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Original Research Report

Determination of Shelf Life of Instant Melon (Citrulluscolocynthis) Soup Powder for Working-Class Mothers in Lagos, Nigeria

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Abstract: The study developed and determined instant melon (*Citrulluscolocynthis*) soup powder's shelf life for working-class mothers in Lagos, Nigeria. The study adopted research and development design. The population for the study was 2,077. The sample size for the study was 341. This consisted of three groups made up of 25 lecturers, 192 mothers working in banks and 124 mothers working. Seven sets of instruments were used for data collection. Data was analyzed using mean and standard deviation for the research questions. Findings of the study indicated that the shelf life determinants included free fatty acid (FFA), moisture content and total viable count measured over a period of 22 weeks. From the analysis, FFA content slightly appreciated over the weeks; from 0.60 at the start to 0.7 5 at 4weeks; 0.86 at 8weeks; 0.95 at 12 weeks; 1.70 at 16 weeks and 4.06 at 22 weeks. The analysis showed that the moisture content of the developed melon soup powder slightly decreased over the weeks; from 9.41 at the start to 9.30 at 4 weeks; 9.00 at 8 weeks; 8.82 at 12 weeks; 8.60 at 16 weeks and 8.30 at 22 weeks. The total viable count (TVC) of the developed melon soup powder increased over the weeks. At the start of the experiment, the TVC of the developed melon soup powder was 8; TVC increased to 10 at 4 weeks; 14 at 8 weeks; 15 at 12 weeks; 18 at 16 weeks and 29 at 22 weeks.

Keywords: Free Fatty Acid, Melon, Shelf Life, Soup Powder, Working-Class Mothers

1. Introduction

A working-class mother is someone who juggles motherhood and a demanding career, or a woman who works outside the home to supplement her income in addition to the work she does at home, such as raising children and catering for the family. Working-class mothers, according to Poduval and Poduval (2009), combine a successful career that provides financial independence with the effective task of raising a responsible and healthy family. This group of workers must care for not only their jobs, but also their families and dependent relatives. A working-class mother, particularly one who wants to balance home and work while also enjoying the stimulation that a job or career provides, must develop the ability to raise a healthy member or members of society while also gaining financial independence. In order to do so, she must be able to balance her career with the additional responsibility of raising a child, particularly in terms of meeting their nutritional needs (Poduval & Poduval, 2009).

Female bank employees are women who work in the banking industry. They work in an inherently stressful profession with long hours and stiff competition, and higher targets are frequently set to justify their pay. Food and beverage workers, on the other hand, work in the food and beverage industries, cafeterias, hotels, and restaurants, among other places, whereas lecturers teach in any institution of higher learning. Significant social and personal adjustments are required to balance their home and career, particularly in urban cities such as Lagos. A preliminary investigation conducted by the researchers among some working-class women in Lagos State revealed that the women face serious challenges, particularly in managing their home and careers. Some of the women complained that they leave their homes very early in the morning and return very late due to the congested road network and traffic in cities. Because they spend more time at work, this invariably affects how they feed their family.

Soup is a dish that is made by combining liquids like water or stock with other ingredients like meat, fish, vegetables, and thickening agents. According to Wu et al. (2012), soup is a liquid food that is usually served warm or hot (but can be cold or hot) and is made by combining various ingredients such as meat, vegetables, and stock or water. According to Chandramouli et al. (2012), hot soups are distinguished by boiling solid ingredients in liquids in a pot until the flavors are extracted, forming a broth, whereas cold soups are typically prepared with fruits, raw, blended vegetables, cream, and a liquid such as stock, juice, or water. Soup is divided into two types: clear soup and thick soup (thickened by starch from vegetables or puree or thickened by cream or roux).

