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PROXIMATE COMPOSITION AND PHYTOCHEMICAL ANALYSIS OF *BOMBAX BUONOPOZENSE* LEAVES (GOLD COAST BOMBAX).

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Abstract

The proximate composition and qualitative phytochemical analysis of *Bombax buonopozense* leaves were investigated. The proximate composition gave a high percentage of carbohydrate (47.65%), crude fat and ash contents were of low to moderate concentrations with values of 2.50% and 6.30% respectively. The crude protein, crude fiber and moisture contents had high values of 13.85%, 17.20%, and 12.50% respectively. The study however, revealed the presence of phytochemical components such as tannins, saponins, steroids, glycosides, flavonoids, terpenoids, alkaloids, oxalates, carbohydrate and protein. The phytochemicals present in the sample were juxtaposed with their ethno medicinal significance and from this, it could be deduced that *B. buonopozense* leaves is a rich source of energy (carbohydrate) and protein for indigenes of Adamawa State if well harnessed.

Keywords: Phytochemical analysis, Proximate composition, Medicinal value and *Bombax buonopozense*.

Introduction

Plants play a vital role in the maintenance of human health (Moerman, 1996). In Nigeria and other parts of the world, many of the indigenous plants are used as spices, food, ornamentals or medicinal adjuvants. Okwu, 2003 reported that many of these plants possess bioactive compounds that exhibit physiological activities against bacteria and other microorganisms. Nigeria, is naturally endowed with both savannah and tropical rain forest vegetation. This diverse flora and fauna offers a wide spectrum of unique medicinal plants. In Nigeria, the indigenous people are exploiting a variety of herbs for effective curing of various ailments (Burkill, 2000).

Vegetables are the fresh and edible portions of herbaceous plants which can be eaten raw or cooked (Fayemi, 1999; Dhello*et al.,*2006). They contain valuable food ingredients which can be successfully utilized to build up and repair body tissues. They are valuable in maintaining alkaline reserve of the body (Onwordi, 2009) and are valued mainly for their high carbohydrates, vitamins and mineral contents. Vegetables may be edible roots, stem, leaves, fruits or seeds. Each group contributes to diet in its own way (Robinson, 1990).

Karrie Heneman*et al.,*2008 defined phytochemicals as a large group of plant derived compounds, hypothesized to be responsible for much of the disease protection conferred from diets high in fruits, vegetables, beans, cereals and plant based beverages such as wine and tea. Harbone, 1973 and Okwu, 2004 considered phytochemicals as compounds formed during the plants normal metabolic processes. These chemicals are often referred to as secondary metabolites: alkaloids, flavonoids, glycosides, cumains, tannins, steroids, phenols and others. These chemicals help the body in a variety of ways (Iroka, *et al.,*2014). Research suggests that phytochemicals working together with nutrients found in fruits, vegetables and nuts, help slow the aging process and reduce the risk of many diseases such as cancer, heart disease, stroke, cataracts, osteoporosis and urinary tract infections (Iroka*et al.,*2014).

Wikipedia defines proximate composition as a good approximation of the contents of consumable food items

which serve as a cheap and easy verification of nutritional panels. It is the determination of the major components of food, which include: moisture, lipids (fats), ash, proteins, fiber and carbohydrate (Onwuka, 2005).

Bombax buonopozense

Bombax buonopozense is of the family *Malvaceae* formerly *Bombacaceae* and is commonly known as Gold coast Bombax or red flowered silk cotton tree (Beentje*et al.,*2001). It is known by the following local names: *Akpe (Igbo), Ponpola (Yoruba), Kurya (Hausa), Ukim (Efik) and IdoUndu (Ijaw)*. It is native primarily to West Africa where it is found in rainforests of Sierra Leone in the North West, East Gabon and some parts of Nigeria (Beentje*et al.,*2001). It is a large tree and often reaches heights of 40 meters (130 feets) and up to 3 meters trunk diameter. The bark of younger trees is covered with spine but sheds the spine with age to some degree and large deep pink to red flowers emerge while the tree is leafless (GRIN, 2007). According to Beentje*et al.,*2001 and Germplasm Resources Information Network, 2007; many parts of this plant is utilized for medicinal and traditional purposes.

Plants which are observed to be efficacious and frequently prescribed may contain compounds that are potential drugs candidates and could rightly be recommended for further examinations. The active principles differ from plant to plant due to their biodiversity and they produce a definite physiological action on the human body (Edeoga *et al.,*2006) that is why phytochemical screenings and proximate analysis of plants should be done constantly even on the one whose secondary metabolites are already known (Temitope*et al.,*2012).

