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The Quantitative and Qualitative Analysis of Phytochemical Natural Constituents of Ethanolic Leaf Extracts of *Solanum Aethiopicum*

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ABSTRACT

In almost the whole universe, solutions from active ingredients of plants are readily used in the treatment of various kinds of diseases. Different medicinal plants possess diverse therapeutic potential as no single plant has all the medicinal properties. Many of the medicinal potentials of plants used in folkloric medicine have been subjected to scientific investigation and this has warranted their widespread use as an alternative or complement to orthodox medicines. However, the medicinal potential of African flora is yet to be fully explored. Some plants of the African vegetation are still being discovered for their medicinal properties. This study was aimed at determining the qualitative and quantitative phytochemical composition of ethanol extract of *Solanum aethiopicum* leaf. Phytochemical analyses of crude extracts revealed the presence of alkanoids, glycosides and tannin in all while the fractions had terpanoids among others in relative proportions spectrophotometrically.

KEYWORDS: *Solanum aethiopicum, phytochemical, Spectrophotometrically, Mkpuru ofe*

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INTRODUCTION

Solanum aethiopicum, commonly called African eggplant or garden egg, is among the oldest vegetables indigenous to tropical Africa. It is widely cultivated across West Africa especially for its nutritional, medicinal and economic values of the leaves and fruits. The fruit may be consumed freshly raw, dried, cooked and in salad form. It is one of the most important vegetable crops in West Africa as it is consumed daily and remains a source of income for many rural dwellers (Nwodo *et al.,* 2013). Although the plant is seasonal, it is grown in all parts of Nigeria. The existing ethnic groups in Nigeria describe it with different names, for instance, the Igbos of South-eastern Nigeria call the fruit "Aňara" "Afufa" or "Mkpuruofe", the Yorubas of South-western Nigeria call it "Igbagba" while the Hausas of Northern Nigeria call it "Dauta".

Solanum aethiopicum also known as Ethiopian eggplant or scarlet eggplant is a vegetable crop belonging to the family *solanaceae.* The genius Solanum includes both the edible and non-edible species. The family is one of the largest and most important families of vegetable grown for their fruits (Prophens *et al.,* 2015). They are native to sub-Sahara Africa and are essentially tropical in origin. *S. aethiopicum* is of high edible quality. The fruits can be eaten fresh without cooking and have a long history of consumption in West Africa (Bonsu *et al.,* 2012). Depending on the type, either the leaves and the young shoots or the fruits or both are eaten. Fruits and vegetables are important to the body (Olusanya, 2018).

In natural medicine, *S. aethiopicum* has a magnificent ways of applications from weight reduction to treatment of several ailments including asthma, allergic disease, swollen joint pains, gastro-esophageal reflux disease, constipation, and dyspepsia. Scientific studies have supported the

traditional use of this plant in treating inflammation, asthma, glaucoma, diabetes and excessive weight gain (Anosike *et al.,* 2012*)*. The fruit is easily eaten as a snack and it has been reported to be high in phytochemicals like saponins, flavonoids, tannins and ascorbic acid (Nwodo *et al.,* 2013*)*.

Remedies from plants are readily used in the treatment of various kinds of diseases. Different medicinal plants possess diverse therapeutic potential as no single plant has all the medicinal properties (Ghasi *et al.,* 2011). Many of the medicinal potentials of plants used in folkloric medicine have been subjected to scientific studies and this led to their universal usage as an alternative to orthodox medicines. Therefore, the medicinal potential of African flora is yet to be fully understood. This study was aimed at determining the qualitative and quantitative phytochemical composition of ethanol extract of *Solanum aethiopicum* leaf.

MATERIALS AND METHODS

Collection and Identification of Specimens

Collection, authentication and processing of plant material: fresh leaves of *S. aethiopicum* were collected from the Agric farm of Faculty of Agricultural Sciences of the University of Nigeria, Nsukka. Plant material was identified by Dr. late Ugwuozor, a taxonomist of Botany Department of University of Nigeria, Nsukka. Taxonic identity of the plant was achieved by deposited voucher specimen and use of documented literature from Dalziel (2016) in the herbarium unit of Department of Botany, University of Nigeria, Nsukka.