In Nigeria, different cultures have different soups, and when preparing Nigerian soups, a variety of condiments and ingredients are used to modify the thickening consistency as well as to add flavor. According to Kayode et al. (2010), the ingredients used to thicken Nigerian soup include starchy roots/tubers, legumes, oil seeds, and nuts. Bitterleaf soup, gbegiri, afang, ewedu, edikaikong, ogbono, editan, melon, ofe-nsala (white soup), miyankubewaokro soup, miyankuka, and other soups are popular in Nigeria's various cultures and tribes. Olayemi and Rahman (2013) noted that Nigerian soup can be thickened with melon "egusi" (*Citrulluscolocynthis*), offor (*Detariummicrocarpum*), Bitter African mango ("ogbono"/*Irvingiawombolu*), achi (*Brachystegiaeurycoma*), cocoyam (*Colacasiaesculenta*), groundnut (*Arachishypogaea*) or with the vegetable used in cooking it such as okra, (*Abelmoschusesculentus*), okazi (*Gnetumafricanum*), achara (*Pennisetum purpureum*), bitter leaf (*Vernoniaamygdalina*) soup amongst others. Nigerian soups are generally named after the main ingredients used in their preparation.

Melon soup is thickened with melon seeds (*Citrulluscolocynthis*). Melon, also known as egusi, is a Curcurbitaceae family annual plant with a fibrous and shallow root system that grows along the ground via extending stems or branches. Melon is the name given to the fat and protein-rich seeds of curcubbitaceous plants that, after being dried and ground, are used as a major ingredient in making soup in Nigeria and are prepared in various ways by most tribes (Akusu & Kiin-kabari, 2015). It is known as Miyan Gushi in Hausa, Ofeegwusi in Igbo, and Obeegusi in Yoruba, and is prized for its thickening properties. Cucumeropsismanni, citrulluslanatus, citrulluscolocynthis, and other varieties of melon seeds exist (Javadzadeh et al., 2013). Citrulluscolocynthis is a melon variety that is more commonly consumed and cherished than other varieties, particularly in Nigeria, and has also been in high demand among melon species due to its distinct flavor and aroma (Akusu & Emelike, 2018). There are three basic methods for cooking egusi: frying, boiling, and simmering. Stiff porridges such as semovita, wheat, pounded yam, fufu or fermented stiff porridge made from cassava, plantain, rice, and other various preparations are popular accompaniments for thick soups such as egusi. This soup typically has a short shelf life. According to Olayemi and Rahman (2013), soups can be stored in refrigerators, but the longer soups are stored in the refrigerator, the lower the nutritive value of the foods. Sarkar et al. (2019) reported that the freshness of soups can be preserved if packaged as instant (pre-cooked) foods. Instant foods are foods that provide consumers with convenience and help to reduce the time spent on preparation, cooking, and drudgery, with preparation taking no more than five or ten minutes. According to Marshal (2019), instant foods are powdered foods that can be dissolved in water or any other liquid and consumed with little or no cooking. Instant foods are ready as soon as the water required for preparation boils. They have grown in popularity and accessibility as a result of a lack of time, particularly in the Western world. Instant foods are created by completely processing food, including completely removing water from the product, so that it has a structure that allows it to take back water immediately (Marshal, 2019). The main advantage of instant foods is that they have a longer shelf life and are easy to ship from one part of the country to another. Ready-to-drink sauces, cereals, pudding, noodles, non-cooking jellies, and instant soups are examples of instant foods (Marshal, 2019).

To provide health benefits, functional ingredients such as dried cat fish, beef, ground seeds, pulses, legumes, cray fish, and stock fish, among others, can be easily incorporated into soup powders. The advantage of dehydrated foods, particularly dry soup powder, is that they protect against enzymatic and oxidative spoilage, are light in weight for shipping, and are available all year (Wadikar & Premavalli, 2013). Instant soup can also be made as a dry powder or a mix with some liquid that is prepared by heating its contents (Sarkar et al., 2019). Ingredients used in the development of instant soup are typically ground into fragments, allowing them to dissolve when water is added during the instant cooking or preparation process. By incorporating vegetables, crayfish, dried fish, and other seasonings into the soup powder, a nutritional balance will be achieved. For easy transportation, instant soup powder should also be properly packaged or sealed. Instant melon soup is a simple soup powder made from ground melon seeds. To alleviate the stress that working-class mothers face when preparing soup, the soup powder is reconstituted and ready in less than fifteen minutes. For working-class mothers, this study packaged instant melon soup. Packaging materials play an important role in food preservation throughout the distribution chain. Food processing can be jeopardized without packaging because food can become contaminated through direct contact with physical, chemical, and biological contaminants. Novel food packaging can increase food shelf life, safety, and quality. Certain materials are better suited to certain food

