators.

Color. It refers to the color of vegetable noodles.

Aroma. It alludes to the olfactory perception of sensory information.

Proximate Content. It refers to the amount of ash, the moisture content, crude protein, crude fat and carbohydrates based from laboratory test.

Shelf Life. It refers to how long the vegetable noodles have been safe for consumption.

Return of Investment. It refers to the estimated revenue from one blend, typically represented in percentages.

Review of Literature

The mentioned literature was used as a resource for conceptual formulation and result interpretation in this study's creation and assessment of vegetable noodles.

Microbial Load Content of Vegetables Noodles

The microbial load content of noodles made from vegetable powder is a critical aspect to consider, as it directly impacts food safety, shelf life, and consumer health. Several studies have examined the microbial quality of these innovative noodles, providing valuable insights into the factors influencing microbial contamination and control strategies.

A study by Chen et al. (2019) investigated the microbial load content of noodles fortified with various vegetable powders, including spinach, pumpkin, and carrot. Results indicated that vegetable powder incorporation did not significantly affect the microbial load content of the noodles compared to traditional wheat-based noodles. However, variations in microbial counts were observed among different vegetable

powder sources, suggesting that the microbial quality of vegetable powders may influence the microbial load content of the final noodle product.

Similarly, Li et al. (2020) conducted a microbial analysis of noodles enriched with pumpkin powder. Microbiological assessments revealed that pumpkin powder supplementation did not lead to increased microbial contamination in the noodles. However, proper handling and storage practices during processing and distribution are essential for minimizing the risk of microbial contamination and ensuring food safety.

Contrastingly, a study by Wang et al. (2018) reported higher microbial counts in noodles formulated with carrot powder compared to traditional noodles. Microbiological analysis revealed elevated levels of bacterial and fungal contamination in carrot powder, which may have contributed to increased microbial load content in the noodles. This highlights the importance of quality control measures and rigorous testing of raw materials to mitigate microbial risks in vegetable powder-based products.

Furthermore, Zhang et al. (2017) examined the impact of broccoli powder fortification on the microbial quality of noodles. Microbiological assessments revealed that broccoli powder supplementation did not significantly alter the microbial load content of the noodles. However, proper sanitation practices and hygienic processing conditions are essential for preventing microbial contamination during manufacturing and ensuring product safety.

In conclusion, while the microbial load content of noodles made from vegetable powder may vary depending on various factors such as vegetable powder source, processing methods, and storage conditions, proper hygiene and quality control measures are crucial for ensuring food safety and microbial control. Future research should focus on developing effective sanitation protocols, microbial testing methods, and preservative strategies to enhance the microbial quality and safety of vegetable powder-based noodles, thereby promoting consumer health and confidence in these innovative food products.

Sensory Acceptability of Noodles Using Vegetable Powder

Noodles made from vegetable powder have garnered increasing attention in recent years due to their potential health benefits and sustainability. Several studies have explored the sensory acceptability of these innovative noodles, shedding light on consumer preferences and perceptions.

A study by Hu et al. (2019) investigated the sensory attributes of noodles fortified with spinach powder. Sensory evaluations revealed that noodles with higher concentrations of spinach powder were perceived to have a stronger vegetable flavor and greener color, which positively influenced consumer acceptability. However, excessive spinach powder incorporation led to undesirable bitterness, highlighting the importance of optimizing formulation parameters to balance flavor and acceptability.

In a similar vein, Li et al. (2020) conducted a sensory evaluation of noodles enriched with pumpkin powder. Results indicated that pumpkin powder supplementation enhanced the aroma and color of the noodles, contributing to higher overall acceptability scores among consumers. Texture analysis further revealed that pumpkin powder incorporation improved the chewiness and springiness of the noodles, enhancing sensory satisfaction.

Furthermore, a study by Wang et al. (2018) explored the sensory properties of noodles formulated with carrot powder. Sensory evaluations demonstrated that carrot powder addition imparted a subtle sweetness and orange hue to the noodles, positively influencing consumer liking. Additionally, texture analysis revealed that carrot powder supplementation improved the firmness and elasticity of the noodles, enhancing overall sensory acceptability.

Contrastingly, a study by Zhang et al. (2017) examined the sensory acceptability of noodles fortified with broccoli powder. Results indicated that while broccoli powder incorporation increased the nutritional value of the noodles, it negatively impacted consumer acceptability due to its strong and distinctive flavor profile. Sensory evaluations revealed that consumers perceived the broccoli-flavored noodles as less palatable compared to traditional noodles, highlighting the challenges associated with incorporating certain vegetable powders into noodle formulations.

In conclusion, the sensory acceptability of noodles made from vegetable powder is influenced by various factors, including flavor, aroma, color, and texture. Optimizing formulation parameters and ingredient proportions is crucial for balancing sensory attributes and enhancing consumer acceptability. Future research should focus on exploring novel vegetable powder sources and innovative processing techniques to further improve the sensory properties of vegetable powder noodles and meet evolving consumer preferences.

Nutrient Analysis of Vegetable Noodles

Noodles made from vegetables represent a nutritious and innovative alternative to traditional wheat-based noodles, incorporating a variety of locally sourced vegetables commonly found in the Filipino dish pinakbet. Several studies have examined the nutrient content of these vegetable noodles, highlighting their potential health benefits and nutritional advantages.

A study by Reyes et al. (2019) investigated the nutritional composition of noodles fortified with pinakbet vegetables, including bitter melon (ampalaya), eggplant (talong), squash (kalabasa), and string beans (sitaw). Results revealed that vegetable noodles were rich in essential vitamins and minerals, including vitamin A, vitamin C, potassium, and dietary fiber. These nutrients are known to support immune function, promote healthy vision, and regulate blood pressure, highlighting the nutritional value of vegetable noodles made from vegetables.

