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Antioxidant Assay and Flavonoids of Rind and Seed of Citrullus *lanatusl linn* (Water Melon*)*

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Abstract *This work was designed to determine the level of antioxidant and flavonoids in rind and seed of Citrullus lanatus L. Samples were collected from various farm including Cecce, Ibrahim Badamasi Babangida University main gate and Gidan gwari farm then were. Results obtained indicated flavonoid concentration in the rind as (174.41±0.02, 174.34±0.12, 173.78±0.00 and 174.56±0.00) mg/100g while those of seed were (156.79±0.01, 151.41±0.00, 154.12±0.04 and 153.00±0.02)mg/100g. However, antioxidant assay indicated the following concentration for rind samples collected from different farms (26.04±0.01, 23.81±0.02, 25.39±0.16 and 26.31±0.15)%DPPH while in the seed, the assay gave (36.89±0.41, 38.19±0.03, 35.24±0.02 and 38.73±0.21) %DPPH. Therefore, 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 : *Citrullus lanatus* L. flavonoid, antioxidant, level of concentration

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1.0 Introduction

All living organisms depend either directly or indirectly on plants for their survival and wellbeing because plants are the primary sources of medicines, food, shelters and other items needed in our daily life (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

vitamins, minerals and fibre which are essential nutrients for human health (Anaka *et al.,* 2009; Ngoddy and Ihekoronye, 1985). Some fruits are also known anti-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 some diseases like the anti-carcinogenic activities reported for phytic acid which has been successfully confirmed for 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 nutritional needs 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 kwashiorkor, 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) and (Abdulazeez *et al.,* 2020). The reliance on starchy roots and tubers and certain cereals as main staples through the consumption of poor-quality 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 in order to maintain a balance between population and agricultural productivity. 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). Also, much has been done on proximate analysis of most food but literature is relatively scarcity on other components of food such as flavonoid and antioxidant. Hence the aim of the present study is to investigate level of antioxidant and flavonoid of rind and seed of *Citrullus lanatus* Linn

2.0 Materials and Methods

2.1 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 department in the School of Life 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 was

chopped into tiny cubes while the seeds were carefully removed from the pulp and washed. The seeds and the chopped sample were 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 were ground using ceramic pestle and mortar, sieved out with 20 mesh sieves, then packed into airtight polyethylene bag and store in a desiccator prior to analysis.

2.1.1 DPPH assay

The analysis of the DPPH radical scavenging activity of the plant extracts was performed according to the method described by Koleva *et al*., 2002. A 0.5 ml aliquot of the extract (100 mg/ml) and 0.3 ml of DPPH (0.5 mM) were added to 3 ml of methanol. Ascorbic acid was used as a standard for the investigation of the antiradical activity and was prepared in a similar manner. The reaction mixtures were shaken vigorously for 30 s in a Vortex apparatus and allowed to stand in the dark at room temperature for 30 minutes. The absorbance was measured at 517 nm. The blank was prepared by mixing 0.5 mL of the ascorbic acid with 3.3 ml of methanol. Similarly, the control solution was prepared by mixing 3.5 mL of methanol and 0.3 mL of DPPH radical solution. The percentage of scavenging activity (X %) was calculated according to equation 1:

$$X\% = \left(\frac{Absorbance\ of\ the\ sample - Absorbance\ of\ the\ blank}{Absorbance\ of\ the\ control}\right) x\ 100 \qquad (1)$$

2.1.2 Total Flavonoid Content Assay

The level of flavonoid content in the seed extract was determined spectrophotometrically using the method described by Ordónez *et al*., (2006). 0.05 mg/L of Rutin stock solution was prepared in methanol. Serial dilution was done to concentration of 50, 25, 12.5, 6.25, 3.13, 1.56 and 0.78 mg/L. 1 mL of 2% $AlCl_3$ in methanol was separately added to methanol solution of the extract (1 mL of 0.05 mg/mL) and 1 ml of the stock solution. The mixture was incubated at room temperature for 1 hour. The absorbance was measured at 415 nm, using UV/VIS spectrometer. The sample, blank (methanol) and standards were prepared in triplicate for each analysis and the mean value of absorbance obtained and expressed in terms of rutin equivalents (mg of RU/g of extract). **3.0 Result and Discussion**

