# Proximate, Anti-Nutritional and Mineral Composition of *Cucumis melo* Seeds Found in Mubi, Nigeria

*Sudi, P.D., Ibrahim, M., Shettima, U.A. and Suleiman Muhammad Danazumi

Department of Chemical Science Technology,

Federal Polytechnic, Mubi. Adamawa State, Nigeria

*Corresponding Author: sudipatrickdaniel@gmail.com

***Accepted: September 1, 2025. Published Online: September 3, 2025***

## ABSTRACT

The purpose of this study was to investigate the mineral, nutritional and anti-nutritional composition of sweet melon (C*ucumis melo*) seeds. The proximate analyses were determined by Soxhlet extraction, AOAC, Kjeldhal and other standard procedures. Mineral contents were determined using flame photometer, Atomic Absorption spectrophotometer and Vanodo-molybdate method, while anti-nutrients were carried out using standard procedures. The results obtained from proximate analysis were: 3.2% (moisture content), 8.1% (ash content), 8.4% (crude fibre), 25.30% (crude protein), 46.20% (crude lipid), and 8.10% (carbohydrate). The anti-nutritional factors results were oxalate: 10.20 mg/100g, tannin: 8.04 mg/100g, phytate: 0.38 mg/100g, and hydrocyanic acid: 0.8 mg/100gm. Mineral analyses showed that iron have the highest value (150.80 gm/100g), followed by magnesium (22.68 mg/100g), zinc (18.41 mg/100g), manganese (16.20 mg/100g), potassium (8.19 mg/100g), Sodium (5.17 mg/100g), phosphorus (4.21 mg/100g), copper (3.53 mg/100g) while calcium was the least with 1.5 mg/100g. The results of this study revealed that *Cucumis melo* seed is a good source of important nutrients such as fat, protein, fiber and minerals. The high content of protein, fiber, crude lipid and fiber and some minerals make these seeds valuable dietary supplement for human and animal consumption

**Keywords:** Proximate, nutritional, anti-nutritional, minerals, composition and *Cucumis melo*

## INTRODUCTION

The consumption of fruit is crucial to the availability of micronutrients to human body. This is because they are rich sources of vitamin and mineral required for normal functioning of the human body [1]. Although required in small quantities, both vitamin and minerals are essential part of the daily diet as the body cannot synthesize them in sufficient quantities to meet the nutritionally recommended quantities [2]. Fruits are called protective food as they contain adequate quantity of vitamins, phytochemicals and minerals which help us to keep our body healthy by regulating body process and helping the body to produce substance which would fight against the disease-causing agents [3]. Fruits also contain high amount of anti- oxidant which help in the removal of free radicals from the body and therefore, provide protection against numerous infection's diseases [4]. Apart from micronutrients provided, fruits contain both soluble and insoluble dietary fiber which reduces the body fat and cholesterol levels from the body and also help in smooth bowel movement [1].

Developing countries like Nigeria depend on starchy food as their main staple food and recently to processed food which contributes to high incidence of non-communicable disease trend as a result of rapid shift from traditional diet to western diets [5]. Individuals that consumed westernized food are at risk of increased consumption of preservatives and saturated fats with reduce dietary fiber intake, essential nutrient and bio active compounds when compared to the recommended nutrients intake [1]. The fruit, *cucumis melon,* belongs to the family of *cucurbitaceae* or *cucurbit.,* Other members of the family of the plant include cucumber, pumpkin, squash, calabash, chayote, and water melon. They are creeping in nature and are also warm season crops, very susceptible to cold injury. The stems of *cucumis melon* are usually trailing up to 3 m in length [6]. The fruit is a fleshy berry that is round to ellipsoid, hairy, during its early development, and smooth to reticulate at maturity, which varies in colour showing shade yellow, green, orange, white and often molted or striped. *Cucumis melo* weighs 0.4 – 22 kg, bear many seeds taste and smell sweet [6]. These findings contribute to knowledge by highlighting their potential as a nutritious food supplement, promoting food security and identifying their suitability for industrial application.

