



RESEARCH ARTICLE

GROWTH, SHOOT YIELD AND NUTRITIONAL VALUES OF FLUTED PUMPKIN AS INFLUENCED BY DIFFERENT FERTILIZER TYPES IN OGBOMOSO

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ABSTRACT

Fluted pumpkin is a vegetable grown for its succulent leaves, shoots and seeds which are consumed by human and used as forage for livestock feeding. Problems affecting production of fluted pumpkin production include low soil fertility. Therefore, this study examined the influence of fertilizer types on growth, shoot yield and nutritional values of fluted pumpkin at the Teaching and Research Farm, Ladoké Akintola University of Technology, Ogbomoso. The treatments consisted seven fertilizer types (Aleshinloye Grade A, Aleshinloye Grade B, NPK 20:10:10, Poultry manure, Sunshine Grade A, Sunshine Grade B and Urea) applied at 60 kg N/ha, and control. The treatments were arranged in a Completely Randomized Design, replicated four times. Data collected on growth, shoot yield, mineral and proximate analysis of the harvested shoot were subjected to Analysis of Variance (ANOVA) and treatment means separated by Duncan Multiple Range Test (DMRT) at 5% probability level. The results showed that fertilizer types had significant effect ($p \leq 0.05$) on number of leaves, nutritional value and shoot yield compared with the control, irrespective of fertilizer types. The optimum growth and shoot yield performance of fluted pumpkin were obtained from NPK20:10:10 fertilizer which was similar to poultry manure and sunshine grade A. The highest nitrogen (0.50%), phosphorus (5.60%), potassium (0.56%), crude protein (3.10 g/100g), and crude fiber (1.80 g/100g) contents were obtained from shoot treated with urea, closely followed by those treated with poultry manure. Control plant had the least nutritional values. In conclusion, NPK20:10:10 fertilizer, poultry manure and sunshine grade A had similar best growth, shoot yield and nutritional values. Therefore, poultry manure could be recommended for cultivation of fluted pumpkin in the study area.

KEYWORDS

Fluted pumpkin, growth, shoot yield, nutritional value, fertilizer types

1. INTRODUCTION

Fluted pumpkin (*Telfairia occidentalis* Hook. f.) is an indigenous leafy and seed vegetable of considerable nutritional and economic importance in West Africa, particularly Nigeria. The leaves and tender shoots are widely consumed as vegetables, while the seeds are utilized as sources of oil and protein. The edible shoots contain approximately 85% moisture, and their dry matter fraction consists of about 25% carbohydrate, 11% crude protein, 3% fat, and appreciable concentrations of essential minerals, including potassium, phosphorus, magnesium, calcium, and iron (Oyolu, 1980, cited in Kajihaua et al., 2010).

The seeds of *T. occidentalis* are characterized by high nutritional density, containing about 20.5% protein, 45% fat, 23% carbohydrate, 2.2% crude fiber, and 4.8% total ash (Aworunse, 2018). The high oil content of the seeds supports their use for edible and industrial oil production. The physicochemical and fatty acid characteristics of fluted pumpkin seed oil indicate its suitability for culinary and industrial applications (Adejumo and Adekoya, 2023). In addition, the oil has been identified as a promising biodiesel feedstock, highlighting its potential role in renewable energy production (Ekele, 2025).

Nitrogen is a key nutrient influencing vegetative growth and yield in fluted pumpkin due to its role in protein synthesis and chlorophyll formation.

For vegetable production in the Nigerian savannah zone, nitrogen application rates of approximately 50 kg N ha⁻¹ have been recommended as a minimum requirement (FAO, 1982; NIHORT, 1983). Higher application rates of around 100 kg N ha⁻¹ have been reported to be suitable for dual-purpose production involving both leaf and fruit harvest.

Soil fertility management is critical for sustainable production of fluted pumpkin. Although mineral fertilizers provide readily available nutrients, organic amendments have been shown to significantly improve crop growth and yield by enhancing soil physical, chemical, and biological properties. Studies have demonstrated that poultry manure and other organic fertilizers increase vine length, leaf number, and yield compared with sole mineral fertilizer application (Idem et al., 2012; Edu et al., 2015). Integrated use of organic and inorganic fertilizers has also been reported to result in higher and more stable yields than single nutrient sources, due to improved nutrient synchronization and soil biological activity (Idem et al., 2012). Poultry manure application further enhances vegetative growth and leaf yield across different cutting frequencies (Umunnakwe, 2022).

