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# A Comparative Study of Proximate Composition and Dpph Radical Scavenging Activity of Cucurbita Species from South-West, Nigeria

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# Abstract

Cucurbita species, widely cultivated and consumed globally, are underutilized in Nigeria despite their rich nutritional and health-promoting properties. This study investigated the proximate composition and antioxidant activity of various Cucurbita accessions collected from local markets in Ondo State, South-West Nigeria. The fruits were identified, processed, and analyzed for moisture, ash, protein, fat, fiber, and carbohydrate content following AOAC standard protocols. Antioxidant activity was assessed using the DPPH radical scavenging assay on methanolic extracts. Results showed considerable variation among the accessions. Protein content ranged from 9.21% to 14.79%, crude fiber from 22.19% to 32.02%, and carbohydrate content from 20.63% to 44.76%, with moisture content consistently below 10%, enhancing storage potential. The DPPH assay revealed strong antioxidant capacity across all samples, with CUC 15 and CUC 16 showing the highest scavenging activity (81.22% and 81.08%, respectively), while CUC 40 displayed the lowest (72.33%). These findings align with existing literature and confirm that methanol is an effective solvent for extracting antioxidant compounds in Cucurbita. The study underscores the potential of Cucurbita gourds as nutrient-rich, functional foods with substantial antioxidant properties. Promoting their consumption and industrial application could enhance food security, public health, and local economic development in Nigeria.


# INTRODUCTION

### 1.1 Introduction

In agricultural, botanical sciences, and nutritional studies, exploring various plant species and their compositions is pivotal to understanding their potential health benefits. Among these species, Cucurbita, commonly known as squashes and pumpkins, offers a rich field of study due to its diverse varieties and widespread cultivation. Cucurbitaceae (Cucurbit) is an important family comprising one of the most genetically diverse groups of food plants. The genus Cucurbita encompasses diverse species renowned for their nutritional value and functional properties, contributing significantly to global diets. Proximate composition, including moisture, ash, protein, fat, fiber, and carbohydrate content, plays a crucial role in understanding their nutritional value.

Furthermore, studies show that the incorporation of pumpkin flesh and seeds into probiotic yogurt can significantly enhance its nutritional value. Their edible pulp is consumed worldwide as puree, soup, and baked products. Recent studies highlight the health-promoting potential of pumpkin phytochemicals. The optimal blend of seed and flesh filtrate contributes to a remarkable probiotic profile, with high levels of bifidobacteria and beta-carotene, suggesting that these species are not just nutritionally dense but also versatile in their applications (Nasarani *et al.*, 2023). The presence of bioactive compounds, including phenolics and carotenoids, enhances the appeal of Cucurbits as functional foods, potentially offering antioxidant and anti-inflammatory benefits. Consequently, a comprehensive investigation into the proximate and anti-oxidant composition of Cucurbita species is warranted, as it elucidates their nutritional profiles and potential health-promoting properties.

Antioxidant components are micro-constituents that are present in the diet and can delay or stop lipid oxidation by inhibiting the initiation or propagation of oxidizing chain reactions, and are also involved in scavenging free radicals (Tyug et al., 2010). Cucurbits are rich sources of phytochemicals and also act as a rich source of antioxidants. Kulczyński et al. (2020) assert that antioxidants neutralize free radicals, mitigating oxidative stress linked to aging and chronic diseases. The DPPH (2,2-diphenyl-1-picrylhydrazyl) assay is a standard in vitro method to measure radical scavenging capacity. Recent studies highlight the antioxidant capacity of Cucurbita species, suggesting their potential to combat oxidative stress and related diseases.

Solvent choice and extraction method markedly influence reported antioxidant values. In general, more polar solvents (methanol, hydroalcoholic) extract phenolics more effectively than ethanol or water. For example, Yadav et al. (2024) showed that 80% methanol extracts of pumpkin pulp had higher DPPH activity than aqueous extracts. Other solvents such as acetone, ethanol, hexane, and dichloromethane, among others, have proved to be as effective as methanol in DPPH inhibition. For instance, (Ibisanmi and Aribisala 2022; Renuka and Praveena, 2023; Abdullah et al., 2024; Matseke et al., 2024) have used different solvents to affirm the antioxidant properties of the parts of various plants. By contrast, some studies found water extracts nearly as active: Ibisanmi and Aribisala (2023) reported that Nigerian *M. charantia* water extract (69.2% inhibition) slightly exceeded its ethanol extract (67.9%). Overall, methanol (and methanol–water) appears optimal for Cucurbitaceae polyphenols, likely due to better solvation of polar antioxidants (Yadav et al., 2024)

Despite the depth of nutritional and medicinal knowledge of the *Curcubits* in other parts of the world, their existence in Nigeria is threatened due to neglect. The populace is not aware of the high nutritional and nutraceutical values of *curcubita* (Blessing *et al.*, 2011). Pumpkin is cultivated at a subsistence level in Nigeria because of the lack of awareness of its nutritional (proximate) and nutraceutical (antioxidant) values. It is regarded as a traditional food mainly for low-income earners. This assertion has discouraged high-income earners and urban citizens from making the crop a part of their diet. *Curcubita* has not benefited from the same level of research attention given to other vegetable crops, especially in Nigeria. This knowledge gap limits their potential utilization in the food and pharmaceutical industries. The study is essential for promoting the consumption and industrial application of *Cucurbita* species' gourds from South-west, Nigeria by providing scientific data on their nutritional and antioxidant properties. It may also contribute to food security and public health awareness regarding the benefits of locally available crops.