The aim of this research is to conduct analysis on the proximate, anti-nutritional and mineral compositions of sweet melon (C*ucumis melo)* seeds.

## MATERIALS AND METHODS

### Sampling and Sample Collection

The sampling method described by AOAC [7] was adopted. The C*ucumis melo* fruits were randomly sampled from the farm where it was produced. The fruits were collected in a plastic container and sent to the laboratory for further treatment.

### Sample Preparation

The C*ucumis melo* fruits collected were sliced using a slicing knife and cut into pieces. The seeds were removed from the freshly fruit part and air dried in the laboratory for 7 days. The dried seeds were collected and pound using mortar and pestle and the pounded samples were used for the analysis.

**Proximate Analysis**

The proximate analysis was carried out using the methods describe by AOAC [7].

***Determination of Moisture Content***

Approximately 2 g of the sample was measured into a preheated cooled and weighed silica dish. It was dried in an oven for 24 hours at a regulated temperature of 80$^o$C to a constant weigh. The dish and the content were allowed to cool in a desiccator before weighing. The moisture was determined as a percentage moisture as shown in Equation 1:

$$\% \text{ moisture} = \frac{\text{Weight of a sample before drying - Weight of sample after drying}}{\text{Weight of sample before drying}} \times 100 \quad (1)$$

***Determination of Ash Content***

The crucible was thoroughly washed cleaned and placed in a hot air-oven for 2 hours and allowed to cool to room temperature in a desiccator. The empty crucibles were transferred to the muffle furnace to burn off all organic matter and also to stabilize the weight of the crucibles at the temperature of 600$^o$C. The desiccator was allowed to cool at room temperature. Approximately 2 g of sample was accurately weighed into a labeled crucible, placed in the muffle furnace and ash at 600$^o$C for 3 h. The ash samples were removed into a desiccator to cool at room temperature and was reweighted. The % ash is calculated as shown in Equation 2.

$$\% \text{ Ash} = \frac{\text{Weight of a crucible and ash – Weight of crucible}}{\text{Weight of sample}} \times 100 \quad (2)$$

***Determination of Crude Protein***

**Digestion**: Approximately 1 g of the samples was measured and introduced to the bottom of 500 mL. Kjeldal flask. Conc. $H_2SO_4$ (20 mL) was added and mixed gently by swirling under tap water. Anhydrous $Na_2SO_4$ weighing 10 g and 1 g of $CuSO_4$ were mixed together and 3.0 g of this was introduced into the flask. An anti-bumping chip was added into the mixture. The $Na_2SO_4$ and $CuSO_4$ mixture were added to the Kjedahl catalyst. The entire mixture was boiled gently in the Kjeddal flask in a fume cupboard until charred particles disappeared and a clear green solution was obtained. The digest was made up to 100 ml with distilled water.

**Distillation:** Approximately 10 mL of 2% boric acid was measured into a 250 mL beaker and phenolphthalein indicator was added. 10 ml of the digest was placed in the distillation flask. The heating system was switched on, and was heated continuously for 25 minutes. The receiver beaker was removed and the distillate was titrated with 0.1N until the end point was determined.

$$NH_4OH + HCl \longrightarrow NH_4Cl + H_2O \quad (3)$$

14 g N react with 36.5 g of HCl to give product

36.5 g HCl in 100 ml = 1.0 mol/dm$^3$

Therefore

0.1 mol/dm$^3$ HCl = 3.65 g HCl in 100 ml

14 g N in 100 ml of 1.0 N HCl = Product

Therefore 1.4 g N will react with 100 ml of 0.1M HCl or

1.4 mg N will react with 1.0 ml of 0.1M HCl

If their titer value = X mL, then the amount of nitrogen will give 1.4 x X

Since 100 ml volume of sample was made and 100 ml aliquot was distilled, then amount of N = 1.4 x X x 100/10 mg

100/10 =Dilution factor (D.F)

Original volume of sample (ml)

i.e % N x 6.25

since protein contains 16% nitrogen on the average

***Determination of Total Carbohydrate***

This is conveniently done by differences method i.e

Total CHO = 100 – (% lipid + % ash + moisture + % protein) (4)

