

Proximate Analysis, Vitamin and Mineral Composition of Instant Melon (*Citrullus colocynthis*) and Dikanut (*Irvingia wimbolu*) Soup Powders

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Abstract

The study determined the vitamin and mineral composition of instant melon (*Citrullu colocynthis*) and dikanut (*Irvingia wimbolu*) soup powders. The study adopted experimental research design. Data were analyzed using mean and standard deviation. Findings reveal among others, proximate compositions of (15.80%) moisture content for dikanut soup powder1(DSP1) and (9.41%) for melon soup powder1(MSP1); for ash content, DSP1 (7.71%) while MSP1 (7.41%); the crude fibre content of both samples had (2.10%)and (2.09%) for DSP1 and MSP1; fat composition of DSP1 had (39.99%) and MSP1 (14.20%); crude protein composition, MSP1 (42.28%) while DSP1 (4.64%); carbohydrate composition, DSP1 (29.76%), and MSP1 (24.61%). Vitamin compositions include: Vit A, MSP1 3.6 ug while DSP1 2.4 ug, Vit B₁, MSP1 4.2 mg while DSP1 3.0 mg; and others. Findings on mineral compositions indicate that Phosphorus for MSP1 986mg while DSP1 628mg; Iron content, MSP1 4.27 mg while DSP1 had 2.81 mg; for Manganese, MSP1 had 0.35mg while DSP1 had 0.25mg; for Magnesium, MSP1 had 11.84 mg while DSP1 had 12.49mg; for Potassium content, MSP had 1.85mg while DSP1 had 5.72 mg and for Selenium, MSP1 contained 0.37mg while DSP1 contained 0.33mg.

Keywords: Instant, Soup, Melon, Dikanut, Minerals, Vitamins, Proximate Analysis,

Introduction

Soup is a dish made by combining liquids such as water or stock with other ingredients such as meat, fish, vegetables and thickening agents. Wu, *et al* (2012) described soup as a liquid food usually served warm or hot (but may be hot or cold), made by combining various ingredients, such as meat, vegetables with stock or water. Chandramouli, *et al* (2012) noted that hot soups are additionally characterized by boiling solid ingredients in liquids in a pot until the flavors are extracted, forming a broth while cold soups are usually prepared

using fruits, raw, blended vegetables, cream and liquid such as stock, juice or water. Some soups are neither thin nor thick and sometimes certain soups are classified into a category called international soups. Essentially international soups are soups from different countries. These soups represent the region or origin of such soups. This is where Nigerian soups because they are garnished, thickened or other ingredients are added to the soup. Nigerian soup is a viscous liquid food that is cooked to be eaten with stiff porridge such as pounded yam,

semovita, maize or cereal, cassava, potatoe and rice porridge. Kayode, *et al* (2010).. Kayode, *et al* (2010) reported that the ingredients used to thicken Nigerian soup ranges from starchy roots/tubers, legumes, oil seeds and nuts. Olayemi, & Rahman (2013) reiterated that Nigerian soup is of two kinds; drinking and eating soup. Eating soups are soups such as melon and dikanut that are often chewed before swallowing while drinking soups are soups like pepper soups that are usually swallowed without chewing.

Nigerian soups have watery or thick consistencies depending on their composition. Ingredients used for thickening soups in Nigeria are usually based on the available staple foods in the cultural setting. Nigeria is multi-cultural society with different traditional soups which are indigenous to the different ethnic and cultural settings. There are different types of soups in the different culture and tribes in Nigeria and these include; *gbegiri*, *afang*, *ewedu*, *edikaikong*, *ogbono*, *editan*, melon, *ofe-nsala*, (white soup) among others. Olayemi & Rahman (2013) noted that Nigerian soup can be thickened with melon (*Citrullus colocynthis*), *offor* (*Detarium microcarpum*), Dikanut (*Irvingia wombolu*), (*Brachystegia eurycoma*), cocoyam (*Colacasia esculenta*) among others. Nigeria, melon soup is likely the most populous Nigerian soup going by its rate of acceptability, distinctive aroma and flavor

