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Comparative vitamins, phytochemical and proximate composition of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis*

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ABSTRACT

The comparative vitamins, phytochemical and proximate composition of leaf-extracts of *Mucuna poggei and Telfairia occidentalis* were investigated using standard methods. Cobalamin, ascorbate and retinol concentration were significantly ($P < 0.05$) higher in *Telfairia occidentalis* relative to *Mucuna poggei.* Pantothenic acid, folate, beta carotene, calciferol and tocopherol concentration were significantly ($P < 0.05$) higher in *Mucuna poggei* relative to *Telfairia occidentalis.* The concentration of the vitamins in leaf-extracts of *Telfairia occidentalis* was of the range 0.27 ± 0.15 mg / l for niacin to 101.83 ± 0.24 mg / l for beta carotene , while that of *Mucuna poggei* was of the range 0.23 ± 0.22 mg / l for niacin to 125.94 ± 0.18 mg / l for beta carotene. The concentration of fat soluble vitamins in ethanol leaf-extracts of *Telfairia occidentalis* was in the the order of beta carotene > retinol > tocopherol > calciferol > vitamin K and the range in *Telfairia occidentalis* was 1.34 ± 0.17 mg / l for Beta carotene

to 101.83 ± 0.24 mg / l for vitamin K. However, the concentration of the fat soluble vitamins in ethanol leaf-extracts of *Mucuna poggei* was in the the order of > tocopherol > retinol > calciferol > vitamin K and the range in *Mucuna poggei* was 1.32 ± 0.21 mg / l for vitamin K to 125.94 ± 0.18 mg / l for beta carotene. The concentration of all the phytochemicals were significantly (P < 0.05) higher in *Telfairia occidentalis* relative to *Mucuna poggei*, except flavonoids**.** The concentration of all the phytochemicals were in the order; Saponins > Tanins > Alkaloids > Phenols > Flavonoids > Glycosides in *Telfairia occidentalis* while the order in *Mucuna poggei* were Saponins > Flavonoids > Tanins > Alkaloids > Phenols > Glycosides with saponins as the highest (28.70 ± 0.02 % vs18.19 ± 0.12 %) and glycosides as the lowest (0.07 ± 0.05 % of vs 0.05 ± 0.002 %) in *Telfairia occidentalis* and *Mucuna poggei*, respectively. The proximate composition of both extracts indicated that the levels of moisture, ash, crude fiber, crude fat, protein and carbohydrates were significantly higher (p< 0.05) in *Telfairia occidentalis* than in *Mucuna poggei* while crude fat and carbohydrates were significantly higher (p< 0.05) in *Mucuna poggei* than in *Telfairia occidentalis.* The range in *Telfairia occidentalis* was 0.5 ± 0.18 % for crude fibre to 50.4 ± 0.23 % for carbohydrates, and the range in *Mucuna poggei* was 0.4 ± 0.23 % for crude fibre to 69.1 ± 0.18 % for carbohydrates. The results of the present study revealed that the leaf-extracts of *Mucuna poggei and Telfairia occidentalis* could meet nutritional and energy needs for man and livestock and can be applied in the development of drugs.
Keywords: Comparative vitamins, phytochemical, proximate composition, leaf-extract, *Mucuna poggei* and *Telfairia occidentalis*

INTRODUCTION

Nature has been a source of medicinal treatments for many years and plant-based systems play an essential role in the primary health care of 80% of the world's developing countries [1]. The use of plants whether herbs, shrubs or trees in parts or in a whole in the treatment and management of diseases and disorders date back to prehistoric days [2] . Plants provide an alternative in search for new drugs. There is a rich abundance of plants reputed in traditional medicine to possess protective and therapeutic properties [3]. Medicinal plants as defined by World Health Organization [4] are plants which one or more parts contains substances that can be used for therapeutic purposes or which are precursors for the synthesis of useful drugs [5]. Herbs are useful in the search for new drugs because they are valuable sources of new molecules which may be scientifically modified to provide improved drugs. Medicinal plants range from those used in the production of mainstream pharmaceutical products to plants used in herbal medicine. Plants that have medical uses can be found growing in many settings all over the world [6]. Although modern medicine may be available in developing countries, herbal medicine is still popular in these countries till date. Plants have helped to maintain a relatively disease- free state when properly utilized as herbal medicine [5].

Mucuna is a genus of around 100 accepted species of climbing lianas (vines) and shrubs of the family *Fabaceae* and tribe, *Phaseoleae* and typically found in tropical forests [6] . The leaves are tri-foliolate, alternate, or spiraled silky-pubescent beneath, the flowers are pea-like but larger, with distinctive curved petals, and occurring in racemes and the fruits are covered by itchy hairs that break loose on slight touching when fully dry. Like other legumes, *Mucuna* plants bear pods. They are generally bat-pollinated and produce seeds that are buoyant sea-beans [7]. *Mucuna poggei* is called "agbara" by Igbos, "matara" by Hausas, "igbekpe" in Benin, and "werepe" by Yorubas [8]. *Telfairia occidentalis* commonly known as "fluted pumpkin" is a seed and leaf vegetable that is highly consumed all over Nigeria, West and Central Africa [9]; [10]. *Telfairia occidentalis* (Fluted pumpkin) is one of the popular and widely grown vegetable crops in Nigeria particularly in the eastern (Anambra, Imo, Abia and Ebonyi States) and mid-western areas (Edo, and Delta States) and to an appreciable degree in the south western states (Ondo, Ogun, Ekiti, Oyo and Lagos). *Telfairia occidentalis* (Fluted Pumpkin) is from the tribe of *Joliffieae* and the sub-family *Cucurbitaceae* [11]. The green leaves of *Telfairia occidentalis* is known locally as 'Ugu' by Igbos, 'Iroko' by Yorubas, Ubong' by Ibibios and umeke by Edos [12]. The Ghanians refer to it as 'okrobonka' while to the Sierra-Leoneans, it is known as 'Oroko' [13]. It is a pot-herb cultivated mainly for its succulent young leaves and shoots which are used as vegetables [14]. It is a high climbing perennial with partial drought tolerance and parenting root system. Due to the high concentration of blood-enriching minerals including iron, potassium and phosphorus as well as vitamins (thiamine, riboflavin, nicotinamide, folic acid, cyanocobalamin and ascorbic acid) and phytochemicals in the plant, the leaves are used locally as blood booster [15] ; [16].

Vitamin B_{12} and folate are required for essential metabolic functions. Deficiency states of these nutrients, either singly or in combination, are common clinical conditions. Clinically, they present with not only disordered haematopoiesis, but also widespread effects in other organs that can precede the appearance of haematological abnormalities. Within body cells, methyltetrahydrofolate is converted to a metabolically active form (tetrahydrofolate) in a reaction that requires vitamin B_{12} as a co-enzyme [17]. The B complex vitamins, thiamin, riboflavin, niacin, pyridoxine, panthotenic acid, folic acid and cyanocobalamine are required for normal growth, functioning of the heart and nervous system, eyes, formation of co-enzyme for cellular respiration [18]. These vitamins contained in the samples are essential for metabolic activities as they act as precursors for synthesis of coenzymes [19]. Vitamin C helps in the health of lungs and bronchia, teeth and gums, bones and joints and purifies the blood. It prevents the free radical damage that triggers the inflammatory cascade and associated with reduced severity of inflammatory conditions such as asthma, osteoarthritis and rheumatoid arthritis [20]. Phytochemicals are secondary metabolites produced in plants, and do not participate in metabolic processes within the plants but are a result of metabolic activities in the plant. Phytochemicals are stored virtually in all plant parts and their concentrations may differ from one plant part to another. An antioxidant can be defined as a substance that helps to reduce the severity of oxygen species either by forming a less active radical or by quenching the damaging free radicals chain reaction on substrates such as proteins, lipids, carbohydrates or DNA [21]. Proximate are used in the analysis of biological materials as a decomposition of human-consumable good into its major constituents. The purpose of proximate analysis is to estimate and determine how much of the food major components, which are moisture, carbohydrate, ash, proteins, lipids and crude fibre that exist in a given food or fruits [21]. Hence the study is therefore designed to evaluate the comparative vitamins, proximate composition and phytochemical analysis of *Mucuna poggei and Telfairia occidentalis* leaves [22].

