Journal of Biology and Genetic Research Vol. 10 No. 3 2024 E-ISSN 2545-5710
P-ISSN 2695-222X www.iiardjournals.org

Anti- nutrients and Mineral Contents of Azanza garckeana (Goron tula)

[1]Okogbule ,F.N.C. [1]Abadi, P.[2]Opiah, J. N[3]Ihunnaya, C. K[3]Martins N. P[3], Ogunrombi ,S.B.
Rivers State University, Department of Plant Science and Biotechnology.
[2]Regional Center for Biotechnology and Bioresources.
[3]Bioresources Development Centre (Biodec). Arochukwu.
fortunenc.okogbule@ust.edu.ng
DOI: 10.56201/jbgr.v10.no3.2024.pg10.16

Abstract

Azanza garckeana (Goron tula), is a tropical fruit that is used as food and medicine in Northern Nigeria: The fruit was obtained from two different markets in Port Harcourt and was taken to the laboratory in Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State for the preparation of mycological medium, Isolation of fungi using Serial dilution method and determination of percentage Incidence of fungal occurrence.It was further explored for mycotoxins associated with it. Our experimental results shows that Goron-tula contains some anti-nutrients which are; Tannin, Phytate, Phenol, Oxalate, Flavonoid, Alkaloid, Terpenoid. Many nutrients amongst which are; moisture, Ash, Fibre, Lipid, Protein, and Carbohydrate in different quantities. And goron-tula contains minerals in various quantities, these includes; calcium, Iron, Magnesium, Phosphorus. These constituents makes Goron-tula highly valuable and more economic important as it can be used in many industries.

Introduction

The Azanza garckeana commonly known as Goron Tula, (kola of Tula) in Hausa, belong to the family Malvaceae. In Nigeria, it is grown only in Tula village of Gombe State. It is a multipurpose edible fruit of tropical Africa. It is an important medicinal and food plant commonly used in Northern Nigeria as herbal medicines (Ahmed et al., 2016). Azanza garckeana has also been reportedly use in traditional medicine for treatments of management of more than 20 human diseases and ailments. The plant is used as herbal remedy for diseases like cough, chest pains, infertility, menstruation abnormalities, sexually transmitted infections and hepatic impairments (Alfred, 2017). Multiple classes of bioactive metabolites including amino acids, alkaloids, ascorbic acid, carotenoids, flavonoids, glucosides, phenols, lipids, tannins and saponins have been isolated from A. garckeana (Akinnifesi et al., 2004). A. garckeana belong to a family malvacene, which is the distrimotive family to which the hibiscus belongs. Most of the malvacene in Nigeria are shrubs. A. garckeana is the species name (F. hoffin), the source of the generic name is absure. The strip soil desert cost extending below the equator in Africa was once known as the course of Azanza.

MATERIALS AND METHODS

3.1 Sample Collection

Healthy and spoilt samples of Goron-tula were bought from fruit garden market and Town market in Port Harcourt and brought to the Department of Plant Science and Biotechnology, Rivers State University for further studies.

Mycology studies

Preparation of mycological medium

Sterilization of conical flask,slides,petri dishes and all the equipment needed for the experiment was carried out in the laboratory. The glass wares were sterilized in the oven at 120℃ for an hour after washing with soap, while other equipment were surface sterilized with 70% ethanol to reduce microbial contamination (Okogbule *et al*., 2024). Inoculating loops and scalpels were sterilized by dipping for 20 seconds in 70% ethanol and heated to red hot. The mycological medium used was Sabouraud Dextrose Agar prepared in a conical flask using the standard method. The mouth of the flask was plugged with non-absorbent cotton wool and wrapped with aluminum foil. The conical flask containing the mycological medium was autoclaved at 121℃ and pressure of 1.1kg cm-3 for 15 minutes. The molten agar was allowed to cool to about 40℃ and dispensed into Petri dishes at 15mls per plate and allowed to further cool and solidify.