Similarly, Balmeo et al. (2020) conducted a nutritional analysis of noodles formulated with a combination of string beans, squash, and eggplant vegetables and flour. The study demonstrated that vegetable noodles were a good source of antioxidants, including beta-carotene and phenolic compounds, which play a crucial role in reducing oxidative stress and lowering the risk of chronic diseases such as cancer and cardiovascular disease. Additionally, the high fiber content of pinakbet vegetable noodles contributes to satiety and digestive health, making them a nutritious option for individuals seeking to maintain a balanced diet.

Contrastingly, a study by Santos et al. (2018) reported that the nutrient content of pinakbet vegetable noodles may vary depending on factors such as vegetable variety, processing methods, and cooking techniques. Microbiological analysis revealed that certain vegetables used in pinakbet vegetable noodles, such as bitter melon, may contain anti-nutritional factors such as lectins and trypsin inhibitors, which can inhibit nutrient absorption and digestion. However, proper cooking methods, such as blanching or steaming, can help mitigate the effects of anti-nutritional factors and improve the nutrient bioavailability of pinakbet vegetable noodles.

Furthermore, a study by Garcia et al. (2021) examined the impact of fermentation on the nutrient content of vegetable noodles. Fermentation processes, such as lactic acid fermentation, were found to enhance the bioavailability of nutrients in vegetable noodles by breaking down complex carbohydrates and proteins into more readily absorbable forms. Additionally, fermentation was found to increase the content of certain vitamins, such as vitamin B12 and folate, in vegetable noodles, further enhancing their nutritional value.

In conclusion, noodles made from vegetables are a nutritious and wholesome food option, rich in essential vitamins, minerals, and antioxidants. While the nutrient content of vegetable noodles may be influenced by various factors, including vegetable variety and processing techniques, they offer significant potential for improving dietary quality and promoting overall health and well-being.

Return of Investment of the Vegetable Noodles

While there is a growing interest in the nutritional aspects of vegetable noodles, literature specifically focusing on the nutrient content of vegetable noodles using squash, eggplant and string beans vegetables is limited. However, existing studies on the nutrient composition of vegetable noodles made from various vegetables can provide valuable insights into their potential health benefits.

A study by Agyei et al. (2018) evaluated the nutritional composition of noodles fortified with vegetable powders, including carrot, spinach, and pumpkin. The results indicated that vegetable powder incorporation significantly increased the content of essential nutrients such as dietary fiber, vitamins (A, C, E), and minerals (iron, potassium) in the noodles. These findings suggest that vegetable noodles can serve as a nutritious alternative to traditional wheat-based noodles, providing additional vitamins and minerals essential for overall health and well-being.

Similarly, Liu et al. (2019) conducted a nutritional analysis of noodles enriched with various vegetable purees, including broccoli, carrot, and beetroot. The study demonstrated that vegetable puree supplementation enhanced the antioxidant content of the noodles, particularly phenolic compounds and carotenoids, which play a crucial role in reducing oxidative stress and inflammation. Additionally, vegetable noodles exhibited higher levels of dietary fiber and lower glycemic index compared to conventional noodles, making them a suitable option for individuals with diabetes or those seeking to manage blood sugar levels.

Contrastingly, a study by Chen et al. (2020) examined the nutritional composition of noodles fortified with konjac flour, a low-calorie, high-fiber ingredient derived from the konjac plant. The results revealed that konjac-fortified noodles were significantly lower in calories and carbohydrates compared to traditional wheat-based noodles, making them a suitable option for individuals following low-carbohydrate or weight-loss diets. However, konjac-fortified noodles exhibited lower levels of certain nutrients such as protein and vitamins compared to vegetable noodles, highlighting the importance of considering nutrient density in food product development.

Furthermore, a systematic review by Smith et al. (2021) evaluated the nutritional profile of vegetable noodles across various studies. The review concluded that vegetable noodles, including those made from zucchini, sweet potato, and cauliflower, were generally higher in dietary fiber, vitamins, and minerals compared to traditional wheat-based noodles. Moreover, vegetable noodles exhibited lower calorie and carbohydrate content, making them a favorable option for individuals seeking to increase vegetable intake or reduce calorie consumption.

In conclusion, while specific literature on the nutrient content of vegetable noodles using squash, eggplant and string beans vegetables is limited, existing studies on vegetable noodles made from various vegetables highlight their potential as a nutritious and health-promoting food option. Incorporating a diverse range of vegetables into noodle formulations can enhance their nutritional profile, providing additional vitamins, minerals, and antioxidants essential for overall health and well-being. Further research focusing on the nutrient composition of vegetable noodles using squash, eggplant and string beans vegetables can provide

valuable insights into their potential health benefits and contribute to promoting dietary diversity and sustainability.

CHAPTER II
MATERIALS AND METHODS

This chapter presented the materials, research design, treatments, experimental procedure, data gathering instrument and the statistical analysis of data.

Materials

To prepare vegetable noodles, the study needs a weighing scale, a bowl, a colander, a wooden spoon, a utility tray, measuring cups, a measuring spoon, a rolling pin, knives, and a noodle cutter.

Ingredients Used in Vegetable Noodles

Main Ingredients

Eggplant
squash
string beans

Basic Ingredients for Noodles

1⅔ cups all-purpose flour
¼ C water
Pinch of salt

Methods:

1. Combine powdered vegetables (eggplant, squash and string beans), flour and a pinch of salt. Water and stir the mixture with a wooden spoon until evenly fluffy.
2. Knead the dough until smooth.
3. Cover with a wet cloth and rest for around 30 minutes.
4. Transfer the dough to a large floured operating board.
5. Roll the dough into rectangular or forms, then wrap.
6. Fold the large dough wrapper around 5cm wide.
7. Cut the folded dough into thin strips with a sharp and dry knife.
8. Unfold the strips one by one and then shake the extra flour off.
9. Sundry the noodles or refrigerate for up to 7 days in air-tight bags.

Research Design

The experimental research design using a complete randomized design was used in the study which emphasized the procedure in the attainment of the desired output. It also focused on the gathering of numerical data from the responses obtained from the respondents using the sample products from the experiment. This study will make use of eight treatments, and these are as follows:

Treatments – Noodles in Different Proportions of Selected Vegetables

T1 – 100 g = The results are 33.33 grams every powdered squash, eggplant, and string beans.