MATERIALS AND METHODS

Materials

Chemicals and Reagents

All chemicals and reagents used were of analytical grade.

Samples

Fresh matured leaves of *Telfairia occidentalis* and *Mucuna poggei*.

Instrumentation

The major instrument used in this study include:
UV- VIS Spectrophotometer Model, 752.

Methods

Collection of Samples

Fresh matured leaves of *Mucuna poggei* and *Telfairia occidentalis* were harvested from a local farm in Okpoto, Ishielu local government area in Ebonyi state.

Plant Authentication

The plants were authenticated by Prof. J.C. Okafor, a consultant plant taxonomist at Fame Consultancy Plant Research Centre, Enugu, Enugu State, Nigeria.

Preparation of the Leaves of *Mucuna poggei* and *Telfairia occidentalis*

The leaves were washed and air dried at room temperature for three weeks. After three weeks, the dry samples were blended using mechanical grinder into powder form. The powder was sieved with the sieve of mesh size 1mm and then stored in polythene bags for further use.

Preparation of Leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis.*

This was done as described by Gray and Flatt, (2014) .
Five hundred grams of the powder of *Mucuna poggei* and *Telfairia occidentalis* leaves were each soaked into 1000 ml of ethanol and were allowed to stand for 48 hours. Each extracted solution was filtered off using a sieve cloth and Whatman No. 2 filter paper (Cat no 1001 125) of pore size 125 mm. The filtrates were concentrated by distilling off the solvent and then evaporated to dryness on a water bath at 45 °C. The extracts of the samples were then stored in refrigerator for subsequent usage.

Determination of Percentage Yield

The extracts were obtained from the two leaf samples from the two plants were weighed. The percentage yield per extract was calculated in terms of air dried weight of the leaf material as:

$$\text{Percentage yield} = \frac{\text{Amount of extract obtained}}{\text{Amount of initial sample}} \times 100$$

Vitamins Analysis

Determination of Vitamin A (Retinol)

Vitamin A was determined by the colorimetric method of [23].

Estimation of Beta Carotenoids

This was carried out according to the method of the Association of Official Analytical Chemists (AOAC, 1980). [24].

Determination of vitamin B_1 (Thiamin)

Determination of vitamin B_1 was done by the spectrophotometric method described by kirk and Sawyer, (1998).[23]

Determination of vitamin B_2 (Riboflavin)

Determination of vitamin B_2 was done by the spectrophotometric method described by Kirk and Sawyer, (1998).[23]

Determination of vitamin B_3 (Niacin) [25]

Vitamin B_3 (Niacin) was determined by the spectrophotometric method described by Kirk and Sawyer, (1998).[23]

Determination of vitamin B_5 (Pantothenic acid)

Vitamin B_5 was determined by the spectrophotometric method described by Kirk and Sawyer (1998).[23]

Determination of vitamin B_6 (Pyridoxine)

Vitamin B_6 was determined by the spectrophotometric method described by Kirk and Sawyer (1998). [23]

Determination of Vitamin B_9 (Folic acid).

Vitamin B_9 was determined by the spectrophotometric method described by Kirk and Sawyer (1998). [23]

Determination of Vitamin B_{12} (Cobalamin)

Vitamin B_{12} was determined by the spectrophotometric method described by Kirk and Sawyer, (1998).[23]

Determination of Vitamin C (Ascorbic Acid)

Vitamin C was determined by the spectrophotometric method described by Kirk and Sawyer, 1998.

Determination of vitamin D (Calciferol).

Vitamin D was determined by the method of A.O.A.C., (1990). [26]

Determination of Vitamin E (Tocopherol)

Vitamin E was determined by the spectrophotometric method as described by A.O. A.C., (1990).[27]

Determination of Vitamin K

Vitamin K was determined by the spectrophotometric method described by Kirk and Sawyer (1991).

Quantitative Phytochemical Composition of *Mucuna poggei* and *Telfairia occidentalis* leaves samples.

The quantitative phytochemicals analysis of the phytochemicals, alkaloids, phenols, flavonoids, saponins, glycosides and tannins in ethanol leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* were carried out as decribed by [27].

Proximate Analysis.

Proximate analysis was done using standard procedures as described by [28].

Statistical Analysis.

The results were expressed as mean ± standard deviation (SD). The data wer subjected to One Way Analyses of Variance (ANOVA) by Turkey Post hock test. The data were analyzed using computer software known as Graph Pad Prism 7. Values of P less than 0.05 ($P<0.05$) were considered to be statistically significant.

RESULTS

Comparative Composition of Vitamins in Ethanol Leaf-Extracts of *Telfairia occidentalis* and *Mucuna poggei*.

The concentration of cobalamin and ascorbate were significantly ($P < 0.05$) higher in *Telfairia occidentalis* relative to *Mucuna poggei*. However, the concentration of pantothenic acid and folate were significantly ($P < 0.05$) higher in *Mucuna poggei* relative to *Telfairia occidentalis* (Table 4). The concentration of the water soluble vitamins in ethanol leaf-extracts of *Telfairia occidentalis* was in the order of cobalamin > thiamin > folate > ascorbate > pyridoxine > cobalamin > pantothenic acid > niacin. The range of the water soluble vitamins in ethanol leaf-extracts of *Telfairia occidentalis* was 0.27 ± 0.15 mg / l for niacin to 48.68 ± 0.19 mg / l for riboflavin, while that of *Mucuna poggei* was in the order of thiamin > cobalamin > folate > ascorbate > pyridoxine > cobalamin > pantothenic acid > niacin and the range in *Mucuna poggei* was 0.23 ± 0.22 mg / l for niacin to 37. 44 ± 0.25 mg / l for thiamin. Cobalamin had the highest concentration in *Telfairia occidentalis* while vitamin thiamin had the highest concentration in *Mucuna poggei*, also in both *Telfairia occidentalis* and *Mucuna poggei*, vitamin B_3 had the lowest concentration (Table 4). he concentration of the fat soluble vitamins; beta carotene, calciferol and tocopherol were significantly higher ($P < 0.05$) in *Mucuna poggei* than in *Telfairia occidentalis*. Nevertheless, the concentration of retinol was significantly ($P < 0.05$) higher in *Telfairia occidentalis* than in *Mucuna poggei*. The concentration of vitamin K was higher but not significantly ($P > 0.05$) in *Telfairia occidentalis* than in *Mucuna* *poggei* (Table 5). The concentration of fat soluble vitamins in ethanol leaf-extracts of *Telfairia occidentalis* was in the the order of beta carotene > retinol > tocopherol > calciferol > vitamin K and the range in *Telfairia occidentalis* was 1.34 ± 0.17 mg / l for Beta carotene to 101.83 ± 0.24 mg / l for vitamin K. However, the concentration of the fat soluble vitamins in ethanol leaf-extracts of *Mucuna poggei* was in the the order of > tocopherol > retinol > calciferol > vitamin K and the range in *Mucuna poggei* was 1.32 ± 0.21 mg / l for vitamin K to 125.94 ± 0.18 mg / l for beta carotene. Beta carotene had the highest concentration in both *Telfairia occidentalis* and *Mucuna poggei* while vitamin K had the lowest concentration in both *Telfairia occidentalis* and *Mucuna poggei* (Table 4).

