International Journal of Organic agricultural Research & Development
Volume 20 (3) (2025)

YIELD AND QUALITY RESPONSE OF *TELFAIRIA OCCIDENTALIS* AS AFFECTED BY ORGANIC FERTILIZERS

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ABSTRACT

Telfairia occidentalis Hook F. (fluted pumpkin) is an indigenous leafy vegetable of high nutritional, economic, and medicinal importance in West Africa. It serves as a vital source of protein, vitamins, minerals, and income for smallholder farmers. However, declining soil fertility and overreliance on costly synthetic fertilizers have constrained its productivity and quality. The study was conducted to evaluate the effects of organic fertilizer types on yield and quality of *T. occidentalis* at Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso.

The treatments comprised five organic fertilizers types namely; Aleshinloye A, Aleshinloye B, Poultry Manure, Sunshine A, and Sunshine B, each applied at 60 kg N ha^{-1}, and control (0 kg N ha^{-1}). The experiment was laid out in a Completely Randomized Design (CRD) with four replications. Data collected on vine length, leaf number, fresh shoot weight, mineral composition, and proximate quality were subjected to ANOVA, and means separated using Duncan's Multiple Range Test (DMRT) at a 5% probability level. Results showed that organic fertilizer application enhanced vegetative growth, shoot yield, and nutritional quality compared to the control. Sunshine A and Poultry Manure consistently produced longer vines and higher leaf counts. Poultry Manure recorded the highest fresh shoot weight (56.83 g plant^{-1}) and mineral composition, including N (0.47%), K (0.56%), and Zn (0.28%). It also improved crude protein (3.10%), fibre (1.45%), vitamin A (3.80%), and alkaloids (1.62%). It is therefore concluded that organic fertilizers, particularly Poultry Manure and Sunshine A, significantly enhanced growth, yield, and nutritional composition of *T. occidentalis*.

Keywords: ***Poultry manure, Phytochemical contents, Vine length, Shoot weight, Proximte contents***

INTRODUCTION

Fluted pumpkin (*Telfairia occidentalis* Hook F), is a tropical leafy vegetable indigenous to southern Nigeria and widely cultivated across West and Central Africa. Belonging to the family Cucurbitaceae, it is among the most economically and nutritionally important indigenous vegetables in the region. The crop is cultivated primarily for its tender leaves and shoots, which are consumed as vegetables, and for its seeds, which are processed into soup condiments and used for oil extraction. The increasing demand for *T. occidentalis* in both rural and urban markets underscores its socio-economic relevance in improving household nutrition, enhancing income generation, and promoting sustainable agriculture (Nwanna *et al*., 2008).

Nutritionally, *T. occidentalis* is an excellent source of essential macro- and micronutrients. Its seeds contain approximately 28–37% crude protein and 42–58% oil, while the leaves are rich in protein, dietary fiber, and minerals such as potassium, calcium, iron, and magnesium (Aiyelaagbe and Kintomo, 2002; Akpabio *et al*., 2008). The leaves also contain vitamins A, C, and E, as well as bioactive compounds with antioxidant, hematinic, and hepatoprotective properties that enhance its nutritional and medicinal importance (Nwanna *et al*., 2008). These attributes make *T. occidentalis* a vital crop for addressing micronutrient deficiencies and improving food and nutrition security in sub-Saharan Africa, where vegetable consumption remains below recommended dietary levels.

Soil fertility management plays a critical role in the production of *T. occidentalis*, as its vegetative growth and yield potential depend largely on the continuous supply of essential nutrients. In Nigeria and most tropical regions, however, declining soil fertility, nutrient depletion from continuous cropping, constrain vegetable productivity. Although mineral fertilizers provide rapid nutrient availability and can improve yields, their high cost, potential for soil acidification, nutrient imbalance, and contribution to environmental degradation raise concerns regarding their long-term sustainability (Mojisola *et al*., 2018).