This work therefore is aimed at screening the leaves of *B. buonopozense* for the presence of secondary metabolites and its proximate composition.

Materials and Methods

Sample collection, preparation and analysis

The fresh leaves of the plant (*Bombax buonopozense*) was obtained from Demsa Local Government Area of Adamawa State, Nigeria, in October 2014. The plant was cited from existing collections deposited at the Herbarium in Ibadan, an international herbarium listed in Holmgren *et al.,* 1990. *Bombax buonopozense* P. Beauv. hasForestry Herbarium Index Number FHI 108415 and a specimen of the plant there.

The leaves were dried at room temperature so as to prevent the decomposition of volatile chemical compounds present in them and were pounded into fine powder using mortar and pestle. The pounded sample was then analyzed for:

Proximate composition

Crude protein, crude fat, ash, crude fiber, moisture content and carbohydrate using AOAC (2000).

Qualitative phytochemical analysis

The chemical test was carried out on the methanolic extract of the sample to identify the constituents. Standard analytical procedures as described by Harbone, 1973; Trease and Evans, 1989; Sofowora, 1993 and Aluko*et al.,*2000 were adopted for the tests.

Results and Discussion

Results of each analyte in Table 1 are calculated average of three (3) analytical values. Statistical values were obtained using the IBM-SPSS software version 22, 2015 edition and are presented as mean ±SD.

Table 1: Proximate (%) composition of *Bombax buonopozense* Leaves.

Constituents	Values (%)
Crude protein	13.85 ±0.00577
Crude fat	2.50 ± 0.00577
Ash	6.30 ± 0.00577
Crude fiber	17.20 ± 0.00000
Moisture content	12.50 ± 0.00577
Carbohydrate	47.65 ± 0.00577

The carbohydrate value was obtained via difference i.e.
100- (Values of ash+ crude fiber+ crude protein+ crude fat+ moisture content)
The above results are expressed as % by weight.

The crude protein value is 13.85%. This value is compared with that reported by Onwordi *et al.,* (2009) for *Amaranthus cruentus* (spinach) *, Celusia argenta* (Soko) and *Corchorus olitorius* (Ewedu) with values of 12.66%, 9.35%, and 11.24% respectively but lower than that reported for *Amaranthus candatus* (20.50%). (Onwordi *et al.,* 2009). Plant foods that provide more than 12% of their calorific value from protein have been shown to be good source of protein (Ali, 2009). This shows that

the plant investigated is a good source of protein. Proteins are body builders, they replace worn out tissues, andare also immune booster and can help in cell division as well as growth (Okeke *et al.,* 2006).

The crude fat value obtained is 2.50%. Onwordi *et al.,* 2009 documented 0.21% for spinach and 0.32% for Ewedu while Asaolu*et al.,* 2012 documented 9.05% for bitter leaf. This shows that the investigated sample has a low fat composition as compared to the bitter leaf thus making it good for consumption. In 2006, Hanif*et al.,* documented that crude fat analysis showed that vegetables are deficient in fats and this makes them good for health. The low amount of fat indicates that the vegetable is not a source of lipid accumulation. Lipid accumulation causes arteriosclerosis, aging (Antia *et al*., 2006). The sample under investigation has the same amount/value with that of *Moringa oleifera* as documented by Bamishaiye *et al.,*2011 (2.50%).Fats are important in energy production. Also, fats and oilshelp to regulate blood pressure of vital cell parts (Dutta, 1981).

The ash content is found to be 6.30%. This is low compared to *Moringa oleifera* (8.00%) as documented by Bamishaiye *et al.,*2011, but higher than the Indian spinach (5.02%) as documented by Asaolu *et al.,*2012. Ash content is a measure of the total amount of minerals present within a food. This implies that the ash is the inorganic residue remaining after water and organic matter have been removed by heating (Onwuka, 2005).

Fibers are needed in the human system; adequate intake of dietary fiber can lower the serum cholesterol, risk of coronary heart disease, hypertension, constipation, diabetes, colon and breast cancer (Ishida et al., 2000; Rao and Newmark, 1998; Boutell *et al.,*1998). The crude fiber content of *B. buonopozense* leaves is found to be 17.20% which is higher than those of *Ewedu* (6.66%), Spinach (7.83%), *Tete* (11.70%) and *Moringa* (10.11%) as documented by Bamishaiye *et al.,*2011 and Onwordi *et al.,*2009.

