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EVALUATION OF THE NUTRITIVE AND PHYTOCHEMICAL COMPOSITIONS OF *Phyllanthus amarus*

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ABSTRACT

Phyllanthus amarus is a weed commonly found mostly in gardens, farmlands and uncultivated land in West African. It is a member of *Euphobiaceae* family. The whole plant was analyzed using standard methods of analysis to determine the proximate, mineral, vitamin and secondary metabolites compositions. The result for the proximate analysis revealed that moisture content was higher while other nutrients on dry matter basis have the following composition; ash (6.34%), crude fibre (7.30%), crude protein (4.59%), crude fat (8.81%). Mineral analysis result shows that the plant contained higher concentration of iron (8.76 ppm), the next is calcium (6.21ppm) while some were in small quantities, these are manganese (2.7 ppm), potassium (2.36ppm), magnesium (2.35 ppm) and others were in minute quantities, such as selenium (1.72 ppm), zinc (0.61 ppm) and copper (0.43 ppm). The vitamin analysis result shows that vitamin C, B₃ and A were the prominent and abundant vitamins present (15.67, 2.34 and 3.13 mg/100g respectively) in the plant while vitamin B_{1,2,12} were in traces. The phytochemical compositions analysis revealed that alkaloid (0.63%), saponin (0.39%), tannin (0.022%), and flavonoids (0.0034%) were present respectively. The plant has the potential to be used as a food supplement and to serve as source of traditional drug formulation. Therefore, it could be suggested that the plant

Phyllanthus amarus could be used traditionally in the treatment of various ailments such as piles, diabetes and diverticulitis.

Keywords: *Phyllanthus amarus*, Secondary Metabolites, Prophylactic, Therapeutic

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INTRODUCTION

The world is now clamoring for solution to the prevalent increase in the escalation of fake drugs, adulterated food supplements and other societal problems. The solution to these problems is to go back to the ancient medical practice where people relied on natural products such as plants. In the course of drug production medicinal plants have played important roles in the formulation. However, larger populations still depend on traditional medicines as remedies for the treatment of common illness (Owolabi *et al.*, 2007).

World Health Organization also agreed and reported that medicinal plants are sources of obtaining raw materials for the production of many drugs, reported that medicinal plants are best sources of obtaining variety of drugs used to combat most diseases (Nascimento *et al.*, 2000).

Traditional medicine have been in used for many years to treat and prevent many diseases because of the potency of the plants (Zhang *et al.*, 2002). Recently phytochemicals were investigated as a source of drugs or possessing medicinal properties. It has been used traditionally

in the treatment of various ailments in Nigeria. *Phyllanthus amarus* is locally called Iyin olobe (Yoruba), or kidney stone plant (Adeneye *et al.*, 2006).

Phyllanthus amarus It has been reported to be used for traditionally related problems such as appendicitis and prostate gland problem (Heyde, 1990). *Phyllanthus amarus* had been in use for the treatment of liver, kidney and bladder problem (Tirimana, 1987). Chevalier, (2000) pointed out that *Phyllanthus amarus* is used in India to treat cardiovascular problems. *Phyllanthus amarus* is also used in the treatment of influenza, dropsy, diabetes and jaundice (Foo, 1993).

All the plant parts are employed prophylactically and therapeutically. Leaman, (1995) reported that it is mostly used by traditional healers. Heyde, (1990) also reported that when a decoction of the herb is taken for the treatment of urinary disorder and gynecological complaints there is always a relief. Therefore, there has been an increased interest worldwide on therapeutic values of these plants. It is believed that the treatment and prevention of many ailments and diseases may be found in traditional

pharmacy (Olowosulu and Ibrahim, 2006) and there are many useful bioactive compounds present in these plants. The objectives of this study are to determine the phytochemical and nutritive properties present in the whole plant (leaf, stem, seeds and root) found in this part of the world.

MATERIALS AND METHOD

SAMPLE COLLECTIONS

The entire plant (sample) comprising the stem, root, leaves and seeds were collected from the Department of Pure and Applied Biology, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, botanical garden situated along 1500LT within the school campus.

SAMPLE IDENTIFICATION

The plant was identified by Prof. A.T.J. Ogunkunle a taxonomist in the Department of Pure and Applied Biology, Ladoke Akintola University of Technology, Ogbomoso, Oyo State, Nigeria.

SAMPLE PREPARATION

The plant (sample) was separated from other weeds and dirt, rinsed with distilled water and dried for seven (7) days at room temperature, ground with mortar and pestle into coarse powder and stored in an air tight plastic container with lid and stored in the desiccator prior to analysis.