Preparation of Ethanol Extract of *S. aethiopicum*

The ethanol extract was prepared using the wet method of extraction. One kilogram of the dry stalks of the plant was blended in 1.5 litres of ethanol (96%) with an electric blender and transferred into the amber colored bottle and kept in a cool (4^0C) dark compartment for 72 hours. The mixture was filtered using a cheese material and thereafter with Whatman No: 1filter paper. The extract was concentrated using a rotary evaporator at 37-40^{o}C and dried completely in a desiccator containing a self-indicating silica.

Phytochemical screening

Phytochemical screenings were carried out on the powdered ethanol stalk extract using standard procedures to identify the constituents as described by Nwodo, 2013.

Test for Alkaloids:

Five milliliters (5 ml) of the sample was mixed with 96% ethanol-20% tetraoxosulphate (vi) acid (1:1). One milliliter (1 ml) of the filtrate from the mixture was added to 5 ml of 60% H2SO4 and allowed to stand for 5 minutes. sreading was taken at absorbance of 565 nm.

Glycosides

This was carried out using Buljet's reagent. One gram (1 g) of the fine powder of the sample was soaked in 10 ml of 70% alcohol for 2 h and then filtered. The extract was then purified using lead acetate and disodium hydrogen tetraoxosulphate (vi), (Na2HPO4) solution before the addition of freshly prepared Buljet's reagent. The absorbance was taken at 550 nm.

Flavonoids

Five millitres of the extract was mixed with 5 ml of dilute hydrochloric acid (HC1) and boiled for 30 minutes. The boiled extract was allowed to cool and then filtered. One millitre (1 ml) of the filtrate was added to 5 ml of ethyl acetate and 5 ml of 1% ammonia solution. The absorbance was taken at 420 nm.

Phenolics

Ten millitres (10 *ml)* of the sample was boiled with 50ml acetone for 15 minutes. Five millitres of the solution was pipette into a 50 ml flask. Then, 10 ml of distilled water was added. This was followed by the addition of 2 M NH_4OH and 5ml of concentrated amyl alcohol. The mixture was left for 30 minutes and absorbance was taken at 505 nm.

Tannins

Ten millitres (10 ml) of the sample was pipette into 50 ml plastic bottle containing 50 ml of distilled water. This was shaked for 1 h on a mechanical shaker. The solution was filtered and 5 ml of the filtrate was mixed with 2 ml of $FeCl_3$ in O.INHC1. The absorbance was read at 120 nm.

Steroids

The extract was eluted with normal NH_4OH solution. Two millitres (2 ml) of the eluate was mixed 2 ml of chloroform in a test tube. Three (3 ml) of ice cold acetic anhydride was added to the mixture and two drops of concentrated H_2SO4 was continuously added to the mixture and allowed to cool. The absorbance was taken at 420 nm.

Saponins

Five millitres (5 ml) of the sample was dissolved in aqueous methanol. Then, 0.25 ml of aliquot was taken for spectrophotometric determination for total saponins at 544 nm.

Test for Glycosides (Keller-Killani test)

Five milliliters (5 ml) of the extracts were treated with 2 ml of glacial acetic acid containing one drop of ferric chloride solution. This was underplayed with1 ml of concentrated sulphuric acid. A brown ring of

the interface indicates a deoxysugar characteristic of cardenolides. A violet ring may appear below the brown ring, while in the acetic acid layer, a greenish ring may form just gradually throughout the thin layer.

Extraction of phytochemicals

The plant sample (1g) was transferred into a test tube and ethanol (15ml) and 50% m/v potassium hydroxide (10ml) was added. The test tube was left to stand in a water bath maintained at 60℃ for 60 minutes. The content of the test tube was emptied into a separatory funnel after this time. The reaction product was washed successively with 20ml of ethanol, 10ml of cold water, 10ml of hot water and 3ml of hexane. The extract was finally washed three times with 10ml of 10% v/v ethanol aqueous solution. The solution was dried with anhydrous sodium sulfate and solubilized with 100ul of pyridine. Afterward, it was transferred to a vial for analysis

RESULTS

Phytochemical Composition

The preliminary phytochemical screening of the ethanolic extract of *Solanum aethiopicum* leaf conducted indicated the presence of alkaloids, flavonoids, steroids, tannins, and saponins. Table.1 shows the result of the quantitative phytochemical composition of ethanol extract of *Solanum aehiopicum* leaf. It also showed that the alkaloid's subclass of secondary metabolites were the most abundant in the plant.