Declining soil fertility associated with continuous cultivation remains a major constraint to fluted pumpkin production in Nigeria, resulting in reduced yield and quality. The adoption of appropriate fertilizer types and combinations is therefore essential for improving growth performance, shoot yield, and nutritional quality of fluted pumpkin. This study evaluated

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the effects of different fertilizer types on the growth, shoot yield, and nutritional quality of *T. occidentalis*.

2. MATERIALS AND METHODS

2.1 Experimental site

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).

2.2 Soil sampling and analysis

Composite soil samples were collected from the experimental site prior to planting, air-dried, and sieve through a 2-mm mesh. 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. Potassium (K^+) and sodium (Na^+) 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 determined the Walkley–Black method, and available phosphorus (P) was determined using the Bray P-1 method as described by (Bray and Kurtz, 1945).

2.3 Treatment and experimental design

Cured poultry manure was collected from LAUTECH Teaching and Research Farm, Ogbomoso, Oyo State. NPK 20:10:10 and Urea fertilizer were sourced from Department of Crop Production and Soil Science, LAUTECH, Ogbomoso, Oyo State. Aleshinloye A and B were sourced from Aleshinloye Fertilizer Company, Ibadan, Oyo State. Sunshine A and B were sourced from Ondo State Government Waste Management Company, Akure, Ondo State. Mature fluted pumpkin pods were sourced locally at farmer's market in Ogbomoso, Oyo State, Nigeria.

Topsoil (0–15 cm depth) was collected, thoroughly homogenized, and 10 kg was weighed into perforated plastic pots to ensure adequate drainage and aeration. A total of 96 pots were used. Treatments consisted of seven fertilizer types (Aleshinloye Grade A, Aleshinloye Grade B, NPK 20:10:10, poultry manure, Sunshine Grade A, Sunshine Grade B, and urea), each applied at 60 kg N ha⁻¹, and a control. The experiment was laid out in a completely randomized design (CRD) with four replications with twenty-four pots per replicate.

Table 1: Composition of major nutrient in fertilizers evaluated for cultivation of fluted pumpkin

Fertilizers	Nutrient contents (%)		
	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)

2.4 Agronomic practices

Seeds were extracted from fluted pumpkin pods and air-dried for 24 h prior to sowing. One seed was sown per pot at a depth of 5 cm. Organic fertilizers were incorporated two weeks before sowing, while inorganic fertilizers were applied two weeks after sowing using the ring method. The fertilizers were applied at the rate of 60 kg N/ha each. Rouging was carried out at two-week intervals. Staking was provided four weeks after sowing. Defoliating insect pests were controlled using cypermethrin (10% EC) applied at 30 mL per 15 L of water at two-week intervals.

2.5 Data Collection

Growth and yield measurements commenced four weeks after sowing (4WAS) and were recorded at two-week intervals. Parameters measured included primary vine length, number of leaves, leaf area, and fresh shoot yield. Vine length was measured from the base to the tip using a measuring tape. Number of leaves was determined by direct counting. Leaf area was estimated as the product of leaf length and width multiplied by a correction factor of 0.75. Fresh shoot yield was determined by weighing harvested shoots at 10 weeks after sowing. For mineral and proximate analyses, harvested shoots were oven-dried at 65 °C to constant weight for 48 hours, milled, and analyzed. Nitrogen was determined using the Kjeldahl method, phosphorus by Technicon auto-analysis, calcium and potassium using flame photometry, and magnesium using atomic absorption spectrophotometry (Tel and Hargerty, 1984). Iron, ash, and crude fiber contents were determined following AOAC Method, while crude fat was analyzed using the Pearson modified method (1976) (AOAC, 2012).

2.6 Statistical analysis

Data collected were subjected to analysis of variance (ANOVA) using Genstat 12th edition and treatment means were separated using Duncan Multiple Range Test (DMRT) at 5% probability level.