products than others (Marsh & Bugusu, 2007). The key to successful packaging is to choose the package material and design that best meet competing needs for product characteristics, marketing considerations, environmental and waste management issues, cost, distribution, and consumer needs. Consumer needs drive a person to seek and pay for products or services that meet their needs, whereas consumers are people who buy goods and services for their own use, in this case working-class mothers. Because most family members prefer easy-to-prepare meals such as noodles, pasta, and cereals. The feeding practices and food choices of a working-class mother, as well as what the family members consume, are heavily influenced by time constraints. Working-class mothers are challenged to come up with new ways to prepare soups that are nutritious for all members of their family. As a result, this study created an instant melon soup powder that working-class mothers can use to make soup quickly.

Development is the modification of an existing product, its presentation, or the formulation of an entirely new product to meet the needs of newly defined customers. According to Rizvi, Kapoor and Misra (2021), development is the process of creating something new or more advanced. According to the rising modern lifestyle in Nigeria, people, particularly those living in urban areas such as Lagos, seek fast methods of cooking food, particularly instant food products such as food that is ready to cook and eat in a short period of time. Rich instant food or meal to satisfy current consumer needs is one of the potential products that can be developed to fulfill consumer social requirements and create consumer satisfaction (Rouse, 2020). The process of providing instant soup powders is referred to as development in the context of this study. Dehulling, sorting, drying, milling, extraction, measuring, and packing of instant melon (*Citrulluscolocynthis*) soup powder for working-class mothers were all part of the process. A standard product development procedure was adapted for the study.

This study determined the shelf life of packaged instant melon soup, and it was also based on Fuller (2011)'s research and development of new food products. This study aimed to reduce the stress associated with soup preparation by providing instant melon soup powder, which contains nearly all of the ingredients except beef, oil, pepper, onions, salt, and water. Working-class mothers will appreciate instant soup powder, which can be reconstituted and ready for consumption in less than fifteen minutes. As a result, melon soup powder will aid in reducing the cooking stress experienced by working-class mothers. Despite several studies on melon, information on shelf life is scarce because researchers have not paid much attention to it until this study. This study developed and evaluated an instant melon (*Citrulluscolocynthis*) soup powder for working-class mothers in Lagos, Nigeria.

1.1. Statement of Problem

Hectic nature and indeed busy work schedule in an urban area like Lagos which has also contributed to the increase in the number of working class mothers has immensely given rise to changes in food preparation and also in the habits of food consumption of working class mothers and their family members. Employee demographics in Nigeria have also changed dramatically since the millennium and then again due to globalization and migration. Though there are increasing number of women in the workplace and also in managerial roles, many of whom are still heavily burdened in terms of their family-related responsibilities and incessant power failure, storage problem, cost of alternative power supply for storage of soup and cost of fuel needed for regular reheating of soups going by the current economic situation in the country. This circumstance is particularly challenging

and discouraging for working-class mothers who need time to attend to their family-related roles and are also bent on achieving satisfaction and good functioning at work and home, with a minimum conflict. Challenges working-class mothers face are issues of having to balance their career and chores at home to make things work in their homes. The issue of how working class mothers can manage work-life balance especially as it relates to meeting the nutritional needs of family members in an increasingly global competitive environment is a big challenge for working class mothers. Family dynamics are also changing, with the increasing growth of processed foods and the need for provision of adequate diet and varieties for family members. Furthermore, less time is available for working class mothers to prepare food for their family members and all these changes in lifestyles has made most individuals engage in eating away from home and snacking leading to increased patronage of fast foods and convenience foods.