According to this result, the moisture content of *Bombax buonopozense* leaves is 12.50% which is higher compared to those reported for legumes by Arkroyed*et al.,*(*1964*) which ranges from 7.0 – 10%. The moisture content obtained is higher than those documented for bitter leaf (10.02%), Indian spinach (11.57%), *Moringa* (6.30%); (Bamishaiye *et al.,* 2011 and Asaolu*et al.,*2012). The high moisture content provides greater activity of water soluble enzymes and co-enzymes needed for metabolic activities of the plant (Iheanacho and Udebuani, 2009) as well as that of the human body thus creating a conducive environment for organs to function effectively (Iroka*et al.,*2014).

Carbohydrate was found to be the highest parameter with a value of 47.65% which falls within the range of other reported legumes, 20 – 60.0% as cited by Ojieh*et al.,*(2008). Carbohydrates are hydrolyzed in the body to yield glucose which can be utilized immediately or stored as glycogen in the muscles and liver for future use (Iroka *et al.,* 2014). The primary function of carbohydrates is to provide energy for the body, especially the brain and the nervous system. An enzyme called amylase helps break down carbohydrates into glucose (blood sugar), which gives the body energy.(http://www.nytimes.com/health/guides/nutrition/carbohydrates/overview.html; 2015). Eating too much carbohydrates can lead to an increase in total calories, which can lead to obesity. Not eating enough carbohydrates can cause lack of calories (malnutrition), or lead to an excessive intake of fats to make up for the calories not eaten as carbohydrates. Carbohydrate is broken down into glucose relatively quickly and therefore has a more pronounced effect on blood sugar levels than either fat or protein.(http://www.diabetes.co.uk/ nutrition/ carbohydrates-and-diabetes.html; 2015)

Table 2: Qualitative phytochemical result of *Bombax buonopozense* Leaves

Phytochemical component	Test	Observation	Leaf extract
Tannins	Ferric chloride test	Greenish precipitate	+
Saponins	Emulsion test	Presence of emulsion	+
Steroids	Salkowski test	Red colour at interface	+
Phlobatannins	Hydrochloric acid test	No colour change	-
Glycosides	Sulphuric acid test	Reddish brown colour	+
Flavonoids	Lead acetate	Yellow precipitate	+
Terpenoids	Sulphuric acid test	Grey colouration	+
Anthraquinones	Ammonia solution test	No colour formed	-
Alkaloids	Mayer's and Wagner's test	Reddish brown precipitate	+
Oxalates	Ethanoic acid test	Greenish black colouration	+
Carbohydrate	Iodine test	Blue black colour	+
Protein	Million's test	Pink colouration	+

Table 2 above gives the breakdown of the phytochemicals present or absent in the plant sample.

Anthraquinones and phlobatannins were found to be absent while others (tannins, saponins, steroids, glycosides, flavonoids, terpenoids, alkaloids, oxalates, carbohydrates and protein) were all present in the sample.

The phytochemical constituents identified in the leaf extract which are the plant secondary metabolites are known to have antimicrobial activities which is a property of most medicinal plants (Ebana *et al.,* 1995; Elastal *et al.,*2005 and Adejumobi *et al.,*2008;).

Alkaloids, are said to be pharmacologically active and are known to exhibit marked physiological activity (Okwu, 2004). Their actions are felt in the autonomic nervous system, blood vessels, promotion of diuresis, respiratory system, gastrointestinal tract, uterus, malignant diseases and malaria (Trease and Evans, 1996). However, pure isolated plant alkaloids and their synthetic derivatives are used as basic medicinal agents for analgesics, antiplasmodic and bacterial effects (Stray, 1998).

Tannins have been found to possess astringent properties which hastens the healing of wounds and inflamed mucus membranes (Okwu, 2004; Kozioc, 1998). They are well known for their antimicrobial properties; therefore, this suggests that they may be useful in the treatment of venereal diseases and also helps to regenerate the skin (Okwu, 2004).