Melon (*Citrullus colocynthis*) soup on the other hand is thickened with melon seeds in Nigeria and it is prepared by most tribes in Nigeria in different ways (Akusu & Kiin-kabari, 2015). It is called *Miyan Gushi* in Hausa, *Ofe egwusi* in Igbo and *Obe egusi* in Yoruba language and is best cherished for its thickening ability (Ogbuonye, 2017). Another soup that is

generally accepted by majority of households in Nigeria is dikanut soup also known as (*Ogbono*). Dika tree is a plant that is either planted or grows freely in the tropical rain forests of Eastern, Western and some Southern part of Nigeria. It is a native forest tree belonging to the group of plants classified as Non-Timber Forest Products (NTP) (Don-Lawson, 2018).

There are different varieties of dikanuts but the highly and extensively utilized ones are *Irvingia wombolu*. The fruits of *Irvingia wombolu* are usually purchased for its kernels, which is used in its fresh or dried form to add flavour and consistency to soups (Amal, *et al* 2014). The thick edible draw soup made from the ground dikanut powder is known as "*apon*" in Yoruba or "*ogbono*" in Igbo. According to Kiin-Kabari & Akusu (2017) some people like dikanut soup plain while others would add vegetables to it. Dikanut soup is mostly highly cherished for its drawability. Importantly, adoption of proper storage method is required for preserving ground dikanut powder so as to promote its shelf life (Beatrice, *et al* 2017).

The shelf life of this instant melon (*citrullus colocynthis*) and dikanut (*irvingia wombolu*) soup powders is already determined by Ogbonna, *et al* (2023) in their study. They noted in their study that the shelf life determinants included free fatty acid (FFA), moisture content and total viable count measured over a period of 22 weeks. From their 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 also showed that the moisture content of the developed instant 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 instant melon soup powder increased over the weeks. At the start of the experiment, the TVC of the developed instant dikanut 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. Hence, the findings of Ogbonna, Onyeka, & Attah (2023) revealed that the developed instant melon and dikanut soup powders can comfortably last for six months and still remain safe for human consumption. Having determined the shelf life of the instant soups, it became imperative to also determine the proximate, vitamin and mineral composition of the instant melon and dikanut soup powders. This is the gap this which this study intends to fill.

Proximate analysis is used for estimation of the quantitative of food substances while mineral and vitamin analyses are used for estimation of the quantitative of minerals in food. Aunyachulee & Suksaard (2020). Determination of the major food nutrients in instant melon and dikanut soup powders are of great importance since that can help in the identification of nutritional content, chemical composition and qualities of the instant soup powders. Therefore, there is a great need for comprehensive documentation of the proximate, mineral and vitamin composition of these instant soup powders in order to scientifically validate their usage by homemakers and the general public. Hence, the need for this study that analyzed the proximate, vitamin and mineral composition of instant melon (*Citullus colocynthis*) and

dikanut (*irvingia wombolu*) soup powders that would be useful in commercial processing.

Objective of the Study

The major objective of this study was to investigate nutritional properties of instant melon (*Citullus colocynthis*) and dikanut (*Irvingia wombolu*) Soup Powders. Specifically, the study determined:

- (1) proximate (moisture, ash, lipid, protein, crude fibre, carbohydrate) composition of the instant melon (*Citrullus colocynthis*) and dikanut (*Irvingia wombolu*) soup powders
- (2) vitamin (A, B₁, B₂, B₃, B₆, B₁₂, and E) composition of the instant melon (*Citrullus colocynthis*) and dikanut (*Irvingia wombolu*) soup powders
- (3) mineral (calcium, iron, magganese, magnesium, potassium, selenium, phosphorus and zinc) compositions of the instant melon (*Citrullus colocynthis*) and dikanut (*Irvingia wombolu*) soup powders

Materials and Methods

Design of the study: The study adopted an experimental research design.

