American Journal of

Biochemistry and Molecular Biology

ISSN 2150-4210

Academic
Journals Inc.

www.academicjournals.com

American Journal of Biochemistry and Molecular Biology 1 (1): 30-38, 2011
ISSN 2150-4210 / DOI: 10.3923/ajbmb.2011.30.38

Some Medicinal Values of *Telfairia occidentalis*: A Review

A.A.A. Kayode and O.T. Kayode
Biochemistry Unit, Department of Chemical Sciences, Bells University of Technology, Ota, Ogun State, Nigeria

Corresponding Author: A.A. Kayode Abolanle, Biochemistry Unit, Department of Chemical Sciences, Bells University of Technology, Ota, Ogun State, Nigeria Tel: +23408038272670

ABSTRACT

Several medicinal uses of the fluted pumpkin (*Telfairia occidentalis*) in traditional medicine have been documented. Although, many of these claims are yet to be validated by scientific researchers, a review of some investigated therapeutic activities of the plant are highlighted in this article. Experimental works done on *Telfairia occidentalis* especially in the field of Biochemistry were retrieved via Google search on the internet and studied carefully to identify any therapeutic activity reported on *Telfairia occidentalis*. It can be inferred that the ability of the plant to combat certain diseases may be due to its antioxidant and antimicrobial properties and its minerals (especially Iron), vitamins (especially vitamin A and C) and high protein contents. We therefore conclude that with further chemical manipulation and clinical investigations numerous drug designs could emerge from the plant. An effort to keep the plant protected and conserved is also advocated.

Key words: *Telfairia occidentalis*, leaves, seeds, antioxidants, diabetes

INTRODUCTION

Plants provide an alternative strategy in search for new drugs. There is a rich abundance of plants reputed in traditional medicine to possess protective and therapeutic properties. It is likely that plants will continue to be a valuable source of new molecules which may, after possible chemical manipulation, provide new and improved drugs (Shah *et al*., 2006). Traditional medicinal plants are a therapeutic resource used by the population of the continent specifically for health care, which may also serve as starting materials for drugs (Sofowora, 1993). Iwu *et al*. (1999) reported that infectious diseases account for one-half of all deaths in the tropical countries. As a result, people of all continents have long applied poultice and imbibed infusions of indigenous plants dating back to prehistory for health purposes (Cowan, 1999). It comprises of therapeutics practices in existence for hundreds of years before the development of modern scientific medicine and is still in use today without any documented evidence of adverse effects.

According to the World Health Organization (WHO, 1977) a medicinal plant is any plant which in one or more of its organ contains substances that can be used for the synthesis of useful drugs. This definition distinguishes those plants whose therapeutics properties and constituents have been established scientifically and plants that are regarded as medicinal but which have not yet been subjected to thorough investigation. The term herbal drug determines the part/parts of a plant used for preparing medicines (for examples: leaves, flowers, seeds, roots, barks, stems, etc.). Furthermore, WHO (2001) defines medicinal plant as herbal preparations produced by subjecting plant materials

to extraction, fractionation, purification, concentration or other physical or biological processes which may be produced for immediate consumption or as a basis for herbal products.

Medicinal plants contain biologically active chemical substances such as saponins, tannins, essential oils, flavonoids, alkaloids and other chemical compounds (Harborne, 1973; Sofowora, 1996) which have curative properties. These complex chemical substances of different compositions are found as secondary plant metabolites in one or more of these plants. Tyler (1999) has reported that plants also contain certain other compounds that moderate the effects of the active ingredients.

Telfairia is classified in the tribe Joliffieae of the subfamily Cucurbitaceae. It comprises 3 species, of which *Telfairia pedata* (Sm. ex Sims) Hook. (Oyster nut) is much cultivated for its seed oil in East Africa. The names *Telfairia pedata* and oyster nut are often erroneously used for *Telfairia occidentalis*. Cultivars of *Telfairia occidentalis* are distinguished by seed colour, thickness of vine, size of leaf, growing vigour, days to flowering and succulence. In Nigeria the two main cultivars are ugu-ala, characterized by succulent, broad leaves, small black seeds, thick stem and slow growth and ugu-elu which has a high growth rate, large brownish seeds with high viability and thin stem with small leaves. The large succulent leaves of ugu-ala make this cultivar a commercial vegetable in high demand, while the fast emergence and high growth rate of 'ugu-elu' is preferred by farmers because of quick returns. The seed is often polyembryonic, which is useful for multiplication and in breeding (Akoroda, 1990b).