1.2. Purpose of the Study

The main purpose of this study was to determine the shelf life of instant Melon (*Citrulluscolocynthis*) soup powder for working-class mothers in Lagos, Nigeria. Specifically, the study:

(a) developed instant melon (*Citrulluscolocynthis*)soup powder.
(b) packaged the developed instant melon (*Citrulluscolocynthis*) soup powder based on the feedback from (bankers, food and beverage workers, Home Economics Lecturers and experts from National Agency for Food and Drug Admiration and Control and Standard Organization of Nigeria.
(c) determined the shelf life of the developed instant melon (*Citrulluscolocynthis*) soup powder.

1.3. Research Questions

The following research questions guided the study:

(a) What are the requirement needed for the development of instant melon (*Citrulluscolocynthis*) soup powder?
(b) What are the packaging materials required for the developed instant melon (*Citrulluscolocynthis)* (*Irvingiawombolu*) soup powder?
(c) What are the shelf life ((Free Fatty Acid, moisture content and total viable count) of the developed instantmelon (*Citrulluscolocynthis)*(*Irvingiawombolu*) soup powder?

2. Materials and Methods

1.1. Design for the Study

The study adopted a research and development (R & D) design.

2.1.1. Ethics Statement

In compliance with the research guidelines of American Psychology Association, the institution of the principal investigator approved this research. The researchers also sought for the permission of the participants and their consent were obtained orally.

2.2. Area of the Study

The study was carried out in Lagos State, Nigeria. The choice of Lagos state was because of it very busy and hectic nature which has contributed to changes in food preparation as well as food consumption pattern. Also, Lagos State has several working-class mothers in different establishment such as banks, food and beverage industries and higher institutions among others.

2.3. Population and Sample

The population for the study was two thousand and seventy-seven (2,077). This consisted of three groups of working-class mothers. (Source: Personnel office for the establishments). The sample size for the study was three hundred and forty-one (341). This consisted of three groups made up of 25 lecturers (3 from YABATECH, 12 from UNILAG and 10 from FCE (T) Akoka; 192 mothers working in banks (86 from Zenith Bank and 106 from First Bank) and 124 mothers working in Food and Beverage Industries (58 from Flour Mills PLC and 66 from Nestle Foods Nigeria, PLC,). No sampling was done for the 25 female lecturers and 124 mothers working in Food and Beverage Industries since the numbers (25 and 124) were a manageable size. 10% of the population of mothers working in bank was utilized (86 from Zenith Bank and 106 from First Bank). Gall, Borg and Gall (1996) suggested that for population from 2,000 up to 5,000, 10% of the population can be used as sample size. Simple random sampling technique was used to select 86 mothers working in Zenith bank from 36 branches as well as 106 mothers working in First Bank from 24 branches. In simple random sampling techniques everyone in the population is given equal chance of being selected (Uzoagulu, 2011).

2.4. Instrument for Data Collection and Study Procedure

Questionnaire on packaging materials for the developed instant Soup powder. The instruments were subjected to face validation by seven experts. Two from the Department of Home Economics and Hospitality Management Education, Faculty of Vocational and Technical Education, University of Nigeria, Nsukka and one each from Department of Science and Technology, University of Lagos; Curriculum and instructional Materials Centre, University of Nigeria Nsukka; National Agricultural and Extension Research Liaison Services Ibadan; National Horticultural Research Institute Ibadan; National Centre for Genetic Resources and Biotechnology, Ibadan.

Product development process is the systematic task to generate new products, either by introducing changes to an existing product or creating a completely new and original one (Rouse, 2020). Therefore, the process of processing melon instant soup powder included: 5kg of melon seeds which was dehulled and selected and after dehuling the measurement was 4kg of melon. The selected melon was cleaned, picked from impurities and dried. The dried melon seeds were milled, dried and moisture extracted, and afterwards it was packaged so as to keep it safe and protect it from moisture, moulds and also to sustain the shelf life. One kilogram of biter leaf was picked, washed and dried under room temperature to conserve the nutrient. 5kg medium sized dried cat fish and 3kg crayfish were ground, separately packed included amongst the ingredients for instant soup powder to provide protein. The instant soup powder contained 100g melon soup powder, 50g bitter leaf, 10g of ground cray fish and 25g ground dried cat fish. All the materials were purchased from Oyingbo market, Ebute-metta, Lagos.