Table 1. Comparative Vitamins Composition of Ethanol Leaf-Extracts of *Telfairia occidentalis* and *Mucuna poggei.*

Vitamins Composition	Concentration (mg / l) *T. occidentalis*	*M. poggei*
Water Soluble vitamins		
Vitamin B_1 (Thiamin)	37.52 ± 0.23[a]	37.44 ± 0.25[a]
Vitamin B_2 (Riboflavin)	48.68 ± 0.19[b]	28.08 ± 0.24[c]
Vitamin B_3 (Niacin)	0.27 ± 0.15[d]	0.23 ± 0.22[d]
Vitamin B_5 (Pantothenic acid)	0.91± 0.16[e]	0.94 ± 0.17[e]
Vitamin B_6 (Pyridoxine)	3.45 ± 0.19[f]	3.25 ± 0.16[f]
Vitamin B_9 (Folate)	15.83 ± 0.18[g]	17.37 ± 0.19[h]
Vitamin B_{12} (Cobalamin)	1.69 ± 0.21[i]	1.57 ± 0.18[i]
Vitamin C (Ascorbate)	13.73 ± 0.17[i]	9.86± 0.15[d]
Fat soluble Vitamins		
Beta carotene	101.83± 0.21[a]	125.94 ± 0.18[b]
Vitamin A (Retinol)	54.00 ± 0.24[c]	15.20 ± 0.25[d]
Vitamin D (Calciferol)	10.22 ± 0.19[e]	13.58 ± 0.16[f]
Vitamin E (Tocopherol)	40.0 ± 0.22[f]	41.0 ± 0.19[g]
Vitamin K	1.34 ± 0.17[h]	1.32 ± 0.21[h]

Values are expressed as Mean ± SD of three (3) replicate values.
Values with different superscripts on the same row are significantly different at P < 0.05.

Comparative Quantitative Phytochemical Composition of Ethanol Leaf-Extracts of *Telfairia occidentalis* and *Mucuna poggei.*

The quantitative phytochemical analysis of ethanol leaf-extracts of *Telfairia occidentalis* and *Mucuna poggei* revealed that the concentration of all the phytochemicals were significantly higher (P < 0.05) in *Telfairia occidentalis* than *Mucuna poggei* except flavonoids which had the reverse trend (Table 2).The concentration of all the phytochemicals were in the order; Saponins > Tanins > Alkaloids > Phenols > Flavonoids > Glycosides in *Telfairia occidentalis* while the order in *Mucuna poggei* were Saponins > Flavonoids > Tanins > Alkaloids > Phenols > Glycosides with saponins as the highest (28.70 ± 0.02 % vs18.19 ± 0.12 %) and glycosides as the lowest (0.07 ± 0.05 % of vs 0.05 ± 0.002 %) in *Telfairia occidentalis* and *Mucuna poggei*, respectively (Table 2).

Table 2. Comparative Quantitative Phytochemical Analysis of Ethanol Leaf-Extracts of *Telfairia occidentalis* and *Mucuna poggei.*

Phytochemical	Concentration % w/w	
	T. occidentalis	***M. poggei***
Flavonoids	0.22 ± 0.005[a]	8.00 ± 0.005[b]
Glycosides	0.07 ± 0.05[c]	0.05 ± 0.002[c]
Saponins	28.70 ± 0.02 [d]	18.19 ± 0.12[e]
Alkaloids	6.42 ± 0.02 [f]	2.39 ± 0.01[g]
Tanins	16.48 ± 0.03[h]	12.01 ± 0.01[i]
Phenols	2.09 ± 0.002[j]	1.48 ± 0.02[k]

Values are expressed as Mean ± SD of three (3) replicate values.
Values with different superscripts on the same row are significantly different at P< 0.05.

Comparative Proximate Composition of Leaf-Extract of *Telfairia occidentalis* and *Mucuna poggei.*

The proximate composition of both extracts indicated the presence of moisture, ash, crude fiber, crude fat, protein and carbohydrates with varying compositions and their values were significantly higher ($p< 0.05$) in *Telfairia occidentalis* than in *Mucuna poggei*. However, crude fat and carbohydrates contents showed a reverse trend in that their concentrations were significantly higher ($p< 0.05$) in *Mucuna poggei* than in *Telfairia occidentalis* (Table 3). The proximate compositions of ethanol leaf-extracts of both *Telfairia occidentalis* and *Mucuna poggei* were of the trend Carbohydrates > Crude Protein > Moisture Content > Crude Fat> Crude Ash > Crude Fibre. The range in *Telfairia occidentalis* was 0.5 ± 0.18 % of crude fibre to 50.4 ± 0.23 % of carbohydrates, and the range in *Mucuna poggei* was 0.4 ± 0.23 % of crude fibre to 69.1 ± 0.18 % of carbohydrates (Table 3).

Table 3. Proximate composition of ethanol leaf extracts of *Telfairia occidentalis* and *Mucuna poggei.*

PROXIMATE COMPOSITION	CONCENTRATION % w/w	
	T. occidentalis	*M. poggei*
Moisture Content	11.6 ± 0.16[a]	8.9 ± 0.16[b]
Crude Ash	8.3 ± 0.15[c]	1.4 ± 0.17[d]
Crude Fiber	0.5 ± 0.18[e]	0.4 ± 0.23[e]
Crude Fat	0.6 ± 0.19[f]	3.4 ± 0.19[g]
Crude Protein	28.6 ± 0.21[h]	16.8 ± 0.21[i]
Carbohydrates	50.4 ± 0.23[j]	69.1 ± 0.18[k]

DISSCUSSION

The concentration of the water soluble vitamins in ethanol leaf-extracts of *Telfairia occidentalis* was in the order of $B_2 > B_1 > B_9 > C > B_6 > B_{12} > B_5 > B_3$, the range in *Telfairia occidentalis* was 0.27 ± 0.15 mg / l for vitamin B_3 to 48.68 ± 0.19 mg / l for vitamin B_2, while that of *Mucuna poggei* was in the order of $B_1 > B_2 > B_9 > C > B_6 > B_{12} > B_5 > B_3$ and the range in *Mucuna poggei* was 0.23 ± 0.22 mg / l for B_3 to 37. 44 ± 0.25 mg / l for vitamin B_1. Vitamin B_2 had the highest concentration in *Telfairia occidentalis* while vitamin B_1 had the highest concentration in *Mucuna poggei* also in both *Telfairia occidentalis* and *Mucuna poggei*, vitamin B_3 had the lowest concentration. Vitamin B_1 and B_2 recorded the highest amount in the leaves of *Mucuna poggei* and *Telfairia occidentalis* respectively. This result is in contrast with that of [29], in which vitamin c content recorded the highest amount in the leaves of *Telfairia occidentalis*. Moreso, the concentration of vitamin C obtained in this study was lower compared to that of [30] and [31] on the same plant, where vitamin C content of 17.27% and 3.16% respectively, was reported. The B complex vitamins, thiamin, riboflavin, niacin, pyridoxine, panthotenic acid, folic acid and cyanocobalamine are required for normal growth, functioning of the heart and nervous system, eyes, formation of co-enzyme for cellular respiration [17]. These vitamins contained in the samples are essential for metabolic activities as they act as precursors for synthesis of coenzymes [18].

