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Research Note

Phytochemical and proximate compositions of *Annona senegalensis* flower

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Macro and micronutrients plays a vital role in many metabolic and physiological activities of human body including synthesis of enzymes, monitored growths, and boosts immune and reproductive systems. The *Annona senegalensis* flowers were obtained from Zuru and Aliero L.G.As farms and subjected to phytochemical and proximate screening using Association of official Analytical Chemists (AOAC) methods. From the results obtained, phytochemical screening shows the presences of flavonoid, saponin, glycosides, alkaloids, cardiac glycoside, steroids and volatile oil while tannins, balsams and anthraquinnes were not detected. The proximate composition revealed the presences of carbohydrate (76.96 ± 0.34), crude protein (8.37 ± 013), moisture contents (7.67 ± 0.76), ash (7.33 ± 0.29), lipid (4.17 ± 0.29) and fiber (3.17) with different values contents. While the results of minerals analyzed showed that, potassium 38.00 ± 1.00 and sodium 36.33 ± 1.53 had the highest values followed by magnesium 3.77 ± 0.15, nitrogen 1.34 ± 0.02, calcium 1.23 ± 0.12 and phosphorus with less value of 1.34 ± 0.02. All these values obtained showed significant increase in micro and macronutrients contents of *Annona senegalensis* flowers at P>0.05. It was concluded that, *Annona senegalensis* flowers contains some important elements that have the ability to improve human body, boost food security, foster rural development and support sustainable land care and improve on socioeconomic development in the research areas and Kebbi state when properly utilized.

Key words: *Annona senegalensis, flowers, phytochemical, nutrients*

INTRODUCTION

Nature has made plants useful throughout the existence of man whereby man used plants for food, clothing, fuel, medicine and shelter, which become necessity for life on the earth. Human suffers from malnutrition due to lack of diets food and God provides the solution through the uses of plants species. In order to have a healthy population that can provide development, the relation between food, nutrition and health should be emphases all over the world (Atasie et al., 2009). This can be achieve through exploration of our local edible plant species, since human population in Nigeria is in increasing rate and other developing countries are depending on edible indigenous plants so as to meet up with shortage in macro and microelements that becomes critical issue in African (Achu et al., 2005).

Annona senegalensis belongs to the family Annonaceae called "Gwandan daaji" by Hausa people and African custard-apple/wild sour in English is distributed as single plant in almost part of Kebbi state or Savanna regions. It is a shrub or sometimes grows to assize of a small tree 2-6 m tall but when the environmental condition is favorable it may reach above 6m. The bark is smooth, silver grey or grey-brown and leaves

are alternate, simple, oblong, ovate or elliptic, green to bluish green in color. This plant produce both flowers and fruits. The fruit is formed by many fused, freshly and ovate carpels resembling egg in shape and usually which at early stage is dark in color as it ripens become yellow with pleasant taste. Flowers are up to 3 cm in diameter existing on the leaf axils (Coates Palgrve, 2002).

The flower of *Annona senegalensis* have a fragrant smell and used in soup that has a good flavor which is added as to spices that helps garnish meal. However, it has many different value of elements such as vitamin "C", quality stable oil and the novel flavor of its flower and fruits (Ellof, 2001). Traditionally, in Kebbi state, *A. senegalensis* has multiple uses as plant species used to cure many different diseases e.g. kwashiorkor, marasmus, whitlow, pneumonia, cancer and snake bite (Keta, 2016). This indigenous plant species helps both rural and urban people by providing nutrition which is lacking in many of our children and elderly aged people especially those living in rural communities. Annonaceae family had been utilized by communities leaving nearest to the forest where this plant species is commonly found (Ambrosone, 2009). Vulnerability of women to malnutrition is highly pronounced during conditions of pregnancy and lactation-periods characterized with increased nutritional needs as a result of induced stress. These nutritional needs includes the needs for energy, protein, vitamins and minerals. However, these essential mineral elements such as; iron, calcium, phosphorus, iodine, zinc and magnesium, some of which are often deficient in the diet of many Nigerians more especially from lower income are sufficiently obtained in *A senegalensis*. However, due to increase in population and high demand in nourish foods that contains macro and micronutrients, there is need for plant proteins and plants nutrients in order to reduce and meet the malnutrition problem among the inhabitants of Kebbi state. This study aimed to evaluate the nutritional contents of *Annona senegalensis* flower so as to improve on the livelihood of people in Kebbi State and Nigeria at large by improving on finding new sources of plants protein and nutrient elements that would hence the health of human beings more especially in research area and Nigeria.