Procurement of Materials: melon seeds and dikanut seeds were procured from oggie market in Nsukka

Preparation of Materials (ingredients for instant melon and dikanut soup powders)

Melon seeds: 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 bitter 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 and included amongst the ingredients for instant soup powder to provide protein. The instant soup powder contained 100g melon soup powder, 50g dried bitter leaf, 10g of ground cray fish and 25g of ground dried cat fish. All the materials were purchased from Oyingbo market, Ebute-metta, Lagos.

Dikanut: 10kg of dikanut (*Irvingia wombolu*) seeds were cut, dehulled and selected. The selected dikanut were cleaned, picked from impurities and dried. The dried dikanut seeds were milled and moisture was extracted using oil extraction machine by cold press method before being taken to the laboratory for analysis and afterwards it was packaged in a retort bag and sealed so as to keep it safe from moisture and to sustain the shelf life. 1kg of okro was also purchased, washed, cut and dried with an air dryer under room temperature to conserve the nutrient. Dried 5kg of cat fishes and 3kg of crayfish were oven dried and ground separately. They were separately sealed and were added to the pack of the *instant* dikanut soup powder to provide protein. The ingredients were all purchased from Oyingbo market in Ebute-metta, Lagos. The instant soup powder pack contained 100g dikanut

soup powder, 50g okro, 10g ground cray fish and 25g ground dried cat fish.

Coding of the food products (Instant Soups): The melon and dikanut soup products were coded as follows:

1. Sample A MSP 1 = Melon 50%, cray fish 10%, cat fish 15%, dried okro 25% (5:1:3:25)
2. Sample B DSP1 = Dikanut 50%, cray fish 10%, cat fish 15%, dried bitter leaf 25% (5:1:3:25)

Chemical/Proximate Analysis: Proximate analysis for the instant melon and dikanut soup powders were carried out using Association of Official Analytical Chemist (2010) method. This method was used to determine the nutrient composition, including moisture, ash, lipid, protein, crude fibre, carbohydrate, calcium, iron, manganese, magnesium, potassium, selenium, phosphorus and zinc. While compositions of Vitamin A, B₁, B₂, B₃, B₆, B₁₂, and E composition was done Association of Official Analytical Chemist (2005) method.

Data Analysis: Data were analyzed using means, t-test were used to compare means between the pre and post treatment, mean, standard deviation standard error of the mean (SEM). P value (0.5) was an indicative of significance and Duncans Multiple Range Test (DMRT) and was used to compare and contrast means.

Findings

Results of Chemical Analysis

Table 1: Proximate Composition of Instant Melon and Dikanut Soup Powders

Sample	Moisture%	Ash%	Crude fibre%	Fats%	Protein%	Carbohydrate%
MPSI	9.41	7.41	2.09	14.20	42.28	24.61
DSP1	15.80	7.71	2.10	39.99	4.64	29.76

Key: MSP1: Melon Soup Powder, DSP1: Dikanut Soup Powder,

Table 1 contains the proximate compositions of the soup powders. The results indicated that the DSP1 with 15.80% had more moisture content than

MSP1 which had 9.41%; for ash content, DSP1 had 7.71% while MSP1 had 7.41%; the crude fibre content of both samples are almost the same with DSP1 having 2.10%

and MSP1 with 2.09%; Fat composition, DSP1 had high content of 39.99% and MSP1 had 14.20%; for crude protein composition, MSP1 had high content of

42.28% while DSP1 had 4.64%. Carbohydrate composition, DSP1 contain 29.76% while MSP1 had 24.61%.

