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EFFECTS OF NITROGEN FERTILIZER SOURCES ON GROWTH AND TUBER YIELD OF TIGER NUT (*Cyperus esculentus L.*) IN TWO AGRO-ECOLOGICAL ZONES

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ABSTRACT

Tiger nut (*Cyperus esculentus* L.) carries genuine economic promise, yet the agronomic literature on how nitrogen source shapes its growth and yield in one and more than one environment is very scare. As a result, this study evaluated fifteen nitrogen sources, six organic manures (Turkey, chicken, compost, cow dung, sheep/goat, rabbitry), three organomineral blends (Aleshinloye A, Sunshine A, Mackpure), three inorganic fertilizers (Urea, NPK 15:15:15, NPK 20:10:10), an organic NPK formulation, and control at two sites at Igboora (Derived Savannah) and Ogbomoso (Southern Guinea Savannah). The trial was laid out in a Randomized Complete Block Design with three replications. Data collected include plant height, leaf number, tiller number, tuber circumference, fresh tuber weight and tuber number.

Treatment effects were significant ($P<0.05$) for most parameter. At Igboora, chicken manure, urea, and NPK 15:15:15 produced the tallest plants at 8 WAP (74.67–76.03 cm), more than double the control's 36.33 cm. At Ogbomoso, chicken manure standout across all growth parameter with plant height (82.45 cm at 10 WAP), leaf number (44.84), and tiller count (5.08). Tuber diameter responded strongly and consistently to fertilization at both sites, chicken manure, and NPK 15:15:15 produced the largest tubers at Igboora, up to 13.34 mm against 5.83–6.09 mm in the control. It can be concluded that chicken manure and the inorganic sources (urea, NPK 15:15:15) emerge as the most reliable choices for driving vegetative growth and tuber yield.

Keywords: Tiger nut, nitrogen fertilizer, agro-ecological zones, organic NPK

INTRODUCTION

Tiger nut (*Cyperus esculentus* L.) is a perennial sedge whose tubers are valued for their nutritional richness and their versatility across food applications, and yet the crop remains marginal across much of sub-Saharan Africa a state of affairs that sits uneasily with its potential to improve rural livelihoods and food security (Bamishaiye and Bamishaiye, 2011; Sánchez-Zapata *et al*., 2012; Gambo and Da'u, 2014). Interest in the crop has grown in recent years, largely on the strength of its oil content, dietary fibre, and mineral profile, all of which make it attractive for both direct consumption and industrial processing (Adejuyitan, 2011; Ekeanyanwu and Ononogbu, 2010; Adel *et al*., 2015). But interest has outpaced agronomic investment as production systems remain, for the most part, low-input and rooted in indigenous practice, and rarely approach the crop's genetic ceiling for yield or tuber quality (Novor and Donkor, 2024; Munialo *et al*., 2024; Roselló-Soto *et al*., 2017).

Of the agronomic interventions available, nitrogen fertilization is probably the single most consequential, nitrogen being the nutrient most often limiting in tropical soils, and one that bears directly on vegetative development, photosynthetic capacity, and the partitioning of carbohydrate to storage organs (Marschner, 2012; Havlin *et al*., 2016; Brady and Weil, 2016). What has received comparatively little attention, at least for this crop, is the question of source. Organic, inorganic, and organomineral nitrogen sources differ not just in rate but in release pattern and availability, and these differences cascade through soil biology and physico-chemistry in ways that ultimately determine crop performance (Gebregergs, 2024; Bziouech *et al*., 2022; Rajapaksha *et al*., 2024). Urea and similar inorganic sources act quickly in stimulating vegetative growth and tillering in short order but that speed carries a cost as excessive foliage can come at the expense of tuber development, and the well-documented environmental risks of

nitrate leaching and greenhouse gas emission are hard to ignore (Yu *et al*., 2022; Zheng *et al*., 2024). Organic amendments work on a different timescale altogether as nutrient release is slower, soil structure tends to improve, microbial activity is stimulated, and root development is often enhanced, a combination that, at least in principle, should favor sustained growth and better tuber quality over the season (Bello *et al*., 2021; Tan *et al*., 2023; Hariyadi *et al*., 2023; Adedayo *et al*., 2026). Organomineral fertilizers are positioned, at least by design intent, to capture the best of both rapid initial availability paired with sustained release and soil-health benefits (Olaniyi and Akanbi, 2010; Abo-Elwafa and Ewees, 2020; Musa *et al*., 2021), though whether that promise holds up in practice for tiger nut specifically is very much an open question.

