Asian Journal of
Science, Technology, Engineering, and Art

e-ISSN : 3025-4507
p-ISSN : 3025-5287
Index : Harvard, Boston, Sydney University, Dimensions, Lens, Scilit, Semantic, Google, etc

https://doi.org/10.58578/AJSTEA.v2i4.3314

DETERMINATION OF PHYTOCHEMICALS AND SOME ELEMENTAL COMPOSITIONS OF WATERMELON FROM SOKOTO, NIGERIA

Zubaida Abubakar Ladan
Shehu Shagari College of Education Sokoto, Nigeria
superoxidedismutase594@gmail.com

Article Info:

Submitted:	Revised:	Accepted:	Published:
Jun 20, 2024	Jul 1, 2024	Jul 4, 2024	Jul 7, 2024

Abstract

Currently, many people are battling with infectious and chronic diseases in the country. More especially, the chronic diseases are associated with the level of ingredients in the food we take in, therefore, the easiest way to remedy our challenges is to monitor levels of chemicals in foods, especially the ones around us at affordable prices. Watermelon is a typical fruit that is conspicuous in the state, and can be a source of important natural chemicals for body health. The objective of this study was to perform a phytochemical and an elemental analysis of water melon grown in Sokoto state, Nigeria. The phytochemicals were determined with appropriate methods and chemicals of analytical grade, and elements are determined using atomic absorption spectroscopy. Regarding phytochemicals, flavonoids, alkaloids, saponins, and steroids were determined. Sodium levels in the seed, pulp, and peel reveals 0.40±0.02 (ppm), 3.0±0.01 (ppm), 2.00±0.01(ppm) respectively; potassium levels in the seed, pulp, and peel reveals, 5.000 ±0.04(ppm), 0.15±0.02 (ppm), 3.00±0.02 (ppm) respectively. Calcium determination shows values 20±1.0 (ppm), 20.0±1.00 (ppm), 20.30±0.3 (ppm) in seed, pulp, and peel respectively; and magnesium levels in seed, pulp, and peel are, 2.20±0.001 (ppm), 6.0±0.01

AJSTEA Journal is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License

(ppm), and 0.40±0.03 (ppm) respectively. Iron levels of seed, pulp, and peel of watermelon reveals, 1.01±0.02 (ppm), 0.10±0.01(ppm), 15.00±0.2 (ppm) respectively; and Zinc 15±0.20 (ppm), 20.0±2.0 (ppm), and 10.00±1.05 (ppm) respectively. The watermelon contains significant amount of phytochemicals like flavonoids, alkaloids, saponins, and steroids useful in many purposes such as antimicrobial agents in neutralising the infectious diseases, a burden in the state. Also, the fruit contains useful elements in significant amount like, sodium, potassium, calcium, magnesium, iron, and zinc, that can be used in people that suffers specific nutritional problems.

Keywords: Phytochemicals, Water Melon, Nigeria, Alkaloids, Tannins, Magnesium, Sodium, Elements

INTRODUCTION

Plainly, the food we consumed has an influence to play in our health. Food components provide various chemicals and materials that are needed for the effective functioning of biological systems in humans and animals alike. Any distortion or maladministration of food components into the body can lead to disease, in fact the food being consumed is regarded as one key factor behind the escalation of chronic diseases nowadays (Fellet, 2015; Umar et al., 2024). This has instigated consumers to continue to pay attention to the kinds of foods they take in, and to give a consideration to the increasing relationship between health and food, they are ready to avoid foods that look unhealthy and embrace healthy food as a result of the increasing awareness pertaining the influence of food constituents on health (Fellet, 2015; Sarkingobir et al., 2022). Most of knowledge regrading food is obtained through studies. Food is known to be useful either through scientific or investigation on the nutritional components of the food in questions, thus, the beneficial effects of food (Fellet, 2015).

The exploration of nutrients contents from food is useful to give a reliable data on food composition, fundamental in constructing guidelines for healthy nutrients, releasing the necessary information on food sources for various nutrients, unfolding information on food bioavailability and the likes (Elmadfa & Meyer, 2010). Certainly food analysis studies disgorge the required information needed to modify behaviours of consumers for the better, like in the prevention of overweight and other chronic diseases that can be prevented through healthy lifestyles adoption. Moreover, nutritional analysis of foods is

required to aid in formulation of foods materials that are needed for people with special or specific food needs (Elmadfa & Meyer, 2010).