2.5. Data Collection Technique

Data for the study was collected by the researchers with the aid of two research assistants. Out of the 341copies of the instruments distributed, 321 were returned indicating 94% return rate.

2.6. Data Analysis Technique

Data collected were analyzed using mean and standard deviation. For the decision rule, the real limit of numbers of the respondents made was used to categorize the mean ratings of the respondents. Mean ratings from 2.50 and above were considered as agreed upon while items with mean ratings of 2.49 and below were considered as disagreed upon. Frequency and percentage were used to analyze

data gathered from the focus group discussion. Mean and standard deviation were used for research questions while Analysis of Variance (ANOVA) were used for hypotheses. ANOVA was also used to test the difference in the mean ratings of working class mothers on the sensory evaluation .A null hypothesis was accepted when the probability value was greater than 0.05 ($p>0.05$) and rejected when the probability value was less than 0.05 ($p<0.05$). All data collected were analyzed using Statistical Package of Social Sciences (SPSS) version 25.The melon and ogbono soup products were coded as follows. Melon 50%, cray fish 10%, cat fish 15%, dried okro 25%

3. Results and Discussion

3.1 Research Question One: What are the requirement needed for the development of instant melon (Citrullus*colocynthis)* soup powder?

Table 1: Mean and Standard Deviation Responses on Requirement needed for the Development of Instant Melon Soup Powder

S/No	Requirements needed for developing Instant Melon and Ogbono Soup Powder	Mean	SD	Decision
1	Instant soup should be nutritious	4.00	0.00	Highly Required
2	Instant soup should be easy to prepare	3.86	0.43	Highly Required
3	Content of instant soup should be stated on the package	3.70	0.75	Highly Required
4	Package of instant soup should contain the preparation method	3.60	0.77	Highly Required
5	Instant soup should have a long shelf life	3.73	0.49	Highly Required
6	Nutritive value of instant soup should be intact	3.50	0.86	Highly Required
7	Instant soup should prepared under hygienic conditions	3.40	0.89	Moderately Required
8	Instant soup should be neatly packaged	3.36	0.77	Moderately Required
9	Instant soup should be convenient to use	3.62	0.94	Highly Required
10	Instant soup should not be deficient in nutritional quality	3.33	0.47	Moderately Required
11	There should be no additives in the instant soups	3.73	0.73	Highly Required
12	Preservatives should not be added to instant soup	3.60	0.89	Highly Required
13	Preservatives should be added to instant soup	1.93	1.11	Slightly Required
14	Colourants should not be added to instant soups	3.83	0.46	Highly Required
15	Colourants should be added to improve instant soup colour	1.26	0.44	Not Required
16	Instant soup should be easily stored at room temperature	3.67	0.71	Highly Required
17	Instant soup should only be stored in freezers	1.23	0.67	Not Required
18	Instant soup must be preserved in refrigerators	2.03	0.66	Slightly Required
19	Instant soup should not be contaminated	3.70	0.46	Highly Required
20	Microorganisms should not be found in instant	3.80	0.66	Highly Required

	soups			
21	Instant soup should not take time in preparation	3.67	0.92	Highly Required
22	Instant soup should be shrink resistant	2.97	1.15	Moderately Required
23	Instant soup should be safe consumption	3.80	0.66	Highly Required
24	Instant soup should undergo laboratory testing determine its nutritional content	3.80	0.41	Highly Required
25	Instant soup should not have awful smell	3.57	0.89	Highly Required
26	Flavour of instant soup can be enhanced with additives	1.53	0.68	Slightly Required
27	Instant soup should be convenient to use	3.53	0.75	Highly Required
28	Instant soup should not ferment after packaging	3.20	0.81	Moderately Required
29	Instant soup should not deteriorate with time	3.43	1.07	Moderately Required

Key: Number = 30 respondents, SD= Standard Deviation.