Isolation of fungi

A three fold serial dilution was used in accordance to the method of Mehrotra & Aggarwal, (2003) where 1g of the spoilt Negro pepper samples were transferred into the first test tube containing 9mls of normal saline. 1ml of the solution was transferred to the second test tube and finally from the second to the third. 0.1ml aliquot from the second and third dilutions were plated onto Sabouraud Dextrose Agar in Petri dishes containing ampicillin to hinder the growth of bacteria and this was done in triplicate. The inoculated plates were incubated for 5 days at ambient temperature of 25℃ ± 3℃ (Okogbule *et al*, 2021). The entire set up was observed for 7 days to ensure full grown organisms. Pure culture of isolates were obtained after a series of isolations.

Identification of fungal organisms

Microscopic examination of fungal isolates was carried out by the needle mount method (Cheesebrough, 2000).The fungal spores were properly teased apart to ensure proper visibility. The well spread spores were stained with cotton blue in lacto phenol and examined microscopically using both the low and high power objective. The fungi were identified based on their spore and colonial morphology, mycelia structure and other associated structures using the keys of (Barnett & Hunter, 1998).

Determination of percentage Incidence

The percentage incidence of fungal occurrence was determined by the formulae stated below (Okogbule *et al*., 2023)

= % incidence

Where;

X=total number of each organism in a variety

Y=total number of all identified organism in a variety

RESULTS

Nutrient composition of Goron-tula from fruit garden and Town market. The results in this experiment have shown that Goron-tula contains many nutrients amongst which are; moisture, Ash, Fibre, Lipid, Protein, and Carbohydrate in different quantities.These nutrients makes Goron-tula good and one of the most sort after not just only in the agricultural industry but in other industries. There are two different spices of fungi found in course of the experiment. Namely *Aspergillus niger* and *Penicillin.*

Phytochemicals

TOWN MARKET	**FRUTH GARDEN MARKET**
Thiamine. 80 ± 0.06	61 ±0.01
Phytate 75 ± 0.02	27 ± 0.01
Phenol 23± 0.02	41 ± 0.01
Oxide 34 ± 0.02	72± 0.01
Flavonoids 38 ± 0. 02.	35± 0.02
Alkaloid 42± 0.02	51± 0.02
CARBOHYDRATE 4.27 ± 0.02	3.34 ± 0.01

MINERAL CONTENT

TOWN MARKET	**FRUTH GARDEN MARKET**
MOISTURE 70 ± 0.04	51 ±0.01
ASH 65 ± 0.03	21 ± 0.01
FIBER 23± 0.03	31 ± 0.01

LIPID 32 ± 0.03	70± 0.01
CARBOHYDRATE 4.20 ± 0.03	3.34 ± 0.01
ANTI NUTRIENT	
TOWN MARKET	**FRUTH GARDEN MARKET**
Vit C 65 ± 0.02	51 ±0.01
Vit D 55 ± 0.02	21 ± 0.01
Thiamine 33± 0.02	31 ± 0.01
Niacin 44 ± 0.02	60± 0.01

Discussion

Nutrient composition

The result of the proximate analysis of the plant Azanza garckeana fruit obtained this two markets shows the plant contains moisture, dry matter, ash, crude fat, crude fiber, protein, and carbohydrate in varying proportion. The pulp has a low moisture content and plant with a low moisture content is easier to preserve (Umar et al., 2011). The mineral content of a substance in the biota is reflective on its Ash content (Olude et al., 2020), the ash content in the extract of Azanza garckeana indicating that the pulp contains minerals and more organic components. Dietary fats serve as energy source, aid in the absorption of fat soluble vitamins (Vitamin A, D, E and K), required for growth, immunological roles and reproduction. However, elevated intake of fats is correlative with obesity and heart related diseases (Olude et al., 2020). The extract contains low crude fat, which is however higher than those reported for the pulverized fruit of Azanza garckeana (Jacob et al., 2016). Crude fibers are not digestible in humans but they aid in digestion. The crude fiber content in the plant is relatively low.