A special grace in the gathering of data of food constituent chemicals is the therapeutic nutrition; since there are some diseases that a patient having them most be advised to avoid some foods and use certain food materials, there is a categorical parable in case of people with diabetes and the likes. In the same vein, in nutritional food analysis new food nutrients that supplied the body with useful chemicals (apart from energy giving nutrients) with bioactive health promoting materials need to be explored. Classes of foods like, fruits vegetables, nuts, seeds, etc are now being recognized as very important foods for providing useful chemicals to the body and are now part of food campaigns. However, the contents of foods type always depend on factors like season, variety geographic location and the likes therefore it is pertinent to analyse food materials from different regions of the world (Elmadfa & Meyer, 2010).

Citrallus lunatus popularly known as watermelon, also regarded *Kankana* as fondly called in Hausa hails from the family of *cucurbiae*. It is a flowering plant that comes from West Africa, a predominant plant in Africa, a numerous variety plant that have more than one thousand varieties. It is useful in making the body hydrated, provide natural sugars, help in removing free radicals in the body (Bayero et al., 2019). Some varieties of the plant are: sugar baby, golden midget, jubilee, star light etc (Bayero et al., 2019). Bayero et al., (2019) reported the plant as having contain the antioxidants, oils, nutrients, (like protein, elements, vitamins, and phytochemicals) that are needed for diverse purposes by human and animals (Bayero et al., 2019; Irabor et al., 2020). Consequently, consumption of water melon is beneficial to reduce chronic diseases risks, some cancers, some age-related diseases or problems, to boost immunity, and for the other nutritional benefits (Aderiye et al., 2020).

In Nigeria there is a recent upsurge of nutritional deficiency and chronic problems due to many reasons including poverty, lack enough knowledge of the nutritional contents of many local and available edible plants. Therefore, it is imperative to perform food constituent analysis for economic, health, and nutritional gain to water melon (Bayero et al., 2019). Thus, the objective of this study was to perform a phytochemical and an elemental analysis of watermelon grown in Sokoto state, Nigeria.

METHODS

Study area

The study was conducted in Sokoto state, Nigeria. The major inhabitants of the area are Hausa/Fulani, Muslims. The major occupations are farming, trading, and livestock keeping, whereas some residents are civil servants (Sarkingobir et al., 2019).

Sample preparation

The watermelon was bought in Sokoto Metropolis Sokoto state, Nigeria, then the seeds, flesh and peels were removed using slicing with the aid of a knife. Then appropriately washed and left to dry at ambient temperature further treatment was described by Sadiq et al., (2013) and Irabor et al., (2020).

Determination of phytochemicals

Phytochemicals, alkaloids, tannins, steroids, flavonoids and saponins analysis was done according to the procedure described by Sadiq et al., (2013).

Determinations of minerals elements

The elements sodium, potassium, calcium, magnesium, iron, and zinc are determined by following the procedure reported by Hamza et al., (20223) using atomic absorption spectrophotometer, statistical Analysis mean and standard deviation were computed using Microsoft excel.

RESULTS AND DISCUSSION

Table 1: Phytochemicals in watermelon as determined using ethanolic extract

Phytochemical	Seed	Pulp	Peel
Flavonoids	++	-	+
Alkaloids	+++	-	++
Tannins	-	-	-
Saponins	+	+	-
Steroids	+++	+	-

Table 2: Different metal elements determined in the components of watermelon in Sokoto, Nigeria

Element	Seed (ppm)	Pulp (ppm)	Peel (ppm)
Sodium	0.40±0.02	3.0±0.01	2.00±0.01
Potassium	5.000 ±0.04	0.15±0.02	3.00±0.02
Calcium	20±1.0	20.0±1.00	20.30±0.3
Magnesium	2.20±0.001	6.0±0.01	0.40±0.03
Iron	1.01±0.02	0.10±0.01	15.00±0.2
Zinc	15±0.20	20.0±2.0	10.00±1.05