Table 1 contains the requirement needed for development of instant melon and ogbono soup powders. 29 items were used to elicit responses on 4-point scale of highly required, moderately required, least required and not required. Result from the table showed that majority of the highlighted items on requirements needed in the development of instant melon and ogbono soup powders were highly required while few were moderately and slightly required. Two of the highlighted items on requirements needed in the development of instant melon and ogbono soup powders were indicated as being not required.

From the table, the items highly required included that instant soup should: be nutritious, be easy to prepare, contain content of the instant soup on the package, contain preparation method on the package, have a long shelf life, have nutritive value intact, convenient to use, not contain preservatives, have no additives, be easily stored at room temperature, not contain colourants, not contaminated with microorganisms, not take time in preparation, be safe for consumption, undergo laboratory testing to determine the nutritional content, not have awful smell and be convenient to use. Results indicated that the items moderately required included that instant soup powders should: be prepared under hygienic conditions, be neatly packaged, not be deficient in nutritional quality, be shrink resistant, not ferment after packaging and not deteriorate with time. The items slightly required for the development of instant soup powders included that preservatives should be added to instant soup, instant soup must be preserved in refrigerators and flavour of instant soup can be enhanced with additives. On the other hand, the items not regarded as requirements for the development of instant soup powders included that colourants should be added to improve instant soup colour and instant soup should only be stored in freezers. Standard deviation responses ranged from 0.00 to 1.15 implying that the mean responses on requirements needed in the development of instant melon and ogbono soup powders were not far from each other.

3.2. Research Question 2: What are the packaging materials required for the developed instant melon (*Citrulluscolocynthis)* (*Irvingi*a*wombolu*) soup powder?

Table 2: Mean and Standard Deviation Responses on Types of Packaging Materials Needed for Instant Melon Soup Powder

S/No	Types of packaging materials needed for Instant Melon and Ogbono Soup Powder	Mean	SD	Decision
1	Tins	1.06	0.25	Disagreed
2	Cans	1.20	0.48	Disagreed
3	Bottles	3.76	0.67	Agreed
4	Plastic bags	3.80	0.40	Agreed
5	Retort bags	3.56	0.62	Agreed
6	Ziplock plastics bags	1.40	0.77	Disagreed
7	Transparent plastic packs	3.66	0.81	Agreed
8	Translucent plastic packs	1.30	0.83	Disagreed
9	Opaque plastic bags	1.36	0.71	Disagreed
10	Paper bags	1.97	0.67	Disagreed
11	Cardboard paper	1.46	0.93	Disagreed
12	Corrugated cardboard	1.40	0.89	Disagreed
13	Paper cushion	1.60	1.03	Disagreed
14	Paper surface protection	1.86	0.86	Disagreed
15	Paper mailing bags	1.73	1.14	Disagreed
16	Corrugated paper boxes	1.50	0.82	Disagreed
17	Paper boxes	1.96	0.92	Disagreed
18	Molded pulps	1.23	0.67	Disagreed
19	Foil wrappings	3.13	0.81	Agreed
20	Resin sachets	1.30	0.47	Disagreed
21	Porous bags	1.56	1.07	Disagreed
22	Glass cans	2.06	1.14	Disagreed
23	Glass bottles	1.63	0.99	Disagreed
24	Glass with lids	3.60	0.89	Agreed
25	Silicon bags	1.57	1.10	Disagreed
26	Silicon boxes	1.53	0.97	Disagreed
27	Zeolite films	1.46	0.93	Disagreed
28	Silver Zeolite films	1.57	0.86	Disagreed
29	Laminated Zeolite films	1.33	0.71	Disagreed
30	Drip absorbent sheets	1.10	0.30	Disagreed

Key: Number = 30 respondents, SD= Standard Deviation.

Table 2 contains the type of packaging material needed for development of instant melon and ogbono soup powder. 30 items were used to elicit responses on 4-point scale of strongly agreed, agreed, disagreed and strongly disagreed. Results from the table showed that majority of the highlighted items on types of packaging materials needed in the development of instant melon and ogbono soup powders were disagreed upon while few were agreed upon.