3. RESULTS AND DISCUSSION

The physical and chemical properties of the experimental soil are presented in Table 2. The soil was classified as sandy loam, comprising 82.95% sand, 12.30% silt and 4.75% clay. The soil pH (6.27) was slightly acidic. Total nitrogen (0.37%) was moderate, whereas available phosphorus (6.38 mg kg⁻¹) was low. Organic carbon (2.57%) was moderately high. Among the exchangeable cations, Ca^{2+} (2.11 cmol kg⁻¹) predominated, followed by Mg^{2+} (0.74 cmol kg⁻¹), K^+ (0.34 cmol kg⁻¹) and Na^+ (0.25 cmol kg⁻¹).

The influence of fertilizer types on vine length of fluted pumpkin at different sampling periods is presented in Table 3. Fertilizer types did not significantly affect vine length ($P \geq 0.05$) across the sampling periods. At 10 weeks after sowing (WAS), Sunshine Grade A fertilizer produced the longest vine length (124.70 cm), followed by NPK 20:10:10 (119.50 cm) and poultry manure (114.60 cm). The shortest vine lengths were recorded under Aleshinloye Grade A (99.70 cm) and Sunshine Grade B (98.10 cm) fertilizers.

The effects of fertilizer types on the number of leaves of fluted pumpkin at different sampling periods are shown in Table 3. Fertilizer types did not significantly influence leaf number at 4 WAS ($P \geq 0.05$). However, significant differences ($P \leq 0.05$) were observed at 6, 8 and 10 WAS. Leaf number increased progressively with crop age across all treatments. At 10 WAS, plants fertilized with NPK 20:10:10 recorded the highest number of leaves (62.73), followed by poultry manure (52.83) and urea (51.58), which were statistically similar. The lowest number of leaves (49.92) was observed in the control treatment.

The influence of fertilizer types on leaf area of fluted pumpkin at different sampling periods is presented in Table 3. Fertilizer types did not significantly affect leaf area at 4 and 10 WAS ($P \geq 0.05$). Significant differences ($P \leq 0.05$) were observed at 6 and 8 WAS. Leaf area increased with crop age across all treatments. At 10 WAS, the highest leaf area (73.58 cm²) was recorded in plants fertilized with urea, followed by NPK 20:10:10 (72.23 cm²) and poultry manure (68.59 cm²). The lowest leaf area (60.36 cm²) was observed in the control treatment.

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 ₂ O)	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 growth parameters of fluted pumpkin at different sampling periods

Fertilizer Type	Weeks after sowing			
	4	6	8	10
Vine length (cm)				
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
N:P:K 20:10:10	35.53a	80.52a	96.53a	119.50a
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
Urea	38.90a	67.69a	87.78a	113.40a
Number of leaves/plant				
Control	11.00a	16.00b	30.91b	49.92b
Aleshinloye A	11.33a	17.33ab	34.84ab	50.16b
Aleshinloye B	12.00a	18.17ab	33.59ab	53.83ab
N:P:K 20:10:10	11.67a	21.50a	40.67a	62.73a
Poultry Manure	11.60a	18.41ab	37.84ab	52.83ab
Sunshine A	12.67a	20.75a	37.98ab	51.42ab
Sunshine B	10.83a	15.50b	32.67ab	50.00b
Urea	11.25a	19.25ab	38.50ab	51.58ab
Leaf area (cm ² /plant)				
Control	27.58a	37.87b	42.61b	60.36a
Aleshinloye A	27.86a	39.65ab	43.20b	61.31a
Aleshinloye B	29.36a	43.45ab	50.39ab	62.59a