Key: values are expressed as mean ± standard deviation

The results for this study was shown in Tables 1 and 2. In the Table 1 analysis of phytochemicals present in the plant was shown, therewith flavonoids, alkaloids, saponins and steroids are found in the seed portion; saponins and steroids are determined in the pulp portion of the plant, and alkaloids, flavonoids are found in the peel portion of the plant. The findings of this study are similar to the study done by Sadiq et al., (2013). The findings of the study are similar to that of Njoya et al., (2019) that found alkaloids, saponins and other phytochemicals, but tannins were not determined in both studies. The analysis of phytochemicals in plant portions such as back, fruits etc is of significant importance because these chemicals exert some diverse activities on biological systems by helping them to fight chronic and infection diseases (Njoya et al., 2019). Similarly, Opara et al., (2018) in a study of phytochemicals on seeds of watermelon in Wukari, Taraba, found the alkaloids, tannins, flavonoids and steroids in agreement with the findings of this study. The presence of phytochemicals in the plant is a promising thing for nutritional and medical purposes conferring a therapeutic value in the plant to act as defence to cure diseases in a natural way without instigating harm to human body system (Opara et al., 2018).

Nevertheless, the phytochemicals found are very useful and make the watermelon a suitable plant for consumption using all its portions. Parable, alkaloids are a top chemicals having therapeutic ability among the chemicals of plants as a natural source of healing serving as analgesic, antispasmodic and antibiotic activity (Tabiri et al., 2016). Alkaloids are natural in plants, acquires their name owing to their nitrogen content, and are manufactured by many other organisms such as bacteria, fungi and animals. They are some varieties of alkaloids that have a diverse function to humans such as being used as toxins,

recreational drugs in caffeine, atropine, and cocaine, stimulants, pharmaceuticals. However, an overdose of alkaloids can trigger effects like cancer, and heart diseases (Ranjitha & Sudha, 2015). Saponins can be useful to kill insects, therefore the plant can be manipulated to act as an insecticide, especially the discarded peels and the seeds that are mostly discarded (Harith et al., 2017).

Table 2 indicates the levels of metals determined in watermelon from Sokoto, Nigeria. Sodium levels in the seed, pulp, and peel reveals 0.40±0.02 (ppm), 3.0±0.01 (ppm), 2.00±0.01(ppm) respectively; potassium levels the seed, pulp, and peel reveals, 5.000 ±0.04(ppm), 0.15±0.02 (ppm), 3.00±0.02 (ppm) respectively. Calcium determination shows values 20±1.0 (ppm), 20.0±1.00 (ppm), 20.30±0.3 (ppm) in seed, pulp, and peel respectively; and magnesium levels in seed, pulp, and peel are, 2.20±0.001 (ppm), 6.0±0.01 (ppm), and 0.40±0.03 (ppm) respectively. Iron levels of seed, pulp, and peel of watermelon reveals, 1.01±0.02 (ppm), 0.10±0.01(ppm), 15.00±0.2 (ppm) respectively; and zinc 15±0.20 (ppm), 20.0±2.0 (ppm), and 10.00±1.05 (ppm) respectively. Naturally, elements are parts of the compositions that made up of cells and tissues of human body serving as building blocks, and catalysts that owed the responsibility of speeding up several reactions in the biological system that could not have happened. Metal elements are pivotal in ensuring the processes of development and growth, adaptation, metabolic reactions, and the entire homeostasis. Invariably, physiological and anatomical role of elements is perfectly played only if there is optimum concentration (Dusova et al., 2012).

Meanwhile, a situation whereby elements in the body or consumed from food are little or too much can exert a problem or threat to the biological system. Elements that are above 0.01%. in the body are termed as marcoelements, like in the case of sodium, potassium, calcium, magnesium. The absolute body composition of these elements in average human is around few grams to forty kilograms due to their forefront role in functioning of tissues, organs, and the entire body's physiology (Skalnaya & Skalny, 2018; Sarkingobir & Yarima, 2021). Ithe intracellular and extracellular environments, sodium and potassium, are respectively, the most abundant elements found. They are equally responsible for the impulses transmission and regulates the osmotic pressure (Dieter, 2008). Potassium is required to activate enzymes, in turn little consumption of the element can elicit high blood pressure, infertility, stroke, cancer, arthritis and gastrointestinal disorders (Hamza et al., 2023). Sparingly soluble calcium compounds are bearings in body's skeleton. There are essential processes in the body like, blood clotting, muscle contraction, transmission, bone