Existing studies on tiger nut fertilization have tended to be single-site affairs, and the results vary considerably depending on local soil conditions, fertilizer type, and management (Abdelkader *et al*., 2017; Eifediyi *et al*., 2018). That variability is itself informative as it strongly suggests that fertiliser effectiveness is not a fixed property of the source but is filtered through site-specific soil characteristics: organic matter content, native nutrient status, rainfall (Manu *et al*., 2022; Fadeyi *et al*., 2023; Akinade *et al*., 2026). What has been missing is a comparative, multi-site test capable of separating the which source works question from the does it depends on where you are question, and that gap is what motivated this study. Therefore, this study evaluated effect of organic, inorganic, and organomineral nitrogen sources on growth (plant height, leaf number, tiller number) and yield components (tuber diameter, fresh tuber weight, tuber number) of tiger nut across two agro-ecologically distinct sites in southwest Nigeria.

MATERIALS AND METHODS

Experimental Site Description

The experiments were conducted at the Teaching and Research Farm, Ladoke Akintola University of Technology, Ogbomoso, and College of Agriculture and Technology, Igboora. Ogbomoso is located on latitude 8°10'N and longitude 4°10'E in the Southern Guinea Savanna Zone of Southwest Nigeria. Igboora is located in Latitude 7° 24 40.6'N and Longitude 3° 17 46.3'E, 397m above the sea level with two seasons of rainfall from April to October and dry season November to March.

Experimental Materials

Tiger nut yellow variety seeds were obtained from Kunlende market, Ilorin, Kwara State.

Fertilizer: N-fertilizer (Urea), P- fertilizer (Single Super Phosphate), K-fertilizer (Muriate of Potash), NPK 15:15:15, NPK 20:10:10 were obtained from Irorun Agbe Agro-allied Limited, Ogbomoso, Oyo State. Organomineral fertilizers (Aleshinloye grade A, Sunrise grade A, and Mackpure) were obtained at farmers' shopping centre, Ogbomoso, Oyo State. Organic fertilizers (Turkey manure, Chicken manure, Sheep and Goat manure, Rabbitry manure, Compost and Cow dung) were obtained from the Teaching and Research Farm, LAUTECH Ogbomoso, and OYSCATECH Igboora, Oyo State.

The organic-based fertilizer used in the experiment was Aleshinloye Grade A organomineral fertilizer was not manufactured by the researchers as well as the Organic NPK. Aleshinloye A was obtained as a commercial fertilizer for the experiment. Previous literature describes Aleshinloye Grade A as an organic-based fertilizer formulated from household waste and cow dung. Because production has since ceased, the product is referred to here as the fertilizer used during the experimental period, not as a currently available product.

Soil Sampling and Analysis

Before the preparation of the site for tiger nut production, pre-planting collection of soil sample was carried out using soil auger at a depth of 0-15 cm, for laboratory analysis of the soil physical and chemical properties. The soil texture was also determined (Smyth and Montgomery, 1962; Bridges, 1997). Samples were bulked into composite sample. The sample was air dried, crushed and sieved through a 2 mm mesh respectively for the determination of particle size, pH, total nitrogen, organic carbon, available phosphorus, iron, copper, zinc, the exchangeable cations (Ca, Mg, Na and K) and exchangeable acidity. Bouyoucos (1951) hydrometer method was used to investigate particle size analysis by using sodium hexametaphosphate as a dispersant. Soil pH was determined in a 1:1 soil water ratio and 2:1 soil: KCl ratio (IITA, 1982).

Total N was determined by using Kjeldahl method (Bremner, 1965) while the colorimeter was used to determine available P and exchangeable cations by Technicon Auto analyzer (1971). Phosphorus and exchangeable cations were determined by Mehlich 3 extractant (Mehlich, 1984). Phosphorus was determined colorimetrically using the Technicon AAII Auto-analyzer, while the cations were determined using Atomic Absorption Spectrophotometer (Model Buck 200A) .