MATERIALS AND METHODS

Sample collection

Fresh flowers part from *Annona senegalensis* were collected from Aliero and Zuru Local Government Areas in Kebbi State, Nigeria.

Figure 1. *Annona senegelensis* flower

The plant was identified by a taxonomist (Prof. Dharmendra Singh), Department of Plant Science and Biotechnology, Kebbi state University of Science and Technology, Aliero and voucher number was issued as KSUSTA/DPSB/509. The flowers were collected from the trees at fields using simple sampling Technique (Keta et al., 2019). The flowers were collected in a sterilized polythene bags and taken to Department of Plant Science and Biotechnology Laboratory, KSUSTA for further analysis.

Preparation of plant material

Fresh flowers collected were washed under running tap water to eliminate dust and other foreign particles and shade-dried for 5 days at room temperature 28 ± 8^{o}C. This was further pulverized to fine powder and 500gram of the pulverized powder was collected in a sterilized plastic container, stored in cool dry place until analysis. About 300 grams of the powdered sample was measured using a weighing balance and subjected to aqueous and organic solvent extraction for analysis.

Preparation of plant extracts

One hundred grams (100g) dried powdered samples was extracted in two stages. The first stage was used for quantitative analysis and in the second stage, fifty grams (50g) of dried powdered flowers was dissolved in sterile water (150ml) at room temperature and left overnight to dissolve and this was then filtered using sterile filter paper (Whatman NO1) as described by Himal et al. (2008).

Phytochemical screening

The phytochemical analysis of plant extracts was carried out according to standard qualitative methods (AOAC, 2000).

Proximate analysis and mineral compositions

Determination of moisture content

Two (2g) grams of the samples was weighed and in a hot dry oven at 105^{o}C for 24 hours, and cooled in desiccators. It was then returned into the oven and dried further for another 24 hours under 105^{o}C and reweighed until the weight was constant obtained (AOAC, 2000). The weight of moisture lost was calculated using formular as;

$$\% \text{ Moisture} = \frac{W_1 - W_2}{W_1 - W_2} \times 100$$

Where; W_1 = weight of the sample
W_2 = weight of the dry sample
W_0 = weight of empty flask.

Determination of crude protein

The sample grams (0.5g) were weighed into 500 ml Macro Kjeldahl flasks 20mls selenium tablets was used as catalyst. The contents in the flask were digested into the cupboard until the solution became clear. The digest was allowed to cool and column made up to 50ml in a volumetric flask. Five (5m) of aliquot was taken in receiver of distillation apparatus. 10ml of 45% solution of sodium hydroxide was added till the blue color was formed. Released ammonia was collected in 10ml of 2% boric acid solution. Faith reddish color of boric acid

started changing was allowed to distil till the original volume of 10 ml boric acid became 30ml. the green color boric acid solution was back titrated with 0.01 ml sulphuric acid and the volume used was noted (AOAC, 2000). Expression below;

$$\% \text{ protein} = \frac{(\text{Titre value} \times 0.01 = 0.014 \times 50 \times 100)}{0.5\text{g} \times 10\text{ml}}$$

Total crude protein percentage = total nitrogen percentage x 6.25

Determination of percentage lipid

Two (2g) grams of sample was weighed into a thimble of soxlet apparatus. The sample was then extracted for 6 hours with petroleum ether. The receiver flask was dried the oven at 103^0C for 1 hour to remove any ether from the flask. The flask now contains only the crude fat (lipid)). The flask was then cooled in the desiccators and weighed (AOAC, 2000). Formula;

$$\text{Weight of ether (oil)} = \frac{W_2 - W_1}{W_0 - W_1} \times 100$$

Weight of empty porous thimble = W_0
Weight of thimble + ground sample = W_1
Weight of empty extraction flask = W_2