and tooth formation, blood clotting, muscle contraction and transmission, that are all possible because of calcium metal. Excess intake can cause soft tissue, constipation, kidney stones, hypercalcemia, and prostate cancer (Comptroller General of the United States, 1978; Food and Nutrition Board Institute of Medicine, National Academies, 1997; Dieter, 2008; Sarkingobir et al., 2020). Magnesium too acts as cofactor of many enzymes (Dieter, 2008). Zinc is equally very relevant in the functioning of the body as it promotes immune system, reduces premature birth, speed up weight gain in infant and youngsters, and reduces the risk of death from all causes (Umar et al., 2022). Entirely, the findings in this study is good tiding to people that are having nutritional deficiency of the mentioned elements can take water melon as a natural and cheap source for nutritional therapy (Zainab et al., 2021). Fe found in the water melon as indicated by Table 2 is another good omen. Among other uses food has been utilized recently to fight iron deficiency anaemia through fortification, likewise, the water melon can be a good source of iron to remedy people with Fe deficiency (Liberal et al., 2020).

CONCLUSIONS

This has revealed that, the watermelon contains significant amount of phytochemicals like flavonoids, alkaloids, saponins, and steroids there essential to serve in many purposes such as antimicrobial agents in neutralising the infectious diseases, a burden in the state. Likewise, the study has proved that, the fruit contains useful elements in significant amount like, sodium, potassium, calcium, magnesium, iron, and zinc, that can be used in people that suffers specific nutritional problems.

REFERENCES

Aderiye, B.L., David, O.M., Fagbohun, E.D., Falaye, J., & Olajide, O.M. (2020). Immunomodulatory phytochemicals properties of water melon juice and pulp (*Citrullus lanatus Lina*) A review. *GSC Biological and Pharmaceutical Sciences* 11(2),153-165.

Bayero, A.S., Datti, Y., Usman, L.A., Asmau, A.A., Nara, T., Garba, A.A., Aliyu, U., Dikko, M. A., Zakari, A.L. &Yusuf, M. (2019). Phytochemical exposition and antioxidarnt activity of the indigenous watermelon seeds obtained in Kano state, Nigeria. *International Journal of Food Science and Nutrition,* 4 (5), 184-187

Comptroller General of the United States. (1978). Recommended dietary allowances: more research and better food guides needed.

Dieter, R. (2008). Introduction to bioinorganic chemistry. A lecture notes University of Lund's

Dusova, H., Travnicek, J, Reksa, Z., Falta, D. & Palkav, (2012). Trace elements content in market eggs in Bohemia. *Acta Universitatis Agriculture Et Silviculturae Medelianae Brunonsus*, LX,6,75-80.

Elmadfa, I. & Meyer, A.I. (2010). Importance of food composition data to nutrition and public health. *European Journal of Clinical Nutrition*, 64 (2010), 54-57

Fellet, M. (2015). The chemistry of food and health molecules and metabolism, American Chemical Society.

Food and Nutrition Board, Institute of Medicine, National Academies (1997). Dietary reference intakes: elements. www.nap.edu.

Hamza A, Gumi, A.M., Aliero, A.A., Umar, A., Sarkingobir, Y., & Tambari, U. (2023). Potential of Neem Leaves on Preservation of Selected Elemental Compositions in Two Tomato Cultivars from Sokoto, Nigeria. *Journal of Bioresources and Environmental Sciences*, 2(1),15-20. doi:10.14710/jbes.2022.17343.

Harith, S.S, Mazlun, M.H., Mydin, M.M., Nawi, L., & Saat, R. (2017). Studies on phytochemical constituents and antimicrobial properties of *Citrullus lannatus*. *Malaysian Journal of Analytical Sciences*, 22 (1), 151-156.

Irabor, G.E., Ebhoaye, J.E., & Odia, A. (2020). Qualitative and quantitative screening of some phytochemical compounds in water melon (*Citrullus lanatus*) seeds cultivated in west local government area of Edo State. *International Journal and Engineering Applied Sciences and Technology*, 5(1), 268-273.

Liberal, A., Pinela, J., Barros, L., &Ferreira, C.F.R. I. (2020). Fighting iron-deficiency anaemia: *Innovations in food fortificants and biofortification strategies*, 9(1871),1-10.