Vitamin B_{12} and folate are required for essential metabolic functions. Deficiency states of these nutrients, either singly or in combination, presents with a number of disorders including megaloblastic anaemia, due to disruption of DNA synthesis and repair that results in ineffective erythropoiesis [31]. The vitamin C (ascorbic acid) contents of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* were 9.86 ± 0.15 mg / l and 13.73 ± 0.17 mg / l respectively. The vitamin C (ascorbic acid) content of leaf-extract of *Telfairia occidentalis* was significantly higher ($P < 0.05$) than that of *Mucuna poggei.* This corroborates the report by Airaodion *et al.*, (2019) which recorded a significant increase in the ascorbic acid content of *T. occidentalis* when compared with that of *O. gratissimum* at ($P < 0.05$).

Vitamin C helps in the health of lungs and bronchia, teeth and gums, bones and joints and purifies the blood. It prevents the free radical damage that triggers the inflammatory cascade and associated with reduced severity of inflammatory conditions such as asthma, osteoarthritis and rheumatoid arthritis [19]. Therefore, the leaves of *Mucuna poggei* and *Telfairia occidentalis* could be used in the herbal medicine for the treatment of common cold and prostate cancer [7]. The Presence of vitamin C and other antioxidants in the leaves of *Mucuna poggei* and *Telfairia occidentalis* makes them ideal food additives to enhance the body's immune system [32]. The concentration of the fat soluble vitamins in ethanol leaf-extracts of *Telfairia occidentalis* was in the order of beta carotene > A > E > D > K and the range in *Telfairia occidentalis* was 1.34 ± 0.17 mg / l for vitamin K to 101.83 ± 0.24 mg / l for beta carotene, while the order in *Mucuna poggei* was beta carotene > E > A > D > K and the range in *Mucuna poggei* was 1.32 ± 0.21 mg / l for vitamin K to 125.94 ± 0.18 mg / l for beta carotene. Beta carotene had the highest concentration in the leaves of both *Telfairia occidentalis* and *Mucuna poggei* followed by vitamin A while vitamin K had the lowest concentration in the leaves of both *Telfairia occidentalis* and *Mucuna poggei.* This result is in agreement with the work of [30], and [12] in which beta carotene had the highest concentration of the vitamins in *Telfairia occidentalis* leaves.

Vitamin E is a good antioxidant, necessary for the formation of red blood cells and the structure, recovery and maintenance of muscle and other tissues [33]. Vitamin E is a fat-soluble vitamin, mostly found in several vegetable oils, nuts, broccoli and fish. Eight different forms have been reported (α-, β-, γ-, and δ-tocopherol, and α-, β-, γ-, and δ-tocotrienol), but α-tocopherol has the highest antioxidant activity, especially in cell membranes [34]. Alpha-tocopherol supplements have been shown to be effective in the treatment of prostate cancer [35]. The quantitative phytochemical analysis of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* revealed that the concentration of all the phytochemicals were significantly higher ($P < 0.05$) in *Telfairia occidentalis* leaf-extracts than in *Mucuna poggei* leaf-extracts, except flavonoids which was significantly higher ($P < 0.05$) in *Mucuna poggei* leaf-extracts than in *Telfairia occidentalis* leaf-extracts. The result of phytochemical analysis of the ethanol leaf-extracts of *Telfairia occidentalis* revealed that the concentration of all the phytochemicals were in the order of Saponins > Tanins > Alkaloids > Phenols > Flavonoids > Glycosides with a range of 0.07 ± 0.05 % for glycosides to 28.70 ± 0.02 % for saponins, while the trend in *Mucuna poggei* was Saponins > Flavonoids > Tanins > Alkaloids > Phenols > Glycosides with a range of 0.05 ± 0.002 % for Glycosides to 18.19 ± 0.12 % for Saponins. Reports presented in this research on the type of phytochemical in ethanol leaf-extract of *Telfairia occidentalis* agreed with the record of [29] who reported the presence of alkaloids, flavonoids, phenols, saponins, glycosides and tannins in the male and female leaves. A similar report by [36] recorded that ethanol-leaf extract of *Telfairia occidentalis* contained saponins, tannins, alkaloids, flavonoids and phenols. Also [37] and [38], reported that various quantities of tannins, alkaloids, flavonoids and phenols were detected in *Telfairia occidentalis* leaf meal and ethanol-leaf extract of *Telfairia occidentalis* respectively. Moreso, the results corroborated that of [39] who observed the presence of alkaloids, flavonoids, phenols, saponins, steroids and tannins as the phytochemical components in *M. poggei* methanol fruit peel extracts.

The quantitative phytochemical analysis of ethanol leaf-extracts of *Telfairia occidentalis* and *Mucuna poggei* revealed that the concentration of alkaloids, phenols, saponins and tannins were significantly higher ($P < 0.05$) in *Telfairia occidentalis* than in *Mucuna poggei*, while the concentration of flavonoids was significantly higher ($P < 0.05$) in *Mucuna poggei* than in *Telfairia occidentalis.* Nevertheless, the concentration of glycosides were higher but not significantly ($P > 0.05$) in *Telfairia occidentalis* compared to *Mucuna poggei.* Saponin had the highest value in both ethanol leaf-extract of *Telfairia occidentalis* and *Mucuna poggei.* This is in contrast with the reports of [29] and

[39], which recorded that the highest phytochemical value was phenol in *T. occidentalis* leaves and also phenol in methanol leaf-extract of *Mucuna poggei*, respectively. The phytochemical result also revealed that the saponins content of the ethanol leaf-extract of *Telfairia occidentalis* and *Mucuna poggei* were 28. 70 % and 18.19 %, respectively. These values are high when compared to the value of 0.75% reported for the fruit of *Napoleona vogelii* and 0.68% reported for the *N. imperialis* seed [40]. Toxicology studies of saponin using relevant experimental models have established that even at an upper concentration of 3.5% saponin was safe and failed to cause systemic side effect [41]. It has been proven that saponins show modulatory effects on transaminases in hepatocytes of rats against liver injury, which could be as a result of their antioxidant mechanism of action [42]. Therefore, ethanol leaf-extracts of *Telfairia occidentalis* and *Mucuna poggei* which contains saponins, may have stabilized the membrane integrity and prevented these enzymes' leakage into blood circulation [42]. This indicated the protective effect of ethanol leaf-extracts of *Telfairia occidentalis* and *Mucuna poggei* revealing their plausible ability of protecting not only the structural integrity of the hepatocellular membrane but also the phenylhyrazine-damaged cells.