T2 – 200 g = The results are 66.66 grams every powdered squash, eggplant, and string beans
T3 – 300 g= The results are 100 grams every powdered squash, eggplant, and string beans

Experimental Procedure

A. Preparatory Phase

a. Gathering of main Ingredients preparing equipment and Tools to be used.

1. Clean and sanitize tools and equipment to prevent contamination.
2. Airing and drying preparation tables and other kitchen utensils to be used.
3. Arrange kitchen utensils, other tools and equipment orderly.

B. Preparing of Vegetable Noodles

THE STANDARD PROCESS FOR VEGETABLE NOODLES

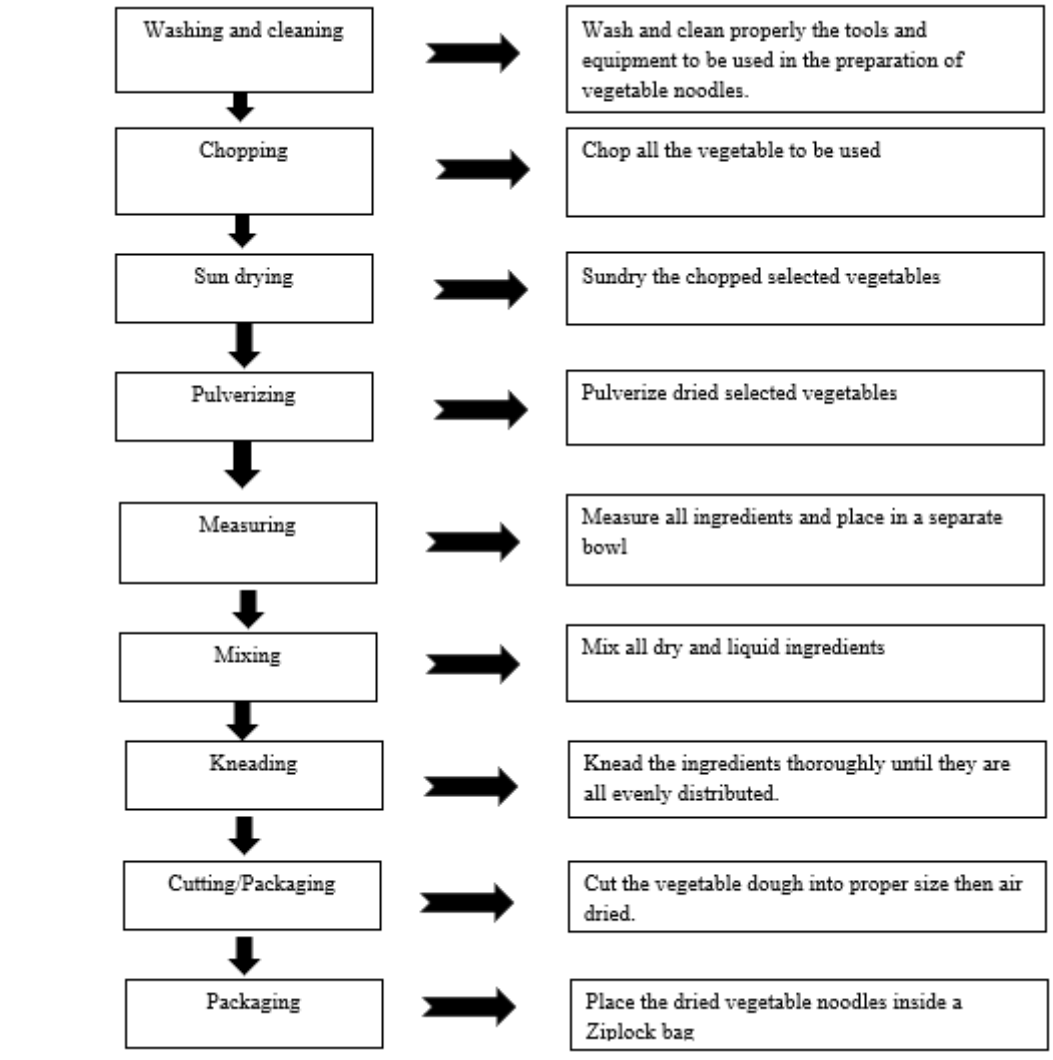

Figure 2. Process Flowchart in Preparing the Vegetable Noodles

C. The Procedure in Making Vegetable Noodles

1. Wash the vegetables properly.
2. Chop all the vegetables so be into desired cut.

3. Measure all ingredients then place in a separate bowl.
4. Mix the dry and liquid ingredients.
5. Knead the mixture until smooth and elastic.
6. Dust with flour and roll.
7. Extrude the mixture using noodles cutting machine

Data Gathering Procedure/Instrument

The study used the experimental procedure.

The data required for this study will be collected using a sensory test score sheet. It applied the 5-point Likert scale to measure the level of acceptability of Vegetable Noodles in terms of texture, appearance, aroma, and color.

Microbial Analysis

A series of treatments was delivered to the Molecular and Microbiology Laboratory at Mariano Marcos State University in Batac, Ilocos Norte, where they underwent microbial analysis to determine their suitability for human consumption. If the results indicate the absence of Escherichia coli, Salmonella sp., Listeria monocytogenes, molds, and Staphylococcus aureus in the treatments, they were then subjected to an organoleptic evaluation. In addition to the evaluators' feedback based on predefined criteria, comments and suggestions were also collected, aiming to enhance the product's quality.

Proximate Analysis

The best treatment was T1 – 100 g powdered vegetables + basic ingredients. It is subjected to proximate analysis to determine the nutrients content of the vegetable noodles.

Shelf-Life Analysis

The best treatment in the study, which consisted of 100 grams of powdered vegetables along with basic ingredients, underwent a shelf-life analysis at the Molecular and Microbiology Laboratory of Mariano Marcos State University. This analysis aimed to establish the duration before undesirable microbes began to proliferate.

Return of Investment

The Return on Investment (ROI) for Vegetable Noodles was computed based on the identified expenses, gross sales, and income.