Organic fertilizers, including poultry manure, compost, and crop or green residues, are increasingly recognized as sustainable alternatives to synthetic inputs. They are organic materials of plant or animal origin that undergo decomposition to release nutrients for plant uptake. Unlike inorganic fertilizers, organic amendments improve soil physical structure, enhance microbial activity, increase nutrient and water retention capacity, and contribute to the buildup of soil organic matter (Ayoola and Makinde, 2009). In tropical agroecosystems characterized by high rainfall and nutrient leaching, organic fertilizers provide a more sustainable nutrient management strategy. Their slow and steady nutrient release pattern aligns well with the physiological nutrient requirements of leafy vegetables such as *T. occidentalis*, which demand continuous nutrient availability for sustained leaf expansion and chlorophyll development (Makinde and Ayoola, 2010; Ojeniyi *et al*., 2012).

For smallholder farmers who dominate vegetable production in Nigeria, the use of organic fertilizers offers a cost-effective means of recycling agricultural and urban wastes while maintaining soil fertility and improving crop performance (Ewulo *et al*., 2008; Akinrinlola *et al*., 2020). Despite these advantages, comparative studies assessing the effects of different organic fertilizer types on the growth, yield, and nutritional composition of *T. occidentalis* under local agroecological conditions remain limited (Akanbi *et al*., 2005; Ogunlade *et al*., 2011). Moreover, variability in the nutrient composition and mineralization rates of organic materials complicates their agronomic recommendations, underscoring the need for site-specific evaluations (Ayeni and Adeleye, 2011; Mbah *et al*., 2012).

Vegetable production in Nigeria continues to face challenges related to declining soil fertility and the unsustainable use of chemical fertilizers. Although *T. occidentalis* contributes significantly to nutrition and livelihoods, its productivity remains low due to inadequate soil fertility management and the underutilization of locally available organic resources. In many farming communities, poultry manure, compost, and crop residues are abundant but often poorly managed or wasted. Understanding how these organic fertilizer sources influence the growth performance, shoot yield, and nutritional quality of *T. occidentalis* is therefore essential for promoting efficient, low-cost, and environmentally sustainable production systems. Therefore, this study was carried out to evaluate the effects of different organic fertilizer types on the growth, shoot yield, and nutritional quality of *Telfairia occidentalis*.

Materials and Methods

The experiment was conducted at the Teaching and Research Farm, Ladoke Akintola University of Technology (LAUTECH). Ogbomoso lies between latitude 8°10´ N and longitude 4°10´ E with highest rainfall (212.30mm) in August and (141.10 mm) in October. The environment recorded its average relative humidity of 72%, average maximum temperature 34.6°C and average minimum temperature 21.5°C (NIMET, 2023).

Top soil (0-15cm) was collected from LAUTECH Teaching and Research Farm, Ogbomoso, Oyo State. It was mixed thoroughly using a spade to obtain homogenous soil in all pots. The pots were perforated at the bottom to allow easy drainage and facilitate aeration. 10 kg of soil was weighed and poured into pots. A total number of 96 pots were used for the experiment.

Composite soil samples were collected from the experimental site, air-dried, and passed through a 2 mm sieve for physical and chemical analysis. Particle size distribution was determined using the hydrometer method as described by Bouyoucos (1962). Soil pH was measured in a 1:1 soil-to-water suspension. Exchangeable cations (Ca^{2+}, Mg^{2+}, K^+, and Na^+) were extracted using 1 N ammonium acetate (NH_4OAc) at pH 7.0. Sodium (Na^+) and potassium (K^+) concentrations were determined using a flame photometer, while calcium (Ca^{2+}) and magnesium (Mg^{2+}) were analyzed using an atomic absorption spectrophotometer (PerkinElmer Model 403). Organic carbon was analyzed by the Walkley–Black method, and available phosphorus (P) was determined using the Bray P-1 method as described by Bray and Kurtz (1945).