The phytochemicals result also revealed that the flavonoid content of the leaves of *Telfairia occidentalis* and *Mucuna poggei* was 0.22 % and 8 .00 %, respectively. This is in contrast with the report of [39], which observed that flavonoid had the highest concentration in methanol extract of *Mucuna poggei* fruit peel. Moreso, the value of flavonoid content of the ethanol leaf-extract of *Mucuna poggei* observed in this study was moderately higher when compared to the value of 1.0 % reported for African elemi pulp [41]. However, [43] reported that high amounts of flavonoid help protect blood vessels from rupture or leakage, enhance the power of vitamin C and protect cells from oxygen damage and prevent excessive inflammation [44]. However, caution has been expressed in the consumption of plant materials with very high concentration of alkaloids because they could inhibit certain mammalian enzymes activities such as those of cyclic adenosine monophosphate (cAMP) [45]. European Food Safety Authority [14] stated that since cooking only lowers alkaloid content of foods by 40 – 50 %, highly sensitive individuals should avoid this category of food entirely. Thus, the high alkaloids content of *Telfairia occidentalis* (6.42 ± 0.02 %) and *Mucuna poggei* (2.39 ± 0.01%) leaves implies that they should be properly cooked to reduce the percentage alkaloid. Cardiac glycosides had the lowest concentration in the leaves of *Telfairia occidentalis* and *Mucuna poggei* (0.07 % and 0.05 %), respectively from the results obtained in the present study. This is in agreement with the findings of [29] in which cardiac glycosides had the lowest concentration (0.02 g) in the leaves of *Telfairia occidentalis.* Variation and differences observed in the quantities of phytochemical constituents of the leaves of *Telfairia occidentalis* and *Mucuna poggei* might be as a result of the age of the leaves used in the study, growing conditions, age at harvest and environmental factors, as posited by [46] and [47]. The proximate composition of both extracts indicated the presence of moisture, ash, crude fiber, crude fat, protein and carbohydrates with varying compositions and their values were significantly higher ($p< 0.05$) in *Telfairia occidentalis* than in *Mucuna poggei.* However, crude fat and carbohydrates contents showed a reverse trend in that their concentrations were significantly higher ($p< 0.05$) in *Mucuna poggei* than in *Telfairia occidentalis.* The proximate compositions of leaf-extracts of both *Telfairia occidentalis* and *Mucuna poggei* were of the trend Carbohydrates > Crude Protein > Moisture Content > Crude Fat > Crude Ash > Crude Fibre. The range in *Telfairia occidentalis* was 0.5 ± 0.18 % of crude fibre to 50.4 ± 0.23 % of carbohydrates, and the range in *Mucuna poggei* was 0.4 ± 0.23 % of crude fibre to 69.1 ± 0.18 % of carbohydrates.

The result of proximate composition of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* indicated that the moisture contents were 8.9 % and 11.6 % respectively. The moisture content of leaf-extract of *Telfairia occidentalis* was significantly higher ($p< 0.05$) than that of *Mucuna poggei.* The factors that might be responsible for moisture content differences in *Telfairia occidentalis* and of *Mucuna poggei* leaves include application of organic fertilizer and genetic [48]. This result is in tandem with the report of [21] wherein the leaves of *Mucuna poggei* had moisture content of 8.25%. The results revealed the fact that the samples had low moisture contents when compared to the moisture content of other leaves such as *Corchorus oiltorius* leaves-79.98 % [49] and *Maerua crassifolia* leaves 62.00 % [6] with high moisture content. However this result is in accordance with the result of [21] which reported low percentage of 10.0 + 0.30% of moisture, in *Moringa oleifera* leaves and 7.96±0.53 % in *Phoenix dactylifera* fruit [21] and the leaves of *Persea Americana* [50]. [51] reported that micro-organisms that encourage food spoilage flourish well in foods with high moisture contents, thereby reducing the shelf life. Therefore the low moisture content of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* gives them a longer shelf life.

The result of proximate composition of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* indicated that the crude fibre contents were 0.4 ± 0.23 % and 0.5 ± 0.18 % respectively. This indicated that the samples had low crude fibre contents. On this bases, these leaves will not require the softening properties of other leaves to make them palatable. Unlike some leaves that require the softening properties of other leaves to make them palatable [52], the *Mucuna poggei* and *Telfairia occidentalis* leaves will not require the softening properties of other leaves to make them palatable. On the other hand diets low in fibre has the disadvantage of causing constipation based on the fact that fibre softens stool and helps in easy defeacation thereby preventing constipation [53]. The crude fibre content of the leaves of *Mucuna poggei* and *Telfairia occidentalis* indicated that they may aid digestion, absorption of water from the body . Consequently, *Mucuna poggei* and *Telfairia occidentalis* may be useful in the control of body weight, aiding digestion, reducing high cholesterol levels, reducing high blood pressure, combating diabetes, breast and colon cancer [29]. The result of proximate composition of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* indicated that the crude fat contents were 3.4 ± 0.19 % and 0.6 ± 0.19 % respectively. The lower crude fat content observed in leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* suggests that they can be easily incorporated into weight reducing diet. Literature searches have revealed that ash content levels is an indication of the level of the inorganic matter present. They are also expected to facilitate the metabolic processes, growth and development [54]. The result of proximate composition of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* indicated that the ash contents were 1.4 ± 0.17% and 8.3 ± 0.15 % respectively. The ash content of leaf-extract of *Telfairia occidentalis* was significantly higher ($p < 0.05$) than that of *Mucuna poggei.* The ash content of leaf-extract of *Telfairia occidentalis,* 8.3 ± 0.15 % was extremely higher than the reported values of 3.7% and 4.2% for sesame and *Canarium album* respectively[41]. The ash content of leaf-extract of *Mucuna poggei* and *Telfairia occidentalis* are good sources of minerals as revealed in the present study. Notably, the ash content of the leaves of *Telfairia occidentalis* in the present study was within the ranges reported by [29], 6.00 – 6.02 % [55], 8.19 to 10.75 %, [56] and 7.67 to 10.17 %, [57]. The result of proximate composition of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* indicated that the crude protein contents were 16.8 ± 0.21 % and 28.6 ± 0.21 % respectively. The crude protein content of leaf-extract of *Telfairia occidentalis* was significantly higher ($p < 0.05$) than that of *Mucuna poggei* . However the crude protein content of leaf-extract of *Telfairia occidentalis* tallied with the result of [29] who reported that the crude protein content of the female leaf plant of *Telfairia occidentalis* was 33.33%. In this study, there was an appreciable amount of protein in both plant samples. Protein is an essential component of human diet needed for the replacement of dead tissues and for the supply of energy and adequate amount of required amino acids [41]. The protein content of the leaves was essential for the synthesis and repair of body tissues and enzymes [58].The result of proximate composition of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* indicated that the percentage carbohydrate content of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* were 69.1 ± 0.18 % and 50.4 ± 0.23 % respectively. The percentage carbohydrate content of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis* were much higher than that of Monodora myristica seeds -37.13 % [59]. Hence the leaves are good sources of energy for animals when put in their feed and also a good sources of energy for human beings for daily activities and exercise if incorporated into diet [60-72]. Adequate carbohydrate is also required for optimum function of the brain, heart, nervous, digestive and immune system while carbohydrate deficiency causes depletion of body tissue [61-72]. The result of this study revealed that leaves of *Mucuna poggei* and *Telfairia occidentalis* contained an appreciable amount of carbohydrates, 69.1 ± 0.18 % and 50.4 ± 0.23 % respectively. The result correlated [36] that reported 78.92±0.27% carbohydrates in *Phoenix dactylifera* fruits. Similarly, the result is in correlation with [62] which reported 72.92 ± 1.08 % carbohydrates in *Bryophyllum pinnatum* leaves. [63], also reported 42.18 % of carbohydrates in Ipomea aquatic. This confirms *Mucuna poggei* and *Telfairia occidentalis* leaves are good sources of carbohydrates. The major function of carbohydrate is to provide the body with energy.