Statistical Treatment of Data

The following statistical tools are used to statistically analyze all the collected data. The statistical analysis of data is done using Microsoft Word and Microsoft Excel.

1. **Mean.** It is employed to assess the degree of acceptability of the chosen vegetable noodles with regard to their appearance, aroma, texture, color and overall desirability.
2. **One-Way Analysis of Variance (ANOVA).** It was employed to identify meaningful distinctions between and among the various treatments applied to the vegetable noodles.
3. **Tukey Kramer Multiple Comparison Test.** It is utilized to ascertain which of the distinct treatments exhibit significant variations in the quality of the vegetable noodles.

DATA CATEGORIZATION

The following norms will be used in the interpretation of data.

Scale	Range	Descriptive Rating
5	4.21 - 5.00	Very Highly Acceptable (VHA)
4	3.41 - 4.20	Highly Acceptable (HA)
3	2.61 - 3.40	Acceptable (A)
2	1.81 – 2.60	Moderately Acceptable (MA)
1	1.00 – 1.80	Slightly Acceptable (SA)

CHAPTER III
RESULTS AND DISCUSSION

This chapter presented the interpretation of findings, conclusion and recommendation of the study.

Findings

Table 1. Microbial Load Analysis of Formulation of Vegetable Noodles

Treatments	***Aerobic Plate Count (Cfu/g) 10^4***	***Detection of Pathogens***			
		Escheri-chia coli	***Salmonel-la sp.***	***Staphylo-coccus***	***Molds***
T0- Basic Noodles	10.0	negative	Negative	negative	negative
T1-100 g powdered vegetables + basic ingredients	13.0	negative	Negative	negative	negative
T2-200 g powdered vegetables + basic ingredients	11.0	negative	negative	negative	negative
T3-300 g powdered vegetables + basic ingredients	14.0	negative	negative	negative	negative

Table 1 shows the result of the microbial load analysis and detection of pathogens of vegetable Noodles. Microbial analysis and detection of pathogens were conducted to test if the Vegetable Noodles is safe for human consumption. One treatment such as T3 – 300 g powdered vegetables + basic ingredients have the highest microbial load of 14.0 g on the other hand T0 – Basic Noodles have lowest microbial load of 10.0 Furthermore, tests show negative results which means absence of harmful bacteria such as Escherichia coli, Salmonella sp., Listeria monocytogenes, molds and Staphylococcus aureus.

The microbial load analysis of vegetable noodles yielding negative results for pathogens signifies a critical aspect of food safety and quality assurance. This outcome assures consumers that the noodles are free from harmful microorganisms known to cause foodborne illnesses. The absence of pathogens suggests that the production, handling, and storage processes have been effectively managed to prevent contamination. It reflects the meticulous adherence to hygiene practices, sanitation protocols, and regulatory standards throughout the production chain. Such rigorous quality control measures not only

safeguard consumer health but also uphold the reputation of the brand by instilling confidence in the safety and integrity of the product.

SENSORY ACCEPTABILITY OF VEGETABLE NOODLES

This presents the level of sensory acceptability of vegetable noodles in terms of texture, appearance, aroma, color and overall acceptability.

Table 2. Level of Acceptability of Vegetable Noodles in terms of Texture.

TREATMENTS	MEAN	DESCRIPTIVE RATING
T0- Basic Noodles	3.93^{ab}	Highly Acceptable
T1-100 g powdered vegetables + basic ingredients	4.37^{a}	Very Highly Acceptable
T2-200 g powdered vegetables + basic ingredients	3.87^{ab}	Highly Acceptable
T3-300 g powdered vegetables + basic ingredients	3.67^{b}	Highly Acceptable

F-test = 2.883* p-value = 0.03

It can be gleaned from Table 2 that T1 – 100 g obtained the highest score of 4.37 described as Very Highly Acceptable. Seconded; T2- 200 g powdered vegetables + basic ingredients with a mean rating of 4.37 as bigly acceptable; and thirdly, T3 – 300 g powdered vegetables + basic ingredients with a mean rating of 3.67 as highly acceptable respectively. These findings suggest an exceptionally positive evaluation of the vegetable. The texture of the noodles has surpassed expectations and is deemed not just highly acceptable but at an even higher level of satisfaction.

In addition, vegetable noodles are likely made to perfection, meeting or even exceeding the desired balance of firmness. This positive description indicates the superior quality of the noodle preparation, contributing significantly to the overall texture of the product. It suggests that the texture is a standout feature, making the noodles a particularly enjoyable and memorable component of the culinary experience.

Conversely, T3 – 300 g powdered vegetables + basic ingredients obtained the lowest mean of 3.67 described as Highly Acceptable. This means the 300 g of powdered vegetables + basic ingredients provide an ideal texture of the vegetable noodles. It further suggests that the noodles have a desirable state, meeting the preferences of those who will be consuming the dish. Moreover, the texture is likely pleasing, with the noodles having a good balance of firmness.

The analysis of variance shows that treatments are significantly different in terms of texture as supported by the computed F-value of 2.883 with a -value of 0.03. The computed F-value of 2.883 with a corresponding p-value of 0.003 suggests a statistically significant difference between and among treatments in the analyzed dataset.

This finding indicates that at least one of the treatments has a measurable effect on the outcome variable under consideration. With a p-value below the conventional significance threshold of 0.05, there is strong evidence to reject the null hypothesis, which states that there are no differences between treatments.

Instead, the alternative hypothesis, asserting that there are differences between treatments, is supported by the data.

This statistical significance underscores the importance of considering treatment effects when analyzing the observed outcomes, as the variations in treatments contribute meaningfully to the observed differences.

The post hoc analysis shows that T1 – 100 g powdered vegetables + basic ingredients and T2 – 200 g powdered vegetables + basic ingredients are not significantly different to the T0 – control treatment. This means that the differences between T0, T1 and T2 are not substantial enough to be considered statistically significant. Essentially, the textures of the items under examination are similar enough.