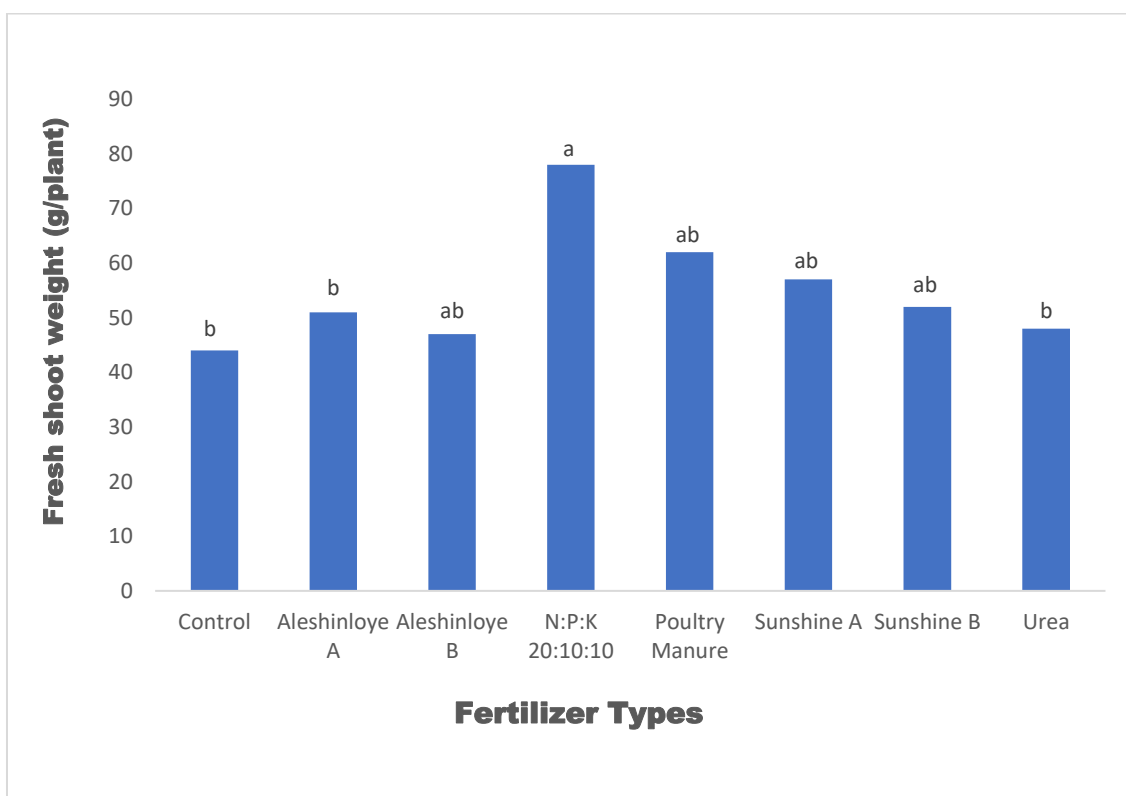
Table 3 (cont): Influence of fertilizer types on growth parameters of fluted pumpkin at different sampling periods

N:P:K 20:10:10	30.18a	56.74a	65.27a	72.23a
Poultry Manure	31.23a	48.13ab	51.93ab	68.59a
Sunshine A	32.37a	47.47ab	58.19ab	66.35a
Sunshine B	30.52a	40.84ab	46.76b	64.69a
Urea	29.28a	44.44ab	53.09ab	73.58a

Mean with the different letter(s) within the same column are significantly different by DMRT at $P \leq 0.05$

The influence of fertilizer types on shoot fresh weight (g plant^{-1}) of fluted pumpkin is presented in Fig. 1. Fertilizer type had a significant effect on shoot fresh weight ($P \leq 0.05$). Plants treated with NPK 20:10:10 produced the highest shoot fresh weight ($78.22 \text{ g plant}^{-1}$), followed by poultry manure ($62.09 \text{ g plant}^{-1}$), whereas the control treatment recorded the lowest shoot fresh weight ($43.68 \text{ g plant}^{-1}$). Although NPK fertilizer produced the numerically highest shoot fresh weight, the differences among most fertilizer treatments were not statistically significant.

The influence of fertilizer types on the mineral and proximate composition of fluted pumpkin shoots is presented in Tables 4 and figure 2. Fertilizer type significantly affected ($P \leq 0.05$) both mineral and proximate contents of the shoots. Shoots treated with urea recorded the highest values for most mineral and proximate parameters, closely followed by shoots supplied with poultry manure. The lowest mineral and proximate contents were generally observed in the control treatment.