CONCLUSION

Many local vegetable materials are underutilized due to inadequate scientific knowledge of their nutritional values. Vegetables have been found to contain valuable food ingredients which can be used as energy sources, body building, regulatory and protective materials. The results of this study showed that the vitamins composition of leaf-extracts of *Mucuna poggei and Telfairia occidentalis* contained cobalamin, ascorbate, retinol, Pantothenic acid, folate, beta carotene, calciferol, tocopherol, niacin and beta carotene, while the phytochemical analysis showed that they contained tannins, flavonoids, alkaloids, phenols, saponins and trace amounts of glycosides. The proximate analysis revealed that the leaf-extracts of *Mucuna poggei and Telfairia occidentalis* contained carbohydrates, crude fat, moisture, crude fibre, crude protein and a trace amount of ash. Based on the results of this research, leaf-extracts of *Mucuna poggei and Telfairia occidentalis* could meet nutritional needs for man and livestock and can be applied in the development of drugs. Therefore, the need to explore leaf-extracts of *Mucuna poggei and Telfairia occidentalis* as food, feed and drug is important due to the presence of bioactive substances which are very useful in the food, feed and pharmaceutical industries.

REFERENCES

1. Ndeh,F.J., Ebot,W.O., Uwem,O.A., Immaculate,I.E. and Mohmbashagle,N.S. (2021). Association between Pyridoxal-5'-Phosphate Levels, Liver Homogenates and Serum Activities of Aminotransferases and De Ritis Ratio amongst Alcoholic Hepatitis Patients. *Asian Journal of Research and Reports in Hepatology*, **3** (1), 1-10.
2. Akindele, A.J. and Busavo, F.L. (2011). Effects of the hydroethanolic extract of *Mucuna pruriens* on haematological profile in normal and haloperidol treated rats. *Nigerian Quarterly Journal of Hospital Medicine*, **212**, 8-9.
3. Kayode, A. A. and Kayode, O. T. (2011). Some medicinal values of *Telfairia occidentalis*: A review. *American Journal of Biochemistry* and *Molecular Biology*, **1** (1), 30-38.
4. World Health Organization. (2018). Anaemia: Key facts. World Health Organisation, Geneva, Switzerland. WHO Monographs on Selected Medicinal Plants. **1**, 3 - 4.
5. Nwangwu, F.C., Akintola, K. A., Njorku, O.D., Omosowom, B. C., Ozor, P. L., Olatidoye, O. P. and Adekola, A. G. (2011). Performance of pullet chicks served fluted punpkin (Telfairia occidentalis) leaves extract supplement and the effects on their blood parameters. *European Journal of Scientific Research*, **87** (2), 270-282.
6. Obioma, B., Eze, D., Obeagu, A., Emmanuel, N., Okechukwu, P. C. and Ifemeje, J. C. (2014). The effects of aqueous leaf extract of *Mucuna pruriens*(agbala) on some selected biochemical indices of Wister albino rats. *International Journal of Current Microbiology and Applied Sciences*, **3** (1), 724 - 729.
7. Edem, V. F., Akinyoola, S. B., Olaniyi, J. A., Rahamon, S. K., Owoeye, O. and Arinola, O. G. (2012). Haematological Parameters of Wister rats exposed to 2,2 Dichlorovinyl dimethyl phosphate Chemical. *Asian Journal of Experimental Biology*, **3**, 838 - 841.
8. Oko A.O., Ekigbo J.C., Idenyi J.N. and Ehihia L.U., 2012. Nutritional and Phytochemical Compositions of the Leaves of Mucuna Poggei. *Journal of Biology and Life Science*, **3**(1), 232-242.
9. Salem, M.B., Kolsi, R.B., Dhouibi, R., Ksouda, K., Charfi, S., Yaich, M., Hammami, S., Sahnoun, Z., Zeghal, K.M., Jamoussi, K. and Affes, H. (2017). Protective effects of Cynara scolymus leaves extract on metabolic disorders and oxidative stress in alloxan-diabetic rats. *BMC Complemenary and Alternative Medicine*, **17**(1), 328.
10. Christopher, S. L., O.S.O. Ejuoghanran and O.A. Festus (2015). Profertility effects of aqueous leaf extract of *Telfairia occidentalis* in adult male Wistar rats. *Journal of Experimental and Clinical Anatomy,* **14**, 88-94.
11. Almeida, O. P. (2015). Systematic review and meta-analysis of randomized placebo-controlled trials of folate and vitamin B12 for depression. *AfrircanJournal of Biomedical Research*, **14**, 32.
12. Oladele, J.O., Oyewole, O.I., Bello, O.K. and Oladele, O.T. (2017). Hepatoprotective Effect of Aqueous Extract of *Telfairia occidentalis* on Cadmium Chloride-Induced Oxidative Stress and Hepatotoxicity in Rats. *Journal of Drug Design and Medicinal Chemistry*, **3**(3), 32-36.
13. Igbayilola, Y.D., Saka, W.A., Aina, O.S., Mofolorunso, A.M. and Ashiru M.A.(2021). Anti-Hyperlipidemic and Antioxidant Potentials of Aqueous Leaf Extract of Telfairia occidentalis (Hook. F.) in Male Sprague-Dawley Rats. *Nigerian Journal of Physiological. Sciences*,**36,** 109 – 114.
14. Almieda, O., Ayoola, M. and Akinoso, O. (2015). Performance characteristics and physiological Response of broiler chickens at finisher stage to oral Supplementation with fluted pumpkin, *Telfairia occidentalis* leaf extract. *Journal of Central European Agriculture*, 18(3), 646-656.
15. Obeagu, N.A and Ani, J.C. (2014). The Hypoglyceamic and Hypolipideamic Potentials of Raw and Boiled Vernonia amygdalina Leaf Extract on Normal, Diabetic Induced and High Fat Fed Male Albino Rats. *Journal Natural Sciences Research*, **5**(7), 30–39.
16. Mohanty, J., Nagababu, E. and Rifkind, J. (2014). Red blood cell oxidative stress impairs oxygen delivery and induces red blood cell aging. *Frontiers in Physiology*, **5** (84), 1–6.
17. Sioen I, van Lieshout L, Eilander A, Fleith M, Lohner S, Szommer A, Petisca C, Eussen S, Forsyth S, Calder PC, Campoy C and Mensink RP. (2017). Systematic Review on N-3 and N-6 Polyunsaturated Fatty Acid Intake in European Countries in Light of the Current Recommendations - Focus on Specific Population Groups. *Annals of Nutrition and Metabolism*, **70**(1), 39-50.

18. Ayoola, P. M., Faboya, O.O. and Onawuwunmi, O. O. (2013). Comparative Analysis of the Phytochemical and Nutrient Evaluation of the Seeds and Leaves of *Plukenetia conophera* Plant. Journal of *Chemistry and Material Research*,**3**(9), 93.
19. Zoratti, L, Karppinen, K., Luengo, E. A., Häggman H. and Jaakola L. (2014). Light-controlled flavonoid biosynthesis in fruits. *Frontiers in Plant Science*, **5**(534), 1-16.
20. Elejalde, E., Mari,C., Carmen,V, and Rosa, M.A. (2021). Grape polyphenols supplementation for exercise-induced oxidative stress. *Journal of the International Society of Sports Nutrition*,**18**, 3.