Determination of ash contents

Two (2g) of the sample was weighed and a muffle furnace was used at 500^0C for 3 hours. The sample was cooled in the desiccators and was weight again until the dried ash was obtained (AOAC, 2000). Expression as;

$$\% \text{ Ash} = \frac{W_2 - W_0}{W_1 - W_0} \times 100$$

Determination of crude fiber

Two (2g) grams of the group sample were weighed into a thimble. The mouth of the thimble was plugged with fat free absorbent cotton wool; a dry receiver flask was weighed the thimble was collected with soxhlet extraction system. The extraction unit was assembled and filled with petroleum ether. The apparatus was placed on heating mantles 60^0C, fixed by champs to reshot stand, and cold water circulation was started in the sample from soxhlet. The receiver flask finally dried in the oven 105^0C for 1hour to remove any further ether in the flask (AOAC, 2000).

$$\%\text{crude fibre} = \frac{W_1 - W_2}{W_0 - W_1} \times 100$$

Determination of carbohydrate

Forty-five (45mg) milligrams of each sample was diluted to 450mlof distilled water. One milliliter of the diluted filtrate was pipetted into different test tubes and 1ml of water was pipetted into a test tube as a blank and 1ml of glucose into a test tube as a standard. To each of the test tubes, five (5ml) of freshly prepared 0.10% Anthrone reagent was added, stoppered and mixed thoroughly by gently shaking. Each tube was labelled and placed in a test tubes rack both the test tubes and the rack were placed in water bath 30°C for 12 min, removed and was then allowed to cool down to room temperature. The absorbance of the samples and standard were read from a spectrophotometer machine at 630 nm against the blank. The presence of green color which shows the presence of glucose was stable for about 2hrs (AOAC, 2000). Total available carbohydrates as percentage glucose were calculated using the formula below:

$$\text{Glucose (\%)} = \frac{25A_1 \times 100}{X \times A_2}$$

RESULTS AND DISCUSSION

The results of phytochemical screening revealed the presences of steroids, volatile oils and alkaloids in higher amounts. Flavonoid, saponin, glycoside, cardiac glycosides were obtained in moderate amounts while saponin glycosides, balsams and anthraquines were not detected as seen in Table 1. The results of the proximate composition analyzed showed that, crude protein (8.37 ± 0.13), carbohydrate (76.96 ± 0.34), ash (7.33 ± 0.29), lipid (4.17 ± 0.29) had the highest values and fiber (3.17 ± 0.29) had least value as presented in Table 2 respectively. However, Table 3 revealed the presences of Ca, P, Mg, Na and K as Potassium had the highest value (38.00 ± 1.00), and lowest value was observed in Phosphorus (0.35 ± 0.01). The standard deviation was employed in the analysis of the mineral contents and the statistical analysis showed significant differences ($P < 0.05$) of Na, K, Ca, Mg, and P (Table 3).

Table 1. Qualitative Phytochemical Screening of *Annona senegalensis* flower

Phytochemical	Screening Test
Flavonoids	++
Tannins	-
Saponin	++
Glycosides	++
Alkaloids	+++
Cardia glycosides	++
Steroids (Salkows)	+++
Saponin glycosides	-
Balsams	-
Anthraquines	-
Volatile oils	+++

Key: +++ = Present in high amount
++ = Present in moderate amount
- = Not detected

Phytochemical screening of *Annona senegalensis* flower obtained in this study revealed the presence of several secondary substances such as; flavonoids, saponin, glycosides, alkaloids, cardia glycosides, steroids and volatile oils while tannin, saponin glycosides balsams and anthraquines were not detected. These findings are in line with the work of many researchers which were conducted on different parts of *Annona senegalensis* plant (Ngamo et al*.,* 2007; Yasi et al., 2010; Mpiana et al*.,* 2012; Afolabi and Afolabi, 2013; Ijaiya et al. 2014 & Jada et al., 2015). However, there were differences

in steroids values which showed to be present in their findings but not detected in our study, however was detected in the study conducted by Ijaiya et al. (2014). These could be due to the methods used, chemicals or otherwise part of the sample (plant) used and ecological differences or environmental factors. Some of these phytochemicals are believed to be agents that protect human cells from damage which may be lead to cancer.