***Determination of Percentage Lipid***

This is done mainly by the gravimetric method of the AOAC [7]. Approximately 5 g of sample was measured into a thimble set. The lipid contained in the sample was exhaustively extracted using petroleum ether ($40^0$-$60^0$C) for 3 hours. The extractant petroleum ether was distilled off and the flask was re-weighted the percentage lipid was calculated as shown in Equation 5:

$$\% \text{ Lipid} = \frac{\text{Weight of flask and lipid} - \text{Weight of flask}}{\text{Weight of sample}} \times 100 \quad (5)$$

**Determination of Anti-nutritional Components**

The anti-nutrient oxalate was determined using the method describe by Day and Underwood [8], tannin by the method described by Maker *et al.*, [9], phytate was determined by the colometric method modified by Reddy *et al.*, [10] whereas hydrocyanic acid was determined by the method described by Bradbury *et al.* [11].

**Mineral Analysis**

Sodium and potassium in the samples were determined by PFP7 flame photometer. The concentration of phosphorus was determined by the Vanado – molybdate method described by [12] while other minerals such as iron, potassium, sodium, magnesium, phosphorous, copper, calcium, zinc and manganese were determined by atomic absorption spectrophotometry (Buck Scientific VPG 210 Ltd USA).

**RESULTS AND DISCUSSION**

The results for proximate, anti-nutritional and minerals analysis of *Cucumis melo* seeds were presented in Tables 1 to 3.

Table 1: Proximate analysis of *Cucumis melo* seeds

| Parameters | Results (%) |
|---|---|
| Moisture content | 3.2± 0.03 |
| Ash Content | 8.1 ± 0.02 |
| crude fibre | 8.4 ± 0.7 |
| crude protein | 25.30 ± 1.2 |
| crude lipid | 46.20 ± 1.8 |
| Carbohydrate | 8.10 ± 0.9 |

Data are mean of triplicate determination ± standard deviation

Table 2: Anti-nutritional composition (mg/100g) of sweet melon (*Cucumis melo*) seeds.

| Parameters | Results |
|---|---|
| Oxalate | 10.20 ± 0.2 |
| Tannin | 8.04 ± 0.1 |
| Phytate | 0.38 ± 0.01 |
| Hydrocyanic acid | 0.8 ± 0.02 |

Data are mean of triplicate determination ± standard deviation

Table 3. Mineral composition (mg/100g) of sweet melon (*Cucumis melo*) seeds

| Elements | Concentration (mg/100g) |
|---|---|
| Na | 5.17 ± 0.2 |
| K | 8.19 ± 0.4 |
| Ca | 1.5 ± 0.008 |
| Mg | 22.68 ± 0.08 |
| Fe | 150.80 ± 0.42 |
| Zn | 18.41 ± 0.20 |
| Cu | 3.53 ± 0.002 |
| Mn | 16.20 ± 0.012 |
| P | 4.21 ± 0.009 |

Data are mean of triplicate determination ± standard deviation.

The proximate composition of *Cucumis melo* seeds is shown in Table 1. The moisture content was 3.2± 0.03% which is lower than what were reported for varieties of melon seeds; 4.78 – 5.21% [13] and pumpkin seeds, 5.00% [4].

The low moisture content in the melon will help to improve its life span. The ash content was 8.1±002% which is higher than that reported for melon seeds variety 3.35 – 4.89% [14] but close to that reported for melon seed; 6.84-6.99% by Bankole [15] The high ash content in the sample indicate the percentage of inorganic mineral elements present in melon seeds. High mineral element in food enhances growth and development and also catalysis metabolic process in human body.

The crude fibre content was 8.4±0.7%, which is higher than reported for four varieties of melon seeds, 1.66-2.16% [13] and *Mangifera indica* kernels, 2.22-3.95% cultivars grown in western part of Nigeria [16] also higher than those of ripe and unripe *Carica papaya* seeds 7.85% and 7.40%, ripe and unripe *Citrus sinensis* seeds 8.05% and 7.40% respectively [17].