However, T1, the best treatment in the experimental treatment in terms of texture is significantly different to T3 – 300 g powdered vegetables + basic ingredient. This implies that the texture of T1 and T3 significantly vary. There is a substantial or statistically meaningful contrast in the texture of these two treatments. This indicates that the texture of the vegetable noodles with 100 g of powdered vegetables has better and measurable tactile characteristics than 300 g of vegetable powder.

Table 3 presents the level of acceptability of the vegetable noodles in terms of appearance.

Table 3. Level of Acceptability of Vegetable Noodles in terms of Appearance

TREATMENTS	MEAN	DESCRIPTIVE RATING
T0- Basic Noodles	3.53[b]	Highly Acceptable
T1-100 g powdered vegetables + basic ingredients	4.30[a]	Very Highly Acceptable
T2-200 g powdered vegetables + basic ingredients	3.63[b]	Highly Acceptable
T3-300 g powdered vegetables + basic ingredients	3.37[b]	Acceptable
F-test	5.627**	

T1 obtained the highest mean score of 4.30 described as very highly acceptable. The vegetable noodles have a vibrant color, and appetizing presentation, and are evenly textured. It has exceeded the expectations of the consumers and is considered not just highly acceptable but at an even higher level of satisfaction in terms of their appearance.

Conversely, T3 obtained the lowest computed mean score of 3.37 described as Acceptable. It suggests that the visual presentation of the dish meets a satisfactory standard but does not go beyond. This might mean that while the vegetable noodles with 300 g of powdered vegetables are acceptable in terms of appearance, they may not be particularly impressive or visually striking.

It can be noted from the result that there is a significant difference between and among the treatments as supported by the computed F-value of 5.627 with p-value of 0.001. The computed F-value of 5.627 with a corresponding p-value of 0.000 indicates a statistically significant difference between and among treatments concerning appearance in the analyzed dataset. This finding suggests that at least one of the treatments has a discernible impact on the appearance of the selected vegetable noodles. With a p-value substantially lower than the conventional significance threshold of 0.05, there is sufficient evidence to reject the null hypothesis, which posits no differences between treatments. Instead, the alternative hypothesis, suggesting the presence of differences, is strongly supported by the data. This statistical

significance emphasizes the importance of considering treatment effects when evaluating appearance-related attributes, as the variations in treatments significantly influence the observed differences.

Looking closer at the data, the post hoc analysis shows that T1 has significantly a better appearance when compared to the control treatments and the other experimental treatments considered in the study. The 100 g of powdered vegetables added to the basic ingredients have provided better and comparable characteristics in terms of appearance. It contributes a more pleasing and appealing look to the selected vegetable noodles.

Conversely, T0, T2, and T3 are not significantly different in appearance. Despite initial indications of differences among treatments, the subsequent post hoc analysis reveals that the variations specifically between T0, T2, and T3 are not statistically significant. The visual differences between the food samples are within a range and they are not indicative of a meaningful or purposeful divergence in appearance.

The result that T1 is significantly different from T0, T2, and T3 of the vegetable noodles in terms of appearance, as determined by post hoc analysis, holds substantial implications for understanding the effect of different treatments on the visual attributes of the noodles. The differences between T1 and the other treatment groups indicate that the amount of the vegetable powder represented by T1 has a discernible effect on the appearance of the vegetable noodles compared to the control (T0) and other treatment variations (T2 and T3).

Table 4 shows the level of acceptability of the vegetable noodles in terms on aroma.

Table 4. Level of Acceptability of Vegetable Noodles in terms of Aroma

TREATMENTS	MEAN	DESCRIPTIVE RATING
T0- Basic Noodles	3.53^{b}	Highly Acceptable
T1-100 g powdered vegetables + basic ingredients	4.23^{a}	Very Highly Acceptable
T2-200 g powdered vegetables + basic ingredients	3.80^{ab}	Highly Acceptable
T3-300 g powdered vegetables + basic ingredients	3.70^{ab}	Highly Acceptable
F-test	3.108*	

It can be noted from Table 4 that T1 obtained the highest computed mean score of 4.23 described as very highly acceptable in terms of aroma. This means that the scent or smell of the food is not only good or pleasing but has surpassed expectations to an exceptional degree. This suggests a strong, positive evaluation of the fragrance emitted by the food, indicating that it is considered highly enjoyable, enticing, or even exceptional.

Conversely, T0 – Control Treatment marked the lowest with a computed mean of 3.53. This suggests that the smell or fragrance of the food is considered satisfactory but does not go beyond a standard level. In other words, the aroma is deemed decent, but it may not be particularly remarkable or exceptional.

The analysis of variance further shows that a significant difference is observed between and among treatments as provided by the computed F-value of 3.108 with p-value of 0.029. There is strong evidence to suggest that there are meaningful variations in the fragrance or smell among the various treatments being compared. It indicates that the observed differences in aroma are unlikely to have occurred by chance alone.

Looking closer at the data, T1 is significantly different from the control treatment and other experimental treatments. The 100 g of selected vegetable powder provided a better aroma of the food. Conversely, T0, T2 and T3 do not show significant variation in the aroma. It suggests that, based on a statistical analysis, there is no strong evidence to indicate meaningful variations in the fragrance or smell among the three different samples or treatments being compared.

The level of acceptability of the vegetable noodles in terms of color is presented in Table 5.

Table 5. Level of Acceptability of Vegetable Noodles in terms of Color

TREATMENTS	MEAN	DESCRIPTIVE RATING
T0- Basic Noodles	3.60^{b}	Highly Acceptable
T1-100 g powdered vegetables + basic ingredients	4.37^{a}	Very Highly Acceptable
T2-200 g powdered vegetables + basic ingredients	3.73^{ab}	Highly Acceptable
T3-300 g powdered vegetables + basic ingredients	3.50^{b}	Highly Acceptable
F-test	5.104**	

It can be noted from Table 5 that T1- emerged the highest computed mean of 4.37 described as Very Highly Acceptable. indicating that this particular variation or manipulation resulted in noodles that were most visually appealing to the participants. The higher mean suggests that Treatment 1 likely incorporated ingredients that enhanced the color attributes of the noodles, making them more vibrant and attractive. This finding underscores the importance of carefully selecting ingredients and techniques to optimize the visual appeal of food products, as color plays a significant role in consumer perception and overall acceptability.