Telfairia occidentalis Hook f. commonly called fluted pumpkin occurs in the forest zone of West and Central Africa, most frequently in Benin, Nigeria and Cameroon. It is a popular vegetable all over Nigeria. It is rare in Uganda and absent in the rest of East Africa. It has been suggested that it originated in south-east Nigeria and was distributed by the Igbos, who have cultivated this crop since time immemorial. It is, however, equally possible that fluted pumpkin was originally wild throughout its current range, but that wild plants have been harvested to local extinction and are now replaced by cultivated forms. It has different traditional names; among the Igbos, it is known as Ugu, iroko or aporoko in Yoruba, ubong in Efik, umee in Urhobo and umeke in Edo (Akoroda, 1990a; Badifu and Ogunsina, 1991). In this article we intend to only discuss the therapeutic potentials of *Telfairia occidentalis* which by far outweighs the little possible toxicity in biological systems that has been reported.

GENERAL HEALTH BENEFITS DERIVED FROM *TELFAIRIA OCCIDENTALIS*

Telfairia occidentalis is an important staple vegetable grown in Nigeria. The plant produces luxuriant edible green leaves, which are rich in iron and vitamins. Stems of the plants have branching, long twisting tendrils and the leaves are divided into three to five leaflets with the terminal leaflets up to 15 cm long, while the male plant is grown principally for leaves and seeds, which are important soup condition. Recent studies have shown that *Telfairia occidentalis* leaf is rich in minerals (such as iron, potassium, sodium, phosphorus, calcium and magnesium), antioxidants, vitamins (such as thiamine, riboflavin, nicotinamide and ascorbic acid, phyto-chemicals such as phenols. Harvesting of fluted pumpkin takes place 120-150 days after sowing (Longe *et al*., 1983; Okoli and Nyanayo, 1988; Akoroda *et al*., 1990; Ladeji *et al*., 1995; Oboh and Akindahunsi, 2004; Horsfall and Spiff, 2005; Oboh, 2005; Fasuyi, 2006; Oboh *et al*., 2006; Ajibade *et al*., 2006; Kayode *et al*., 2009). The leaves contain essential oils, vitamins; root contains cucubitacine, sesquiterpene, lactones (Iwu, 1983). The young leaves sliced and mixed with coconut water and salt are stored in a bottle and used for the treatment of convulsion in ethno medicine (Gbile, 1986). The leaf extract is useful in the management of cholesterolemia, liver problems and

impaired defense immune systems (Eseyin *et al.*, 2005a, b).The roots are used as rodenticide and an ordeal poison (Gill, 1992). The essential amino acids contents compared favorably with those of important legumes (Asiegbu, 1987). The amino acid profile of *T. occidentalis* had also been shown to be very rich and includes alanine, aspartate, glycine, glutamine, histidine, lysine, methionine, tryptophan, cystine, leucine, arginine, serine, threonine, phenylalanine, valine, tyrosine and isoleucine (Tindall, 1968; Fasuyi, 2006). Emeka and Obidoa (2009) study reveals that the long term feeding of *T. occidentalis*-supplemented diet caused a significant increase in weight of animals which may be due to its content of rich nutrients.