Njoya, H.K., Erifeta, G.O., Okwuonu, C.U., & Elandu, Z. E. (2019). Estimation of some phytoconstituents in the aqueous extract of the endocarp, seeds, and exocarp of watermelon (*Citrullus lanatus*) Fruits. *Journal of Pharmacognosy and Phytochemistry*. 8(3),4750-4757.

Opara, I.J., Orubia, M.E., Onunze, E.O., Oko-Udu, C.O., & Aoudoyima, I. (2018). Phytochemical screening and nutritional profile of *Citrullus lanatus* seeds. *FUW Trends in Science and Technology Journal*, 3 (1),295-298.

Ranjitha, D., & Sudha, K. (2015). Alkaloids in food. *International Journal of Pharmaceutical, Chemical and Biological Sciences*, 5(4),896-906.

Sadiq, M.S., Mohammed, A. & Yusuf, T.I.(2013).Economic of scale and cost efficiency in small Egusi melon production in Bida local government area of Niger state, Nigeria. Journal of Agriculture and Veterinary Science, 3(1), 31-35.

Sarkingobir, Y. & Yarima, S.A. (2021). Evaluation of selected mineral elements in some selected parboiled rice varieties from Sokoto, Nigeria. *Aditum Journal of Clinical and Biomedical Research*, 1(1), 1-3.

Sarkingobir*, Y.,* Dikko, M., Tukur*,* M.*,* Umar, A.I**.** (2020). Determination of Some Macroelements (Sodium, Pottasium, Calcium, Magnesium and Phosphoros) in Some Selected Eggs (Chicken, Duck, Quail, Pigeon, Guinea Fowl and Turkey in Sokoto Metropolis. *Journal of Science and Technology Research*. 2 (1),162-166.

Sarkingobir, Y., Nahantsi, M.S., Yarima, S.A., Adili, S.I., Bello, M.M. & Malami, Z. (2019). Assessment of safety practices among modern barbers in Gwadabawa local government, Sokoto state, Nigeria. *Journal of Applied Science and Environmental Management* 23(3):407-410.

Sarkingobir, Y., Umar, A. I., Miya, Y. Y., Hamza, A., Tambari, U., Sule, I.F., & Magori, D.Z. (2022). Determination of Selected Essential (Copper, Zinc) And Non-Essential (Lead, Chromium, Cadmium) Heavy Metals in Some Single-Use Plastics from Sokoto Metropolis, Nigeria. *Journal of Materials and Metallurgical Engineering*, 12(3),29-37.

Shina, S.I., Yakasai, S.M., Lawal, Z., Olareuwaju, A.A., Enes, S.L., & ALi, D.Z. (2021). Proximate analysis and phytochemical screening of watermelon (*citrullus lanatus*) Pulp, peels seeds. *Dutse Journal of pure and Applied Sciences*, 7 (4), 174-182.

Skalnaya, G.M. & Skalny, V.S. (2018). Essential trace elements in human health: A physicians' view. Tomsk Publishing House of Tomsk University: Tomsk.

Tabiri B, Jacob K A, wireko –manu F.D, Ompouna E.I (2016) Watermelon seeds as food Nurients composition phytochemicals and antioxidant activity international Journal of Nutrition and food sciences, 5(2): 139-144.

Umar, A.I., Sarkingobir, Y., Shehu, Z. (2022). Determination of selected micronutrients (zinc, iodine, and selenium) in three different egg varieties from Sokoto, Nigeria. Adamawa State *University Journal of Scientific Research*, 10(1),1-7.

Umar, AI., Sarkingobir, Y. & Tukur, T. (2024). Quantification of iodine in salt, foods; and determination of knowledge and pattern of consumption of iodine containing food materials in Sokoto State, Nigeria. *Kalasin University Journal of Science Technology and Innovation*, 3, 1, 1-15.

Zainab., H.B. U. I, Aminu., I. Mustapha and S. T, Adam (2021). Proximate Analysis and Antinutritional Factors of Water Melon Seeds (*Citrullus lenatus*). *International Journal of Biochemistry Research and Review*, 30(8), 41 – 47. DOI: 10.9734/IJBCRR/2021/v301830285