Table 3.1 Physical and Chemical Properties of the Soil used

Parameter	Igboora	Ogbomoso
pH (H_20)	6.07	6.48
%Organic carbon	1.72	0.87

%Total nitrogen	0.26	0.17
Phosphorus(mg/kg)	33.6	9.97
Exch acidity(cmol\kg)	0.6	0.02
Ca(cmol\kg)	2.75	3.65
Mg (cmol\kg)	1.06	0.76
K(cmol\kg)	0.39	0.36
Na (cmol\kg)	0.24	0.54
Sand%	79	89.4
Salt%	11	5.8
Clay%	10	4.8

Land Preparation and Field Layout
The land was cleared manually and beds constructed. The experimental field size was 40 m by 5.6 m and was divided into 45 experimental plots of 1.2 m by 2.2 m each. The experimental plots were replicated thrice, with each replicate having fifteen (15) treatments. Inter row plot spacing of 1 m and intra row plot spacing of 0.5 m were used

Treatments and Experimental Design
T1 – Control, T2 – Turkey, T3 – Chicken, T4 – Compost, T5 – Cowdung, T6 – Sheep and Goat, T7 – Rabbitry, T8 – Aleshinloye A, T9– Sunshine A, T10 – Urea, T11 – NPK 15:15:15, T12 – NPK 20:10:10, T13 – Mack Pure, T14 – Organic NPK, all at recommended rate
The treatments were laid out in Randomized Complete Block Design, replicated three times.

Cultural Practices
Planting: Tiger nut seeds were soaked in water for 24 hours prior to planting. Two seeds of tiger nuts were planted per hole at depth of 7 cm and at plant spacing of 30 cm × 30 cm (Fabunmi and Oshikoya, 2016). The tiger nuts were treated with Seedrex (a mixture of permethrin and carbendazim) so as to prevent insect attack and rodents from eating them.

Thinning: Two seeds sowed per hole were thinned down to one seedling two weeks after planting to avoid overcrowding of the tiger nut plants.

Fertilizer Application: Fertilizer was applied four weeks after sowing using spot application to enhance plant performance.

Weeding: This was done with the use of hoe and hand weeding at three weeks interval.

Data Collection
Data were collected starting from four weeks after sowing and continued at two weeks interval from each treatment on the following characters: number of leaves, plant height (cm), number of tillers, tuber weight (g/plant), tuber diameter (cm).

Growth Parameters:
Plant height (cm): Plant height was measured using measuring tape, starting from the base of the stem to the tip of the longest leaves. Measurement of plant height was carried out every two weeks. Four (4) samples were selected in each experimental unit for measurement.

Number of leaves: The number of leaves of four tagged plants were taken and recorded by counting all the leaves on a plant stand every two weeks.

Number of tillers: The number of tillers of four tagged plants were counted and recorded by counting all the plant tillers per plant every two weeks.

Yield Parameters:
Tuber Diameter per plant (mm): Tuber diameter of tiger nut was taken by harvesting plant stand of each crop and measuring the diameter with Electronic Vernier caliper.
Fresh Tuber Weight (g): Fresh weight was taken by harvesting plant stands of each crop from each experimental unit and measuring the weight on electronic weighing balance.

Data Analysis
Data collected were subjected to Analysis of Variance (ANOVA) using SAS package and means were separated using Duncan's Multiple Range Test (DMRT) at 5% level of significance.

RESULTS

Effects of N Fertilizer Sources on Plant Height of Tiger Nut in Two Agro-Ecological Zones

Plant height differed significantly among nitrogen-source treatments at both locations at selected sampling periods (Table 2). At Igboora, the 8-WAP values for chicken manure (74.67 cm), urea (76.03 cm), NPK 15:15:15 (76.03 cm), sheep/goat manure (70.37 cm), and NPK 20:10:10 (72.35 cm) were not significantly different from one another under the reported DMRT grouping. The control had the lowest reported 8-WAP height (36.33 cm). At Ogbomoso, chicken manure had the highest height at 6 WAP (64.75 cm), whereas the control recorded 42.11 cm. At 8 WAP, turkey and chicken manure recorded 72.43 and 73.68 cm, respectively, compared with 46.24 cm for the control. At 10 WAP, chicken manure (82.45 cm) and rabbitry manure (79.62 cm) recorded highervalues than the control (51.53 cm). Interpretations here are limited to the means shown in Table 2.