Cured poultry manure was collected from LAUTECH Teaching and Research Farm, Ogbomoso, Oyo State. Aleshinloye grade A and

B were sourced from Aleshinloye Fertilizer Company, Ibadan, Oyo State. Sunshine grade A and B were sourced from Ondo State Government Waste Management Company, Akure, Ondo State. Fluted pumpkin pods were sourced locally at farmer's market in Ogbomoso, Oyo State, Nigeria.

The experiment was arranged in a completely randomized design (CRD) replicated four times. The factor considered was fertilizer type – Aleshinloye A and B, Poultry manure, Sunshine A and B.

Table 1: Composition of major nutrient in fertilizers evaluated for cultivation of *Telfairia occidentalis*

	Nutrient contents (%)		
Fertilizers	N	P	K
*Aleshinloye A	5.09	0.44	1.08
*Aleshinloye B	1.20	0.80	2.90
Poultry manure	2.90	1.32	1.69
**Sunshine A	3.50	2.50	4.00
**Sunshine B	3.50	1.00	2.50

Source: *Aleshinloye Fertilizer Company, Ibadan; **Ondo waste government waste management (2012)

Fluted pumpkin seeds were extracted from the pods and air dried for 24 hours before sowing directly into the pots. One seed was sown per pot at a depth of 5cm. Application of fertilizer was done two weeks before sowing by ring method. The fertilizers were applied at the rate of 60 kg N/ha each and Control (0 kg N/ha). Rouging was carried out at two weeks interval after sowing. Staking was done four weeks after sowing.

Data collection was carried out at two-week interval starting from four weeks after sowing (4WAS) for ten weeks. Primary vine length (cm) was determined using a measuring tape centimeter from the base of the vine to the tip. Number of leaves/plants was obtained by visual observation. Fresh shoot weight (g/plant) was obtained by weighing the cut fresh shoot. For determination of elemental mineral analysis and proximate composition, harvested fluted pumpkin shoot were oven dried to constant weight at 65˚C for 48 hours. The dried samples were milled and analysed for Nitrogen (N), using Kjedahl digesting method, Phosphorus (P) using technicon AAI, Calcium (Ca) using flame photometer and magnesium (Mg) by the use of atomic absorption spectrometer, Iron (Fe) was determined by AOAC Method (AOAC, 2012). Data collected were subjected to analysis of variance (ANOVA) using Genstat 12th edition and significant means were separated using Duncan Multiple Range Test (DMRT).

Results and Discussion:

The physical and chemical properties of the experimental soil are presented in Table 2. The soil was classified as sandy loam, consisting of 82.95% sand, 12.3% silt, and 4.75% clay. The soil pH (6.27) was slightly acidic. The total nitrogen (0.37%) was moderate, while the available phosphorus (6.38 mg/kg) was low. The organic carbon (2.57%) was moderately high. Among the exchangeable cations, Ca^{2+} (2.11 cmol/kg) predominated, followed by Mg^{2+} (0.74 cmol/kg), K^+ (0.34 cmol/kg), and Na^+ (0.25 cmol/kg). These findings agree with earlier reports by Agbenin (1995) and Akinrinde and Obigbesan (2000) that tropical soils are often sandy, weak in nutrient retention, and low in phosphorus due to fixation by Fe and Al oxides. The slightly acidic reaction observed supports assertion that pH 6.0–6.5 enhances macronutrient availability, while the moderate nitrogen and organic carbon levels align with Udo et al. (2009), who associated such soils with fair fertility and good structural stability.