21. Aja, P. M., Ibiam, U. A., Uraku, A. J., Orji, O. U., Offor, C. E. and Nwali, B. U. (2013). Comparative Proximate and Mineral Composition of *Moringa oleifera* Leaf and Seed. *Journal of Global Advanced Research of Agricultural Science*, **2**(5), 137-141.
22. Graw, J. A, Mayeur, C., Rosales, I., Liu, Y., Sabbisetti, V. and Riley, F. E. (2016). Haptoglobin or hemopexin therapy prevents acute adverse effects of resuscitation after prolonged storage of red cells clinical perspective. *Journal* of *Circulation Science*, **134**, 945–60.
23. Kirk, R.S and Sawyer, R. (1998). Pearsons Food Composition and Analysis (4th Edition).Macmillan Publisher Company. United Kingdom.
24. AOAC. (1980). Official Methods of Analysis. Howitz (ed.). 734-740.
25. Salem, M.B., Kolsi, R.B., Dhouibi, R., Ksouda, K., Charfi, S., Yaich, M., Hammami, S., Sahnoun, Z., Zeghal, K.M., Jamoussi, K. and Affes, H. (2017). Protective effects of Cynara scolymus leaves extract on metabolic disorders and oxidative stress in alloxan-diabetic rats. *BMC Complemenary and Alternative Medicine*, **17**(1), 328.
26. AOAC. (1990). Official Methods of Analysis. Howitz (ed.). 734-740.
27. Santhi, K. and Sengohuvel, R. (2016). Qualitative and Quantitative phytochemical analysis of *Moringa concarensis nimmo. International Journal of Current Microbiology and Applied Sciences*, **5** (1), 633-640.
28. Horwitz, W. (2006). Official methods of analysis of Association of Official and Analytical Chemists. 18th Edition. International. Maryland USA.
29. Orole, Regina Temitope, Orole, Olukayode Olugbenga, Aisoni Japhet Erasmus, Isyaku Jamilu and Mohammed Yahaya Shehu (2020). Comparative study of the physicochemical properties of male and female flutted pumpkin (Telfairia occidentalis). *The Journal of Medical Research*, **6** (2), 55-61.
30. Okonwu, K., Akonye, L. A., and Mensah, S. I. (2018b). Nutritional composition of Telfairia occidentalis leaf grown in hydroponic and geoponic media. *Journal of Applied Science and Environmental Management*, **22**(2), 153-159.
31. Carmel, R. (2013). Diagnosis and management of clinical and subclinical cobalamin deficiencies: why controversies persist in the age of sensitive metabolic testing. *Biochimie Journal*, **95**, 1047-55.
32. Besong, E. E., Balogun, M. E., Djobissie S. F.A, Obu, D. C. and Obimma, J. N. (2016). Medicinal and Economic Value of *Dialium guineense. African Journal of Biomedical Research*, **3**(19), 163- 170.
33. Picciano, M. F. (2012). Vitamins in milk. A Water- soluble vitamins in Human milk. In: Jensen, R.G., ed. Handbook of Milk Composition. San Diego: Academic Press, p. 90- 99.
34. Salehi, B., Rescigno, A., Dettori, T., Calina, D., Docea, A. O. and Singh, L. (2020). Avocado–soybean unsaponifiables: a panoply of potentialities to be exploited. *Biomolecules*, **10**, 130.
35. Gyorkos, T.W, Gilbert, N.L, Larocque, R. andCasapía, M. (2011).*Journal of Tropical Medicine& International Health*, **16** (4), 531–537.
36. Ajibade, T.O., Olayemi, F.O and Arowolo, R.O. (2012). The haematological and biochemical effects of methanol extract of the seeds of *Moringa oleifera* in rats. *Journal of Medicinal Plants Research*, **6**(4), 615-621.
37. Ochokwu, I. J., Taiwo, M.A., and Bashir, S.Y. (2021). Haematological Indices and Carcass Composition of African Catfish Clarias gariepinus (Burchell, 1822) Fingerlings Fed with
38. Airaodion, A. I., A. H. Ibrahim , U. Ogbuagu , E. O. Ogbuagu , O. O. Awosanya , J. D. Akinmolayan , O. C. Njoku , O. O. Obajimi , A. R. Adeniji and O. A. Adekale (2019). Evaluation of Phytochemical Content and Antioxidant Potential of *Ocimum gratissimum* and *Telfairia occidentalis* Leaves *Asian Journal of Research in Medical and Pharmaceutical Sciences*, **7**(1), 1-11.
39. Hossain, Md. J., Biswas, S., Islama, S., Shahriar, M, and Ahsan, C.R. (2019). *In vitro* phytoconsituents investigation, antioxidant capacity, antimicrobial activity and *in vivo* anticancer activity of *Mucuna poggei* fruit peel extracts obtained by different extraction approaches. *Turkish Journal of Biotechnology*, **102**, 120-129.

