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PROXIMATE COMPOSITION OF RIND AND SEED OF WATERMELON (*Citrullus lanatus L)*

Abdulazeez A[1], Abdullahi U[2], Audu S.S[2], Ibrahim I.L[1], Kwokwu S.I[2], Gimba A[1], Umaru M.T[1], Babatunde J[4], and Uthman A[3]

[1]Department of Chemistry, Ibrahim Badamasi Babangida University, Lapai, Nigeria.
[2]Department of Chemistry, Nasarawa State University, Nasarawa, Nigeria.
[3]Department of Biochemistry, Ibrahim Badamasi Babangida University, Lapai, Nigeria.
[4]Department of Food Science and Technology, Ibrahim Badamasi Babangida University, Lapai, Nigeria.

ABSTRACT: *Citrullus lanatus belongs to the Cucurbitaceae family and consists of four species are C. locynthis, C. ecirrhosus, C. lanatus and C. rehmii. Water melon plant is a trailing hairy annual plant with rough angular stems and dark green alternate leaves carried on fairly long petioles. Water are monoecious and unisexual with pale yellow flowers. The fruit is large and round or oblong with a hard-smooth rind with a size normally ranging from 1.5 to 15 kg. Citrullus lanatus have found to rich in vitamin, antioxidant and minerals. Therefore the aim of this work is to determine Proximate Composition of the rind and seed of watermelon Citrullus lanatus l. four samples of Citrullus lanatus were collected, identified as Ibrahim Badamasi Babangida University, Lapai, farm, Cecce, Ibrahim Badamasi Babangida University main gate and Gidan gwari farm then were washed with distilled water to remove sand particles, followed by slicing to separate the rind using a clean knife. The rind will be chopped into tiny cubes. The seeds will be carefully removed from the pulp and washed. The rind was sun dried for two days followed by oven drying at 50°C for 24 hours. The dried samples will be ground using ceramic pestle and mortar. Finally, the powdered sample was used for all the analysis other than moisture in which fresh sample was used. The values for ash contents of the proximate constituent of seed and rind of watermelon were found in (cecce, IBBUL, IBBL main gate and Gidan gwari) farm ranged between 6.60±0.03, 5.10±0.06, 5.00±0.10 and 4.90±0.00 while rind are 0.25±0.02, 0.25±0.11, 0.20±0.06 and 0.30±0.01, moisture, crude fibre, crude fat, crude protein and carbohydrate ranged between 10.40±0.05, 11-00±0.04, 10.82±0.04 and 11-00±0.01 while 93.66±0.01, 94..00±0.00, 94.00±0.03 and 92.80±0.06, 42.80±0.01, 45.00±0.03, 44.30±012 and 43.00±0.13 while 0.21±0.00, 0.30±0.05, 0.23±0.02 and 0.26±0.02, 14.40±0.02, 13.90±0.05, 14.12±0.05 and 14.10±0.11 while 0.13±0.03, 0.10±0.02, 0.13±0.02 and 0.15±0.00, 7.70±0-04, 8.00±0.01, 7.08±0.07 and 7.50±0.03 while 0.55±0.01, 0.60±0.03, 0.58±0.00 and 0.80±0.02 and 18.10±0.01, 17.00±0.01, 18.70±0.11 and 19.50±0.03 while 5.22±0.02, 5.50±0.05, 5.86±0.01 and 5-69±0,02. The Citrullus lanatus contains nutrients and mineral elements that are essential for life. These Citrullus lanatus rind may provide considerable medicinal, health and economic benefits if freshly consumed or utilized in food products and also supplementing human nutrition requirements for normal growth and adequate protection against defects associated to the malnutrition.*

KEYWORDS: Proximate Composition, Distillation, Uniform Powder, Malnutrition, Watermelon, Citrullus lanatus L

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INTRODUCTION

All living organisms depend either directly or indirectly on plants for their survival and wellbeing. This is because plants are the primary sources of medicines, food, shelters and other items used by humans every day (Alaekwe and Mojekwu, 2013). Their roots, stems, leaves, flowers, fruits and seeds are the sources of their importance to all living organisms (Amaechi, 2009; Hemingsway, 2004).

The importance of fresh fruits and vegetables in our daily life cannot be over emphasized. Fruits and vegetables offered the most rapid sources of providing adequate supplies of vitamins, minerals and fibre which are essential nutrients for the human health (Anaka *et al.,* 2009; Ngoddy and Ihekoronye, 1985). Some fruits are also known to have ant nutritional factors such as phytate, tannins, trypsin, saponins and mimosine that can diminish the nutrient bioavailability if they are present at high concentrations (Baum, 2007). It has also been reported that these anti-nutritional factors could help in the treatment and prevention of certain important diseases like the anti-carcinogenic activities reported for phytic acid which has been demonstrated both *invivo* and *invitro* (Anaka *et al.,* 2009).