Table 3 presents the influence of organic fertilizer types on the vine length (cm) of Telfairia occidentalis at different sampling periods. The results showed a consistent increase in the vine length at different sampling period but were not statistically significant (P≥0.05). At 10 WAS, Sunshine A produced the longest vines (124.70 cm), followed by Poultry Manure (114.60 cm), with control plant gave the least (106.60 cm). The observed differences, though statistically not significant, suggest a consistent trend where Sunshine A and Poultry Manure treatments enhanced vine elongation more effectively than other fertilizer treatments. These findings are consistent with earlier studies that reported improved vegetative growth in Telfairia occidentalis following organic fertilizer application. Adeniyan and Ojeniyi (2005) and Akanbi *et al*. (2010) noted that organic amendments improved the physical and chemical properties of the soil, thereby enhancing plant height and vine development. The superior vine length associated with Sunshine A could be due to its formulation, which may offer a balanced supply of nutrients and support prolonged nutrient availability throughout the growth cycle. Similarly, the effectiveness of poultry manure may be attributed to its richness in nitrogen and its capacity to improve soil organic matter content, microbial activity, and overall nutrient uptake efficiency (Ayeni *et al*., 2012).

Table 4 present the influence of organic fertilizer types on the number of leaves per plant of *Telfairia occidentalis* at different sampling periods. Although no statistically significant differences were observed at 4, 8, and 10 weeks after sowing (10 WAS) but significant effect was observed at 6 weeks after sowing (6 WAS). Sunshine A, Poultry Manure, and Aleshinloye B consistently supported higher leaf count, particularly from 6 WAS onward. Sunshine A recorded the highest leaf count at 6 WAS (20.75), while Aleshinloye B had the highest at 10 WAS (53.83). These findings align with previous studies that highlighted the effectiveness of organic fertilizers in promoting vegetative growth due to their improved nutrient release and soil conditioning properties (Adeniyan and Ojeniyi, 2005; Akanbi *et al*., 2010; Ayeni *et al*., 2012). The results suggest that Sunshine A and poultry manure are promising organic amendments for enhancing early and sustained growth in fluted pumpkin, with potential implications for improved leaf yield and long-term soil fertility.

Figure 1 present presents the influence of organic fertilizer types on the fresh shoot weight (g) of *Telfairia occidentalis* leaves at 10 weeks after sowing. The highest FSW (g/plant) was observed with Poultry Manure (PM) treatment (56.83 g/plant), followed by Sunshine B (SB) (51.72 g/plant), while the lowest was recorded in Aleshinloye B (AB) (46.54 g/plant). However, there were no significant differences among treatments. The result shows that poultry manure had a more positive effect on shoot biomass accumulation compared to other treatments and the control. This observation aligns with the findings of Akanbi *et al*. (2005) and Adekiya and Agbede (2009), who reported improved vegetative growth and yield parameters in vegetables and tuber crops with poultry manure due to its high nutrient content and faster nutrient release rate. Similarly, Ojo *et al*. (2013) noted that poultry manure enhances nitrogen availability, promoting shoot development more effectively than many composted amendments.

Table 5 presents the influence of organic fertilizer types on the mineral composition (%) of Telfairia occidentalis. The results show that applied fertilizer had a significant effect ($P \leq 0.05$) on mineral composition. Poultry manure-treated plants recorded the highest concentrations of N (0.47%), K (0.56%), Fe (0.24%), Mg (0.26%), and Zn (0.28%), all of which were significantly superior to the control and other treatments. Sunshine A also performed notably well, particularly in P (5.60%), K (0.53%), Ca (0.36%), Fe (0.22%), and Zn (0.26%). Aleshinloye A showed high P content (5.53%) and relatively elevated levels of other nutrients. In contrast, the control plant consistently recorded the lowest concentrations of all minerals, indicating nutrient deficiency under unfertilized conditions. The results demonstrate that organic fertilizer application significantly improves the mineral composition of Telfairia occidentalis. Poultry manure had the most profound effect, enhancing macro- and micronutrient content in the leaves. This supports the findings of Ojetayo *et al*. (2011) and Akanbi *et al*. (2007), who reported that poultry manure enhances the uptake and accumulation of essential nutrients in leafy vegetables due to its rich nutrient composition and ability to improve soil physical and chemical properties. The high P and Ca contents observed in Sunshine A-treated plants may be attributed to the balanced nutrient release characteristic of formulated organic blends, which corroborates the report by Ayeni (2010), who emphasized the nutrient buffering capacity of oragnomineral fertilizers. Similarly, the superior performance of Aleshinloye A in P and N contents aligns with the study by Adekiya *et al*. (2015), which highlighted the effectiveness of fortified composts in improving soil fertility and nutrient density of crops.