40. Martin, C. U., Cynthia, O. I., Ifeanyi, C. O., Chibuzor, H. N., Chike, T. E. and George, A. A. (2010). Evaluation of Proximate and Phytochemical Compositions of Fermented Raw and Fermented Napoleona Imperialis Seed and Their Feeding Values on Finisher Broilers. *Nature and Science*, **8**(4), 83-88.
41. Igidi, O. J. and Edene CE. (2014). Proximate and phytochemical compositions of Napoleona volgelii hook fruit. *The Intenational Journal of Engineering and Sciences*, **3**(6), 46-51
42. Iweala, C., Emeka, E.J., Evbakhavbokun, E., Winifred, O. and Maduagwu, E.N. (2019). Antioxidant and Hepatoprotective Effect of Cajanus Cajan in N-Nitrosodiethylamine-Induced Liver Damage. *Journal Scientia Pharmaceutica*, **87** (24), 1-13.
43. Graw, J. A, Mayeur, C., Rosales, I., Liu, Y., Sabbisetti, V. and Riley, F. E. (2016). Haptoglobin or hemopexin therapy prevents acute adverse effects of resuscitation after prolonged storage of red cells clinical perspective. *Journal* of *Circulation Science*, **134**, 945–60.
44. Si, W., Zhang, Y., Li, X., Du, Y. and Xu, Q. (2021). Understanding the Functional Activity of Polyphenols Using Omics-Based Approaches. *Nutrients*, **13**(11), 3953.
45. Kalu, F. N., Ogugua, V. N. I, Ujowumdi, C. O. and Chinekeokwu, C. R. K. (2011). Composition and Acute Toxicity Studies on the Aqueous Extract of Combretum Polichopentalum Leaf in Swiss Albino Mice. *Journal of Chemical Sciences and Research*, **1**(8), 72-75.
46. Anjorin, S. T., Jolaoso, M. A. and Golu, M. T. (2013). Survey of incidence and severity of pests and diseases of okra (*Abelmoschus esculentus L. Moench*) and eggplant (*Solanum melongena L.*) in Abuja, Nigeria. *American Journal of Research Communication*, **1**(11), 333-349.
47. Cristoferi, L., Nardi, A., Ronca, V., Invernizzi, P., Mells, G., Carbone, M. (2018).Prognostic models in primary biliary cholangitis. *Journal Autoimmun*, **95**, 171-178.
48. Kajihausa, O. E., Sobukola, O.P., Idowu, M. A. and Awonorin, S.O. (2010). Nutrient contents and thermal degradation of vitamins in organically grown fluted pumpkin (*Telfairia occidentalis*) leaves. *International Food Research Journal*, **17**, 795-807.
49. Adeniyi, S. A., Ehiagbonare, J. E. and Nwangwu, S. C.O. (2012). Nutritional evaluation of some staple leafy vegetables in Southern Nigeria. *International Journal of Agricultural and Food Science*, **2**(2), 37-43.
50. Odo, J.U., Offor, C.E., Obiudu, I.K. and Udeozor, P. A. (2018). Comparative Chemical Analyses of the Leaves and Seeds of *Persea Americana*. *Journal of Biochemistry, Biotechnology and Allied Fields*. **3**(2), 52-59.
51. Emebu, P. K., and Anyika, J. U. (2011). Vitamin and anti-nutrient composition of kale (Brassica oleracea) grown in Delta State, Nigeria. *Pakistan Journal of Nutrition*, **10**(1), 76-79.
52. Nkongho, G., Achidi, A., Ntonifor, N., Numfor, F., Dingha, B., Jackal, L. and Bonsi, C. (2014): Sweet potatoes in Cameroonnutritional profile of the leaves and their potential new use in local foods. *African Journal of Agricultural Research*, **9**(8), 1371-137.
53. Vanhauwaert, E., Matthys, C., Verdonck, L. and De Preter, V. (2015). Low-residue and low-fiber diets in gastrointestinal disease management. *Advances in Nutrition*, **6**(6), 820-827.
54. Onah, Gloria Tochukwu, Eze, Elijah Ajaegbu and Ifeoma Bessie Enweani (2022). Proximate, phytochemical and micronutrient compositions of Dialium guineense and Napoleona imperialis plant parts . *GSC Biological and Pharmaceutical Sciences*, **18**(03), 193–20
55. Mohd, A. M., Idris, M. B. and Abdulrasheed, A. (2016). The Mineral Composition and Proximate Analysis of *T. occidentalis* (Fluted Pumpkin) Leaves Consumed in Kano Metropolis, Northern Nigeria. *American Chemical Science Journal*, **10**(1), 1-4.
56. Usunobun, U. and Egharebva E. (2014). Phytochemical analysis, proximate and mineral composition and *in vitro* antioxidant activities in *Telfairia occidentalis* aqueous leaf extract. *Journal of Basic and Applied Sciences*, **1**(1), 74-87.
57. Arowosegbe, S, Olanipekun, M. K. and Kayode J. (2015). Ethnobotanical survey of medicinal plants used for the treatment of diabetes mellitus in Ekiti State Senatorial District, Nigeria. *Journal of Botany, Plant Science and Phytology*, **2**(4), 1-8.
58. Okike, P. A., Olatunji, B. P., Egbebi, A. A. and Ojo, C. (2015). Compartive Study of Nutritional and Phytochemical Composition of Phyllantus amarus Leaves and Seeds. American-Eurasian *Journal of Toxicological Sciences*, **7**(4), 321- 327.
59. Offor, C. E. and Aja,P.M. (2014). Effects of ethanol leaf-extracts of Vernonia amygdalina and Azadirachta indica on liver enzymes in albino rats. *Middle East Journal of Scientific Research*, **21**(6), 918-921.
60. Udousoro, I. and Ekanem, P. (2013). Assessment of proximate composition of twelve edible vegetables in Nigeria. *International Journal of Modern Chemistry*, **4**(2), 79-89.

61. Offor, I., F., Ehiri, R.C. and Njoku, C.N. (2014). Proximate nutritional analysis and heavy metal composition of dried Moringa oleifera leaves from Oshirionich L.G.A, Ebonyi State Nigeria. *Journal of Environmental Science, Toxicology and food technology (IOSR-JESTFT)*, **8**(1), 57- 62.
62. Nwali, B. U., Aja, P. M., Okaka, A. N. C., Offor, C. E. and Nwachi, U. E. (2014). Proximate and Mineral composition of Bryophyllum pinnatuma medical plant used to cure
63. Igwenyi, I. O., Eze, C. A., Azoro, B. N., Offor, C. E. and Nwuke, C. P. (2011). Proximate, mineral and amino acid compositions of Irvigna gabonesis and Citrullus colocynth are used as soup thickeners in South Eastern Nigeria. *International Journal of Biotechnology*, **7**(4), 493- 499.
64. Ugwu Okechukwu PC, FC Nwodo Okwesili, E Joshua Parker, Bawa Abubakar, C Ossai Emmanuel, E Odo Christian (2013). Phytochemical and acute toxicity studies of Moringa oleifera ethanol leaf extract. International Journal of Life Science BiotechNology and Pharma Research 2(2): 66-71.
65. Adonu Cyril C, OPC Ugwu, Ossai Esimone Co, A Bawa, AC Nwaka, CU Okorie (2013). Phytochemical analyses of the menthanol, hot water and n-hexane extracts of the aerial parts of cassytha filiformis (Linn) and leaves of cleistopholis patens. Research Journal of Pharmaceutical, Biological and Chemical Sciences,4: 1143-1149.
66. CE Offor, PC Ugwu Okechukwu, PM Aja and IO Igwenyi (2015). Proximate and phytochemical analyses of Terminalia catappa leaves. European Journal of Applied Sciences,7(1): 09-11.
67. Ilozue NM, UP Ikezu, PC Ugwu Okechukwu (2014). Antimicrobial and phytochemical screening of the seed extracts of Persea americana (avocado pear). IOSR Journal of Pharmacy and Biological Sciences,9(2): 23-25.
68. Igwenyi IO, OE Isiguzo, PM Aja, PC Ugwu Okechukwu, NN Ezeani, AJ Uraku (2015). Proximate composition, mineral content and phytochemical analysis of the African oil bean (Pentaclethra macrophylla) seed. American-Eurasian J Agric Environ Sci, 15: 1873-1875.
69. PM Aja, PCU Okechukwu, K Kennedy, JB Ibere, EU Ekpono (2017). Phytochemical analysis of Senna occidentalis leaves. IDOSR J Appl Sci,2(1): 75-91.
70. Offor CE, JU Agidi, CO Egwu, N Ezeani and PC Ugwu Okechukwu (2015). Vitamin and mineral contents of Gongronema latifolium leaves. World Journal of Medical Sciences,12(2): 189-191.
71. Chukwuemeka IM, IP Udeozo, C Mathew, EE Oraekwute, RC Onyeze and OPC Ugwu. Phytochemical analysis of crude ethanolic leaf extract of Morinda lucida. (2013). Int. J. Res. Rev. Pharm. Appl. Sci, 3 (4): 470-475.
72. Ali Ikechukwu A, UA Ibiam, PC Ugwu Okechukwu, OR Inya-Agha, U Orji Obasi, David Obasi Chukwu (2015). Phytochemistry and acute toxicity study of Bridelia ferruginea extracts. World J. Med. Sci, 12 (4): 397-402.

Udeozor P.A., Ibiam U.A. , Uti D.E., Umoru G.U., Onwe E.N., Onwere C. C., Nwosu, C. E., Anaga, C. O., Mbonu, F. O., Atiaetuk, I. E. and Orji, O.U. (2023). Comparative vitamins, phytochemical and proximate composition of leaf-extracts of *Mucuna poggei* and *Telfairia occidentalis*. *NEWPORT INTERNATIONAL JOURNAL OF SCIENTIFIC AND EXPERIMENTAL SCIENCES (NIJSES*), 3(1):1-13.