Six of the packaging materials agreed upon included: bottles, retort bags, plastic sachets, transparent plastic packs, foil wrappings and glass with lids. Results showed that the packaging materials disagreed upon included ziplock plastics bags, tins, cans, translucent plastic packs, paper bags, cardboard paper, corrugated cardboard, paper cushion, paper surface protection, paper mailing bags, corrugated paper boxes, paper boxes, molded pulps, resin sachets, porous bags, glass cans, glass bottles, silicon bags, silicon boxes, zeolite films, zilver Zeolite films, laminated Zeolite films and drip absorbent sheets. On the other hand, the standard deviation ranged from 0.25 to 1.14 indicating that the mean responses were close to each other.

3.3. Research Question 3: What are the shelf life (Free Fatty Acid (FFA), moisture content and total viable count) of the developed instantmelon (*Citrulluscolocynthis)* soup powder?

Table 3: Shelf life (Free Fatty Acid, Moisture Content and Total Viable Count for 22 weeks) of the Developed Melon Soup Powder

Weeks	Free Fatty Acid	Moisture Content	Total Viable Count
0	0.60	9.41	8
2	0.66	9.0	8
4	0.75	9.30	10
6	0.80	9.20	13
8	0.86	9.00	14
10	0.90	8.90	14
12	0.95	8.82	15
14	1.20	8.70	16
16	1.70	8.60	18
18	2.80	8.52	20
20	3.50	8.50	24
22	4.06	8.30	28

Key: Sample: Melon Soup Powder

Table 3 contains the shelf life analysis of the developed melon soup powder. The shelf life determinants included free fatty acid (FFA), moisture content and total viable count measured over a period of 22 weeks. From the analysis, FFA content slightly appreciated over the weeks; from 0.60 at the start to 0.7 5 at 4weeks; 0.86 at 8weeks; 0.95 at 12 weeks; 1.70 at 16 weeks and 4.06 at 22 weeks. The analysis showed that the moisture content of the developed melon soup powder slightly decreased over the weeks; from 9.41 at the start to 9.30 at 4 weeks; 9.00 at 8 weeks; 8.82 at 12 weeks; 8.60 at 16 weeks and 8.30 at 22 weeks. The total viable count (TVC) cfu/g of the developed melon soup powder increased over the weeks. At the start of the experiment, the TVC cfu/g of the developed melon soup powder was 8; TVC increased to 10 at 4 weeks; 14 at 8 weeks; 15 at 12 weeks; 18 at 16 weeks and 29 at 22 weeks.

Findings in Table1 revealed that the items highly required for the development of instant melon and ogbono soup powders included that instant soup should be nutritious, be easy to prepare, contain content of the instant soup on the package, contain preparation method on the package, have a long shelf life, have nutritive value intact, convenient to use, not contain preservatives, have no additives, be easily stored at room temperature, not contain colourants, not be contaminated with microorganisms, not take time in preparation, be safe consumption, undergo laboratory testing to

determine its nutritional content, not have awful smell and be convenient to use. In line with the findings, Farzana et al. (2017) noted that instant soup is one of the foods highly preferred by modern society due to urbanization and busy lifestyles, hence, it should be nutritious and have easy preparation properties. Also in line with the findings, Bamidele, Ojodokun and Fasogbon (2015) reported in their study that instant soup should be safe for consumption. Mitra and Sharma (2020) noted that instant food need to fulfil the adequacy of nutrients and energy requirement of the body since it is preferred to homemade soup because of ease in preparation.