The presence of flavonoids in the leaves indicate the medicinal value of the plant (*Bombax buonopozense*). Hence flavonoids are antioxidants and free radical scavengers which prevent oxidation; they have strong anticancer activity and also protect the cell against all stage of carcinogenesis (Salah *et al.,* 1995; Okwu, 2004). In addition, flavonoids in the intestinal tract lower the risk of heart disease (Okwu, 2004). Flavonoids and flavones are widely distributed secondary metabolites with antioxidant and antiradical properties (Nakayoma and Yamada, 1995). This suggests that taking foods rich in flavonoids help to reduce the risk of heart diseases, and this is of great importance in pharmacology, medicine and human nutrition. In addition, flavonoids are phenolic in nature, and they act as cytoplasmic poisons which have been reported to inhibit the activity of enzymes (Dathak and Iwu, 1991). The antioxidant properties of flavonoids may be responsible for ability of some of the selected plants, such as *Fucus virosa* to treat several diseases like arthritis, anaemia etc.

The sample was found to contain saponins. Saponin is useful in medicine and pharmaceutical industry due to its foaming ability that produces frothy effects in the food industry. Saponins are glycosides of both triterpenes and steroids having hypotensive and cardiac depressant properties, and have been detected in over several plant families (Basu *et al.,* 1967; Olaleye, 2007). They have been shown to possess beneficial properties by lowering the cholesterol level, have anti diabetic and anti-carcinogenic properties (Trease and Evans, 1996) as well have been used as an expectorant and emulsifying agent (Edeoga *et al.,* 2006). Saponins bind to cholesterol to form insoluble complexes. Dietary saponins in the gut of monogastric animals combine with endogenous cholesterol excreted via the bile. This prevents cholesterol reabsorption and results in reduction of serum cholesterol (Cheeke, 1971). They also have been found to be potentially useful for the treatment of hyper cholesterolaemia (presence of abnormally high levels of cholesterol in the blood) which suggests that saponins might be acting by interfering with intestinal absorption of cholesterol (Malinow, 1977). It is also useful in the manufacture of shampoos, insecticides, various drug preparations and synthesis of steroidal hormones. Examples of such compounds include cortisone and estrogenic contraceptive (Dubrovsky, 2005; Okeke, 2009).

The presence of steroids in the sample indicates yet another medicinal property of the plant. Steroids are used in the treatment of some endocrine disorders, regulation of blood sugar, salt imbalance and antimicrobial infections (Dubrovsky, 2005).

Glycosides found in the plant sample are constituents of animal tissues and are important in medicine because of their actions on the heart (Hurrell *et al.,* 1995).

The analysis indicated the presence of oxalates in the plant sample. Oxalic acid and oxalates both occurring naturally in many plants, most of which can be eaten safely without complications. (http://www.moonvalleyreptiles.com/uromastyx/uromastyx-diet/oxalates-goitrogens-toxins, 2015). Many greens, fruits and vegetables that have these phytochemicals present, cannot be avoided. However, choosing staple foods with low amounts of oxalates will balance out the items with higher content. (http://www.moonvalleyreptiles.com/uromastyx/uromastyx-diet/oxalates-goitrogens-toxins, 2015). Calcium oxalate is the main contributor to the formation of kidney stones. About 80% of kidney stones are partially or entirely of the calcium oxalate type. They form when urine has been persistently acidic. Some of the oxalate in urine is produced by the body. Calcium and oxalate in the diet play a part, but are not the only factors that affect the formation of calcium oxalate stones. Dietary oxalate is an organic molecule found in many vegetables, fruits, and nuts. Calcium from bone may also play a role in kidney stone formation (https://en.wikipedia.org/wiki/Calcium_oxalate, 2015).

Conclusion

Wikipedia, 2015 documented that vegetables can be eaten either raw or cooked and play an important role in human nutrition, being low in fat but high in vitamins, minerals and fibers. From the analysis carried out on the plant sample, it was deduced that the sample contains phytochemicals thus making it suitable for industrial purposes like in pharmaceutical and cosmetic industries. Ishida *et al.,*2000, documented that fibers are needed in the human system and adequate intake of fiber lowers serum cholesterol, breast cancer, hypertension etc. Just as *Moringa* is both regarded as both a medicinal plant and consumed as food so also *Bombax buonopozense* leaves can be consumed as food (with adequate cooking alongside other condiments) because of its rich proximate composition and phytochemical properties.

Recommendations

1. If the exact amount of phytochemicals present in the leaves could be determined, then specific metabolites can be screened and isolated to undergo pharmacological processes and a potent drug could be developed or formulated.
2. Active components from the plant could also be isolated and characterized.