The objective of this study is to examine the proximate composition, nutritional values and phytochemical elements of seeds of *Curcubita* species collected from South-west, Nigeria. This study will also investigate DPPH radical scavenging in the species collected from Ondo city, South-west, Nigeria to clarify species-specific antioxidant profiles of Cucurbits. The study will also provide insight into the nutritional quality of *Cucurbita* gourds and support their use as functional foods with potential health benefits, and also aid the food industry in developing value-added products from the pulp of *Cucurbita* species. The examination of the proximate composition of *curcubita* gourds will delve into key

components such as moisture, protein, fat, carbohydrates, and fiber, providing insights into human and animal dietary implications, and the antioxidant properties of the pulp will foster a deeper appreciation for their role in contemporary and traditional culinary contexts. In addition to the above, this study will delineate the different *cucurbita* species collected from South-west, Nigeria to their proximate compositions and anti-oxidant properties.

## MATERIALS AND METHODS

# Collection of fruits

The experimental materials consisted of several *Cucurbita* fruits collected from local traders in Iyalaje, and Owena Markets in Ondo State. The fruits were identified and grouped into various ascessions with the assistance of a descriptor in the herbarium section of Wesley University, Ondo. Each of the fruits was opened into two halves, and seeds were washed and dried, leaving only the gourds/pulp for proximate analysis and proximate analyses, respectively. The gourd and the pulp of the experimental fruits were washed, covered with a muslin cloth to avoid the infestation of insects and dried at room temperature.

## Proximate analyses

The dried gourds were pounded into powder form and preserved in air-tight containers before taking them to the laboratory for proximate analyses. The proximate analyses of the samples (flour) were carried out in triplicate using the methods described by AOAC (2005); and Balogun and Fasakin (2022).

The **Moisture content** was determined by using a moisture extraction oven (Gallenkamp). A clean petri-dish was oven dried and weighed with the use of an electronic weighing balance, and the weight recorded as W1. Five grams of the samples were weighed into three respective petri dishes and recorded as W2. The petri dish containing each of the samples was transferred into the oven and maintained at 80°C and dried to constant weight (Balogun and Fasakin, 2022). The dishes with their contents were removed from the oven, cooled in the desiccators for 30 minutes, weighed, and recorded as W3.

*% Moisture content* = $W2 - W3/W2 - W1 \times 100$

**Ash Content** was determined by following the method of Balogun *et al.*, (2022). Crucibles wree prepared, oven-dried for 30 minutes and weighed as Weight 1 (*Wi*). One gram of the dried sample was put in a clean dried, pre-weighed crucible with a lid ($W_2$). The crucibles were transferred into the muffled furnace set at 550°C (with the lid removed). Ashing of the samples was continued until a light grey white ash is obtained. The crucibles are then cooled in the dessicator and weighed ($W_3$).

*% Ash content* = $W3 - W1/W2 - W1 \times 100$

**Crude lipid** content was determined by using the method described by AOAC (2025). About 150 mL of anhydrous diethyl ether (petroleum ether) at a boiling point of 40–60°C was placed in a flask. Fifteen

filter papers were placed in the oven and cooled in the desiccator for 30 minutes each. The sample was weighed as weight one (W1). One gram (1g) was weighed into the filter papers and recorded as weight two (W2). The filter paper was then tied using wool and transferred into the extraction chamber of the extractor. The ether in the flask was heated until its vapour reached the condenser through the side arm of the extractor. It was then condensed to liquid form and dropped back into the sample and ether soluble substance is dissolved and carried into the solution through the siphon tube into the flask. The extraction process lasted for 6 hours. The improvised thimble was dried and weighed after extraction. The petroleum ether evaporated at the end of the extraction and the oil residue represents the fat content. The samples were then transferred into the oven for 30 minutes, after which they were transferred into the desiccator to cool for another 30 minutes and then weighed as weight 3(W3).