**Figure 1:** Fresh shoot weight (g/plant) of *Telfairia* as influenced by fertilizer types at 10 weeks after sowing.**Table 4:** Influence of fertilizer types on mineral contents of fluted pumpkin

Fertilizer Types	Mineral Contents (%)						
	N	P	K	Ca	Fe	Mg	Zn
Control	0.35c	3.85h	0.40e	0.20e	0.12c	0.14c	0.15g
Aleshinloye A	0.41b	5.26d	0.48c	0.29cd	0.19b	0.21b	0.21d
Aleshinloye B	0.38c	4.86g	0.46cd	0.31c	0.15c	0.22b	0.17f
N:P:K 20:10:10	0.42b	5.32c	0.50bc	0.31c	0.21ab	0.21b	0.23c
Poultry Manure	0.47a	5.53b	0.56a	0.36b	0.24a	0.26a	0.28b
Sunshine A	0.36c	5.14e	0.53ab	0.35b	0.22ab	0.23b	0.26b
Sunshine B	0.32d	4.92f	0.43de	0.27d	0.15c	0.15c	0.17f
Urea	0.50a	5.60a	0.56a	0.40a	0.22a	0.28a	0.30a

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

Mean with the different letter (s) within the same column are significantly different by DMRT at $P \leq 0.05$

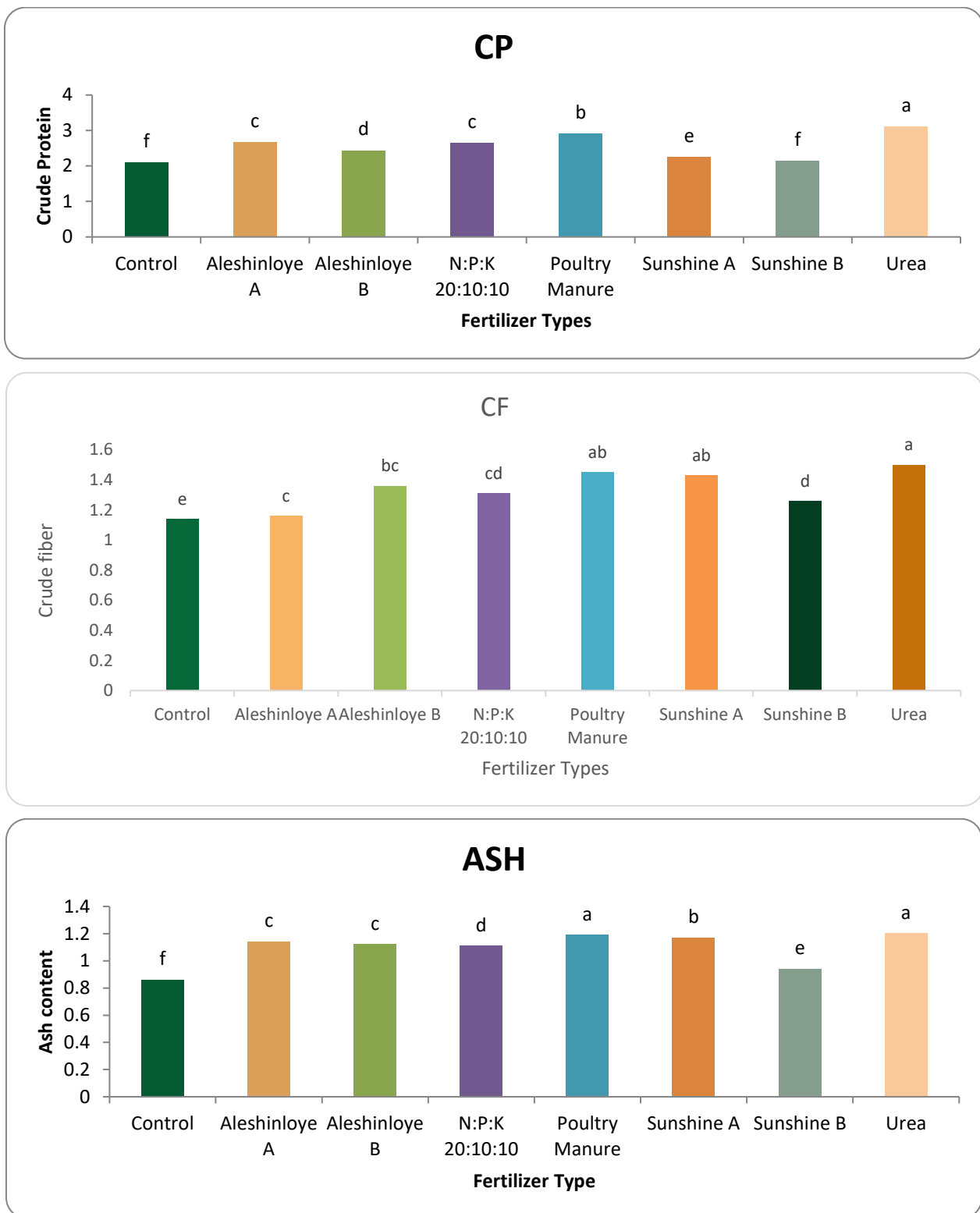


Figure 2: Influence of fertilizer types on proximate contents of fluted pumpkin.