Findings in Table 2 indicated that the six types of packaging material needed for development of instant melon and ogbono soup powder included: bottles, retort bags, plastic sachets, transparent plastic packs, foil wrappings and glass with lids. In line with the finding, Robertson (2013) noted that packaging materials included paper, glass, plastics, polyvinyl chloride (PVC0 and polyethylene terephthalate (PET).Table 3 contained the shelf life analysis of the developed melon soup powder. The shelf life determinants included free fatty acid (FFA), moisture content and total viable count measured over a period of 22 weeks. From the analysis, FFA content slightly appreciated over the weeks; from 0.60 at the start to 0.75 at 4weeks; 0.86 at 8weeks; 0.95 at 12 weeks; 1.70 at 16 weeks and 4.06 at 22 weeks. The analysis showed that the moisture content of the developed melon soup powder slightly decreased over the weeks; from 9.41 at the start to 9.30 at 4 weeks; 9.00 at 8 weeks; 8.82 at 12 weeks; 8.60 at 16 weeks and 8.30 at 22 weeks. The total viable count (TVC) cfu/g of the developed melon soup powder increased over the weeks. At the start of the experiment, the TVC cfu/g of the developed melon soup powder was 8; TVC increased to 10 at 4 weeks; 14 at 8 weeks; 15 at 12 weeks; 18 at 16 weeks and 29 at 22 weeks. In agreement with the findings, Nwakaudu et al. (2017) in their study on ascertaining the shelf-life of ground melon seed (Cococynthiscitrullus) reported similar increase in FFA values from 3.95% to 9.31%. Also in support of the finding, Nwakaudu et al. (2017) reported decreasing moisture content in the melon powder. Decrease in the oil content of the melon soup powder samples might be as a result of the biochemical changes of the oil content. The findings from this study have implications for female bank workers, food and beverage workers, students and lecturers of Home Economics lecturers, curriculum planners and food and beverage companies. This research has limitation in the following areas: data gathering, distribution of questionnaire, time constraint and financial challenges. Other studies can be carried out on the development of instant soups from some commonly available staple foods such as okra, ewedu, groundnut, *achi and okazi*. Similar study can also be carried out among non-working class mothers to determine acceptability of the developed instant melon and ogbono soup powders using a different state and geopolitical zone.

4. Conclusion

Based on the findings of the study, it is concluded that instant soups can be processed from melon and ogbono seeds. The study identified 18 items highly required for the development of instant melon and ogbono soup powders; 6 types of packaging materials and 4 packaging materials highly preferred for the development of instant melon and ogbono soup powders. The study also identified 13 desired features highly required in the development of instant melon and ogbono soup powders. Sensory evaluation attributes of the developed instant melon soup powder showed that the highest rated for taste was “tasty/relish” followed by “sweet”. For mouth feel, “creamy” was the highest. For aroma, “spicy” was rated highest and for colour, “bright’ was rated the highest. Sensory evaluation attributes of the instant ogbono soup powder showed that the highest rated sensory

attribute for taste was “tasty/relish” followed by “sweet”. For mouth feel, the respondents rated “slimy/sticky” as the highest, followed by “thick/syrupy”. For aroma, “spicy” was rated highest. For colour, the highest rated was “bright”. For general acceptability, the respondents indicated appreciable mean value for the developed instant melon and ogbono soup powders. Shelf life analysis of melon and ogbono soup powders indicated that there was a significant difference in the mean values of the shelf life (Free fatty acid, moisture content and total viable count for 22 weeks) of the melon and ogbono soup powders. Therefore they are still safe for consumption for a period of six months. Based on the findings of the study, it was recommended that Foods and Nutrition lecturers should acquire relevant skills required for entrepreneurship training Government and School management should provide relevant tools and equipment’s as well as equipped food and nutrition laboratories for effective practical training. Training and retraining of lecturers is very essential There should be frequent food exhibitions, food funfair as this will enable the students to display some of the items produced by them for others to see and this type of exercise could also to encourage the students and organizing seminars and workshops for lecturers on ways of improving on what the already know is also very important.

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Conflict of Interest

The authors declare no conflict of interest.

Authors’ Contributions

Kemi Ogbonna, Francisca N Onyeka and Blessing I Attah conceptualized the topic, wrote, edited and ensured that data were analyzed and discussion section were completed, they proposed the methodology, provided the software used for analysis and analyzed the data. All authors approved the final version for publication.

Data Availability Statement

The original contributions presented in the study are included in the article. Further inquiries can be directed to the corresponding author.

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