Effects of N Fertilizer Sources on Number of Leaves

Leaf number responses varied by location and sampling time (Table 3). At Igboora, the reported means indicate treatment differences at 4, 6, and 10 WAP. Compost recorded 75.53 leaves per plant at 10 WAP, whereas the control recorded 31.00 leaves per plant. At Ogbomoso, NPK 15:15:15 recorded 23.26 leaves per plant at 6 WAP and 34.16 at 8 WAP, while the control recorded 14.24 and 19.67 leaves per plant, respectively. At 10 WAP, compost recorded 44.84 leaves per plant, compared with 22.33 for the control. These comparisons follow the reported results in Table 3.

Effects of N Fertilizer Sources on Number of Tillers

Tiller number varied among treatments and sampling periods at both locations (Table 4). At Igboora, the highest 10-WAP mean was recorded for compost (9.33 tillers per plant), followed by NPK 20:10:10 (8.33 tillers per plant). The control recorded 2.67 tillers per plant. Chicken manure recorded 6.00 tillers per plant, and NPK 15:15:15 recorded 7.00 tillers per plant. At Ogbomoso, Mackpure recorded the highest 10-WAP mean (5.20 tillers per plant), followed by compost (5.08 tillers per plant), while the control recorded 1.65 tillers per plant.

Table 2: Effects of N fertilizer sources on plant height (cm) of tiger nut in two agro-ecological zones at Different Sampling Period

Treatment	Igboora				Ogbomoso			
	4 WAP	6 WAP	8 WAP	10 WAP	4 WAP	6 WAP	8 WAP	10 WAP
CONTROL	24.33	32.67	36.33 b	51.92	23.2	42.11 c	46.24 b	51.53 b
TURKEY	32.67	51.33	61.00 ab	65.71	41.84	57.29 ab	72.43 a	74.73 ab
CHICKEN	43	62.67	74.67 a	75.63	41.99	64.75 a	73.68 a	82.45 a
COMPOST	40.33	52.33	58.83 ab	76.64	30.86	47.32 bc	60.50 ab	68.96 ab
COWDUNG	35	59.67	65.57 ab	68.07	32.1	44.99 bc	57.15 ab	64.03 ab
SHEEP/GOAT	38.67	64	70.37 a	75.79	33.24	56.30 ab	60.38 ab	69.59 ab
RABBITRY	39.33	49	57.33 ab	63.25	41.02	55.07 abc	70.26 ab	79.62 a
ALESHINLOYE A	31.33	58.33	59.40 ab	64.45	33.22	49.92 bc	62.24 ab	70.83 ab
SUNSHINE A	34	56	62.46 ab	68.52	31.4	47.89 bc	56.31 ab	64.36 ab
UREA	28.33	56.67	76.03 a	83.27	31.13	44.20 bc	56.63 ab	65.74 ab
NPK 15:15:15	37	55.67	76.03 a	82	35.3	49.76 bc	68.91 ab	77.32 ab
NPK 20:10:10	44.67	53	72.35 a	77.62	31.89	45.07 bc	60.74 ab	70.27 ab
MACKPURE	33.33	58.67	59.12 ab	64.45	35.85	56.12 ab	64.42 ab	72.85 ab
ORGANIC NPK	39.33	52.33	60.86 ab	66.72	37.45	52.50 abc	66.67 ab	75.41 ab

Means followed by the same letter(s) within a column (for each location separately) are not significantly different at p ≤ 0.05

Table 3: Effects of N fertilizer sources on number of leaves (no/plant) of tiger nut in two agro-ecological zones