Determination of proximate composition

The determination of moisture content was by drying to constant weight in air, ash content by ignition at 550⁰C in a muffle furnace, oil content by Soxhlet extraction with hexane (an organic solvent), crude protein by the Kjeldahl method and crude fibre by the acid and alkaline digestion methods. The carbohydrate content was estimated, subtracting the sum of moisture, protein, fat, crude fibre and ash percentages from one hundred (AOAC, 2005).

Determination of phytochemical

The phytochemical (quantitative analysis) composition was carried out using methods of Peng and Kobayasli, (1995). Alkaloids were extracted using method of Lees, (1975).

Determination of Mineral Composition

The trace elements such as iron, zinc, manganese and copper were determined using atomic absorption spectrophotometric method while calcium, sodium, potassium and magnesium were determined by flame photometric method (Ayoola *et al.*, 2011).

Vitamin analysis

The analyses were performed using the method reported by the (AOAC, 2005).

RESULTS AND DISCUSSION

Table 1 shows the results of proximate composition of the plant the crude fat content in the plant was in abundance. The high ash content of the plant it is an evidence of the minerals being present in *Phyllanthus amarus* plant. The value of crude fibre obtained was also higher showing that the plant could aid digestion it is therefore an important factor in the absorption of glucose and fat in human system. The plant could be a source of protein and in combination with animal protein may result to nutritional value judging from the amount present in the plant. The carbohydrate content was in highest quantity, this could be a contributing factor for the possession of anti diabetic property of the plant (Pamela *et al.*, 2005). Table 2 shows the result of mineral compositions of *P. amarus*. It shows that *P. amarus* plant contained both the major and minor elements that are useful in bone and body managements. These are calcium, magnesium, sodium and potassium. (Dahl, 1972). The higher concentration of iron is an indication that the plant is effective in any blood related disorderliness such as anemia, coupled with the minute amount of copper present. Copper aids in the absorption of iron, therefore important in the formation of haemoglobin from iron. Manganese has been reported to aids in diabetes management and also for the effective function of the body systems

(Claude and Paule, 1979). Zinc is a fertility mineral which is important in reproduction system.

Table 3 shows the vitamin composition of the *P. amarus*. It contains higher amount of vitamin C (an antioxidants) has been reported to aid in the treatment of common cold and to prevent the formation of carcinogenic substances from dietary material. Lack of this vitamin could result to a disease named scurvy (Elizabeth, 1994).

Other vitamins, such as vitamin A, B, E, though in trace amount, are essential for body metabolism, sight and fertility. Phytochemical present in *P. amarus* are shown in Table 4, this shows that *P. amarus* plants are rich in alkaloids, saponin, tannin and flavonoids. Alkaloids are therapeutically used in human being because they posses analgesic, antispasmodic and bacterial properties (Igboko, 1983). Tannins aids the healing of haemorrhoids (piles), frost bite and varicose ulcers (Maduiyi, 1983).

CONCLUSION

This study revealed that *Phyllanthus amarus* plant contained useful and important chemical compounds that could be regarded as food because of its nutritive constituents as determined by proximate, mineral and vitamin analysis and also as sources of drugs due to the presence of phytochemicals.

Table 1: Proximate Composition of *Phyllanthus amarus* plant (% dry matter)

Nutrient	Composition (%)
Ash content	6.34±0.01
Crude fibre	7.30±0.05
Crude protein	4.59±0.03
Crude fat	8.81±0.02
Carbohydrate	72.96±0.02

Values are means (±SD) of triplicate determinations.

Table 2: Mineral Compositions of *Phyllanthus amarus* plant

Mineral	Concentration(ppm)
Calcium	6.214±0.1
Magnesium	2.354±0.1
Potassium	2.36±0.05
Sodium	6.01±0.02
Iron	8.757±0.01
Manganese	2.722±0.02
Copper	0.425±0.01
Zinc	0.607±0.01
Selenium	1.716±0.01

Values are means (±SD) of triplicate determinations.

Table 3: Vitamin Compositions of *Phyllanthus amarus* plant

Parameter	Composition (mg/100g)
Carotene (VitaminA)	3.13±0.1
Thiamine (Vitamin B ₁)	0.86±0.01
Riboflavine (VitaminB ₂)	0.12±0.02
Niacin(VitaminB ₃)	2.34±0.04
Pyridoxine(Vitamin B ₆)	1.94±0.03
Cyanocobalamin(VitaminB ₁₂)	0.37±0.03
Ascorbicacid(VitaminC)	15.67±0.08
Tocopherol(Vitamin E)	0.0128 ±0.03

Values are means (±SD) of triplicate determinations.