*% Lipid content* = $W2 - W3/W2 - W1 \times 100$

**Crude Fibre** content of the sample was determined by putting the ether extract residue into a one litre conical flask. Two grams (2g) of the sample was weighed into the flask and labelled as weight one (W1) followed by the addition of 200ml of boiling 1.25% of NaOH was added and the solution was allowed to boil gently for 30 minutes. This was rinsed with hot distilled water. The residue is scrapped back into the flask with a spatula, 200ml of boiling 1.25% of NaOH was added and the solution was allowed to boil gently for 30 minutes. This was rinsed finally with hot distilled water again and rinsed once with 10% of HCl and with industrial methylated spirit. The residue was rinsed finally with petroleum ether (40°C boiling range) and allowed to drain, dried and scrapped into a crucible, oven-dried at 105°C and later cooled n the desiccator and reweighed as W2. The residue was ashed at 550°C for 90 minutes in a muffle furnace cooled and weighed again as W3. Percentage fibre was then calculated as follows:

*% Fibre* = $W2 - W3/W1 \times 100$ where W1 = weight of Sample

W2 = Weight of oven-dried residue

W3 = Weight of ashed residue

Crude Protein was determined using the Micro Kjeldahl apparatus (AOAC, 1990 and 2019). The value for the crude protein was obtained by multiplying the nitrogen value by a factor of 6.25 while estimation of available carbohydrate was done by difference thus: CHO = 100 - (% ash + % crude protein + % crude lipid fibre) Energy (kcal) = [(%CHO x 4) + (%CP x 4) + (CL x 9)] (Hassan *et al.*, 2008). All proximate values were reported in %.

## Evaluation of Free Radical scavenging activity by DPPH assay

The DPPH assay followed Brand-Williams *et al.* (1995) as adapted by Królczyky *et al.*, (2020). An amount of 100 µL of the extract was collected and 2.0 mL of the solvent, as well as 250 µL of the DPPH reagent, were added. The whole was shaken on a Vortex at ambient temperature and left in darkness for 20 min. Next, the absorbance was measured at a wavelength λ = 517 nm (Meterek SP 830). The extraction

reagent + DPPH solution was used as a control sample. The results were given as mg Trolox equivalents (Tx) per 100 g of dry mass. All assays were performed in triplicate and averaged.

## Statistical Analysis

All the statistical analyses were performed, and the data were presented as an average of triplicate readings. Data was analysed using EXCEL (Microsoft 2013) and presented as mean ± standard error of the mean. Two-way ANOVA was performed to determine the effects of the extraction solvent across the species differences were assessed by ANOVA ($p < 0.05$).

# RESULTS

## Proximate composition

The nutritional components of the gourds of *Cucurbita* species collected from Ondo West, Nigeria, was profiled based on the major nutritional components (and reported as percentages) such as proteins, carbohydrates, fats, fibre, and ash components. The results of the proximate composition of the different varieties of *Cucurbita* fruits are expressed in Table 1. From the results, the protein content was highest in CUC 10 (14.79%) and lowest in CUC 8 (9.21%). The Ash content was highest in CUC 14 (28.41%) and lowest in CUC 29 (6.25%). Crude fibre was highest in CUC 39 (32.02%) and lowest in CUC 40 (22.19%). Carbohydrate content was highest in CUC 16 (44.76%) and lowest in CUC 14 (20.63%). The moisture content was highest in CUC 9 (9.38%) and lowest in CUC 30 (8.19%). The result of each of the proximate parameters shows that they are closely related to each other.

Table 1
Proximate composition of *Cucurbita* species from South-west, Nigeria

| Accession No. | Protein | Ash | Crude Fibre | Fat | Carbohydrate | Moisture Content |
|---|---|---|---|---|---|---|
| **CUC 1** | 14.72 | 19.85 | 24.33 | 1.73 | 30.57 | 8.76 |
| **CUC 2** | 14.42 | 20.34 | 25.18 | 2.20 | 29.47 | 8.40 |
| **CUC 3** | 10.95 | 30.44 | 26.99 | 1.70 | 20.67 | 9.24 |
| **CUC 5** | 12.22 | 8.64 | 30.99 | 1.59 | 37.99 | 8.46 |
| **CUC 6** | 13.13 | 15.97 | 26.05 | 2.70 | 35.00 | 8.05 |
| **CUC 7** | 12.25 | 23.99 | 25.34 | 2.13 | 27.89 | 8.04 |
| **CUC 8** | 9.21 | 7.78 | 32.01 | 2.27 | 39.51 | 9.23 |
| **CUC 9** | 13.57 | 18.13 | 25.83 | 2.17 | 31.18 | 9.38 |
| **CUC10** | 14.79 | 15.32 | 24.62 | 1.53 | 35.39 | 8.35 |
| **CUC 11** | 13.13 | 12.29 | 24.12 | 1.73 | 40.14 | 8.62 |
| **CUC 12** | 12.65 | 22.97 | 24.15 | 2.10 | 28.68 | 9.15 |
| **CUC 13** | 12.82 | 18.76 | 25.78 | 2.03 | 31.91 | 8.59 |
| **CUC 14** | 10.53 | 28.41 | 30.09 | 1.60 | 20.63 | 8.74 |
| **CUC 16** | 13.90 | 7.28 | 23.98 | 1.80 | 44.76 | 8.27 |
| **CUC 17** | 12.93 | 19.17 | 27.38 | 1.47 | 30.90 | 8.16 |
| **CUC 19** | 12.22 | 11.64 | 27.38 | 2.33 | 37.85 | 8.54 |
| **CUC 20** | 10.11 | 8.27 | 31.01 | 1.73 | 39.72 | 9.16 |
| **CUC 28** | 12.71 | 8.23 | 28.39 | 1.80 | 39.38 | 8.57 |
| **CUC 29** | 11.01 | 6.25 | 30.76 | 2.15 | 39.76 | 8.85 |
| **CUC 30** | 13.40 | 20.70 | 27.15 | 1.85 | 28.91 | 8.19 |
| **CUC 32** | 13.69 | 11.65 | 25.35 | 1.37 | 38.10 | 9.17 |
| **CUC 33** | 13.83 | 10.53 | 26.41 | 2.27 | 38.10 | 8.10 |
| **CUC 37** | 12.41 | 21.45 | 26.65 | 1.60 | 35.71 | 9.33 |
| **CUC 39** | 11.75 | 13.57 | 32.02 | 1.50 | 32.35 | 8.81 |
| **CUC 40** | 12.18 | 9.38 | 22.19 | 1.86 | 44.63 | 9.15 |