Table 1: Phytochemical Analysis of the Crude Extracts

Phytochemicals	ASA	ESA	AC	EC
Alkaloids (Wagner's) (Dragendorf s)	++	++	+ +	+++
Tannins	+	++	+	+++
Anthraquinones	++	-	-	-
Flavonoids	-	++	++	++
Terpenoids	+++	++	++	++
Saponins	+	-	+	-
Phenols Glycosides	+++ +++	+++	+++	+++

Keys: - = absent; + = slightly present; ++ = moderate; +++ = abundant

ASA = *S.aethiopicum*aqueous extract; ESA = *S.aethiopicum*ethanolic extract; ethanolic extract; AC = combined before extraction aqueous extract; EC = combined before extraction ethanolic extract.

Table 2: Qualitative Phytochemical Composition of Ethanol Extract of *Solanum aehiopicum* leaf

Phytochemicals	Quantitative Concentration (%)
Alkaloids	6.43
Flavonoids	0.83
Tannins	0.27
Terpenoids/Steroids	2.0
Saponins	4.38

Key: + = present;- = absent

Vitamin composition

The essential screening of vitamin contents of *S. aethiopicum* quantitatively revealed the presence of vitamins: B_1 (0.46), B_2 (10.32), B_3 (14.34), C (408) and E (0.56)

Table 3: Some vitamin composition of *Solanum aethiopicum* leaf extract

Parameters	Concentrations (mg)100g
Thiamine (B_1)	0.46
Riboflavin (B_2)	10.32
Nicotinamide (B_3)	14.34
Ascorbic Acid (C)mg	408
∞-Tocopherol (E)	0.56

DISCUSSION

Solanum aethiopicum phytochemical screening revealed presence of flavonoids, saponins, Alkaloids, Phenolics, tannins, Resins, Steroids and glycocides in both ethanol Nwodo, (2013) reported that plants occur in varying habitats, a great magnitude of variation in the concentration and composition of phytochemical ingredients in different parts of such plant is expected. Moreover, Waller and Nowacki (2018) reported that phytochemicals are produced in response to perceived threats by the plants, therefore variation exist in the production of these phytochemicals depending on the type and amount of threat encountered by the plant.

These vitamins are vital because of its pivotal in energy production in the animal's body, for breakdown of fat and protein and keeping the mucus membrane healthy.

Vitamin (B_1) (thiamine) content of *S. aethiopicum* (0.46) was higher compared to 0.18 mg reported by Duel and Sturts, 2010 and Szeto *et al*, 2012 for a different species of garden egg. With this, the plant can be assumed as really a very good source of vitamin B_1. Vitamin (Riboflavin) plays a supportive role in the treatment of sickle-cell anaemia. It is also the precursors for enzyine W-factors that help in their work as catalysts in metabolism, knapp, 2011 `as well as osei *et al*., 2012. Vitamin B_2 content of ***S***.

aethiopicum (10.33) compared well to the value 12.20mg as showed by Rice *et al*., 2008 and therefore, a good source of vitamin B_2.

Vitamin B_3 (Nicotinamide) is also a precursor for enzyme co-factors that aid in their work as catalyst in body metabolism. Its deficiency causes lead to pellagra (Osagie, 2011).

Vitamin B_3 content of *S. aethipicum* (14.34) compared well to 13.60mg obtained by Dobson, 2010 as well as Osei *et al*., 2012. From the result, *S. aethiopicum* is a good source of this vitamin having (14.34).

Vitamin C (Ascorbic acid) is always found in fruits and edible leaves in large quantities. It is a very important anti-oxidant (Dala, 2011). Ascorbic acid content of *S. aethiopicum* was 408mg and correlated with the results reported by Szeto *et al*., 2012 which reported 400mg for another egg plant species. This proved that this plant is a very good source of vitamin C.

Vitamin E (Tocopherol). This is an essential anti-oxidant used for the production of numerous types of cosmetic products ranging from soaps, creams, etc. Vitamin E content of *S. aethiopicum* was low (0.53) mg, but this compared very well to the findings of Rotimi *et al*., 2018.