Mean with the different letter (s) within the same column are significantly different by DMRT at $P \leq 0.05$

The physical and chemical properties of the experimental soil reflect typical conditions of many tropical soils, where coarse texture and low-activity mineral fractions limit nutrient retention and inherent fertility (Sanchez, 2019). The sandy loam texture observed has important implications for nutrient dynamics and crop productivity under continuous cultivation. Low available phosphorus is characteristic of highly weathered tropical soils, where phosphorus is immobilized through sorption and precipitation reactions involving iron and aluminum oxides (Abekoe and Tiessen, 1998; Eduah et al., 2019). The slightly acidic soil reaction recorded falls within a range generally favorable for nutrient availability, as soil pH strongly regulates nutrient solubility and uptake (Brady and Weil, 2016; Neina, 2019). The moderate nitrogen content and moderately high organic carbon indicate a relatively improved fertility status compared with severely degraded sandy soils, highlighting the

importance of soil organic matter in nutrient retention and supply (Brady and Weil, 2016).

The absence of significant differences in vine length among fertilizer treatments suggests that vine elongation in fluted pumpkin is less responsive to fertilizer type, particularly during early growth stages. However, numerically longer vines under Sunshine Grade A, NPK 20:10:10, and poultry manure treatments indicate improved nutrient availability, consistent with reports that fertilizer application enhances vegetative elongation in creeping vegetable crops (Adeniyi and Ojaniyi, 2005; Ayeni et al., 2010). Significant increases in leaf number at later growth stages highlight the importance of sustained nutrient supply for vegetative development. The superior leaf production under NPK fertilizer reflects the central role of nitrogen in leaf initiation and photosynthetic capacity, in agreement with established findings in vegetable crops (Brady

and Weil, 2016; Sanchez, 2019). Comparable leaf numbers under poultry manure and urea indicate that both organic and inorganic nitrogen sources can effectively support leaf development when applied at adequate rates.

Leaf area and shoot fresh weight responses further confirm the importance of nitrogen availability for biomass accumulation. Higher values under urea, NPK, and poultry manure treatments reflect enhanced nutrient uptake, cell expansion, and photosynthetic efficiency (Akanbi et al., 2007; Idem et al., 2012). Although NPK fertilizer produced the highest shoot yield, poultry manure also resulted in substantial yield and nutritional quality improvements, demonstrating its effectiveness as a sustainable nutrient source (Oyekunle and Abosede, 2012; Akintoye et al., 2023; Rabiou et al., 2025).

Shoot treated with urea fertilizer gave the highest mineral and proximate contents closely followed by shoot nourished by poultry manure. The significant increase in the mineral and proximate content of fluted pumpkin shoots could possibly be due to enhanced nutrient availability, improved uptake, and utilization (Ogbuwu and Iken, 2014; Adeyemi and Akande, 2013; Udemba et al., 2022). This aligns with previous research showing increased proximate composition in fertilized pumpkin leaves (Amodu et al., 2019).

4. CONCLUSIONS AND RECOMMENDATION

Results from this trial showed the potentials of all the fertilizers tested to enhance the growth and shoot yield of fluted pumpkin. From the result obtained in this study, it has shown that growth, shoot yield, and nutritional values of fluted pumpkin were influenced by the applied fertilizer types. The NPK20:10:10 contributed highest to the shoot yield measured as higher with fertilizer closely followed by poultry manure and sunshine grade A than other fertilizer applied and control. With respect to nutritional quality, urea fertilizer closely followed by poultry manure was superior to other fertilizers tested and control. Owing to the numerous advantages of organic manure such as easy availability (cheapness) and it helps the activation of soil microorganisms, which aid the decomposition process of organic matter and transform it into nutrients that plants can easily absorb. Therefore, poultry manure could be recommended for production of fluted pumpkin in the study area.

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