*Where CUC = Cucurbita fruit collected;*

## Each value is a mean of three replicates for the experiment

## Methanolic extracts of Curcubita gourds

The bar chart (Fig. 2) illustrates the triplicate of methanol extracts from different Cucurbita accessions, labelled as A, B, and C. Each variety was presented in triplicate, allowing for a comparison of the extraction.

Across most of the varieties, the antioxidant activity is quite similar between the three measures, as the heights of the bars are closely matched. This suggests that the single extraction represented in A, B, and C provides consistent results for most accessions. However, a few exceptions show slight differences, which may indicate variations in how certain compounds in the extract interact with different tests.

The highest antioxidant activity was recorded for CUC 15, where all three variables measured values around 81, making it the top-performing variety. Similarly, CUC 16 and CUC 30 also displayed high antioxidant activities, indicating their potential for strong antioxidant properties. On the other hand, CUC 40 showed the lowest antioxidant activity, with values around 72 across all three variables. This suggests that this variety might have lower levels of antioxidant compounds compared to the others.

# DPPH Radical scavenging activity of Cucurbita fruits

The results of the DPPH scavenging assay of Cucurbita pulp collected from Ondo are expressed in Table 2. The table shows the mean and standard error results of the methanolic extracts of *Cucurbita* accessions. The result showed high DPPH radical scavenging activity, with mean values around 72–81%, with CUC 15 showing the highest (81.22%) and CUC 40 being the lowest (72.33%)

Table 2
Results of the DPPH Radical scavenging activity of Cucurbita gourd

| SAMPLE ID | Mean ± Standard error |
|---|---|
| CUC 05 | 79.24 ± 0.003 |
| CUC 20 | 79.22 ± 0.017 |
| CUC 28 | 76.22 ± 0.010 |
| CUC 29 | 77.86 ± 0.007 |
| CUC 37 | 74.09 ± 0.010 |
| CUC 11 | 74.16 ± 0.023 |
| CUC 40 | 72.33 ± 0.007 |
| CUC 06 | 79.38 ± 0.023 |
| CUC 32 | 78.41 ± 0.047 |
| CUC 19 | 75.86 ± 0.327 |
| CUC 17 | 78.00 ± 0.043 |
| CUC 09 | 78.50 ± 0.000 |
| CUC 10 | 79.52 ± 0.430 |
| CUC 30 | 79.78 ± 0.075 |
| CUC 07 | 79.50 ± 0.047 |
| CUC 14 | 76.94 ± 0.030 |
| CUC 15 | 81.22 ± 0.015 |
| CUC 02 | 75.45 ± 0.013 |
| CUC 16 | 81.08 ± 0.030 |
| CUC 01 | 76.37 ± 0.027 |
| CUC 13 | 75.76 ± 0.050 |
| CUC 33 | 77.82 ± 0.027 |
| CUC 08 | 77.74 ± 0.013 |
| CUC 39 | 78.56 ± 0.027 |
| CUC 03 | 77.54 ± 0.023 |

The data suggests that CUC 15 and CUC 16 are the most promising varieties for antioxidant activity, with consistent and strong results. Meanwhile, varieties like CUC 40 and those with high variability (e.g., CUC 10) may not perform as well or may require more precise testing methods to confirm their results as shown in Fig. 2 below.