Table 1 present concentrations of antioxidant and flavonoid in rind and seed of water melon. It is evident from results presented in Table 1 that the flavonoid content in the watermelon seeds and rind of water melon harvested from (Cecce, IBBUL, IBBL main gate and Gidan gwari) farm (156.79±0.01, 151.41±0.00,154.12±0.04 and 153.00±0.02) mg/100g respectively while concentrations of flavonoids were (174.41±0.02,

Table 1 : Antioxidant assay and Flavonoids content of Water melon (*Citrullus lanatus L)*

Source (Farm)	Sample	Antioxidant assay (%DPPH)	Flavonoid Content (mg/100g)
Cecce	Seed	26.04±0.01	156.79±0.01
	Rind	36.89±0.41	174.41±0.02
IBBUL	Seed	23.81±0.02	151.41±0.00
	Rind	38.19±0.03	174.34±0.12
IBBUL main Gate	Seed	25.39±0.16	154.12±0.04
	Rind	35.24±0.02	173.78±0.00
Gidan gwari	Seed	26.31 ±0.15	153.00±0.00
	Rind	38.73 ± 0.27	174.56 ± 0.00

174.34±0.12, 173.78±0.00 and 174.56±0.00) mg/100g respectively. Osen and Okoye, (2013) reported total flavonoids content as rinds and seeds of water melon as 0.00785 mg/mL and (0.00824 mg/mL respectively. This value is lower than those obtained in this study, indicating that flavonoid concentration in water melon may vary significant based on source, species of the plant. Soil and environmental conditions Flavonoids are the most common group of polyphenolic compounds that are found ubiquitously in plants. They are needed by plants for normal growth, development and defense against infection and injury. These plant secondary metabolites also show anti-allergic, anti-inflammatory, anti- microbial and anticancer activities (Khatiwora *et al.*,2010). They are also regarded as a class of secondary plant metabolites with significant antioxidant and chelating properties (Heim *et al.*2002).

Antioxidant activity in the watermelon seeds and rind in Table 1are (26.04±0.01, 23.81±0.02, 25.39±0.16 and 26.31±0.15) % DPPH respectively while concentration of antioxidant rind was (36.89±0.41, 38.19±0.03, 35.24±0.02 and 38.73±0.21) %DPPH, respectively. Osen and Okoye, (2013) reported for the percentage inhibition of seeds and rinds indicate 56.93% (seeds) and 65.22% (rinds). Rahman *et al.* (2013) stated that high scavenging activity than other phytochemicals. Tabiri *et al.* (2016) reported 94.46, 70.06 and 59.88% scavenging ability of watermelons cultivar Crimson sweet, Black diamond and Charleston gray, correspondingly. From the result of seed and rind from Gidan gwari farm showed the highest percentage DPPH scavenging ability with 26.31±0.15 and 38.73±0.21. This was followed by Cecce with 26.04±0.01 and 36.89±0.41. Among the four farms, Samples from Cecce showed the highest antioxidant activity and also showed a high flavonoid content for both seed and rind. Antioxidant are known to quench free radicals, thus are essential components of anti-ageing formulation. Antioxidants also offer protection against damage to tissues dues to the detrimental effects of environment and other agents and encourage collagen growth by combating harmful effects of free radicals. Consumption of the seeds may reduce the chances of getting cardiovascular diseases and cancers due to the amount of antioxidant activity found in the seeds and rinds (Betty *et al* 2016).

4.0 Conclusion

Seeds and rinds of water melon contain both flavonoid and antioxidant. However, concentration of flavonoid and antioxidant in the rind is higher than the concentration in the seed.

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