CONCLUSION

The present study has shown the ethanolic phytochemical constituents of *Solanum aethiopicum* leaf extract. The observation made so far in the present study revealed non-negative ingredients on the function of both animals and humans. The implication could be that humans that consume this leaf are exposed to the same health benefits. The results demonstrated that eggplants have great medicinal values such that they could be useful in health or pharmaceutical industries. Nwodo, 2013 reported that soluble fibers could be fermented in the colon into short-chain fatty acids which in turn lower the synthesis of cholesterol and triacylglycerols. The necessity of reduced levels of these lipids in managing dyslipidemia, especially in artherogenic condition is well known (Rotimi *et al*., 2012). Our results, therefore, suggest that *S. aethiopicum* leaf may be beneficial in the dietary management of dyslipidemia and weight hence its contituents.

REFERENCES

[1] Adeli, K., Taghibiglou, C, and Van Iderstine, S. C. (2011). Mechanisms of hepatic very low-density lipoprotein overproduction in insulin resistance. *Trends in Cardiovascular Medicine*, 11(5):170–176.

[2] Anosike, C. A., Obidoa, O. and Ezeanyika, L.U. (2012). The Anti-inflammatory activity of garden egg (*Solanum aethiopicum*) on egg albumin induced edema and granuloma tissue formation in rats. *Asian Pacific Journal of Tropical Medicine*. 5:62-66.

[3] Bonsu, K. O., Fontem, D. A., Nkansah, G. O., Iroume, R. N., Owusu E. O. and Schippers R. R. (2012). Diversity within the Gboma eggplant (*Solanum macrocarpon),* an indigenous vegetable from West Africa. *Ghana Journal of Horticulture.* 1:50–58.

[4] Borradaile, N. M., de Dreu, L. E., Barrett, P. H., Behrsin, C. D. and Huff, M. W. (2013). Hepatocyte apo B-containing lipoprotein secretion is decreased by the grapefruit flavonoid, naringenin, via inhibition of MTP-mediated microsomal triglyceride accumulation. *Biochemistry*, 42(5):1283-91.

[5] Chan, T.Y.K. (2019). Potential risks associated with the use of herbal antiobesity products. Drug Safe. 32(6):453-456.

[6] Chen, Y., Factor-Litvak, P., Howe, G.R., Graziano, J. H., Brandt-Rauf, P., and Ahsan, H. (2017a). Arsenic exposure from drinking water, dietary intakes of B vitamins and folate, and risk of high blood pressure in Bangladesh: A population-based, cross-sectional study, *American Journal of Epidemiol*ogy, 165(5) pp. 541-552.

[7] Chinedu, S. N, Olasumbo, A. C. and Eboji, O. K. (2011). Proximate and phytochemical analysis of *Solanum aethiopicum* L. and *Solanummacrocarpon* L. fruits. *Research Journal of ChemicalSciences*, 1(3):63-71.

[8] Cohen-Kohler, J. C. (2017). The morally uncomfortable global drug gap. *Clin. Pharmacol. Therapy.* 84(5): 610-614

[9] Dalal, S., Beunza, J. J., Volmink, J., Adebamowo, C., Bajunirwe, F. and Njelekela, M., (2011). Non-communicable diseases in sub-Saharan Africa: what we know now. *International Journal of Epidemiol*. 40, 885-901.

[10] Duru, M. K. C. (2019). Physicochemical and biochemical studies on Otamiri River, Owerrri, Imo State. M.Sc thesis, Abia State University, Uturu. Nigeria. p. 34.

[11] Elekofehinti, O. O., Adanlawo, I.G., Saliu, J. A. and Sodehinde, S. A. (2012). Saponins from *Solanum anguivi* fruits exhibit hypolipidemic

potential in *Rattus novergicus. Der Pharmacia Lettre*. 4 (3):811-814.

[12] Elujoba, A. A., Odeleye O. M. and Ogunyemi, C. M. (2015). Traditional medical development for medical and dental primary healthcare delivery system in Africa. *African Traditional Complementary and Alternative Medicine* 2(1): 41-46.

[13] Ezeugwu, C.O., Okonta, J.M. and Nwodo, N. J. (2014). Antidiabetic properties of ethanolic fruit extract of Solanum aethiopicum L. *Res J Pharm Allied Sci* 2(2):251-4.