The worsening food crisis and the consequent widespread prevalence of malnutrition in developing and under-developed countries have resulted in high mortality and morbidity rates, especially among infants and children in low-income groups (Enujiugba and Akanbi, 2005). Even when the food is available it is not prepared in the balanced form. A balanced diet needs to contain foods from all the main groups in the correct proportions to provide the body with optimum nutrition. The average nutritional requirements of groups of people are fixed and depend on such measurable characteristics as age, sex, height, weight, degree of activity and rate of growth. Good nutrition requires a satisfactory diet which is capable of supporting the individual consuming it, in a state of good health by providing the desired nutrients in required amounts (Hampl *et al.,* 2007).

Poor diet can have an injurious impact on health, causing deficiency diseases such as scurvy, beriberi and kwashiokor, health-threatening conditions such as obesity, metabolic syndrome, and such common other diseases as cardiovascular diseases, diabetes and osteoporosis. Under-nutrition among pregnant women in developing countries leads to one out of six infants being born with low birth weight, which is a risk factor for neonatal deaths, learning disabilities, mental retardation, poor health and premature death. One out of three people in developing countries is affected by vitamin and mineral deficiencies making them prone to infectious diseases and impaired psycho intellectual development.

Endogenous antioxidants include enzymes such as superoxide dismutase, glutathione peroxidase and catalase, and exogenous antioxidants like glutathione and vitamins A, C and E obtained through dietary or pharmacological means. These antioxidants when used individually, or in combination have the tendency to delay, inhibit or prevent the oxidation of oxidizable substrate by scavenging free radicals and diminishing oxidative stress. The human body has systems responsible for maintaining this balance but in disease conditions or old age, the defense against reactive species is weakened or damaged and the oxidative load increases and this arise the need to get the antioxidants from external sources like vitamins and phytochemicals such as carotenoids and flavonoids (Chawda *et al.,* 2011).

The reliance on starchy roots and tubers and certain cereals as main staples resulted in the consumption of non-nutritious foods. The insufficient availability of nutrient rich diets and the high cost of available ones have prompted an intense research into harnessing the potentials of the lesser known and underutilized crops, which are potentially valuable for human and animal foods to maintain a balance between population and agricultural productivity, particularly in the tropical and sub-tropical areas of the world. For a food to be considered safe for human and animal consumption, its effect on these parameters need to be investigated to understand the nutritional potentials and safety of such foods with a view to determining their acceptability (WHO, 2007).

METHODOLOGY

Sample Collection and Preparation.

The plant sample were collected from Ibrahim Badamasi Babangida University, Lapai, farm, Cecce, Ibrahim Badamasi Babangida University main gate and Gidan gwari farm Lapai, Niger State, Nigeria and was identified at the plant biology in the School of Iife Science by Dr Adebola M.O with Voucher no FUT/PLB/FMCUC/039 of Federal University of Technology, minna as water melon (*Citrullus lanatus).*

The collected samples were washed with distilled water to remove sand particles, followed by slicing to separate the rind (exocarp) from the pulp (mesocarp) using a clean knife. The rind will be chopped into tiny cubes. The seeds will be carefully removed from the pulp and washed. The seeds and the chopped sample will each be transferred into a tray lined with foil and sun dried for two days followed by oven drying at 50°C for 24 hours. The dried samples will be ground using ceramic pestle and mortar, sieved out with 20 mesh sieves, then packed into airtight polyethylene bag and store in a desiccator until required for analysis. Finally, the powdered sample was used for all the analysis other than moisture in which fresh sample was used.

Proximate Analysis

Percentage concentrations of protein, fat, carbohydrate crude fibre, moisture and ash in the rind and seeds of C. *lanatus* will be determine using the AOAC method (1990).

Determination of Moisture Content

The freshly collected sample (2 g) was weighed into a pre-weighed crucible and place in a hot air-drying oven at 105^0C for 24 hours, after which the samples were removed and cooled in a desiccator and then weighed again.

The weight lost was obtained by subtracting the weight of dry sample from the original weight of the sample and the moisture content calculated as in equation below.

$$(\%)\ \text{Moisture content} = \frac{\text{Loss in weight}}{\text{Sample weight}} \times 100$$

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Determination of Ash Content

Dried sample (2g) was weighed into a pre weighed crucible and incinerated in a muffle furnace at 550^0C for six hours. The sample was cooled in a desiccator and weighed. The ash was cooled in a desiccator and weighed.