Treatment	Igboora				Ogbomoso			
	4 WAP	6 WAP	8 WAP	10 WAP	4 WAP	6 WAP	8 WAP	10 WAP
CONTROL	13a	21.33c	26.5	31d	8.56a	14.24 b	19.67 c	22.33 e
TURKEY	13.67a	43.33b	52	57.33b	10.22a	16.12 ab	26.19 bc	34.39 d
CHICKEN	13a	26c	41.53	51.36b	10.78a	20.02 ab	30.05 ab	40.78 abcd
COMPOST	17.33a	56a	66.66	75.53a	10.33a	21.06 ab	32.79 ab	44.84 a
COWDUNG	17a	38.33bc	48.31	53.11b	9.67a	17.29 ab	27.23 ab	36.94 abcd
SHEEP/GOAT	15.33a	45ab	58.73	64.46a	9.33a	18.25 ab	27.96 ab	38.73 abcd
RABBITRY	11.67a	35bc	46.47	52.07b	9.33a	17.39 ab	27.26 ab	36.36 bcd
ALESHINLOYE A	12.33a	41.67ab	51.45	56.44c	10a	19.43 ab	29.67 ab	41.06 abcd
SUNSHINE A	11.33a	33.33c	44.67	52.36bc	8.89a	16.88 ab	27.09 b	36.82 abcd
UREA	11.33a	37.67c	48.32	56.32c	8.78a	17.43 ab	27.47 ab	35.52 cd
NPK 15:15:15	12.67a	55a	50.35	61.58a	12.44a	23.26 a	34.16 a	44.25 ab
NPK 20:10:10	13.33a	49.33ab	61.25	69.99a	11.11a	21.16 ab	31.30 ab	41.25 abcd
MACKPURE	12.33a	47.67ab	60.16	62.42a	11.33a	22.34 a	32.30 ab	43.18 abc
ORGANIC NPK	17.33a	27.67c	39.02	49.02b	10.22a	18.78 ab	28.41 ab	37.85 abcd
CONTROL	16.33a	25c	36.2	52.41ab	9.78a	18.80 ab	29.00 ab	38.30 abcd

Means followed by the same letter(s) within a column (for each location separately) are not significantly different at p ≤ 0.05

Table 4: Effects of N fertilizer sources on number of tillers (no/plant) of tiger nut in two agro-ecological zones at Different Sampling Period

Treatment	Igboora				Ogbomoso			
	4 WAP	6 WAP	8 WAP	10 WAP	4 WAP	6 WAP	8 WAP	10 WAP
CONTROL	0.67a	2a	2.00	2.67 b	1.22a	1.25 b	1.45 b	1.65 b
TURKEY	1.33a	4.67a	5.67a	7.00 ab	2.56a	2.92 ab	3.32 ab	4.29 ab
CHICKEN	1a	2.67a	4.67a	6.00 ab	2.5a	3.17 ab	3.99 ab	4.57 a
COMPOST	1.67a	7a	8a	9.33 a	3.22a	4.00 a	4.67 a	5.08 a
COWDUNG	1.67a	4.33a	5.67a	6.00 ab	1.78a	1.98 ab	2.40 ab	2.87 ab
SHEEP/GOAT	1.33a	4.67a	6.33a	7.33 ab	1.78a	1.89 ab	2.42 ab	2.72 ab
RABBITRY	1a	4a	5.33a	6.00 ab	1.78a	2.17 ab	2.72 ab	3.03 ab
ALESHINLOYE A	1a	6.33a	6a	6.67 ab	2.22a	2.73 ab	3.12 ab	3.52 ab
SUNSHINE A	1a	3.67a	5a	6.67 ab	1.44a	1.77 ab	2.50 ab	2.90 ab
UREA	1a	5.33a	5.33a	7.67 ab	1.33a	1.83 ab	2.38 ab	2.68 ab
NPK 15:15:15	1.33a	6.67a	5.67a	7.00 ab	32.22a	3.08 ab	4.07 a	4.50 a
NPK 20:10:10	1.33a	6.33a	7.33a	8.33 a	2.89a	3.40 ab	4.22 a	4.47 a
MACKPURE	1.33	6a	7a	7.33 ab	3.11a	4.15 a	4.85 a	5.20 a
ORGANIC NPK	1.67a	2.67a	4.67a	5.67 ab	1.33a	1.75 ab	2.32 ab	2.63 ab
CONTROL	1.67a	3.33a	4.33a	6.00 ab	1.78a	2.22 ab	2.70 ab	3.00 ab

Means followed by the same letter(s) within a column (for each location separately) are not significantly different at p ≤ 0.05

Effects of N Fertilizer Sources on Yield Parameters

Tuber diameter differed significantly among nitrogen-source treatments at both locations, according to the reported results and Figures 1 and 2. At Igboora, the reported diameter range was 8.59–13.34 mm for fertilized treatments, compared with 5.83 mm for the control; chicken manure, sheep/goat manure, and NPK 15:15:15 were identified in the original results as having the largest diameters. At Ogbomoso, fertilized treatments were reported to range from 10.23 to 12.60 mm, compared with 6.09 mm for the control.