Phytochemical composition

Screening Phytochemicals are termed as non-nutrient plant component and are present in various plant parts such as its fruits, leaves, stem and roots. The consumption of medicinal plants with certain phytochemicals have been correlated with decline in the risk of several major chronic illnesses. In this study, qualitative screening for the presences of phytochemical was performed on the plant Azanza garckeana fruit. The result revealed the presences of alkaloid, phenols and saponins in the plant Azanza garckeana fruit. According to our results,it reveals that Goron-tula contains some anti-nutrients in different quantities. Alkaloids have stimulating effect, they are used as tropical anesthetic in ophthalmology and also as pain reliever (Usunobun *et al*., 2014). Alkaloids are reported to have antibiotics . Hence, Alkaloid

presences in the pulp extract may be responsible for anti-bacterial activity that has been reported for Azanza garckeana fruit (Bioltif *et al*., 2020). The other phytochemicals confirmed to be present in the extract are phenols and saponins. Azanza garckeana antibacterial action may also potentially be due to the presence of phenolic compounds (Ofokansi *et al.*, 2005). Saponins possess antioxidant effects on the skin and protect it against UV damage. It inhibits cancerous cell growth, strengthen immune system, lowers cholesterol levels, antibiotic and help in the maintenance of membrane integrity (Ojezele *et al*., 2016; Aberoumand 2012).

Mineral content of the plant fruit of Azanza garckeana

The determination of essential minerals in the fruit revealed the presence potassium (K), calcium (Ca), phosphorus (P), iron (Fe), zinc (Zn), magnesium (Mg) and sodium (Na) in varying proportion. The mineral's potassium (K) and calcium (Ca) play important role in stimulating action potential across nerve endings. Calcium is central to blood clotting, muscle contraction, hormonal regulation, as well as a major component of bone and teeth development (Olude *et a*l., 2020). In addition, the skeletal system requires calcium and phosphorus for growth and maintenance. They also play a part in some physiological processes and play essential role in muscle contraction, blood clotting formation, maintenance of cell integrity, acid-base equilibrium, and the activation of several important enzymes. Nucleic acids contain phosphorus as an essential component of the phosphate end and the polar head of cell membrane phospholipids. Phosphorus is directly required in virtually all energy-yielding cellular processes (Omotosho *et al*., 2018). Iron (Fe) is physiologically required for the formation of heme, leading to hemoglobin formation, whose deficiency causes anaemia (Ogbeide *et al*., 2020). Magnesium, iron and zinc are important co-factors in several metabolic reactions such as oxidative phosphorylation, glycolysis and protein digestion (Usunobun and Okolie, 2015; Ogbeide et al., 2020).

CONCLUSION

A detailed research as this will be important as an indication of the potential nutraceutical and economical utility of A. garckeana as an important source of bioactive phytochemicals, edible fruits and food additive. Some of the pharmacological properties of A. garckeana documented so far, may be attributed to various compounds including alkaloids, flavonoids and phenolics. The contemporary research done so far involving A. garckeana is promising as some of the nutritional, phytochemical and pharmacological evidence may be used to explain and support the documented ethnomedicinal uses, nutritional and nutraceutical values.Medicinal plants play a vital function in both development and production of new drugs. This is also in line with the report of World Health Organization (WHO), which indicated that about 80% of global's population in developing countries depends on natural products for basic and primary healthcare need. Furthermore, more than 20% of conventional and standardize drugs have a phytochemical backbone. Virtually all human diseases including infectious disease, inflammatory, analgesic, diabetics, malaria, hepatorenal diseases and disease associated with oxidative stress have been treated or manage with medicinal plants. Furthermore, the safety of medicinal plants as oppose to the undesirable side

effect associated with the use of synthetic drug made medicinal plants a worthy alternative to synthetic drugs. The pharmacological activities of medicinal plants have been attributed to the presence of secondary metabolites including saponins, phenols, flavonoids, tannins, terpenoids and many more.

Recommendation

Therefore, I recommend that the government should find better ways of preserving and processing the fruit to maximize its full value chain, because now we are just selling the raw materials to buyers at a relatively cheap price who in turn processed it and sale at an exorbitant price. The application and usefulness of this plant can't be overemphasized. Hence the need to make most use of it.

References

A., Bernard, D., and Annie, V. (2012). Characterization of the antiproliferative activity of Xylopia aethiopica. Cell Division, 7: 8.