Table 2. Proximate composition of *Annona senegalensis* flower

Parameters	% Content (Mg/100g)
Moisture	7.67 ± 0.76
Ash	7.33 ± 0.29
Crude protein	8.37 ± 0.13
Carbohydrate	76.96 ± 0.34
Lipid	4.17 ± 0.29
Fiber	3.17 ± 0.29

Values are represented as mean ± standard deviation.

Table 3. Minerals element of *Annona senegalensis* flower

Parameters	% Content (Mg/100g)
Sodium	36.33 ± 1.53
Potassium	38.00 ± 1.00
Magnesium	3.77 ± 0.15
Phosphorus	0.35 ± 0.01
Calcium	1.23 ± 0.12
Nitrogen	1.34 ± 0.02

Values are represented as mean ± standard deviation.

The proximate analysis results reveals the presence of moisture 7.67 ± 0.76, carbohydrate 76.96 ± 0.34, ash 7.33 ± 0.29, crude protein 8.37 ± 0.13, crude lipid 4.17 ± 0.29 and crude fiber 3.17 ± 0.29. This findings was similar with the findings of Tijjani et al. (2013) with slights difference in values. The disagreement in values could be due to the differences in sample as flowers of *Annona senegelensis* were used. Moreover, location, nature of the soil where this plant was found, methods used and/or the reagents used during practical may contributes in differences in values obtained. Macronutrients obtained provides energy to human that are required in large amounts in order to maintain body functions and carryout daily life activities**.**

According to Hill et al. (2000), macro-element are powerful compounds that builds and repair body tissues, from hair and finger nails to muscles and in addition to maintaining the body's structure, proteins speed up chemical reactions in the body, serves as chemical messengers, fight infection and transport oxygen from the lungs to the body tissues. Although protein provides four calories of energy per gram, the body uses protein for energy source (Hill et al., 2000). From the results obtained, flowers of *Annona senegalensis* showed good source of microelements that play a vital role in the human body metabolism. The analyses conducted on the mineral compositions revealed that the flowers are good source of both macro and micronutrients (Tables 2 & 3). This coincided with the findings of Yisa et al. (2010), that found *A. senegalensis* have many minerals such as potassium 0.47,calcium 1.35, magnesium 0.24, zinc 0.48 and copper 0.29 mg/g which gives it paramount important as good source of nutrient elements. However, the values obtained in this study were higher compared than that reported by Yisa et al. (2010). The nutritional properties of *Annona senegalensis* flowers showed that the nutrients are safer and would provide human diet with good source of the needed nutrients in the body for good and effective metabolism. The flowers have high nutritional values and good ratios of saturated and unsaturated fatty acids which makes it very effective in the body metabolism (Zhu, 1996). Due to its rich source of protein, oils, magnesium, phosphorus and potassium, more values and important are attached to the flower which makes it important African diet (Lawal, 1999). The flower of *Annona senegalensis* showed to had (1.23 ± 0.12) as source of calcium (Table 3). This is still not bad for the body since calcium combines with other mineral components such as phosphorous and potassium in bones and teeth formation. Phosphorus is a component of bone and ATP phospholipids and genetic material. The RDA for adolescents is 1250 mg / day, to support growth; adults only need 7000mg/day. The *Annona senegalensis* flower analyzed showed appreciable amount of phosphorus which is associated with good calcium content which could help in growth and maintenance of body cells. For good and maximum calcium and phosphorus utilization, calcium to phosphorus ratio should be close in ratio (Ambrose, 2009).

CONCLUSION

Deficiency of both micro and macronutrients is the key factors effects healthy sectors of every nation globally. Findings another ways that provide good nutrients is of paramount nowadays. The results from the analysis so far conducted in this research revealed that the flowers of *Annona senegalensis* are potentially good sources of both micro and macronutrients present in higher contents. The analyses of the flower showed that nutrients molar ratio indicates that the flowers are relatively safe for consumption and would help in body growth and develop and regulates proper metabolic activity in the body when properly utilized.

AUTHOR CONTRIBUTIONS

This research work was done in collaboration with both authors in other to provide another sources of nutrients using flowers. Manuscript was compiled by Mubarak Aminu and both authors read and approved the final manuscript.