# DISCUSSION

The intricate roles of macronutrients—carbohydrates, proteins, and fats—are pivotal in delineating the proximate composition of *Curcubita* species. Carbohydrates serve as the primary source of energy that saturates the plant tissues, and the gourd of cucurbits, fostering both growth and cellular functions. The study revealed that CUC 16 and CUC 40 have the highest carbohydrate content, suggesting high energy-yielding potential, hence can be recommended for energy-boosting dietary products. Conversely, CUC 3 and CUC 14 have the lowest, which may suit low-carb dietary requirements. The findings are comparable to those of Emebu and Anyika (2017), who reported 35–42% carbohydrates in dried *Cucurbita maxima*. Proteins, on the other hand, contribute significantly to the growth and repair of tissues. As highlighted in previous studies, dietary protein quality may vary widely based on source and processing, illuminating the importance of context when evaluating plant proteins. Therefore, the results of this study aligns well with values reported by Adelekan and Abiodun (2018), who documented *Cucurbita pepo* seed flour protein content in the range of 10.2–15.1%. Similarly, Oluba *et al.*, (2020) reported protein contents of 11.6–13.8% in *Cucurbita maxima*, suggesting that CUC 10 is particularly promising for protein-rich dietary applications.

Fat content is relatively low across all accessions in this study, indicating that *Cucurbita* is a low-fat food, suitable for low-fat dietary formulations. CUC 6, with the highest fat content, may have a slightly higher caloric value. Fats, while often viewed with caution, are crucial for numerous physiological processes, including nutrient absorption. A deeper understanding of these macronutrients within *Curcubita* species is essential for advancing food quality and addressing dietary needs, particularly in the context of innovative food technologies (Batool et al, 2022). The relatively low fat component of *Cucurbita* gourd compared to values reported for *Cucurbita pepo* seeds, which can range between 20–30% (Ogunbusola et al., 2021). However, since these results appear to reflect whole pulp or flour analysis rather than seeds alone, the low fat is consistent with findings from Omolola et al. (2019), who reported 1.5–3% fat in defatted pumpkin pulp flour. All accessions of the pulp showed high crude fibre content (22.19–32.02%), with CUC 39 and CUC 8 standing out. These values exceed the 14–22% fibre range reported in dried pumpkin pulp and seed meals by Nkosi et al. (2020). High fibre is beneficial for bowel regulation and metabolic health, indicating that CUC 8 and CUC 39 may serve well in high-fibre diets or functional food formulations. Malgorlzata (2023), and Mokhtar et al., (2021) asserted that *C. pepo*, *C. moschata*, and *C. maxima* are particularly noted for their high levels of vitamins A and C, carotenoids (notably β-carotene), dietary fiber, and essential minerals, phenolic acids, and flavonoids that can contribute to antioxidant properties.

These findings support the utility of *Cucurbita* in dietary fibre supplementation. The values of the moisture content of *Cucurbita* pulp are consistent with literature, which reports moisture contents of 7–10% in dried *Cucurbita* pulp (Adepoju *et al*., 2021). Low moisture levels enhance shelf life, suggesting the accessions are suitable for processing and storage as flours or powders.

The proximate analysis of these *Cucurbita* accessions collected from Ondo-West, Nigeria, reveals a rich nutritional profile that varies across genotypes. Such diversity is beneficial in selecting accessions for specific food and industrial purposes.

The values of the antioxidant properties of the *Cucurbita* accessions reveal their robust antioxidant potentials. Different studies corroborate the findings of this study; Kar et al., (2023) reported aqueous extracts of dried *Cucurbita maxima* seeds, peels, leaves, and flowers with DPPH scavenging of 48.4%, 55.7%, 83.9%, and 58.3%, respectively. The findings of these authors show a similarly high activity (~ 84% for leaves) in the same range as the top accessions of this study. Similarly, Mala and Kurian (2016) found that methanol extracts of pumpkin peel and pulp achieved 50% inhibition (IC50) at a concentration of 18 mg $mL^{1}$, while at 50 mg $mL^{-1}$, scavenging activity reached approximately 80% DPPH inhibition at 50mg/mL, paralleling the approximately 80% inhibition seen in the methanolic extracts of this study. Quantitative comparisons are complicated by differing units, but overall the results are consistent: for instance, Gramza-Michałowska and Królczyk (2020) measured DPPH activity in 14 *C. maxima* cultivars, finding values up to 245–246 mg Trolox/100g dry matter (indicating strong radical scavenging), and noted that 80% aqueous methanol extracts had the highest activity. Kostecka-Gugała et al. (2020) reported that the popular *C. maxima* 'Hokkaido' cultivar had the highest antiradical (DPPH) capacity among 18 pumpkin cultivars. These findings underscore the importance of Cucurbita species in both health promotion and food innovation. The results of these literatures qualitatively agree that pumpkin extracts generally exhibit high antioxidant activity, with cultivar-dependent variation.

On the solvent used for the extracts, related gourds and melons from the Cucurbitaceae family likewise show significant DPPH-scavenging activity, often in a similar range with the present study. For bottle gourd **(***Lagenaria siceraria***)**, recent work by Yadav et al., (2024) in India found that methanol extracts consistently gave the strongest antioxidant activity: the average $IC_{50}$ (µg/mL) was lowest (best) in methanol extract (28.8 µg/mL) versus butanol (32.6) and ethanol (39.4). The same study also reported a percent DPPH inhibition of approximately 55% for raw bottle gourd and showed methanol extract (ME) > butanol Extract (BE) > ethanol extract (EE) in scavenging power. A recent study by Renuka and Praveena (2023) on leaf extracts of ridge gourd **(***Luffa acutangula***)** found DPPH scavenging rising from 27% at 20 µg/mL to 67% at 100 µg/mL. These results, obtained with ethanolic extracts, again demonstrate potent activity at moderate concentrations.