The ash content was calculated using equation below;

$$(\%)\ \text{Ash} = \frac{\text{Weight of ash}}{\text{Weight of dry sample}} \times 100$$

Determination of Crude Fibre

Ground sample (2 g) was weighed into 500 cm^3 conical flask, 200cm^3 of 10% H_2SO_4 will be added and boiled for thirty minutes and then filtered. The residue was boiled in 200 cm^3 of 10%

NaOH for 30 minutes and filtered again. The residue was dried, weighed and ashed at 600^{0C} for ninety minutes in a furnace. This was finally cooled in a desiccator and weighed.

The percentage crude fibre was calculated using equation below.

$$(\%)\ \text{Crude fibre} = \frac{\text{Loss of weigh on ignition}}{\text{Weight of sample}} \times 100$$

Determination of Crude Lipid

Ground sample (2 g) was weighed into a porous cellulose thimble whose mouth is covered with fat free absorbent cotton wool. Hexane (200 cm^3) was filled into a dried and pre-weighed 250 cm^3 round bottom flask and the covered porous thimble was placed into the extraction chamber and the soxhlet apparatus assembled. The assembled apparatus was placed on a heating mantle, fixed to a clamp on a retort stand and cooled water circulation in the condenser was on. The extraction was carried out by heating at 60^0C for 6 hours after which the thimble was carefully removed. The receiver flask will be transferred to a rotary evaporator where the hexane was removed at 40^0C. The receiver flask containing the crude lipid was oven dried at 105^0C for one hour, cooled in a desiccator and weighed.

The percentage crude lipid content was calculated using equation below;

$$\text{Percentage crude oil lipid} = \frac{\text{Weight of oil extracted}}{\text{Weight of sample}} \times 100$$

Determination of Crude Protein

The Micro-Kjeldahl apparatus was used. The technique will be based on the transformation of protein nitrogen and other nitrogen compounds other than nitrate and nitrite into ammonium sulphate by acid digestion with strong acid usually, Conc. H_2SO_4. The stages involved are:

Sample nitrogen + $H_2SO_4(aq) \longrightarrow (NH_4)_2S0_4(aq.)$

The ammonia present in the digest with the help of sodium hydroxide was distilled out and collected into a receiving flask containing boric acid indicator which changes colour from pink to green.

$(NH_4)_2SO_4(aq) + NaOH(aq) \longrightarrow 2NH_3(g) + N_2O + NaSO_4(aq)$

$NH_3(g) + H_3BO_3(aq) \longrightarrow NH_4^+(aq) + H_2BO_3(aq).$

The nitrogen content was then estimated by titrating the content in the receiving flask with standard acid (H_2SO_4).

$H^+ + H_2BO_3 \longrightarrow H_3BO_3(aq).$

The amount of H^+ consumed in the reaction is equivalent to the amount of nitrogen present in the sample. Although the assumption is not entirely valid, because the protein contained in plant sample in term of nitrogen content is between 13-18%.

Procedure

Two grams of the dried sample was weighed into Kjeldahl digestion flask and a catalyst mixture ($NaSO_4$, $CuSO_4$ and Selenium oxide in 10:5:1 ratio) was added, followed by 10cm^3 of concentrated tetraoxosulphate (vi) acid. The flask was heated at 106°C in the digestion block till

the water is removed and frothing ceased. The heating was continued for four hours until the digest become cleared. After heating, the flask is cooled and diluted to 50 cm^3 with distilled water, filtered into a 100 cm^3 volumetric flask and made up to the mark with distilled water. 10 cm^3 of the aliquot was taken into the digestion flask and 20cm^3 of 45% NaOH solution was added. The content was diluted to 200cm^3 with distilled water and distilled using Micro-kjeldahl

distillation apparatus. The distillate was received into receiver flask containing 10cm^3 boric acid indicator. After the distillation, the distillate was titrated with 0.01M HCl until the colour changes at the end point from green to pink. The blank was also prepared in the same manner without sample added.

The crude protein is then calculated using equation below;

$$\text{Crude protein (\%)} = \frac{TV \times C \times 0.0014 \times V1}{W \times V2} \times 100$$

Where

TV = Titre value of the acid C = Concentration of acid used.

V1 = Volume of the distilled water used for diluting the digest

V2 = Volume of the aliquot used for titration

W = Weight of the sample used F = Protein multiplication factor = 0.0014

Determination of Carbohydrate (By Difference).

The method of James (1995) was used where the total amount of carbohydrate in the sample was obtained by calculation using percentage weight difference. This involved subtracting the

percentage sum of the food nutrients; % crude protein, % crude lipid, % crude fibre, %moisture and % ash from 100% dry weight.

The percentage carbohydrate was calculated using equation below:

Carbohydrate (%) = 100 – (% crude protein + % crude lipid + % crude fibre + % moisture + % ash).