Conversely, T3 yielded the lowest mean score in terms of color acceptability. This suggests that the variation applied in T3 resulted in noodles that were less visually appealing compared to other treatments. It is possible that certain ingredients or preparation methods used in T3 did not complement each other well, leading to a less desirable color outcome. Understanding which factors contributed to the lower acceptability of color in T3 can provide valuable insights for refining the recipe or process to improve visual appeal and overall consumer satisfaction.

Overall, the contrasting outcomes between treatment 1 and treatment 3 highlight the significant impact of recipe variations and preparation methods on the color acceptability of selected vegetable noodles. By identifying the specific ingredients and techniques that led to the highest and lowest mean scores, this can better understand the factors influencing color perception in food and inform strategies for enhancing the visual appeal of similar dishes. This study underscores the importance of sensory evaluation in food research and provides valuable insights for product development and optimization in the culinary industry.

The result on the overall acceptability of the vegetable noodles is presented in Table 6.

Table 6. Overall Acceptability of Vegetable Noodles

TREATMENTS	MEAN	DESCRIPTIVE RATING
T0- Basic Noodles	3.65[b]	Highly Acceptable
T1-100 g powdered vegetables + basic ingredients	4.35[a]	Very Highly Acceptable
T2-200 g powdered vegetables + basic ingredients	3.73[b]	Highly Acceptable
T3-300 g powdered vegetables + basic ingredients	3.55[b]	Highly Acceptable
F-test	7.673**	

The evaluation of the overall acceptability of selected vegetable noodles shows that treatment 1 obtained the highest mean score of 4.35 described as Very Highly Acceptable, indicating that the ingredient combination resulted in the noodles being most favored and satisfactory to the participants across various sensory dimensions. The higher mean suggests that treatment 1 likely incorporated ingredients that synergistically enhanced the flavor, texture, aroma, and color of the noodles, resulting in a more enjoyable overall eating experience. This finding underscores the importance of a holistic approach to recipe development and culinary preparation, where each component contributes harmoniously to the overall acceptability of the dish.

Conversely, T3 yielded the lowest mean score in terms of overall acceptability, suggesting that T3 resulted in noodles that were less preferred and satisfactory compared to other treatments. It is conceivable that certain ingredients used in T3 failed to complement each other or resulted in undesirable sensory attributes, leading to a diminished overall acceptability of the dish. Understanding the specific factors contributing to the lower overall acceptability of T3 is crucial for identifying areas for improvement and refinement in the recipe formulation and culinary techniques.

The contrasting result in the sensory acceptability between Treatment 1 and Treatment 3 highlight the significant impact of recipe variations and culinary practices on the overall acceptability of vegetable noodles. By discerning the specific ingredients and methods that led to the highest and lowest mean scores, researchers can gain valuable insights into the complex interplay of sensory factors that influence overall acceptability perception in food. This knowledge can inform strategies for optimizing recipe formulation and culinary processes to create vegetable noodles that are not only visually appealing but also palatable and satisfying to consumers.

Overall, this study underscores the multifaceted nature of overall acceptability in food evaluation and product development. By systematically assessing the overall acceptability of vegetable noodles across different treatments, researchers can pinpoint strengths and weaknesses in recipe formulations and culinary techniques, guiding efforts to enhance the sensory attributes and consumer appeal of the dish. The findings provide valuable insights for chefs, food manufacturers, and culinary professionals seeking to create dishes that excel in both sensory enjoyment and overall acceptability in the marketplace.

The analysis of variance shows that T1 is significantly different from the control treatment, T2 and T3. This is supported by the computed F of 7.673. This finding suggest that this particular variation has a

notable impact on the acceptability of the noodles. This finding indicates that certain ingredients used in T1 result in a sensory profile that sets it apart from the other treatments.

Moreover, the significant difference observed in acceptability between T1 and the other treatments underscores the need for targeted marketing and product positioning strategies. If T1 emerges as the most preferred option among consumers, highlighting its unique attributes in marketing materials and product descriptions can help drive sales and enhance brand perception. By leveraging insights from the ANOVA results, food businesses can develop effective marketing campaigns that emphasize the distinctiveness and appeal of T1, thereby maximizing its market potential and consumer appeal.

On the other hand, there is no significant difference between the control treatment, T2 and T3. The absence of a significant difference in the overall acceptability among the control treatment, T2, and T3 in the analysis highlights an interesting aspect of the study. This finding suggests that despite variations in ingredients among these treatments, participants did not perceive a notable disparity in terms of overall acceptability. It implies that the sensory attributes and eating experiences offered by these treatments were relatively similar, leading to comparable levels of satisfaction among participants. Such results could indicate that certain core aspects of the vegetable noodles, which are consistent across these treatments, contribute predominantly to their overall acceptability.

This result on the similarity of the overall acceptability of the control treatment, T2 and T3 could be attributed to the formulation or preparation methods. It is plausible that while these treatments may have incorporated slight variations from the control, these differences were not significant enough to alter the sensory profile of the noodles significantly. As a result, participants perceived all three treatments as equally acceptable, suggesting that minor deviations from the control did not substantially impact consumer preferences.

Additionally, the absence of significant differences in overall acceptability among these treatments may indicate the robustness or versatility of the vegetable noodle recipe. It is possible that the fundamental characteristics that define vegetable noodles, such as their flavor profile, texture, and visual appeal, remain consistent across different variations. As a result, participants did not discern a significant discrepancy in overall acceptability between the control treatment and the experimental treatments, suggesting that the core attributes of vegetable noodles are resilient to minor modifications and variations in preparation methods.

In conclusion, the lack of significant difference in overall acceptability among the control treatment, T2, and T3 underscores the stability and consistency of the vegetable noodle recipe across different variations. While variations may exist in ingredients or cooking techniques, these treatments ultimately offer comparable levels of satisfaction to consumers. These findings provide valuable insights for food manufacturers and chefs, indicating that minor adjustments to the recipe may not significantly impact consumer preferences and allowing for flexibility in product development and innovation.