In summary, the methanol-extract results from this study (mean approximately 75–81%) show antioxidant activities that are comparable to or slightly higher than many published pumpkin studies, highlighting that the tested accessions are among the more active varieties

# Declarations

### Ethical Approval

All experimental procedures were based on plant samples and did not involve any

animal or human participants, hence no ethical approval was required.

### Consent to Participate

Not Applicable as the study did not involve any human participant.

### Consent to Publish

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### Data Availability

The datasets generated and/or analysed during the current study are available from the

corresponding author on reasonable request.

### Competing Interests

The authors declare that they have no competing interests.


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### Authors' Contributions

Baderinwa-Adejumo, A.O conceived and designed the study. Udoh, F.E performed the experiments' data analysis, and drafted the manuscript. All authors read and approved the final manuscript.

# References


1. Abdullah, A.T.M., Rahman, M.M., Sharif, M., Khan, T.A., and Islam, S.N. (2024): Bioactive polyphenolic compounds and antioxidant potentials of two leafy vegetables in Bangladesh: the *Momordica charantia* and the *Ipomoea aquatica*. *Food Prod Process and Nutr* **6**, 35 (2024).
2. Adelakun, O.E., and Abiodun, O.A. (2018): Proximate composition and functional properties of *Cucurbita pepo* seed flour. Unpublished manuscript.

3. AOAC (2005): Official methods of Analysis (18th ed.). Gaithersburg, MD: AOAC International.
4. Balogun, A.M., and Fasakin, E.A (2022): Methodologies in Aquacultural Research. *In Methodologies in Fisheries and Aquaculture Research.* Pp(32-36) ISBN: 978-978-921-232-3
5. Batool, M., Najar, B., & Pistelli, L. (2022). *Nutritional Value, Phytochemical Potential, and Therapeutic Benefits of Pumpkin (Cucurbita spp.). Foods*, 11(12), 1954.
6. Emebu, P.K., and Anyika, J.U., (2017): Proximate and Mineral composition of kale (*Brassica oleracea*) grown in Delta State, Nigeria. *Pakistan Journal of Nutrition,* **10**(2), 190-194
7. Gramza-Michałowska, A., and Królczyk, J. B. (2020). Optimization of extraction conditions for the antioxidant potential of different pumpkin varieties (*Cucurbita maxima*). *Sustainability, 12*(4), 1305. https://doi.org/10.3390/su12041305
8. Ibisanmi, T.A., Aribisala, J.O. (2022). Evaluation of antioxidant, phytochemicals and antibacterial potential of *Mormordica charantia* (Linn) against pathogenic bacteria isolated from ready to eat food sold in Akure Metropolis, Nigeria. *Bull Natl Res Cent* **46**, 72 (2022).
9. Kar, S., Dutta, S., & Yasmin, R. (2023). *A comparative study on phytochemicals and antioxidant activity of different parts of pumpkin (Cucurbita maxima)*. *Food Chemistry Advances*, 3, 100505.
10. Kostecka-Gugała, A., Kruczek, M., Ledwożyw-Smoleń, I., and Jaroniewski, D. (2020). Antioxidants and health-beneficial nutrients in fruits of eighteen *Cucurbita* cultivars: Analysis of diversity and dietary implications. *Molecules, 25*(8), 1792.
11. Kulczyński, B., Gramza-Michałowska, A., and Królczyk, J. B. (2020). Optimization of Extraction Conditions for the Antioxidant Potential of Different Pumpkin Varieties (*Cucurbita maxima*). *Sustainability*, *12*(4), 1305.
12. Mala, K. S. and Kurian, A. E. (2016): Nutritional Composition and Antioxidant activity of Pumpkin wastes. *Int. J. Pharm. Chem. Biol. Sci. 6 (2016) 336*
13. Matseke B, Mapfumari S, Mothibe M. Qualitative Phytochemical Profiling and In Vitro Antioxidant Potential Evaluation of South African Momordica Balsamina Linn Fruit Pulp. Life (Basel). 2024 Dec 24;15(1):4. PMCID: PMC11766754.
14. Mokhtar, M., Bouamar, S., Di Lorenzo, A., Temporini, C., Daglia, M., and Riazi, A. (2021). The influence of ripeness on the phenolic content, antioxidant and antimicrobial activities of pumpkins (*Cucurbita moschata* Duchesne). *Molecules, 26*(12), 3623.
15. Nasarani, E.E.B., and Winarti, S. (2023). Probiotic yoghurt from pumpkin seed and pulp filtrate within different fermentation times. *G-Tech Journal of Applied Technolog*, 7(3), 1051 - 1060
16. Nkosi, S., Moyo, B., and Ndlovu, P. (2020). Nutritional composition and functional properties of *Cucurbita maxima* seed flour. *South African Journal of Botany*, 133, 283–288.
17. Ogunbusola, E. M., Ajayi, O. B., and Adetuyi, F. O. (2021). Comparative evaluation of seed oils from different *Cucurbita* species. *Journal of Applied Sciences and Environmental Management*, 25(4), 565–570. Adepoju, A., Ogunsola, R., and Adesina, B. (2021). Proximate and mineral composition of pumpkin (*Cucurbita maxima*) flour and its potential in food fortification. *Journal of Food Biochemistry*, 45(4), e13635.