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COMPETING INTERESTS

The authors have no conflict of interests.

ETHICS APPROVAL

Not applicable

REFERENCES

Achu, M. B., Fokou, E., Tchiégang, C., Fotso, M., & Tchouanguep, F. M. (2005). Nutritive value of some Cucurbitaceae oilseeds from different regions in Cameroon. *African Journal of Biotechnology*, *4*(11).

Afolabi, F., & Afolabi, O. J. (2013). Phytochemical Constituents of some medicinal plants in South West, Nigeria. *IOSR Journal of Applied Chemistry*, *4*(1), 76-78.

Ambrose, C., Leoncini E. & Malaguti, M. (2009). Modulation of phase II enzymes by Sulforaphane: implications for its cardioprotective potential. *Journal of Agric*, *57*(12), 5615 22.

Association of Analytical Chemists. (2000). Official methods of Analysis. Washington, D.C, USA; 450

Atasie, V.N., Akinlanmi, T.F. & Ojiodu, C.C. (2009). Proximate Analysis and physic-chemical properties of Groundnut. *Pakistan Journal of Nutrition*, *8*(2), 194-197

Coates Palgrave, K. (2002). Trees of Southern Africa. Struik Publishers, Cape Town.

Ellof, H., Shang, X. & Wu, H. (2001). Combination treatment with resveratrol and sulforaphaneinduces apoptosis in human U251 glioma cells, *35*(1),152-161.

Himal, E., Nevo, E., Solowey, E. & Bishayee, A. (2008). Chemical extraction: a review. *Journal of Plant Medical*. *79*, 713-722.

Ijaiya, I., Arzika, S. & Abdulkadir M. (2014) Extraction and Phytochemical Screening of the Root and Leave of *Annona senegalesis* (Wild Custad Apple). *Academic Journal of Interdisciplinary Studies, 3*(7), 9–15.

Jada, M,, Usman, W. & Olabisi, A. (2015) Crude Flavonoids Isolated from the Stem Bark of *Annona senegalensis* have Antimicrobial Activity. *Journal of Advances in Biology & Biotechnology, 2*(1), 24–29.

Keta J.N. (2016). Herbs and Shrubs in C"lela Medicine in Kebbi State. P. 16

Lawal, M. (1999). Chemical investigation of the leaves of *Annona senegalensis* 1. Constituents of the leaf wax. *Journal of Science, Food and Agriculture*, *7*,203-205.

Mpiana, P.T., Dianzenza, E.N., Ngbolua, K.N., Tshibangu, D.S.T., Mbala, B.M., Shetonde, O.M., Atibu, E.K., Kakule, M.K. & Bokota, M.T. (2012) Antisickling properties, thermal and photochemical degradations of anthocyanins extract from *Annona senegalensis* (Annonaceae). *International Journal of Biological and Chemical Sciences, 6*(5), 2241–2251.

Ngamo, T.L., Goudoum, A., Ngassoum, M., Mapongmetsem, L.G., Malaisse, F. & Hance, T. (2007). Chronic Toxicity of Essential Oils of 3 Local Aromatic Plants towards *Sitophilus zeamais* Motsch. (Coleoptera: Curculionidae). *African Journal of Agricultural Research, 2*(4), 164–167.

Tijjani, M.A., Abdurahaman, F., Abba, Y.S., Idris, M., Baburo, B. S. I., Mala, G.A., Dungus4, M. H.M., Aji, B.M. & Abubakar, K.I. (2013). Evaluation of Proximate and Phytochemical Composition of Leaves *Annona Senegalensis* Pers. *Journal of Pharmaceutical and Scientific Innovation*, *2* (1), 7-9.

Yisa, Y., Egila, J.N. & Darlinton, A.O. (2010).Chemical composition of *Annona senegalensis* from Nupe land, Nigeria, *African Journal of Biotechnology* , *9*(26), 4106-4109.

Zhu, H., Jia, Z. & Zhou, K. (1996). Cruciferous dithiolethione-mediated coordinatedinduction of total cellular and mitochondrial antioxidants and phase 2 enzymes in human primary cardiomyocytes: cytoprotection against oxidative/electr. Exp Biol Med (Maywood).