Table 6 presents the influence of organic fertilizer types on the proximate and phytochemical contents (%) of *Telfairia occidentalis*. Poultry manure-treated plants recorded the highest levels of crude fibre (1.45%), crude protein (3.10%), vitamin A (3.80%), and alkaloids (1.62%), all of which were significantly higher than the control and other treatments. Sunshine A also performed well particularly in vitamin C (26.13%) and crude fibre (1.43%). Aleshinloye B showed a competitive level of vitamin C (27.60%) and vitamin A (3.46%). In contrast, the control plant recorded the least values suggesting that nutrient deficiency under unfertilized conditions limited biochemical accumulation. The results also showed that organic fertilizers significantly enhance the nutritional and phytochemical qualities of *Telfairia occidentalis*. Poultry manure was the most effective in improving both proximate compositions, notably protein and fibre and bioactive compounds such as alkaloids and vitamins, confirming the reports of Ojeniyi *et al*. (2007) and Akanbi *et al*. (2007), who observed similar increases in leafy vegetables treated with poultry manure. The high nutrient bioavailability from poultry manure may explain the improved biochemical synthesis in the plant tissues. Furthermore, Sunshine A and Aleshinloye B contributed significantly to vitamin and secondary metabolite content, likely due to their balanced nutrient formulations and slow-release characteristics. These findings are consistent with the work of Olaniyi and Ojetayo (2010), who emphasized the role of organic-based fertilizers in enhancing the phytonutrient density of vegetables. The low nutrient and phytochemical levels observed in the control plants highlight the importance of soil fertility management in optimizing the nutritional value of vegetables. The increase in flavonoid and alkaloid contents with organic fertilizer application also suggests a potential improvement in the medicinal and antioxidant properties of *T. occidentalis*, as reported by Ayodele et al. (2014).

Conclusion

The study demonstrated that organic fertilizer application significantly influenced the growth, mineral composition, and phytochemical properties of *Telfairia occidentalis*. Poultry manure showed the most pronounced effect on shoot biomass and nutrient enrichment, leading to higher concentrations of key macronutrients (N, K, Mg) and micronutrients (Fe, Zn). It also improved the biochemical quality of the leaves, reflected in elevated levels of crude protein, crude fibre, vitamins, and alkaloids.

Table 2: Chemical and physical properties of the top soil used for the experimental site

Soil characteristics	Values
Physical characteristics	
Sand (%)	82.95
Silt (%)	12.30
Clay (%)	4.75
Textural Class	Sandy loam
Chemical characteristics	
PH (H_2O)	6.27
Total N (%)	0.37
Available P (mg/kg)	6.38
Organic carbon	2.57
Exchangeable cations (C mol/kg)	
Ca^{2+}	2.11
Mg^{2+}	0.74
K^{+}	0.34
Na^{+}	0.25

Table 3: Influence of fertilizer types on vine length (cm) of fluted pumpkin at different sampling periods

