

## Determination of Differences in Nutrient Composition of *Citrullus vulgaris* (Water Melon) Fruits after Plucking

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**Abstract:** The aim of this research was to find out if there were any differences in nutrient composition of *Citrullus vulgaris* (water melon) during storage period after plucking were studied. The moisture content from Zaria and Kaduna (Central Market) was found to be 94.6 and 94.2%, respectively while that from Jaji was 93.4% due to the period of storage. The ash content from Kaduna and Zaria were 0.55 and 0.50, respectively while that from Jaji was 0.50. The dry powder of the whole water melon was fairly rich in lipids (Jaji 0.15%, Zaria 0.10% and Central Market 0.10%) while an acceptable amount of protein was found (Jaji 0.50, Zaria 0.50 and Central market 0.60). Mg, Ca, and Fe were also found in the samples. The result of this work suggest that water melon fruit that cannot be consumed within the shelf life period can be dried, ground into powder and used as animal feed supplement instead of leaving to spoil.

**Key words:** Carbohydrate, Carotenoids, *Citrullus vulgaris*, crude fibre, supplement

### INTRODUCTION

Watermelon belongs to the gourd family called Cucurbitaceae and the genus *Citrullus*. The entire content of watermelon constitutes 96% water that is very sweet and refreshingly tasty. The outer cover of the fruit is relatively hard compared to the pulp. The pulp initially is white and changes colour as it matures to ripening. The ground dried to constant weight watermelon serve, as typical beverage, which could be used in the place of Bournvita, pronto in tea preparation. It starts its production of the fruits by wet season probably from the month of March to May and before the end of the year, the fruit would have completed its maturation. The seeds are flat, having marginal groove on each side near the base and white black margins 10-15 mm long (Alexander, 1981). Reports have it that watermelon fruit is made up of 95% moisture, 0.5% Ash, 0.1% oil, 0.5% fibre 5% Carbohydrate, 250,000 mg vitamin A, 0.04 mg thiamine, 0.03 mg Riboflavin, 8.0 mg Calcium, 9.00 mg Phosphorus, 0.200 mg Iron, 0.6 mg Niacin, 15.0 mg Ascorbic Acid and 6.0 mg potassium (Slavery and White, 1974). Watermelon is rich in carotenoids some of which include lycopene, phytofluene, phytoene, Beta-carotene, lutein. Lycopene make up the majority of the carotenoids in watermelon. The carotenoid content varies depending on the variety of the watermelon. Watermelon seeds are excellent sources of protein (both essential and non-essential amino acids) and oil.

Watermelon diet helps to regulate acid-base equilibrium, removes/lowers the cholesterol level, has strong diuretic tendencies (i.e., increases the amount of

water in the urine) removes excess water from the body, contribute to clearing the kidneys/prevents the formation of bladder stones, kidney stones among others.

Watermelon contains 96% water, and vitamin C and traces of Cholesterol. It also contains thirst quencher and also some anti-inflammatory compounds responsible for asthma, arteriosclerosis, diabetes, colon cancer and arthritis. It contains high levels of lycopene antioxidant that may help the body fight cancer.

Watermelon contains no cholesterol of dietary significance and only a small amount of fat. It is an important source of potassium and many micronutrients (Sundia, 2007).

**Objectives of the research:** Watermelon is a readily perishable fruit. Therefore, it is expected that significant changes in nutrient composition will take place when not consumed immediately after plucking but stored for a period of time before consumption. Therefore, it is necessary to investigate the nutrient composition and the changes that take place during storage.

### MATERIALS AND METHODS

**Sample collection:** This research/benchmark was carried out in the Chemistry/Biochemistry Laboratories of the Department of Applied Sciences Kaduna Polytechnic Nigeria between the months of February to September 2010.

Watermelon fruits were brought from Jaji, Zaria and Kaduna Central market, Kaduna State, Nigeria. The fruits

were sliced/chopped into small sizes using Kitchen knife. Duplicates of the sliced fruits were measured fresh using a digital weighing balance and were oven dried to constant weight at 120°C for 2 h. The percentage weights of the dry matter were recorded for each duplicate of the three samples.

**Determination of moisture content:** The total water component of a sample is described as the moisture content of the food sample. It determines the storage capacity of the sample. Three crucibles were oven dried at 90°C for 30 min and transferred into desiccators to cool. After cooling, 5 g of each of the samples were weighed in the crucible and oven dried at 110°C to a constant weight.