The seeds are highly nutritious and are roasted or boiled and eaten like the seeds of breadfruit (Treculia); they are also sometimes used as soup thickeners (Okoli and Mgbeogu, 1983). The seed is very rich in oil, especially unsaturated fatty acids which form 61% of the oil (Odoemena and Onyeneke, 1998; Okoli and Nyanayo, 1988). Akubue *et al.* (1980) and Taylor *et al.* (1983) have documented that fluted plumpkin seeds are a good source of four minerals required in human nutrition. There report showed that the seed contained 29% oil and 30% protein. Asiegbu (1987) reported fluted pumpkin seed contain 47% oil and 31% protein. The protein was said to be markedly deficient in the sulphur amino acid. Longe *et al.* (1983) reported that fluted plumpkin seeds had 53% fat, 22% protein, 3% fibre, 15% carbohydrates and 2% ash. Oyolu (1980) observed that vegetables will continue to remain the primary source of proteins, minerals and vitamins in African countries, he noted that leaves and edible shoots of fluted pumpkin together contain 85% moisture, while the dry portion of what is usually consumed contains 11% crude protein, 25% carbohydrate, 3% oil, 11% ash and as much as 700 ppm iron. The results of the study carried out by Christian (2007) shows that the seed contained essential nutrients in significant amount that can supplement other foods. The levels of crude protein (3.47%), crude fat (31.38%), moisture (10.93), Ash (2.02%), carbohydrate (50.08%), fibre (2.12%), calcium (280 $\mu g\ g^{-1}$), phosphorus (2100 $\mu g\ g^{-1}$), iron (69 $\mu g\ g^{-1}$), sodium (10.80 $\mu g\ g^{-1}$), potassium (1280 $\mu g\ g^{-1}$), vitamin A (890 IU) and vitamin C (0.7 $\mu g\ g^{-1}$) detected in the seed were compared with nutritional composition of some plant foods in Nigeria. The study shows that the seed of *Telfairia occidentalis* Hook F. is high in carbohydrate, fat and phosphorus. The seed also contained levels of vitamin A which can supplement other dietary sources. The oil of *Telfairia occidentalis* seeds have a high iodine values compared to palm oil which indicates that the oil has a high content of unsaturated fatty acids relative to palm oil. This suggests that it may be used as edible oil for cooking or manufacturing of margarine (Christian, 2007).

The high protein content in leaves of plants such as *Telfairia occidentalis* could have supplementary effect for the daily protein requirement of the body. The symptoms of protein energy malnutrition such as Kwashiorkor and Marasmus were rarely observed among dwellers in region where adequate amount of protein is obtained from fruits/seeds and leaves of plants rich in proteins such as *T. occidentalis* (Dike, 2010; Kayode *et al.*, 2010; Kayode *et al.*, 2009).

Fasuyi and Nonyerem (2007) investigations shows that *Telfairia occidentalis* leaf meal caused increased growth in birds. Adaramoye *et al.* (2007) reported that *Telfairia occidentalis* leaves has hypolipdemic effect and may be a useful therapy in hypercholestolemia. This confirms the research work of Eseyin *et al.* (2005a). The vitamin A content and consumption pattern of some green leafy vegetables (which includes *Telfairia occidentalis*) among pregnant women in Calabar, Nigeria was investigated by Williams *et al.* (2009). They observed that *Telfairia occidentalis* has the highest vitamin A content which is adequate enough to sustain their vitamin A requirement (Williams *et al.*, 2009). The fruits of *Telfairia occidentalis* have been utilized in the production of

marmalade (Egbekun *et al.*, 1998). The use of *Telfairia occidentalis* in reproduction and fertility in traditional medicine is gradually becoming a thing of interest in medical science. A study carried out by Nwangwu and his colleague shows that *Telfairia occidentalis* has the potential to regenerate testicular damage and also increase spermatogenesis (Nwangwa *et al.*, 2007). However, more research work is required to establish this observation.