Table 2: Vitamin Compositions of Instant Melon (*Citullus colocynthis*) and Dikanut (*Irvingia wombolu*) Soup Powders

Sample	Vit A (ug)	Vit B ₁ (mg)	Vit B ₂ (mg)	Vit B ₃ (mg)	Vit B ₆ (mg)	Vit B ₁₂ (mg)	Vit E (mg)
MSP1	3.6	4.2	11.8	0.22	0.18	0.26	0.70
SP1		2.4	3.0	9.2	0.16	0.12	0.20

Key: MSP1: Melon Soup Powder, DSP1: Dikanut Soup Powder,

Table 2 contains the vitamin compositions of the developed soup powders. The results indicated that the vitamin compositions of the soup powders had Vit A:-3.6 ug for MSP1 and 2.4 ug for DSP1; Vit B₁:- MSP1 contain 4.2 mg while DSP1 contain 3.0 mg; Vit B₂:- MSP1 contain 11.8 mg while DSP1 contain 9.2 mg; Vit B₃:-

MSP1 contain 0.22 mg while DSP1 contain 0.16 mg; Vit B₆:- MSP1 contain 0.18 mg while DSP1 contain 0.12 mg; Vit B₁₂:- MSP1 contain 0.26 mg while DSP1 contain 0.20 mg; Vit E composition:- MSP1 contain 0.70 mg while DSP1 contain 0.60 mg.

Table 3: Mineral Compositions of Instant Melon (*Citullus colocynthis*) and Dikanut (*Irvingia wombolu*) Soup Powders

Sample	Phosphorus (mg)	Iron (mg)	Manganese (mg)	Magnesium (mg)	Potassium (mg)	Selenium (mg)
MPSI	986	4.27	0.35	11.84	1.85	0.37
DSP1	628	2.81	0.25	12.49	5.72	0.33

Key: MSP1: Melon Soup Powder, DSP1: Dikanut Soup Powder,

Table 3 contains the mineral compositions of the developed soup powders. The results indicated that the mineral compositions of the soup powders had Phosphorus:- 986 mg for MSP1 and 628 mg for DSP1; Iron content:- MSP1 had 4.27 mg while DSP1 had 2.81 mg. Manganese:- MSP1 had 0.35 mg while DSP1 had 0.25 mg; Magnesium:- MSP1 had 11.84 mg while DSP1 had 12.49 mg, Potassium content:- MSP had 1.85 mg while DSP1 had 5.72 mg. The Selenium composition of the soup powders, MSP1 contain 0.37 mg while DSP1 contain 0.33 mg.

Discussion of Findings

Table 1 shows the proximate compositions of the instant soup powders. The results indicated that the DSP1 with (15.80%) had more moisture content than MSP1 which had (9.41%) for ash content, DSP1 had (7.71%) while MSP1 had (7.41%); the crude fibre content of both samples are almost the same with DSP1 having (2.10 %) and MSP1 with (2.09 %); For fat composition, DSP1 had high content of (39.99 %) and MSP1 had (14.20 %); for crude protein composition, MSP1 had high content of (42.28%) while DSP1 had (4.64 %). For carbohydrate composition, DSP1 contain

(29.76 %) while MSP1 had (24.61%). This supports the findings of Omah, Ajayi & Nwankwo (2015) who stated in a study on proximate analysis of varieties of egusi soup reported similar findings on proximate analysis of (10.89 %) moisture, (15.19 %) fat and (23.30 %) carbohydrate. However, Omah and Okafor (2015) reported lesser value of (19.73%) crude protein. The increase in protein content of the developed melon soup powder may be attributed to the addition of their ingredients.

Also, in support of the findings, Bamidele, Ojodokun & Fasogbon (2015) in a study on physio-chemical properties of different varieties of soup prepared from instant ogbono mix powders, reported similar value of sensory evaluation of moisture which ranged from value ranged from (9.60-14.36 %); crude fat values ranged from (20.13-%) 34.62 ash content ranged from (6.98 - 8.23 %). The crude fat content of ogbono may be because dikant seed has been classified as an oil seed (Idowu, *et al*, 2013). The developed dikanut soup sample recorded higher value of carbohydrate based on the carbohydrate content of the ingredients added.