The percentage content of each sample was then calculated as follows:

$$\text{Moisture content (\%)} = \frac{W^3 - W_1}{W^2 - W_1} \times 100$$

where;

$W_1$  = Weight of Crucible

$W_2$  = Weight of Crucible and sample before drying

$W_3$  = Weight of Crucible and sample after drying

**Determination of ash content:** The ash of a Biological material is an analytical term for the organic residue that remains after organic matter has been burnt off. The crucibles were dried in an oven at 90°C for 30 min, and were transferred into the desiccators to cool and weighed, 5 g of each of the samples were weighed into the crucible and heated in a muffle furnace set at 500°C for 2 h after which the crucibles were transferred into desiccators to cool and weighed. The percentage ash was then calculated as follows:

$$\text{Crude Ash (\%)} = \frac{W_3 - W_1}{W_2 - W_1} \times 100$$

where;

$W_1$  = Weight of Crucible

$W_2$  = Weight of Crucible and Sample before ashing

$W_3$  = Weight of Crucible and Sample after ashing

**Determination of crude fat:** The lipid content of each sample was extracted by soxhlet with the use of an extraction apparatus. Each thimble used for the extraction was weighed, labeled before 10 g of the powdered sample was transferred into the thimbles.

The weight of the thimble plus the sample then were recorded, and the apparatus filled with 250 cm<sup>3</sup> petroleum ether. The top of the condenser were then plugged with cotton wool and cold water from the tap was circulated through the condenser. This apparatus were then heated

gently and the extraction allowed to continue until the solvent around each thimble became colourless after 4 h indicating the end of the extraction. The thimbles were then removed from the apparatus and the cotton wool removed before they were dried to constant weight in an oven set at 70°C, the thimbles were cooled and then re weighed. This was repeated for each of the sample. The lipid content of each content was calculated as follows using the formula:

$$\text{Crude fat (\%)} = \frac{W_1 - W_2}{W_3} \times 100$$

where,

$W_1$  = Weight of the thimble plus dried sample before extraction

$W_2$  = Weight of thimble plus residue after extraction

$W_3$  = Weight of dried sample used in grams

**Determination of crude fibre:** Crude Fibre represents the organic residue left behind after the material has been treated under standardized condition with petroleum ether boiling dilute sulfuric acid, boiling dilute sodium hydroxide solution and dilute hydrofluoric acid.

A soxhlet apparatus was used to extract fat from 10 g of grounded sample, 100 cm<sup>3</sup> of boiled 1.3% H<sub>2</sub>SO<sub>4</sub> was poured into the extracted sample and allowed to boil for 30 min. It was filtered; the excess acid was washed down from the sample with warm water, and transferred into a beaker. 100 cm<sup>3</sup> boiled 2.5% NaOH was added and allowed to boil for 30 min. It was filtered, excess NaOH removed from the residue by washing down with warm water. The filter paper containing the residue was folded and placed in a crucible of known weight, and placed in an oven, dried at 105°C for 3 h, the weight was recorded, and dried further for 15 min to constant weight. The crucible was transferred to a furnace and burnt at 500°C to complete ash

$$\text{Crude fibre (\%)} = \frac{W_1 - W_2}{W_3} \times 100$$

where,

$W_1$  = Weight of Residue + Crucible before ashing

$W_2$  = Weight of residue + crucible after ashing

$W_3$  = Weight of dried sample

**Determination of vitamin C:** Watermelon from the three different sources 100 g were cut into small pieces and grounded with a mortar and pestle. 10 cm<sup>3</sup> of distilled water were added several times, and decanted into a 100 mL volumetric flask. The grounded fruit pulp was strained through a cheese cloth, filtrate were collected and washed in volumetric flask. The extracted solution was made up to 100 mL with distilled water. 20 mL aliquot of

the sample solution were pipette into a 250 mL conical flask, 150 mL distilled water and 1 mL starch solution were added.

The sample was titrated with 0.005 Miodine solution. The end point of the titration was identified as the first permanent trace of a dark blue-black colour due to the starch-iodine complex.

The titrations were repeated 2 times with further aliquot of sample solution until a constant result obtained.

**Determination of crude protein:** This analysis was carried out using the distillation MicroKjedahl methods described by Oyeleke (1984). This process involves, digestion, distillation and titration. Powdered watermelon (100 mg) was weighed into Micro Kjedadahl flask for digestion, 0.04 (achip) of a mixed catalyst (from a mixture of 1 g of  $\text{CuSO}_4$ , 8 g  $\text{K}_2\text{SO}_4$  and 1 g selenium dioxide) with a spatula was added to the samples), along with 5 mL of Nitrogen free concentrated sulphuric acid.