ANTIOXIDANT AND FREE RADICAL SCAVENGING PROPERTY

Almost all organisms possess antioxidant defense and repair systems that evolved to protect them against oxidative damage, these systems are insufficient to prevent them entirely. However, antioxidant supplements or foods containing antioxidants may be used to help human body reduce oxidative damage (Yang *et al.*, 2002). In recent years, there has been a particular interest in the antioxidant and health benefit of phytochemicals in food and vegetables. This was as a result of their potential effects on human health (Wei and Shiow, 2001). Many researchers especially in the field of medical sciences have observed free radical scavenging ability and antioxidant property in *Telfairia occidentalis*. The darkish green leafy vegetable leaves of *Telfairia occidentalis* and extracts (such as aqueous and ethanol extracts) from the leaves have been found to suppress or prevent the production of free radical and scavenge already produced free radical, lower lipid peroxidation status and elevates antioxidant enzymes (such as superoxide dismutase and Catalase) both *in vitro* and *in vivo* (Oboh *et al.*, 2004, 2006; Nwanna and Oboh, 2007; Adaramoye *et al.*, 2007; Emeka and Obidoa, 2009; Kayode *et al.*, 2009; Kayode *et al.*, 2010). *Telfairia occidentalis* has also be found to protects and ameliorates oxidative brain and liver damaged induced by malnutrition in rats (Kayode *et al.*, 2009, 2010). Nwanna and Oboh (2007) reported the hepatoprotective property of polyphenol extracts of *Telfairia occidentalis* leaves on acetaminophen induced liver damaged. Oboh (2005) reported that both aqueous an d ethanolic extracts of *T. occidentalis* leaves protect the liver cells against garlic- induced oxidative damage. However, the aqueous extract is more effective than the ethanolic extracts, which could be attributed to the higher antioxidant activity of the aqueous extracts of *T. occidentalis* leaves. Hepatoprotective effects of *Telfairia occidentalis* leaves have been reported by Eseyin *et al.* (2005b), Emeka and Obidoa (2009) and Kayode *et al.* (2010). The use of the leaves in folk medicine in Nigeria in the treatment of certain diseases in which the participation of reactive oxygen species have been implicated could be as a result of the antioxidant and free radical scavenging ability.

ANTIPLASMODIAL AND ANTIMICROBIAL PROPERTIES

Malaria is a potentially life-threatening disease in the tropics as it affects over 400 million people yearly and is responsible for the deaths of an estimated 10,000 women of reproductive age and over 1 million infants and young children each year (Barbin, 1989; Mishra *et al.*, 2003). Drug resistance, increases in the production and circulation of fake drugs and high cost of newer and effective drugs have been a major factor affecting the poor populace, thus making their choice of herbal remedies inevitable and economical. A study has shown that the ethanol root extract of *T. occidentalis* possess antiplasmodial potential. The blood schizontocidal activity of the root extract is comparable to that of chloroquine (Okokon *et al.*, 2007). The ethanolic and aqueous extracts of *Telfairia occidentalis* have been reported to show inhibitory effect on growth on some of the commonly encountered Enterobacteriaceae in Nigeria, namely *Escherichia coli*, *Pseudomonas aeroginosa*, *Proteus* sp. and *Salmonella typhii*. However, both extracts did not inhibit the growth of the fungi tested, which are *Aspergillus favus*, *Aspergillus fumigatum*, *Peniccillium italium* and

Geotrichum albidun (Oboh *et al.*, 2006). Antibacterial activity of the leaves was also reported by Odoemena and Onyeneke (1998) while Oluwole *et al.* (2003) reported *Telfairia occidentalis* anti-inflammatory activities. Antibacterial activity of the root extract against *Staphylococcus aureus*, *Streptococcus pyogenes*, *Shiegella dysenterae* and *Kliebsiella pneumoniae* has been reported by Odoemena and Essien (1995).

FLUTED PLUMPKIN BOOSTS BLOOD LEVEL AND BEAT DIABETES

In Nigeria, the herbal preparation of the plant has been employed in the treatment of anaemia, chronic fatigue and diabetes (Alada, 2000; Dina *et al.*, 2006; AderIbigbe *et al.*, 1999). Anaemia constitutes a serious health problem in many tropical countries because of the prevalence of malaria and other parasitic infections. In anaemia there is decreased level of circulating haemoglobin, less than 13 g dL^{-1} in male and 12 g dL^{-1} in females (Okochi *et al.*, 2003). In the tropics, where malaria is endemic, between 10 to 20% of the population presents less than 10 g dL^{-1} of Haemoglobin (Diallo *et al.*, 2008). Children are more vulnerable. The leaves are rich in iron and play a key role in the cure of anaemia, they are also noted for lactating properties and are in high demand for nursing mothers (Okoli and Mgbeogu, 1983).