Table 2 shows the vitamin compositions of the developed soup powders. The results indicated that the vitamin compositions of the soup powders had for Vit A, 3.6 ug for MSP1 and 2.4 ug for DSP1; for Vit B₁, MSP1 contain 4.2 mg while DSP1 contain 3.0 mg; for Vit B₂, MSP1 contain 11.8 mg while DSP1 contain 9.2 mg; for Vit B₃, MSP1 contain 0.22 mg while DSP1 contain 0.16 mg; for Vit B₆, MSP1 contain 0.18 mg while DSP1 contain 0.12 mg; for Vit B₁₂, MSP1 contain 0.26 mg while DSP1 contain 0.20 mg; for Vit E composition, MSP1 contain 0.70 mg while DSP1 contain 0.60 mg. This

supports the findings of Bamidele, Ojodokun & Fasogbon (2015) in a study on physio-chemical properties of different varieties of soup prepared from instant ogbono mix powders, reported similar values of Vitamin A content from 0.01 mg/100 g for control to 3.15 mg/100g for ogbono mix powder as well as Vitamin B₃ with value of 0.16 0.01 mg/100 g.

However, Bamidele, *et. al.* (2015) reported a higher Vit B₂ content which ranged from 12.25 to 30.25 mg/100g. The increase in Vitamin B₂ content of all the samples may be due to addition of fluted pumpkin (*Ugwu*) leaf which is believed to be rich in vitamins (Adumanya, Obi-Adumanya & Chukwu, 2012). This supports the finding, Prerna & Sharma (2020) in a study on development of Mung Dal (Mung beans) based instant soup mix fortified with moringa which reported similar value of 2.64 mg/100g for Vitamin B₁.

Table 3 shows the mineral compositions of the developed soup powders. The results indicated that the mineral compositions of the soup powders had for Phosphorus, 986 mg for MSP1 and 628 mg for DSP1; for Iron content, MSP had 4.27 mg while DSP1 had 2.81 mg; for Manganese, MSP1 had 0.35 mg while DSP1 had 0.25 mg; for Magnesium, MSP1 had 11.84 mg while DSP1 had 12.49 mg; for Potassium content, MSP had 1.85 mg while DSP1 had 5.72 mg. For the Selenium composition of the soup powders, MSP1 contain 0.37 mg while DSP1 contain 0.33 mg. In line with the findings of Olubi, *et al*, (2021) in a study on physio-chemical, mineral and sensory characteristics of instant egusi soup reported similar values for phosphorus which ranged from 822.2-905.3 mg/100g. This supports the findings of Kayode, *et al* (2010) that reported 3.0mg/100g for

magnesium which is similar to the report of the present study.

Conclusion

On the basis of the findings, it was concluded that proximate compositions of the instant melon and dikanut soup powders indicated that instant dikanut soup had more moisture content than instant melon soup powder with (15.80%) and (9.41%) respectively. Dikanut soup powder had (7.71%) ash while melon soup powder had (7.41%). The developed instant dikanut soup sample recorded higher value of carbohydrate based on the carbohydrate content of the ingredients added. The vitamin compositions of the developed instant soup powders indicated that instant melon soup powder had 3.6 µg of vit A, while dikanut soup powder had 2.4 µg. On the other hand, instant melon soup powder contained 4.2 mg for Vit B₁ and 4.2 mg for dikanut soup powder. The results also indicated that the mineral compositions of the instant melon soup powders had higher level of Phosphorus; 986 mg while instant dikanut soup powder had 628 mg; for Iron content, instant melon soup powder had 4.27 mg while dikanut soup had 2.81 mg;

Recommendation

Based on the findings of the study, the following recommendations were made:

1. Awareness should be carried out to encourage home makers, working class mothers, chefs and cooks in different communities, market places, churches and mosques on the availability and nutritional content of instant melon and dikanut soup powders.
2. Cooking demonstrations on how to prepare instant melon and dikanut soup powders should be carried out by home economist and nutritionist

during various conferences and workshops so as to sensitize the public.

3. Instant melon and dikanut soup powders should be popularized by packaging into different sizes so as to encourage wide patronage from many Nigerians.

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