This was heated gently on a digestion stand until fumes of sulphuric acid were freely evolved. Blank solution was prepared by heating 2 mL of concentrated sulphuric acid and mixed catalyst without any sample in the digestion flask. A Markham distillation apparatus was used for the distillation of this digest. The apparatus was steamed for 10 min before use. The digest in the digestion flask was washed out twice into the distillation flask followed by addition of 2 mL of distilled water and 10 mL 40% NaOH. The ammonia that was liberated from the digest was condensed in the condenser of the apparatus and collected in 25 mL beaker containing 5 mL 2% Boric acid plus 2 drips of mixed indicators (a mixture of 6ml methylred 0.16% in 95% alcohol, 12 mL Bromo-cresol green (0.04% in water) and 6 mL of 95% alcohol) The tip of the condenser was set up to touch the surface of the solution in the beaker and the position was maintained throughout the distillation period to arrest any escape of ammonia. The distillation was continued till the 25 mL mark on the beaker was reached. After distillation of each sample, the apparatus was washed thoroughly with distilled water before the next sample was introduced into it.

The distillate collected was titrated against 0.02 N HCl solution until a faint pink colour was obtained. The procedure was repeated for each sample. Percentage nitrogen content of each sample was calculated using:

$$= \frac{(A - B) N \times 14.001}{W} \times 100$$

where,

A = Quantity of hydrochloric acid used to neutralize test sample

B = Quantity of hydrochloric acid used to neutralize blank

N = Normality of hydrochloric acid (0.02N)

N = Weight of sample taken in mg

The percentage of protein content of each sample was calculated as follows:

$$\text{Protein (\%)} = \text{Nitrogen (\%)} \times \text{Conversion factor (6.25)}$$

**Determination of mineral elements:** The analytical method employed was that of Atomic Absorption Spectrophotometry (A.A.S). The technique is a very sensitive one, in which the absorption of radiant energy by the atoms of the metal in question is determined. Here, a solution of the element of interest is aspirated into the flame where the bulk of the atoms remain in the ground state while only 1% are excited to higher electronic state by absorbing some of the radiant energy from a characteristic wavelength hollow cathode lamp which is passed through the flame. Decrease in radiation is then measured using a monochromator and a detector system. The extent of absorption depends on the number of atoms in the ground state and the decrease in intensity is related to the concentration of the element in solution.

The ashed sample was digested in 50 mL distilled water, 20 mL Nitric acid ( $\text{HNO}_3$ ) was added then the mixture was heated to dryness on an electric heating mantle, allowed to cool, 40 mL distilled water added and filtered. The filtrate was made up to 100 mL with distilled water until a clear solution was formed.

## RESULTS AND DISCUSSION

Moisture content of a food sample is the total water component of the food sample. It is used to determine the quality of food sample. From Table 1, the moisture content of the fruits from Jaji was 93.4%, Zaria 94.6% and Central Market Kaduna 94.2%. The differences in values were not significant because all the fruits were still fresh when purchased from the market. Moisture content influences the activities of microorganisms during storage. The higher the moisture content, the more susceptible the sample will be to microbial attack.

The Ash content of a biological material is the organic residue that remains after organic matter has been burnt. From Table 1, the ash content of the fruits from Jaji, Zaria and Central market were 0.55, 0.50 and 0.50% which didn't show any significant difference. The husk from the seeds is the major contributor to the ash content; the supplement can therefore provide minerals to meet the demand of animals taking the feed. The lipid, protein, Carbohydrate, Vitamin C, Iron, magnesium and Calcium from Table 1 and 2 didn't show any significant differences.

Watermelon has many nutritional values which could be beneficial to the body; the difference in nutrient

Table 1: Nutritional content of water melon fruit

Parameters analyzed	Sample 1 (Jaji) (%)	Sample 2 (Zaria) (%)	Sample 3 (Central market) (%)
Moisture content	93.4	94.6	94.2
Ash content	0.55	0.50	0.50
Fat content	0.15	0.10	0.10
Crude fibre	0.40	0.30	0.30
Crude protein	0.50	0.50	0.60
Carbohydrate	5.00	4.00	4.30
Vitamin C	8.80	8.40	9.70

Table 2: Showing the mineral element content

Elements analyzed	Sample 1 (Jaji) (mg)	Sample 2 (Zaria) (mg)	Sample 3 (Central market) (mg)
Iron	0.18	0.33	0.32
Magnesium	34.93	38.06	38.87
Calcium	0.71	0.71	0.62

composition was due to the period of storage. Sequel to this observation, dry watermelon powder could be used as a good animal feed supplement.

### CONCLUSION

Watermelon has many nutritional values in the body, the differences in nutrient composition of the pulp/fruit was due to the period of storage. Sequel to this observation, dry watermelon powder could be used as a good animal feed supplement. This is because the whole

fruit dry powder is fairly rich in lipid and has an acceptable amount of protein that has been derived from the pulp. Moreover, the sugar from the pulp gives a good taste to the powder making it acceptable for animal consumption.

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