The crude lipid content was found to be 46.20% which is higher than that reported for four varieties of melon seeds 40.26-45.21% [13] but much higher than those reported for different cultures of Mango kernels, 5.92-13.50, ripe and unripe *carica papaya* seeds 0.10% and 0.15% respectively [17]. Crude fat is very vital since it provide the body with tremendous amount of energy.

The protein content was found to be 25.30% which is comparable to those reported for *colocynthis cutrullus* seed 28.63% and *cucurbita pepol* seeds 27.48% [17]. Thus *cucumis melo* seeds could provide the necessary protein requirement in the body.

Carbohydrate content was found to be 8.10%, so *cucumis melo* seeds cannot be considered as potential source of carbohydrates when compared with other sources such as cereals which contain 65-75% carbohydrates.

The anti-nutritional composition of *cucumis melo* is presented in Table 2. The composition of oxalate, tannin, phytate and hydrocyanic acid in the seeds were 10.20mg/100g, 8.04mg/100g, 0.38mg/100g and 0.8mg/100g respectively.

Oxalate has the highest value while phytate has the least value. These values are lower than the values of oxalate, tannin, phytate and hydrocyanic acid reported for mango seed which are 309 mg/100g, 370.0 mg/100g, 9.06 mg/100g and gmelina fruit as follows, 229.5 mg/100 mg, 650 mg/100g, 10.5 mg/100g,/ and 101.0 mg/100g respectively.

The phosphoric acid moiety of the phytate molecule has a strong capacity to form complexes with monovalent cations, including Ca, Mg, Zn, Fe, Mn and Cu.
These phytate-mineral complexes are generally insoluble at physiological pH and hence render the minerals biologically unavailable to monogastric animal and human [18].

Tannin concentration in the sample compete favourable with the values reported for some Nigeria medicinal plant which ranged from 6.08-15.25 mg/100g [19]. Higher value of oxalate in human died can increase the risk of renal calcium absorption and has been implicated as a source of kidney stones [20]. Higher value of tannin in foods interferes with protein absorption and digestive enzymes. A neurological disease known as tropical ataxia neuropathy (TAN) is linked to consumption of high level of cyanide in cassava-based diet [21].

The results for the mineral composition are presented in Table 3. The most abundant mineral found in the sample is iron with the concentration of 150.80 mg/100g. Iron helps in the formation of blood and in the transfer of oxygen and carbon dioxide from one tissue to another iron deficiency result in imperial learning ability and behavioural problems in children and also anaemia [22].

Magnesium is the next abundant element in the seed samples with the value of 22.68 mg/100g. Magnesium is beneficial to blood pressure and help to prevent sudden heart attack, cardiac arrest and stroke. Magnesium is an important component of bone and contribute to its structural development and relaxes the muscles [23].

The next abundant element is zinc followed by manganese found in the seed sample with value of 18.41 mg/100g and 16.20 mg/100g respectively. Zinc boosts the health of the hair, plays a role in the proper functioning of some sense organs such as ability to fate and smell, helps in carbohydrate and protein metabolism and also assist in metabolism of vitamin A, from its storage site in the livers and facilitates the synthesis of DNA and RNA necessary for cell production [24]. Manganese plays important role in the transfer of oxygen from lungs to cells and activation of enzymes reactions concerned with carbohydrates, fat and protein metabolism [23]. Manganese deficiency can result to regard growth and skeletal disorder.

The next abundant element is potassium, followed by sodium with the values of 8.19 mg/100g and 5.17 mg/100g respectively. High concentration of potassium in the body was reported to increase iron utilization and beneficial to people taking diuretics to control hypertension and suffer from excessive excretion of potassium through the body fluid [25]. Recommended daily intake value stands as 3500 mg. Sodium regulates fluid balance in the body and helps in the proper functioning of muscles and nerve [23]. According to the Institute of Medicine, Food and Nutrition Board Washington DC [25], the daily value for sodium is 2400 mg for adult and children aged 4 and older. High dietary sodium is implicated in cardiovascular and renal disorders [26].