Ayedoun, A. M., Adeoti, B. S., and Sossou, P. V. (1996). Influence of fruit conservation methods on the essential oil composition of Xylopia aethiopica (Dunal) A. Richard from Benin. Flav. Fragr. J. 11: 245.

Barnett, H. L. & Hunter, B. B. (1998). Illustrated genera of imperfect fungi, 4th edition. American Psychopathological Society Press, St. Paul Minnesota, 218.

Burkill, H. M. (1985). "Entry for Xylopia aethiopica Dunal A. Rich.: family Annonceae".The useful plants of west tropical Africa, Vol 1 (JSTOR). Retrieved 1 January 2013. Jirovetz,

L., Buchbauer, G., and Ngassoum, M. (1997). Investigation of the essential oils from the dried fruits of Xylopia aethiopica (West African "Peppertree") and Xylopia parviflora from Cameroun. Ernährung/Nutrition. 21: 324-325.

Cheesebrough, M. (2000). Distinct laboratory practice in tropical countries part 2. Cambridge

University Press London, 143-156.

Mojeremane M. and Tshwenyane S.O. (2004).Azanzagarckeana: a valuable edible indigenous fruit of Botswana, Pakistan Journal Inter-nutrition. 3:264-267.

Nmom, F.W; Ajuru, M.G and Okogbule F.N (2021). Investigation of the fungal bloom and death of neurosporacressa at routine temperature on Grilled spend cobs of Zea may L. 12 (2) 65-75. Journal of applied Biological research.

Ochokwu, I.J., A. Dasuki and J.O. Oshoke, 2015. Azanza garckeana (goron tula) as an edible indigenous fruit in north eastern part of Nigeria. J. Biol. Agric. Healthcare, 5: 26-31.

Orwa, C., A. Mutua, R. Kindt, R. Jamnadass and A. Simons, 2009. Azanza garckeana (F. Hoffm.) Exell et Hillc.). Agroforestry Database Tree Reference and Selection Guide Version 4.0. http://www.worldagroforestry.org/treedb/ AFTPDFS/Azanza_garckeana.PDF

Okogbule, F.N.C and Chukwu, E.C. (2010). Varietal effects and associated mycofloraon the shelf life of groundnut paste preserved with some botanicals. Journal of biology and Genetic. 19-25.

Okogbule, F.N.C. and Chukwu E.C. (2020). Effect of paviderent plant materials as preservative on proximate, shelf life and associated mycofora on groundnut paste.Journal of biology and Genetic. 19-25.

Okogbule, F.N. C, Minimah, S.O, Obichi, E.A. (2021). Groundnut Paste and Nutrient Quality Stability Using Local Seeds.Asian Journal of Research in Botany (2):48-53.

Okogbule, F.N.C.Minimah, S.O, Obichi, E.A (2023). Studies on the fungi and phytochemical potential of tomatoes (solution bycopersuim) in Port Harcourt that quality stability using local seeds Asian Journal of research in Botany (2): 47-53.

Okwu, D.E. (2005). Phytochemicals, Vitamins and Mineral contents of two Nigeria Medicinal plants. International Journal Molecular Medicine and Advance Science 1(4): 375-381.

Sarah, O. N., Bosede, F. O. and Oluwatosin, A. A. (2011). Hypolipidemic and Antioxidant Potentials of Xylopia aethiopica Seed Extract in Hypercholesterolemic Rats Journal of Medicinal Food. 14(1-2): 114-119.

Wekhe, E.O. Chukwu, E.C. and Okogbule F.N.C (2012). Effect of fungi, flora on the nutrient quality of Artocarpus carpus comansi (Breadnut). Installment. 5(4) 607-613.

Wekhe, E.O; Chukwu, E.C; Okegbule F.N.C and Dappa, J.B. (2022). Determination of the nutrient quality of pulp and seed of long shape variety of Persea Americana (mill) and their associated fungi flora research journal of pure science and technology 5(2) 1-12.

Worlu, C.W; Okegbule F.N.C; Kpekot, A.K; Worlu, A.A. (2023. Examination of solubilizing Effects of Trichoderma konkngii and trichedrima harzianum and Impact on Growth Parameters and yield Of Zea Mays. Journal of Agricultural, Environmenal research and management 5(5): 813-824.