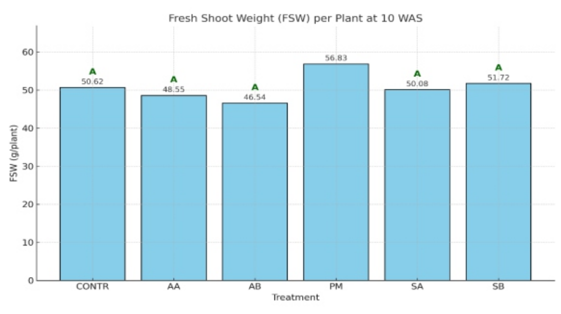
	Weeks after sowing			
Fertilizer Type	**4**	**6**	**8**	**10**
Control	38.14A	65.22A	82.53A	106.60A
Aleshinloye A	36.29A	66.51A	74.97A	99.70A
Aleshinloye B	48.72A	70.98A	89.11A	108.30A
Poultry Manure	53.22A	87.46A	95.15A	114.60A
Sunshine A	52.55A	94.40A	104.61A	124.70A
Sunshine B	40.73A	73.89A	81.78A	98.10A

Mean with the same letters within the column are not significantly different by DMRT at P=0.05

Table 4: Influence of fertilizer types on number of leaves/plant of fluted pumpkin at different sampling periods

	Weeks after sowing			
Fertilizer Type	**4**	**6**	**8**	**10**
Control	11.00A	16.00B	34.84A	49.92A
Aleshinloye A	11.33A	17.33AB	30.91A	50.16A
Aleshinloye B	12.00A	18.17AB	33.59A	53.83A
Poultry Manure	11.60A	18.41AB	37.84A	52.83A
Sunshine A	12.67A	20.75A	37.98A	51.42A
Sunshine B	10.83A	15.50B	32.67A	50.00A

Mean with the same letters within the column are not significantly different by DMRT at P=0.05



Mean with the same letters within the column are not significantly different by DMRT at P=0.05
CONTR: Control, AA: Aleshinloye A, AB: Aleshinloye B, PM: Poultry Manure, SA: Sunshine A, SB: Sunshine B
Figure 1: Fresh shoot weight (g/plant) of *Telfairia* as influenced by fertilizer type at 10 weeks after sowing.

Table 5: Influence of fertilizer types on mineral composition (%) of fluted pumpkin

	Mineral Composition (%)						
Fertilizer Type	**N**	**P**	**K**	**Ca**	**Fe**	**Mg**	**Zn**
Control	0.35CD	3.85F	0.40D	0.20d	0.12C	0.14C	0.15E
Aleshinloye A	0.41B	5.53B	0.48B	0.29bc	0.19B	0.21B	0.21B
Aleshinloye B	0.38BC	4.86E	0.46BC	0.31b	0.15C	0.22B	0.17D
Poultry Manure	0.47A	5.26C	0.56A	0.35a	0.24A	0.26A	0.28A
Sunshine A	0.36C	5.60A	0.53A	0.36a	0.22AB	0.23B	0.26A
Sunshine B	0.32D	4.92D	0.43C	0.27c	0.15C	0.15C	0.19C

N= Nitrogen, P= Phosphorus, K= Potassium, Ca= Calcium, Fe= Iron, Mg= Magnessium, Zn= Zinc

Mean with the different letters within the column are significantly different by DMRT at P≤0.05

Table 6: Influence of fertilizer types on Proximate and phytochemicals contents (%) of fluted pumpkin

	Proximate and phytochemicals contents (%)						
Fertilizer Type	**CF**	**CP**	**MC**	**VIT_A**	**VIT_C**	**FLAVD**	**ALK**
Control	1.14E	2.30F	11.36A	3.32E	21.14D	0.14C	1.21F
Aleshinloye A	1.34C	2.85B	10.70B	3.16F	24.90BC	0.15B	1.49B
Aleshinloye B	1.36BC	2.70D	10.90B	3.46D	27.60A	0.15B	1.41D
Poultry Manure	1.45A	3.10A	10.60B	3.80A	26.50AB	0.16A	1.62A
Sunshine A	1.43AB	2.80C	10.88B	3.57C	26.13AB	0.15B	1.47C
Sunshine B	1.26D	2.52E	10.60B	3.70B	22.80CD	0.15B	1.32E

Mean with the different letters within the column are significantly different by DMRT at P≤0.05

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