Type 2 diabetes is associated with increased oxidative stress, which probably results both from excess generation of reactive oxygen species and decreased antioxidant defenses (Baynes, 1991; Tribe and Poston, 1996). In recent years, it has been known that, the most important factor to increase the free radicals production in diabetes is the hyperglycemic status, which can induce damage through overproduction of superoxide radical in the mitochondria (Brownlee, 2001). Superoxide is converted to hydroxyls, which can diffuse through membranes and initiate lipoperoxidation. The oxidation of unsaturated lipids has implications not only for atherosclerosis, but also for stability and integrity of the red cell membranes (Steinberg *et al.*, 1989). Increased levels of lipoperoxidation as evidenced by breakdown products like malondialdehyde have been found in erythrocytes and plasma type 2 diabetic patients. Supplementation with antioxidants is therefore, an attractive potential therapy. Aqueous extracts of *Telfairia occidentalis* had been reported to reduce blood glucose level and also have antidiabetic effects in glucose induced hyperglycemic and streptozotocin (STZ) induced diabetic mice (AderIbigbe *et al.*, 1999), while it did not alter the glucose levels in normoglycemic mice. Salman *et al.* (2008) also reported reduced blood glucose level by *Telfairia occidentalis* leaves in male rats. Hypoglycemic effects have also been reported by many researchers (AderIbigbe *et al.*, 1999; Eseyin *et al.*, 2000, 2005c, 2007; Nwozo *et al.*, 2004).

REFERENCES

Adaramoye, O.A., J. Achem, O.O. Akintayo and M.A. Fafunso, 2007. Hypolipidemic effect of *Telfairia occidentalis* (fluted pumpkin) in rats fed a cholesterol-rich diet. J. Med. Food, 10: 330-336.

AderIbigbe, A.O., B.A.S. Lawal and J.O. Oluwagbemi, 1999. The antihyperglycaemic effect of *Telfairia occidentalis* in mice. African J. Medicine Med. Sci., 28: 171-175.

Ajibade, S.R., M.O. Balogun, O.O. Afolabi and M.D. Kupolati, 2006. Sex differences in the biochemical contents of *Telfairia occidentalis* Hook f. J. Food Agric. Environ., 4: 155-156.

Akoroda, M.O., 1990a. Ethnobotany of *Telfairia occidentalis* (cucurbitaceae) among Igbos of Nigeria. Econ. Bot., 44: 29-39.

Akoroda, M.O., 1990b. Seed production and breeding potential of the fluted pumpkin, *Telfairia occidentalis*. Euphytica, 49: 25-32.

Akoroda, M.O., N.I. Ogbechie-Odiaka, M.L. Adebayo, O.E. Ugwo and B. Fuwa, 1990. Flowering, pollination and fruiting in fluted pumpkin (*Telfairia occidentalis*). Scientia Hortic., 43: 197-206.

Akubue, P.I., A. Kar and F.N. Nncheita, 1980. Toxicity of extracts of roots and leaves of *Telfairia occidentalis*. Planta Medica, 38: 339-343.

Alada, A.R.A., 2000. The haematological effects of *Telfairia occidentalis* diet preparation. Afr. J. Biomed. Res., 3: 185-186.

Asiegbu, J.E., 1987. Some biochemical evaluation of fluted pumpkin seeds. J. Sci. Food Agric., 40: 151-155.

Badifu, G.I.O. and A.O. Ogunsina, 1991. Chemical Composition of kernels from some species of cucurbitaceae grown in Nigeria. Plant Foods Human Nutr., 41: 35-44.

Barbin, B.J., 1989. Malaria in pregnancy, its importance and control part 1. Postgraduate Doctor, 11: 57-59.

Baynes, J.W., 1991. Perspective in diabetes: Role of oxidative stress in development complications in diabetes. Diabetes, 40: 405-412.