Table 4: Secondary Metabolites Compositions (phytochemical) of *Phyllanthus amarus* plant

PARAMETERS	Compositions (%)
Alkaloid	0.63±0.01
Saponin	0.39±0.02
Tannins	0.043±0.001
Flavonoid	0.0035±0.005

Values are means (±SD) of triplicate determinations.

**PLATE 1: *Phyllanthus amarus* plant**

REFERENCE

- Adeneye, A.A., O.O. Amole and A.K. Adeneye (2006). Protective Effect of the Aqueous Leaf and Seed Extract of *Phyllanthus amarus* on alcohol-induced hepatotoxicity in Rats West African. *J. Pharmacol. Drug Res.* 22(23): 42-50.
- A.O.A.C. (2005). Standard Methods of Analysis of the Association of Official Analytical Chemists. 8th edn., Gaithersburg, MD, USA.
- Ayoola, P.B., Adeyeye, A and Onawumi, O.O.E. (2011). Trace Elements and Major Minerals Evaluation of *Spondias mombin*, *Vernonia amygdalina* and *Momordin charantia* leaves. *Pakistan Journal of Nutrition* 9(8):755-758.
- Chevalier, A. (2000). Encyclopedia of Herbal Medicine: Natural Health 2nd Edn. Dorling Kindersley Book, U.S.A. p: 336.
- Claude, B., and Paule, S. (1979). "The Manual of Natural Living" 1st Edn. Biddles Limited Guildford Surrey. Pp: 98-99, 101.
- Dahl, L.K. (1972). Salt and Hypertension. *Am. J. Clin. Nutr.*, 25: 231-238.
- Elizabeth, K. (1994). Immense Help from Natures Workshop. 1st edu. Elikaf Health Services Ltd. Lagos. P: 207.
- Foo, L.Y. (1993). Amarin, a di-dehydrohexahydroxy diphenoyl hydrolysable tannin from *Phyllanthus amarus*. *Phytochem.*, 33:487-491.
- Heyde, H. (1990). Medicijn planten in Suriname. (Den dresi wiwiri foe Sranan). "Medicinal Plants in Suriname" Uitg Stichting Gezondheidsplanten Informaite (SGI) Paramaribo. 157. (Ger).
- Igboko, D.O. (1983). Phytochemical Studies on *Garcinia kola* Heckel. M.Sc.Thesis. University of Nigeria, Nsukka. Pp: 202.
- Leaman, D.J (1995). Malaria remedies of the Kenyah of Apo kayan East Kalimantan. *Journal of Pharmacology*, 49: 1-16.
- Lees, R. (1975). Food Analysis: Analytical and Quality control methods for the food manufacturer and buyer 3rd Edn. Leonard Hill Books, London.
- Maduiyi, I. (1983). Biochemical and Pharmacological Studies of active principles of the Seeds of *Garcinia kola* Heckel. M.Sc. Thesis University of Nigeria, Nsukka, pp: 108
- Nascimento, G.G.F., Locatelli, J., Freitas, P.G and Silva, G.L(2000). Antibacterial activity of plant extracts and phytochemicals on antibiotic-resistant bacteria. *Braz. J. Microbiol.*, 31:247-256.
- Okwu, D.E. and Okwu, M.E. (2004). Chemical Composition of *Spondia mombin* plants. *J. Sustain Agric. Environ.* 6: 140-147.
- Olowosulu, A.K and Ibrahim, Y.K.E. (2006). Studies on the Antimicrobial screening of aqueous extracts of five plants used in folk medicine in Nigeria. *West African J. Biol., Sc.*, 3:21-26.

Owolabi, O.J., Omogbai, E.K.I and Obasuyi, O (2007). Antifungal and Antibacterial activities of the ethanolic and aqueous extract of *Kigella* African (*Bignoniaceae*) stem bark. *African Journal of Biotechnology*, 6: 1677-1680.

Pamela, C.C., Richard, A.H, and Denise, R.F. (2005). Lippincott's illustrated Reviews Biochemistry. 3rd edn., Lippincott Williams and Wilkins, Philadelphia, 335 – 388.

Peng, J.P and Kobayasli, H.(1995). Novel Furastonol Glycosides from

Allium Anacros Tenon plant *Media*. 6: 58-61.

Tirimana, A.S.L (1987). Medicinal plants of Suriname: Uses and chemical constituents. Chemical laboratory. Ministry of Agriculture, Animal Husbandry and Fisheries, Suriname. Pp: 92.

Zhang, Y.J., Abe, T., and Tanaka, T. (2002). Two new acylated flavanone glycosides from the leaves and branches of *Phyllanthus emblica*, *Chem. Pharm. Bull.* 50: 841-843.