Result of Proximate Analysis of Rind and Seed of Watermelon

Table 1: Proximate Analysis of Watermelon (*Citrullus lanatus L)*

Farms	Sample %	Protein	Lipid	Fibre	Ash	Moiture	CHO
Cecce	Seed	7.70±0.04	14.40±0.02	42.80±0.01	6.60±0.03	10.40±0.05	18.10±0.01
	Rind	0.55±0.01	0.13±0.03	0.21±0.00	0.25±0.02	93.66±0.01	5.22±0.02
IBBUL	Seed	8.00±0.01	13.90±0.05	45.00±0.03	5.10±0.06	11-00±0.04	17.00±0.01
	Rind	0.60±0.03	0.10±0.02	0.30±0.05	0.25±0.11	94..00±0.00	5.50±0.05
BBUL main Gate	Seed	7.08±0.07	14.12±0.05	44.30±012	5.00±0.10	10.82±0.04	18.70±0.11
	Rind	0.58±0.00	0.13±0.02	0.23±0.02	0.20±0.06	94.00±0.03	5.86±0.01
Gidan Gwari	Seed	7.50±0.03	14.10±0.11	43.00±0.13	4.90±0.00	11-00±0.01	19.50±0.03
	Rind	0.80±0.02	0.15±0.00	0.26±0.02	0.30±0.01	92.80±0.06	5-69±0,02

DISCUSSION

Proximate analysis

The result of the proximate constituent of seed and rind of watermelon were found in (cecce, IBBUL, IBBL main gate and Gidan gwari) farm are presented in table 4.1. The values for ash contents of seed were 6.60±0.03, 5.10±0.06, 5.00±0.10 and 4.90±0.00 while rind are 0.25±0.02, 0.25±0.11, 0.20±0.06 and 0.30±0.01, respectively and the value of seed this is an indication of the level of inorganic chemical present in the sample and account for its potency of been attacked by insects (Lee, 2005). The moisture contents were found to be 10.40±0.05, 11-00±0.04, 10.82±0.04 and 11-00±0.01 while 93.66±0.01, 94.00±0.00, 94.00±0.03 and 92.80±0.06, respectively. The high value indicates general increase in the tendency of microbial attack on the watermelon since water is a good medium for microbial growth (Lee, 2005). The crude fibre contents were 42.80±0.01, 45.00±0.03, 44.30±012 and 43.00±0.13 while 0.21±0.00, 0.30±0.05, 0.23±0.02 and 0.26±0.02, respectively. Since fibre value indicates the degree of digestibility of food in animals. This value as compared with the minimum standard 40.00% is corroborated by recommendation of consumption after every meal as it helps in human digestion (Oyeleke *et al*., 2006). Non-starchy vegetables like this

plant are reported to be a very rich source of dietary fibre and therefore are employed in the treatment of diseases such as obesity, high blood pressure, diabetes, cancer and gastrointestinal disorders (Agostoni *et al*., 1995). The crude fat contents in this study were found to be 14.40±0.02, 13.90±0.05, 14.12±0.05 and 14.10±0.11 while 0.13±0.03, 0.10±0.02, 0.13±0.02 and 0.15±0.00. This value accounts for the fact that the plant is recommended for patient with high obesity and arteriosclerosis. These abnormalities are ascribed to high fat content in food consumed by patients (Lee, 2005). The crude protein contents were found to be 7.70±0-04, 8.00±0.01, 7.08±0.07 and 7.50±0.03 while 0.55±0.01, 0.60±0.03, 0.58±0.00 and 0.80±0.02, respectively. These values are not surprising as the plant syrup have always been recommended for patients that are diabetic. The carbohydrate contents in

this study was found to be 18.10±0.01, 17.00±0.01, 18.70±0.11 and 19.50±0.03 while 5.22±0.02, 5.50±0.05, 5.86±0.01 and 5-69±0,02, respectively. This is in-tune with recent studies with respect to chemical content in of Watermelon (*Citrullus lanatus L)* (Lee, 2005). Anthony, (2015). Reported the proximate analyses of the rind and seed showed moisture content (93.65 and 10.92 %), ash (5.03 and 3.00 %), crude fat (0.13 and 21.54 %), crude fibre (0.23 and 26.10 %), crude protein (0.53 and 19.45 %) and carbohydrate (5.22 and 16.98 %).

CONCLUSION

The result shows that the seed is a better source for the proximate, minerals and amino acids the preponderance of these nutrients in the samples, especially in that of the seed, may be of nutritional and physiological importance. The rind is good source of antioxidant, flavonoid and phenolic. These watermelon rinds may provide considerable medicinal, health and economic benefits if freshly consumed or utilized in food products.

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