Brownlee, M., 2001. Biochemistry and molecular cell biology of diabetic complications. Nature, 414: 813-820.

Christian, A., 2007. Fluted pumpkin (*Telfairia occidentalis* hook f.) seed: A nutritional assessment. Electron. J. Environ. Agric. Food Chem., 6: 1787-1793.

Cowan, M.M., 1999. Plant products as antimicrobial agents. Clin. Microbiol. Rev., 12: 564-582.

Diallo, A., M. Gbeassor, A. Vovor, K. Eklu-Gadegbeku and K. Aklikokou *et al.*, 2008. Effects of *Tectona grandis* on phenylhydrazine induced anaemia in rats. Fitoterapia, 79: 332-336.

Dike, M.C., 2010. Proximate, phytochemical and nutrient compositions of some fruits, seeds and leaves of some plant species at umudike, Nigeria. ARPN J. Agric. Biol. Sci., 5: 7-16.

Dina, O.A., A.A. Adedapo, O.P. Oyinloye and A.B. Saba, 2006. Effect of *Telfairia occidentalis* extract on experimentally induced anaemia in domestic. Afr. J. Biomed. Res., 3: 181-183.

Egbekun, M.K. E.O. Nda-Suleiman and O. Akinyeye, 1998. Utilization of fluted pumpkin fruit (*Telfairia occidentalis*) in marmalade manufacturing. Plant Food Hum. Nutr., 52: 171-176.

Emeka, E.J.I. and O. Obidoa, 2009. Some biochemical, haematological and histological responses to a long term consumption of *Telfairia occidentalis*-supplemented diet in rats. Pak. J. Nutr., 8: 1199-1203.

Eseyin, O.A., E. Oforah and B.D. Dooka, 2000. Preliminary study of the hypoglycaemic action of the extract of Telfairia occidentalis in normoglycaemic guinea pigs. Global J. Pureand Applied Sci., 6: 639-641.

Eseyin, O.A., A.C. Igboasoiyi, E. Oforah, H. Mbagwu, E. Umoh and J.F. Ekpe, 2005a. Studies of the effects of alcohol extract of *Telfairia occidentalis* on alloxan-induced diabetic rats. Global J. Pure Applied Sci., 11: 85-87.

Eseyin, O.A., A.C. Igboasoiyi, E. Oforah, P. Ching and B.C. Okoli, 2005b. Effects o f leaf extract of *Telfairia occidentalis* on some biochemical parameters in rats. Global J. Pure Applied Sci., 11: 77-79.

Eseyin, O.A., A.C. Igboasoiyi, E. Oforah, N. Nkop and A. Agboke, 2005c. Hypoglycaemic activity of *Telfairia occidentalis* in rats. J. Pharm. Bioresouor., 2: 36-42.

Eseyin, O.A., A. Ekpo, I. Idem, A.C. Igboasoiyi and E.J. Edoho, 2007. Effects of the fruit of *Telfairia occidentalis* on some biomolecules in rat. Pak. J. Biol. Sci., 10: 3240-3242.

Eseyin, O.A., P. Ebong, A. Ekpo, A. Igboasoiyi and E. Oforah, 2007. Hypoglycemic effect of the seed extract of *Telfairia occidentalis* in rat. Pak. J. Biol. Sci., 10: 498-501.

Fasuyi, A.O., 2006. Nutritional potentials of some tropical vegetable leaf meals: Chemical characterization and functional properties. Afr. J. Biotechnol., 5: 49-53.

Fasuyi, A.O. and A.D. Nonyerem, 2007. Biochemical, nutritional and haematological implications of *Telfairia occidentalis* leaf meal as protein supplement in broiler starter diets. Afr. J. Biotechnol., 6: 1055-1063.

Gbile, Z.O., 1986. Ethnobotany, Taxonomy and Conservation of Medicinal Plants. In: The State of Medicinal Plants Research in Nigeria, Sofowora, A. (Ed.). University of Ibadan Press, Ibadan, Nigeria.