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References

Adejumobi A.J., Ogundiya M.O., Kolapo K.A., Okunade M.B. (2008): Phytochemical composition and in vitro antimicrobial activity of *Anogeissus leiocarpus* on some common oral pathogens. *Journal of med. Plants Res.; 193-196*

Ali A. (2009): Proximate and mineral composition of the marchubeh (*Asparagus officinalis*). *World Dairy and Food Science, 4*(2), *142-149*

Antia, B.S., E.J. Akpan, P.A. Okon and I.U. Umoren (2006): Nutritive and anti-nutritive evaluation of sweet potatoes (*Ipomoea batatas*) leaves. *Pak. J. Nutr., 5:166-168.*

AOAC (2000). Association of Official Analytical Chemists. 18th edition. official methods of analysis. Washington dc: pp.18-62

Arkroyed W.R and Doughty J. (1964): Legumes in Human Nutrition*. Food and Agricultural Nutrition Studies Publication.*

Basu N, Rastogi R. P. (1967): Triterpenoid, Saponins and Sapogenins. *Phytochem., 6: 1249-1270.*

BeentjeH, Smith S. (2001): Plant systematic and Phytogeography for the understanding of African Biodiversity*. Systematic and Geography of plants; 71(2):234-286.*

Boutwell R. K. (1998): An Overview of the Role of Nutrition in Carcinogenesis, Nutrition, Growth and Cancer. *Allan R, Liss Inc. London, 418.*

Burkill, H. M (2000): The useful plants of West Tropical Africa, *RoyalBotanical Gardens,Kew 2nd Edition, Vol.5, pp 686*

Chionyedua T. Onwordi, Anuoluwa M. Ogungbade and Adedoja D. Wusu (2009): The proximate and mineral composition of three leafy vegetables commonly consumed in Lagos, Nigeria. *African journal of pure and Applied chemistry vol.3(6), pp.102-107, june 2009.*

Dathak P, Iwu M (1991): Inhibition of Xanthine oxidase activity by some flavonoids. *Phytother., 63: 385.*

Dhellot J.R, MatoubaE, Maloumbi M.G, Nzikou J.M, Safou-Ngoma D.G,Linder M, Desobry S, Parmentier M (2006): Extraction, chemical composition and nutritional characterization of vegetable oils: Case of *Amaranthus hybridus* (Var 1 and 2) of Congo Brazzaville. *Afr. J. Biotechnol. 5(11): 1095-1101.*

Dutta A. C. (1981): Botany for Degree students. *Oxford University Press, 16th Edition New Delhi, 708.*

Dubrovsky B. O. (2005): Steroids, Neuroactive Steroids in psychopathology. *Progress in Neuropsycho pharamacology and Biological psychiatry; 29:169-192.*

EbanaR. U,EssienA. I,EkpaO. D. (1995):Nutritionaland Potential Medicinal value of the leaves of *Lasianthera africana* (Beauv):Alkaloid, Tanninand saponin contents of some Nigeria Medicinal plants. *Journal of Medicinal Aromatic plant science; 23:344-349.*

E.I. Bamishaiye, F.F. Olayemi, E.F. Awagu& O.M. Bamshaiye (2011): Proximate and Phytochemical Composition of *Moringa oleifera* Leaves at three Stages of Maturation. *Advance Journal of Food Science and Technology 3(4): 233-237, 2011ISSN: 2042-4876*

El astal Z.Y, Aera A, Aam A. (2005): Antimicrobial activity of some medicinal plant extracts in Palestine. *Pak. J. Med. Sci.; 21(2): 187*

Fayemi P.O (1999): Nigerian Vegetables, *Heinemann Educational Books Nigeria,1stEdition pp 1-8.*

Germplasm Resources Information Network (2007): (GRIN"Bombax" http://www.ars-grin.gov.

HarboneJ.B. (1973): Phytochemical methods*. Chapmanand Hall Ltd, London 1973; 279.*

HurrellR.f, Reddy M, Cook J.D. (1995): Inhibition of nonharm Iron absorption in man polyphenolic-

containing beverages. *The British Journal of Nutrition; 81(4):289-95.*

Iheanacho, K. &Ubebani, A. C. (2009): Nutritional composition of some leafy vegetable consumed in Imo-State, Nigeria. *J. Appl. Sci. Environ. Manage, 13(3), 35-38.*

Iroka Finian Chisom,Okereke Chukwu N, Okeke C. U. (2014): Comparative phytochemical and proximate analyses on *Ceiba pentandra* (L) Gaertn. and *Bombax buonopozense* (P) Beauv.:*International Journal of Herbal Medicine 2014; 2(2): 162-167*