Table 7. Proximate analysis of the Formulation of Vegetable Noodles Per 100 g.

Analysis Name	Result	Methodology
Ash	1.40 g	AOAC Official Method 923.03
Moisture Content	11.41g	AOAC Official Method 923.03
Crude Protein	24.60 g	AOAC Official Method 923.03
Crude Fat	24.60 g	AOAC Official Method 923.03
Carbohydrates	51.59 g	AOAC Official Method 923.03

It can be noted from the table the existence of significant nutrient in the vegetable noodles. Using, AOAC Official Method 923.03, the following results emerged.

Ash. The ash content of vegetable noodles is 1.40 g per 100 g. It provides insight into the mineral composition of the product. Ash content in noodles typically represents the inorganic mineral content left behind after complete combustion, which includes elements like calcium, potassium, magnesium, and phosphorus. Comparing this ash content with the standard ash content of noodles allows for an assessment of the nutritional density and quality of the vegetable noodles.

In the context of vegetable noodles, an ash content of 1.40 g per 100 g suggests a relatively high mineral density compared to standard noodles. This indicates that the vegetable noodles may contain a significant amount of mineral-rich ingredients such as vegetables, legumes, or whole grains, contributing to their overall nutritional value. The higher ash content reflects the presence of essential minerals that play vital roles in various bodily functions, including bone health, muscle function, and nerve transmission.

According to Sarmiento (2019), the standard ash content of noodles can vary depending on factors such as the type of flour used, processing methods, and additional ingredients. However, it generally falls within a certain range, serving as a benchmark for evaluating the nutritional value of noodle products. By comparing the ash content of pinakbet noodles (1.40 g per 100 g) with this standard, the result can be used to determine whether the noodles contain higher or lower levels of minerals.

Moisture Content. The analysis shows that the 11.41 g of the 100 g of the vegetable noodles is water. This finding suggests that approximately 11.14% of the weight of the Vegetable noodles consists water. This moisture content falls within an acceptable range for noodles, indicating that the product likely has the right balance of moisture to maintain its desired texture and quality.

The moisture content is a critical parameter in food products, as it affects their texture, shelf life, and overall quality. In noodles, an appropriate moisture content helps maintain the desired texture and prevents them from becoming too dry or too soggy. If the moisture content is too high, it could lead to issues such as microbial growth and spoilage. Conversely, if it is too low, the noodles might be dry and unpalatable.

In addition, vegetable noodles are a Filipino dish that typically consists of mixed vegetables, meat, and noodles cooked in a flavorful broth. The moisture content of the noodles can influence the overall eating experience, ensuring they complement the other ingredients and contribute to the authenticity of the dish.

Crude Content. A crude protein content of 24.6 g per 100 g indicates that approximately 24.6% of the weight of Vegetable noodles consists of proteins. Proteins are essential macronutrients necessary for various bodily functions, including tissue repair, enzyme production, and immune system support. In the context of a meal, this protein content contributes significantly to meeting daily protein requirements.

Vegetable noodles, with a relatively high protein content, can be a valuable source of protein in a diet, especially for individuals looking to increase their protein intake or those following vegetarian or plant-based diets. Protein is crucial for muscle maintenance and growth, making it particularly important for active individuals, and those engaged in physical exercise.

Crude Fat. A crude fat content of 24.6 g per 100 g indicates that approximately 24.6% of the weight of Vegetable noodles consists of fats. While fats are an essential macronutrient required for energy production and absorption of fat-soluble vitamins, a high fat content in a food product like noodles might be unexpected, as noodles are typically not perceived as high-fat foods.

Fats are the most calorie-dense macronutrient, containing more than twice as many calories per gram compared to protein and carbohydrates. Therefore, a high fat content in vegetable noodles contributes

significantly to their overall calorie density. This might be a consideration for individuals watching their calorie intake or those concerned about weight management (Sarmiento, 2019).

In traditional Filipino cuisine, the use of fats, such as cooking oils or fatty ingredients, is common for flavor enhancement and cooking techniques. Therefore, the crude fat content of Vegetable noodles might reflect the traditional cooking methods associated with the dish, which prioritize flavor and richness (Sarmiento, 2019).

Carbohydrates. Carbohydrates serve as the primary source of energy for the body. With a carbohydrate content of 54.59 g per 100 g, Vegetable noodles provide a significant amount of carbohydrates, which can contribute to meeting daily energy needs. While the total carbohydrate content includes sugars, starches, and fiber, it is essential to consider the fiber content separately.

According to Agyie et al. (2018), dietary fiber found in plant-based foods like noodles plays a crucial role in digestion, promoting satiety, and supporting gut health.

Carbohydrates are an essential part of a balanced diet, providing energy for daily activities and supporting overall health. Including Vegetable noodles, with their carbohydrate content, as part of a balanced meal can contribute to meeting nutritional needs (Liu et al., 2019). While carbohydrates are necessary for energy, consuming them in excess can contribute to weight gain and other health issues. Monitoring portion sizes and balancing carbohydrate intake with other macronutrients, such as protein and fats, is important for maintaining a healthy diet (Smith et al., 2018).

Overall, it can be deduced that Vegetable noodles can be part of a balanced diet when prepared with wholesome ingredients and in moderation. They offer a combination of macronutrients and micronutrients that contribute to overall nutrition and can be enjoyed as part of a diverse and varied meal plan.

The shelf-life analysis on the Vegetable Noodles in a 30-day observation is presented in Table 8.

Table 8. Shelf Life of Formulation of Vegetable Noodles.