Gill, L.S., 1992. Ethromedical Uses of Plants in Nigeria. Uniben Press, University of Benin, Benin City, Edo State, Nigeria, pp: 228-229.

Harborne, J.B., 1973. Phytochemical Methods. A Guide to Modern Techniques of Plant Analysis. 1st Edn., Chapman and Hall, London, ISBN: 0412572605.

Horsfall, Jr. M. and I.A. Spiff, 2005. Equilibrium sorption study of Al, Co^{3+} and Ag^{2+} in aqueous solution of fluted pumpkin (*Telfairia occidentalis* Hook f) waste biomass. Acta Chim. Slov., 52: 174-181.

Iwu, M.W., 1983. Traditional Igbo Medicine. Institute of African Studies University of Nigeria, Nsukka.

Iwu, M.M., R.A. Duncan and C.O. Okunji, 1999. New Antimicrobials of Plant Origin. In: Perspectives on New Crops and New Uses, Janick, J. (Ed.). ASHS Press, Alexandria, Virginia, pp: 457-462.

Kayode, O.T., A.A. Kayode and A.A. Odetola, 2009. Therapeutic effect of telfairia occidentalis on protein energy malnutrition-induced liver damage. Res. J. Med. Plant, 3: 80-92.

Kayode, A.A.A., O.T. Kayode and A.A. Odetola, 2010. *Telfairia occidentalis* ameliorates oxidative brain damage in malnorished rats. Int. J. Biol. Chem., 4: 10-18.

Ladeji, O., Z.S.C. Okoye and T. Ojobe, 1995. Chemical evaluation of the nutritive value of leave of fluted pumpkin (*Telfairia occidentalis*). Food Chem., 53: 353-355.

Longe, O.G., G.O. Rarinu and B.L. Fetnoa, 1983. Nutritious value of fluted pumpkin (*Telfairia Occidentalis*). J. Agric. Food Chem., 31: 982-992.

Mishra, S.K., S. Mohapatra and S.Y. Mohanty, 2003. Jaundice in *falciparum* malaria. JIACM., 4: 12-13.

Nwangwa, E.K., J. Mordi, O.A. Ebeye and A.E. Ojieh, 2007. Testicular regenerative effects induced by the extracts of Telfairia occidentalis in rats. Caderno de Pesquisa, Serie Biol., 19: 27-35.

Nwanna, E.E. and G. Oboh, 2007. Antioxidant and hepatoprotective properties of polyphenol extracts from *Telfairia occidentalis* (Fluted Pumpkin) leaves on acetaminophen induced liver damage. Pak. J. Biol. Sci., 10: 2682-2687.

Nwozo, S.O., O.A. Adaramoye and E.O. Ajaiyeoba, 2004. Antidiabetic and hypolipidaemic studies of *Telfairia occidentalis* on alloxan induced diabetic rabbits. Nig. J. Nat. Prod. Med., 8: 45-47.

Oboh, G. and A.A. Akindahunsi, 2004. Change in the ascorbic acid, total phenol and antioxidant activity of sun-dried commonly consumed green leafy vegetables in Nigeria. Nutr. Health, 18: 29-36.

Oboh, G., 2005. Hepatoprotective property of ethanolic and aqueous extracts of *Telfairia occidentalis* (Fluted Pumpkin) leaves against garlic-induced oxidative stress. J. Med. Food, 8: 560-563.

Oboh, G., E.E. Nwanna and C.A. Elusiyan, 2006. Antioxidant and antimicrobial properties of *Telfairia occidentalis* (Fluted pumpkin) leaf extracts. J. Pharmacol. Toxicol., 1: 167-175.

Odoemena, C.S. and J.P. Essien, 1995. Antibacterial activity of the root extract of *T. occidentalis* (fluted pumpkin). W. Afr. J. Biol. Applied Chem., 40: 1-4.

Odoemena, C.S. and E.C. Onyeneke, 1998. Lipids of fluted pumpkin (*Telfairia occidentalis*) seeds. Proceedings of the 1st African Conference on Biochemistry of Lipids, (ACBL'98), Ambik Press, Benin City, Nigeria, pp: 147-151.