Ishida H, Suzuno H, Sugiyama N, Innami S, Todokoro T, Maekawa A (2000): Nutritional evaluation of chemical component of leaves, stalks and stems of sweet potatoes (*Ipomea batatas* Poir). *Food Chem. 68:359-367.*

Karrie Heneman (PhD), Sheri Zidenberg-Cherr (PhD) (2008): UC Cooperative Extension Center for Health and Nutrition Research Department of Nutrition University of California Davis, CA 95616-8669

Kozioc M.J, Marcia (1998): Chemical composition nutritional evaluation and economic prospects of *Spondias purpurea* (Anacardiaceae). *Economic Botany; 52:373-380.*

Malinow M.R, Mclaughin P, Kohler G.O, Livingstone AL (1977a): *Alfalfa saponins*: A family of substances potentially useful for treatment of hypercholesterolaemia. *Clin. Res., 25: 974-979.*

Moerman D.E. (1996): An analysis of the food plants of native North American. *Journal of Ethnopharamcology; 52:1-22.*

Nakayoma J, Yamada M. (1995): Suppression of active oxygen-indeed cyto toxicity by flavonoids. *Biochem. Pharmcol., 45: 265-267.*

Olaleye M.T. (2007): Cytotoxicity and antibacterial activity of methanolic extract of *Hibiscus sabdariffa*. *J. Med. Plants Res., 1(1): 009-013.*

O.F. OWOSO, O. Aluko& O. I. Banjoko (Mrs) (2000): Manual of food analysis & quality control. *Concept Publications Ltd ppg 36-38*

Ojieh G. C., Oluba O. M., Ogunlowo Y. R., Adebisi K.E., Eidangbe G.O and Orole R.T (2008): Compositional Studies of *Citrullus lanatus* seed. *The internet journal of nutritional and wellness. Vol.6 No.1*

Okeke C.U, Elekwa I. (2006): Proximate and Preliminary Photochemical Analyses of Avocado Pea *Persea gratissima* Cacrtn. F. (Family Lauracea). *Nigeria Journal of Botany; 9(1):159-162.*

OkwuD.E. (2004): Phytochemicals and Vitamin content of indigenous spices of South Eastern Nigeria. *Journal of sustenance of AfricaEnvironment;6:30-34.*

P.K. Holmgren, N.H. Holmgren, L.C. Barnett (Eds.) (1990): Index Herbariorum. Part I: The Herbaria of the World (Regnum Veg. vol. 120). *New York, New York Botanical Garden.*

RumezaHanif, Zafar Iqbal, Mudassar Iqbal, Shaheena Hanif&Masooma Rasheed (2006): Use of vegetables as nutritional food: role in human health. *Journal of Agricultural and Biological Science VOL.1, NO.1, ISSN 1990-6145. 2006 Asian Research Publishing Network (ARPN). All rights reserved. www.arpnjournals.com*

Rao C.V., Newmark H.L., (1998): Chemo-preventive effect of Squalene on colon cancer. *Carcinogenesis 19: 287-290.*

Robinson D.S (1990): Food biochemistry and nutritional value. *Longman scientific and technical publisher, New York. USA.*

Salah W, Miller N.J, Pagauga G., Tijburg G, Bonel A.P, Rice E, Evans C. (1995): Polyphenolic flavonoids as scavengers of aqueous phase radicals as chain breaking oxidant. *Arch Biochem Bioech 1995; 2:339346.*

S. S. Asaolu, O. S. Adefemi, I. G. Oyakilome, K. E. Ajibulu& M. F. Asaolu (2012): Proximate and Mineral Composition of Nigerian Leafy Vegetables. *Journal of Food Research; Vol. 1, No. 3; 2012 ISSN 1927-0887 E-ISSN 1927-0895. Published by Canadian Center of Science and Education.*

Sofowora A. (1993): Medicinal plants and tradition medicine in African. *Spectrum Books Ltd, Ibadan Nigeria, 2nd Edition, 1993,289.*

Stray F. (1998): The National Guide to Medicinal Herbs and Plants. *Tiger Books International London, 1998, 72.*

Temitope Israel Borokini, Felix Oluwafemi Omotayo (2012): Phytochemical and ethnobotanical study of some selected medicinal plants from Nigeria; *Journal of Medicinal Plants Research Vol. 6(7), pp. 1106-1118, 23 February,2012.*

Trease G.E, Evans W.C (1989): Textbook of Pharmacognosy. *W.B. Sanders, London.14th Edition.*