[14] Ghasi, S., Egwuibe, C., Achukwu, P. and Onyanusi, S. (2011). Assessment of the medical benefit in the folkore use of Bryophyllum pinnatum leaf among the Igbos of Nigeria for the treatment of hypertension. *African Journal of pharmacy and pharmacology* 5(1): 83-92

[15] Grubben, G.J.H. and Denton, O.A. (2014). Plant resources of tropical Africa 2: vegetables. Wageningen: PROTA Publication; p. 253-254

[16] Guyton, A. C. and Hall J.E. (2016). *Textbook of medical physiology*, 10th edition, W.B. Saunder Company, NewYork. pp.523-753.

[17] Lewis, S. M., Bain, B. J. and Bates, I. (2019). Dacie and Lewis: *Practical Haematology*, Ninth Edition, London, New York: Elsevier, pp. 9-40.

[18] Mirmiran, P., Noori, N., Zavareh, M.B. & Azizi, F. (2019). Fruit and vegetable consumption and risk factors for cardiovascular disease. *Metabolism.* 58: 460-46

[19] Nwabuisi, C. (2012): Prophylactic effect of multiherbal extract 'Agbo-Iba' on malaria induced in mice. *East African Medical Journal* 79(7), 343 – 346.

[20] Nwodo, S. C, Okwuchukwu, K. E. and Solomon, O. R. (2013). Effects of *Solanum aethiopicum* Fruit on Plasma Lipid Profile in rats. *Advances in Bioresearch*, Vol 4 (4) pp 79-84

[21] Odetola, A. A., Iranloye, Y.O. and Akinloye, O. (2014). Hypolipidaemic Potentials of Solanum melongena and Solanum gilo on Hypercholesterolemic Rabbits. *Pakistan Journal of Nutrition*, 3 (3): 180-187.

[22] pinnatum (Family: Crassulaceae) leaf aqueous extract. *Journal of Ethnopharmacology*, 99: 13–19.

[23] Oliver-Bever, B. (2019). *Medicinal Plants in Tropical West African*. Cambridge Unit. Cambridge. pp.70.

[24] Olusanya, J.O. (2018). Essentials of Food and Nutrition, 1st edition, Apex Book limited, Lagos. pp. 36-75.

[25] Osim, E. E., Akpogomeh, B. A., Ibu, J. O.and Eno, A. E. (2014). Experimental Physiology Manual, Department of Physiology, University of Calabar, Calabar 3rd ed. Pp. 60 – 81.

[26] Ossamulu, I. F., AkanyA, H. O., Jigam, A.A., Egwim, E. C. and Adeyemi, H. Y. (2014). Hypolipidemic Properties of Four Varieties of Eggplants (*Solanum melongena* L.). *International Journal of Pharmaceutical Science Invention*, 3 (8): pp 47-54

[27] Prohens, J., Blanca, J. M. and Neuz, F. (2015). Morphological and molecular variation in a collection of eggplant from a secondary center of diversity: implications for conservation and breeding. *Journal of the American Society for Horticultural Science,* 130: 54-63.

[28] Roberts, S. J. and Amein T. Forsberg G. Kromphardt C. Kock E.Schimitt A.Werner S. (2016). Physical and biological seed treatments for control of bacterial diseases of carrots and brassicas caused by Xanthomonas app., 11th International Conference on Plant Pathogenic Bacteria, Edinburgh, Scotland.

[29] Rotimi, O.A., Olayiwola, I. O., Ademuyiwa, O. and Balogun, E.A. (2012). Effects of fiber-enriched diets on tissue lipid profiles of MSG obese rats. *Food Chemistry and Toxicology*. 50(11): 4062-4067.

[30] Saba, A. B., Dina, O.A., Adedapo, A.A and Akhiromen, I. O. (2013). Effect of aqueous leaf extract of Solanum aethiopicum on isolated guinea pig ileum. *African Journal* of *Biomedical* Research, 6(3): 146-147.

[31] Sofowara, A. (2013). Medicinal Plants and Traditional Medicine in Africa. Spectrum Book Limited. Ibadan Nigeria pp.289.

[32] Trease, G. E. and Evans, W.C. (2012). *Phytochemicals in Pharmacognosy*. 15th ed. Saunders Publishers, London. Pp42-44.