18. Omolola, A. O., Jideani, A. I. O., and Kapila, P. F. (2019). Proximate composition and functional properties of defatted pumpkin flour for food applications. *Journal of Food Processing and Preservation*, 43(8), e14024.
19. Renuka, and Praveena, G. (2023). Phytochemical analysis and antioxidant activity of *Luffa acutangula* peel extract. *Journal of Pharmaceutical Sciences and Research, 15*(6), 382–389.
20. Stryjecka, Malgorzata (2023). Chemical composition and antioxidant properties of Peels of five Pumpkin (*Cucurbita sp.*) Species. *Foods 14 (12)*: 2023. https://doi.org/10.3390/foods14122023
21. Tyug, T.S.; Johar, M.H.; Ismail, A. Antioxidant properties of fresh, powder, and fiber products of mango (Mangifera foetida) fruit. *International Journal of Food Properties 2010, 13, 682–691*
22. Yadav, R., Yadav, B.S. and Yadav, R. Influence of various cooking treatments and extraction solvents on bioactive compounds and antioxidant capacities of bottle gourd (*Lagenaria siceraria*) fruit in India. *Food Prod Process and Nutr* **6**, 19 (2024).

# Figures

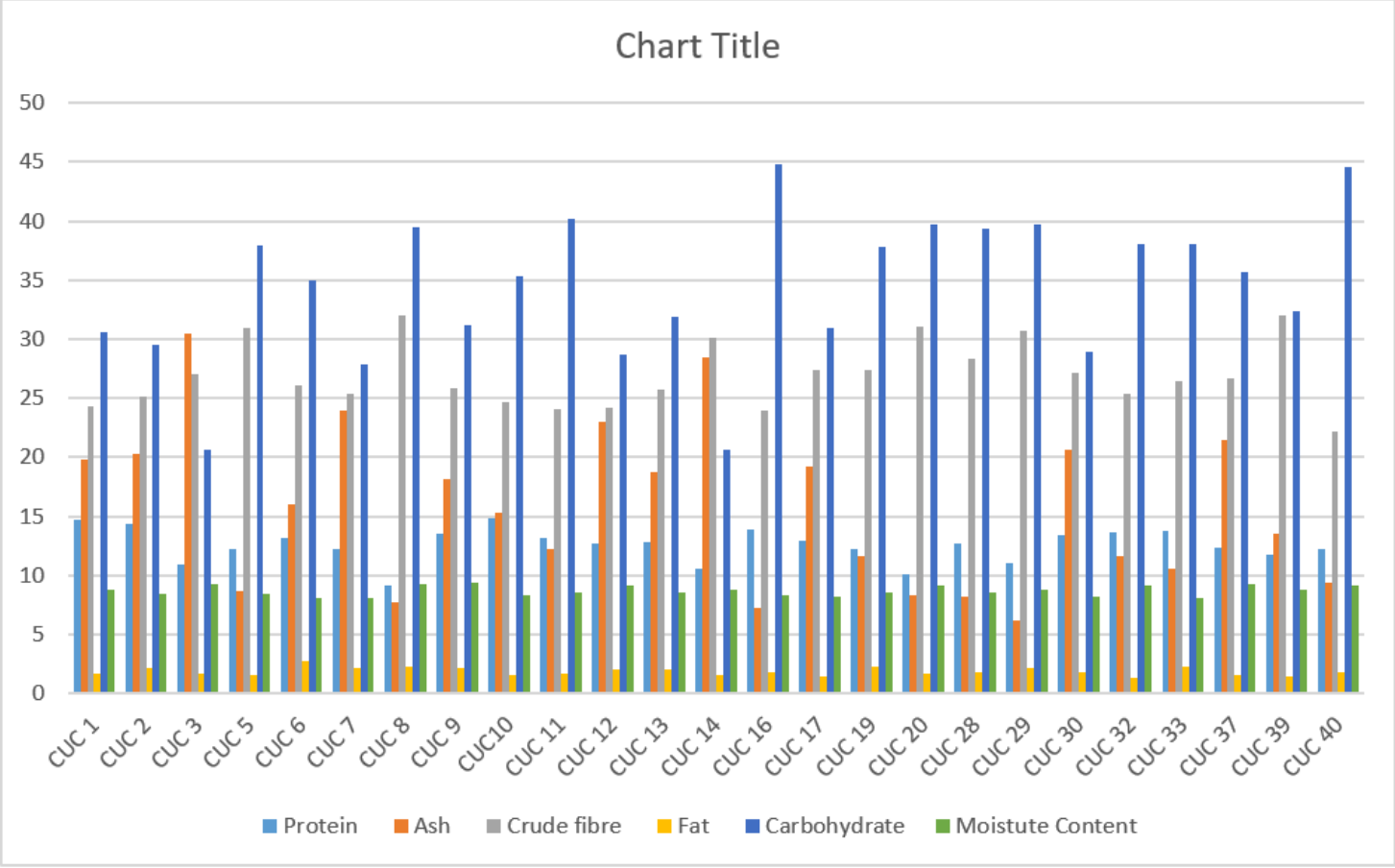



**Figure 1**

Chart showing the Proximate composition of collected Cucurbits from South-west, Nigeria

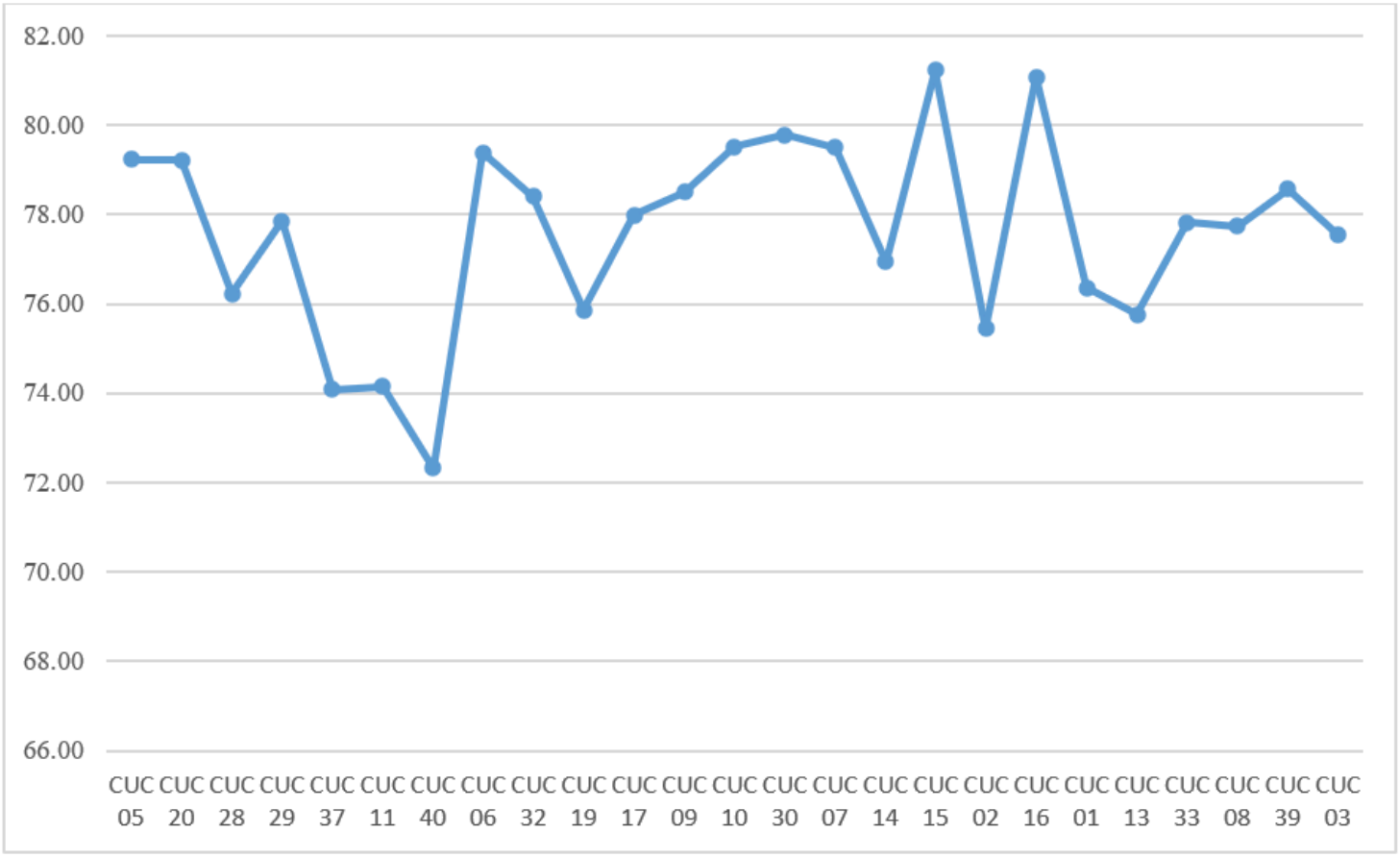



**Figure 2**

Graphical Representation of Antioxidant properties of Cucurbita gourd