Okochi, V.I., J. Okpuzor and L.A. Alli, 2003. Comparision of an african herbal formula with commercially available haematinics. Afr. J. Biotechnol., 2: 237-240.

Okokon, J.E., A.J. Ekpo and O.A. Eseyin, 2007. Antiplasmodial activity of ethanolic root extract of Telfairia occidentalis. Res. J. Parasitol., 2: 94-98.

Okoli, B.E. and C.M. Mgbeogu, 1983. Fluted Pumpkin, *Telfairia occidentalis*: West African vegetable crop. Econ. Bot., 37: 145-149.

Okoli, B.E. and B.L. Nyanayo, 1988. Polynology of *Telfairia* L. (Cucurbitacae). Folia Geobotanica Phytotaxonomica, 23: 281-286.

Oluwole, F.S., A.O. Falode and O.O. Ogundipe, 2003. Anti inflammatory effect of some common Nigeria vegetables. Nig. J. Physiol. Sci., 18: 35-38.

Oyolu, C., 1980. Maximizing the contribution of okro (*Hibiscus esculentus*) to the national diet. Proceedings of the 3rd Conference Host Soc. Nigeria at University of Ife, 30 November, 3 December.

Salman, T.M., L.A. Olayaki and W.A. Oyeyemi, 2008. Aqueous extract of *Telfairia occidentalis* leaves reduces blood sugar and increases haematological and reproductive indices in male rats. Afr. J. Biotechnol., 7: 2299-2303.

Shah, J.S., M.B. Shah, S.S. Goswami and D.D. Santani, 2006. Mechanism of action of antiulcer activity of bark extracts of *Manikara hexandra* against experimentally induced gastric ulcers in rats. Phcog. Mag., 2: 40-45.

Sofowora, A., 1996. Medicinal Plant and Traditional Medicine in Africa. 2nd Edn., Spectrum Books, Ibadan, Nigeria, pp: 112.

Sofowora, A., 1993. Medicinal Plants and Traditional Medicine in Africa. 2nd Edn., Spectrum Books Ltd., Ibadan, Nigeria, ISBN: 978-246-219-5.

Steinberg, D., S. Parthasarathy, T.E. Carew, J.C. Khoo and J.L. Witztum, 1989. Beyond cholesterol. Modifications of low density lipoproteins that increase its atherogenicity. N. England J. Medi., 320: 915-924.

Taylor, O.O.A., B.L. Fetuga and V.A. Oyenuga, 1983. Accumulation of mineral elements in five tropical leafy vegetables as influenced by nitrogen fertilization and age. Scienta Hortic., 18: 313-322.

Tindall, H.D., 1968. Commercial Vegetable Growing. 1st Edn., Oxford University Press, Oxford, UK.

Tribe, R.M. and L. Poston, 1996. Oxidative stress and lipids in diabetes: A role in endothelium vasodilator dysfunction. Vas. Med., 1: 195-206.

Tyler, V.E., 1999. Phytomedicines: Back to the future. J. Nat. Prod., 62: 1589-1592.

WHO, 1977. Resolution-promotion and development of training and research in traditional medicine. WHO Document No., 30: 49-49.

WHO, 2001. Geneva Legal Status of Traditional Medicine and Complementary/Alternative Medicine: A Worldwide Review. World Health Organisation, Geneva, pp: 129-143.

Wei, Z. and Y.W. Shiow, 2001. Antioxidant activity and phenol compounds in selected herbs. J. Agric. Food Chem., 49: 5165-5170.

Williams, I.O., R.S. Parker and J. Swanson, 2009. Vitamin a content of southeastern nigerian vegetable dishes, their consumption pattern and contribution to vitamin a requirement of pregnant women in Calabar Urban, Nigeria. Pak. J. Nutr., 8: 1000-1004.

Yang, J.H., H.C. Lin and J.L. Mau, 2002. Antioxidant properties of several commercial mushrooms. Food Chem., 77: 229-235.