Date of Observation	***Aerobic Plate Count (Cfu/g) 10^4***	***Detection of Pathogens***			
		Escherichia coli	***Salmonella sp.***	***Staphylo-coccus***	***Molds***
Day 0	11.0	Negative	negative	Negative	negative
Day 3	10.0	Negative	negative	Negative	negative
Day 6	16.0	Negative	negative	Negative	negative
Day 9	12.0	Negative	negative	Negative	negative
Day 12	13.0	Negative	negative	Negative	negative
Day 15	15.0	Negative	negative	Negative	negative
Day 16	19.0	Negative	negative	Negative	negative
Day 18	16.0	Negative	negative	Negative	negative
Day 21	20.0	Negative	negative	Negative	negative
Day 24	21.0	Negative	negative	Negative	positive
Day 27	22.0	Negative	negative	Negative	positive
Day 30	22.0	Negative	negative	Negative	positive

It is noted that there is an increase in the aerobic plate count of the Vegetable noodles in the 30-day observation from 10 to 22. This suggests an elevated level of aerobic bacteria present in the vegetable noodles. Aerobic plate count is a measure of the total viable bacteria, including both harmful pathogens and spoilage organisms, that can grow in the presence of oxygen. The presence of these bacteria may indicate improper handling, storage, or processing of the noodles, leading to contamination.

Elevated aerobic plate counts in food products can pose significant food safety concerns. While not all aerobic bacteria are harmful, certain strains can cause foodborne illness if consumed in sufficient quantities. Therefore, an increase in the aerobic plate count in Vegetable noodles may raise concerns about the potential presence of pathogenic bacteria and the risk of foodborne illness.

In addition to food safety concerns, an increase in aerobic plate count can also lead to quality deterioration of the noodles. Spoilage bacteria present in the noodles can produce off-flavors, off-odors, and changes in texture, appearance, and color, rendering the product unpalatable and undesirable to consumers.

Furthermore, an increase in aerobic plate count indicates that the noodles may have exceeded their recommended shelf life or have been subjected to conditions that promote microbial growth. It suggests that the noodles may not be safe for consumption or may have undergone significant quality degradation, compromising their sensory attributes and nutritional value.

Thus, manufacturers and food processors must implement rigorous quality assurance measures, including regular microbiological testing, adherence to Good Manufacturing Practices (GMP), proper sanitation protocols, and effective temperature control throughout the supply chain. This ensures the food safety and quality of the selected vegetable noodles.

After one-month observation, it can be noted that the vegetable noodles are negative for *Escherichia coli*, *Salmonella sp., and Staphylococcus aureus*. However, the product was positive in molds after 23 days of observation.

The presence of mold growth on vegetable noodles indicates a potential food safety hazard. Mold can produce mycotoxins, which are harmful substances that can cause adverse health effects if consumed in sufficient quantities. Therefore, detecting mold growth during shelf analysis raises concerns about the safety of the noodles and the risk of foodborne illness.

In addition, the mold on vegetable noodles suggests that storage conditions may have been inadequate to prevent microbial growth. Factors such as high humidity, improper temperature control, poor packaging, and extended storage periods can create favorable conditions for mold proliferation. Identifying and addressing deficiencies in storage practices is essential for preventing mold contamination and ensuring product integrity.

Table 9. Cost and Return Analysis of the Formulation of Vegetable Noodles

Particulars	TREATMENTS			
	T0	T1	T2	T3
Yield Per Mixture	2	3	4	5
Price Per Pack	15.00	25.00	25.00	25.00
Gross Sales	3.00	75.00	100.00	125.00
Expenses	20.00	53.00	87.00	120.00
Net Income	10.00	21.68	13.00	5.00
ROI (%)	50.00%	41.00%	15.00%	4.00%

It can be noted from the table that the best treatment has a ROI of 17.81%. The ROI of 17.81% indicates that for every unit of currency invested in producing Vegetable noodles, the return is approximately 17.81%. For every one-peso investment, it will generate an income of 0.18 centavos. To calculate ROI accurately, it is essential to consider the initial investment, which includes startup costs, equipment purchases, raw materials, labor, and other expenses incurred to launch and operate the business.

Among the array of treatments available, T3 has garnered attention for its exceptional ROI of 43.46%. This remarkable figure suggests that for every unit of currency invested in T3, the return is 43.46%, highlighting its cost-effectiveness and potential to generate substantial benefits.

Comparing the ROI of producing Vegetable noodles with industry benchmarks and competitors' performance provides valuable insights into the business's financial performance and competitiveness. Analyzing ROI trends over time helps identify areas of improvement and opportunities for growth.

CONCLUSION

Based on the salient findings of the study, the following conclusions are drawn.

1. The absence of pathogens in the microbial load analysis of vegetable noodles signifies a commendable standard of food safety and quality assurance.
2. The vegetable noodles meet consumer’s expectations, making them a favorable choice in the market.
3. The inclusion of 100 g of vegetable powder in the preparation of vegetable noodles has resulted in a remarkably high level of acceptability and improved sensory appeal among consumers.
4. Vegetable noodles generally offer a rich combination of nutrients and flavorful components that contribute to overall nutrition.
5. The shelf-life analysis of vegetable noodles indicates that proper storage and handling practices are crucial for maintaining quality and safety over time.
6. Vegetable noodles demonstrate promising returns on investment relative to the initial investment.

RECOMMENDATIONS

The following recommendations are forwarded based on the conclusion drawn from the study.

1. Stringent hygiene practices among makers of vegetable noodles involved in the production process to ensure that the vegetable noodles meet quality standards and are free from contaminants.
2. Product makers shall maintain a very high acceptability of vegetable noodles through ingredient sourcing; create innovative recipes and culinary experiences; and maximize the utilization of Pinakbet vegetables in product development.
3. Future researchers may continuously explore innovative ways to enrich food products using selected vegetables with the right ingredients while maintaining superior sensory attributes to meet consumer demand and foster brand loyalty.
4. Vegetable noodles shall be incorporated to the diet to provide individuals with essential nutrients necessary for maintaining optimal health and portion sizes and preparation methods shall be considered to ensure that the noodles complement a healthy lifestyle.
5. Vegetable noodle makers shall observe proper storage and handling practices may extend and maintain the shelf life, and sensory acceptability and optimize nutrition content over time.
6. Maintaining a focus on vegetable noodles’ quality, customer satisfaction, and brand reputation is essential for sustaining long-term profitability and competitiveness of the product in the market.

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