The next element found in the seed samples is phosphorus followed by copper with the value of 4.21 mg/100g and 3.53 mg/100g respectively. This value is very low in comparison with the phosphorus value of 47.68 mg/100g reported for pumpkin seed [27], but much higher than 0.87 mg/100g reported for Juglans regia seeds [28]. The recommended daily values for phosphorus is 1000 mg. The low value of phosphorus in the sample may not be unconnected with the fact that whole grains and vegetable are usually low in phosphorus. It is important to note that phosphorus from food source are relatively bioavailable with the exception of plant seeds (beans, peas, cereals, nut) that contain a special storage form of phosphate called phytic acid. Copper has the largest concentration in seed samples. Copper helps the body to use iron and sugar properly. It is also necessary for bone growth and nerves function. Deficiency of copper may result to anemia and osteoporosis (weak bone). Calcium, magnesium, phosphorus, manganese in combination with chloride, protein, vitamin A, C and D are involved in bone formation [29]. The high value of some of the minerals may satisfy the nutritional needs of the consumer [30].

## CONCLUSION

The seeds of *Cucumis melo* are good sources of protein, crude fat and fibre, based on the analytical data. Iron which is the most abundant element is needed for bone formation and transportation of oxygen and carbon dioxide between tissues. Also, *Cucumis melo* is rich in magnesium and zinc. Magnesium is an important component of bone, relaxes muscle and beneficial to blood pressure. Zinc boosts the health of hair and plays a role in ability to taste and smell. The concentration of anti-nutritional factors suggests that the seed of C*ucumis melo* is a good source of food for human. The seed is a poor source of calcium and copper which is needed for bone formation and teeth development. Copper helps the body to use iron and sugar properly but it has low concentration in the seeds.

### Recommendations

The analytical information available based on this study show that C*ucumis melo* is a good source of protein, fibre and crude fat and some minerals. Therefore, it is recommended as a source of food for animal and human consumption. Also, it is recommended that more analysis should be carried out to characterize the oil in the seeds for further applications.

## REFERENCES

[1] Gupta, S., & Prakash, J. (2011). Nutritional and sensory quality of micronutrient rich traditional products incorporated with green leafy vegetables. *International Food Research Journal*. 18, 667-675.

[2] Rolls, B.J., Ello-Martin, J.A. & Johill, B.C. (2004). What can intervention studies tell us about the relationship between fruit and vegetable consumption to weight management? *Nutrition review*. 22, 1-17.

[3] Onyezili, F. (1999). Adequate nutrition a matter of right and address. Nutrition section at the 5th annual previews of nutritional programmes Kaduna. 12-21.

[4] ACC/SCN United Nation Administrative committee on coordination on nutrition (2004) fifth report on world nutrition status. Nutrition for improved development outcome, Geneva.

[5] Kelly, G., Brien, O., Martin, D. & Price, L. (2008). Amaranth Corcun and vegetables types. Echo Technical Note USA: 15.

[6] Grubben, G.J.H. and Denton, O.A. (2004). Plant resources of tropical African 2. Vegetables PROTA Foundation, Wageningen, Netherlands.

[7] AOAC (1990). Official method of analysis, 15th Ed Washington DC, USA Association of Analytical chemist. 400-2200. Wilson Boulevard, Arlinton Virginia USA. 2, 910-928.

[8] Day, R.A. (Jnr) & Underwood, A.L (1986). Quantitative analysis 5th ed. Prentice halls publication, pp701.

[9] Marktar, H.P., Blummel, M. & Becken, K. (1993). Determination of tannin and its correlation with chemical and protein precipitation method. *Journal of Nutrition* 9(9), 905-908.

[10] Reddy, N.R. Balakrishnan, C.V. & Salunkhe, D.K. (1978). Phytate phosphorus and mineral changes during germination and cooking of blackgran (Phaseolia Mungo L.) Seeds. *J. Food Sci*. 43, 2-540.

[11] Brabury, H., Egab, S.M. & Lynch, M.J. (1991). Analysis of cyanide in cassava using acid hydrolysis of cyanogenic glycosides. *Journal Food Sci. and Agric*. 55, 277-290.

[12] Prior, R.L.& Cao, G. (2000) Antioxidant phytochemicals in fruits and vegetables -Diet and health implications. *Horticultural Science* 35(4) ,588-592.

[13] Abiodun, O.A. & Adeleke, R.O. (2010). Comparative studies of nutritional composition of four melon seeds varieties. *Pakistan Journal of Nutritional* 9(9), 905-908.

[14] Elinge, C.M., Muhammad, A., Atiku, F.A., Itodo, A.U, Peni, I.I., Sanni, O.M. & Mbongo, A.N. (2012). Proximate, mineral and anti-nutritional composition of pumpkin (Cucurbita Pepo L.) seeds extracts. *International Journal of Plant Research,* 2(5), 146-150.

[15] Bankole, S.A., Osio, A., Joda, A.O & Kuomehin, O.A. (2005) effect of drying method on the quality and storability of colocynthesis citrullus. *African Journal of Biotl,* 4(8), 799-803.

[16] Kayode, R.M., Sani, O.A., Apata, D.F., Joseph, J.K., Olurunsanya, O.A., Amnongu, A.A & Obalowu, M.A. (2011). Physio-chemical and anti-nutritional characterization of the kernels of some mango (Mangefera Indica) cultivars grown in western part of Nigeria. *Bioresearch bulletin*. 6, 1-8.

[17] Abulude, F.O. (2000). Chemical composition and Nutritive values of caricea papaya and citrus senensis seeds. *The Journal of Techno Science,* 4, 24-27.

[18] Maga, J.A. (1982). Phytate: its chemistry, occurrence, interaction, nutritional significance and methods of analysis. *Journal Agric. Food Chem*-30, 1-9.

[19] Edeoga, H.O, Okwu, D.E & Mbaebe, B.O. (2005). Phytochemical constituent of some Nigeria medicinal plant. *African Journal of Biotech*. 4(7), 685-688.

[20] Chai, W. & Liebman, M. (2004). Assessment of oxalate Absorption from Almond and Black Bean with and without the use of extrinsic label. *J. Urol.* 172 (3), 953-957.

[21] Hassan, L.G. & Umar, K.J. (2004) proximate and mineral composition of seeds and pulp of African Locus bean (Parka biglobosa) *Nigerian Journal of Basic and Applied Sciences* 13, 816-823.

[22] McDonald, A., Edwards, R.A., Green hulgh, F.O & Morgan, C.A. (1995). Animals nutrition. Prentices Hall, London pp101-122

[23] Coutherie, H.A. (1989). (Introduction to nutrition), 7th edition, time mirror Mosby college publishers Boston pp: 155-159

[24] Payne, W.J.A. (1990). An introduction to Animal Husbandry in the tropics Longman publishers Singapore pp 92 -110.

[25] Arinanthan, V., Mohan, V.R. & Britoo, A.J. (2003). Chemical composition of certain tribal pulses in south India. *International Journal of Food Science and Nutrition*, 3, 103-107.

[26] Institute of Medicine, Food and Nutrition Board. Dietary reference intake calcium, phosphorus, magnesium Vitamin D and Fluorite, Washington DC. National Academy Press, 1997.

[27] Aletor, V. A. & Adeogun, O.A. (1995). Nutritional and anti-nutrient components of some tropical leafy vegetables. *Food Chemistry* 53, 375-379

[28] Eleck, H. (1976). Introduction to nutrition, 3rd ed. Macmillan company, New York USA pp. 100-120.

[29] Ogungbenle, H.N. & Alere, A.A. (2014). The chemical, fatty acid and sensory evaluation of parinari curatelllifoloa seeds. *Biotechnology Journal*. 4(4), 375-386.

[30] F.A. O. (1968). Food composition table for use in Africa. *Food and Agric. Org*. US Department of Health Education and Welfare. Rome 22.

.