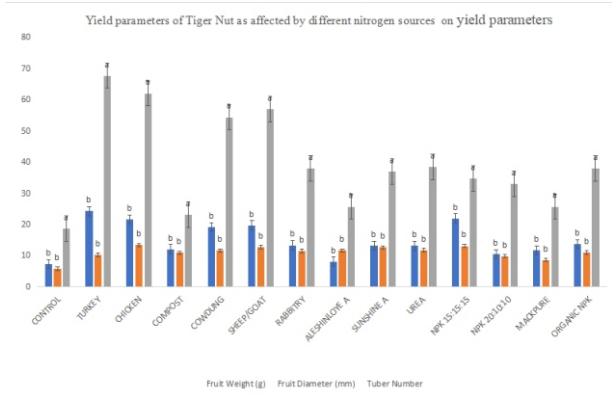


Figure 1: Response of Tiger Nut to Different Nitrogen sources on yield parameters in Igboora

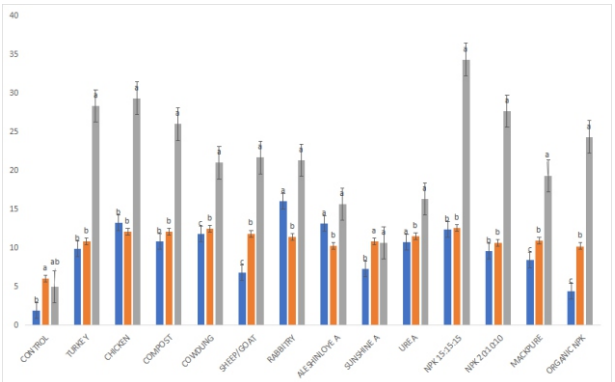


Fig. 2: Effects of N fertilizer sources on yield parameters of tiger nut in Ogbomoso. *Means followed by the same letter(s) within a column (for each location separately) are not*

significantly different at $p \leq 0.05$

DISCUSSION

Plant height

Chicken manure, urea, and NPK 15:15:15 were significantly higher in height at both sites while Chicken manures had the best performance at Ogbomoso with the tallest plants at every sampling period, this might be because of readily available nitrogen paired with continued release later in the season, appears to sustain vegetative growth in a way that a single fast pulse does not (Musa *et al*., 2021; Novor *et al*., 2025).

The consistent height advantage at Igboora over Ogbomoso trails that site's stronger baseline soil chemistry as organic carbon of 1.72% against 0.87%, total nitrogen of 0.26% against 0.17% while

at Igboora, urea and NPK 15:15:15 essentially matched chicken manure for height, whereas at Ogbomoso chicken manure had the best performance. The fact that treatment differences widened progressively and were largest at 10 WAP, rather than plateauing earlier, suggests nitrogen availability continued to matter well into the vegetative period, with the more responsive treatments continuing to invest in shoot growth as long as nutrients remained adequate (Yu et al., 2022). The performance of organomineral and most organic sources revealed a sustained-release nutrient profile which is enough to support steady growth, but without the sharp early stimulation that characterises straight inorganic fertilizer (Bziouech *et al*., 2022; Gebregergs, 2024; Rajapaksha *et al*., 2024; Adedayo *et al*., 2026).

Leaf number

Nitrogen source had a strong and significant effect on leaf number as urea produced 23.26 leaves at 6 WAP against 14.24 in the control, and chicken manure reached 44.84 leaves at 10 WAP against 22.33 in the control. At Igboora, by contrast, leaf number ranged widely (11.33 to 75.53) but without any clear treatment separation. Chicken manure's advantage at Ogbomoso, most pronounced by 10 WAP, is consistent with the broader poultry-manure literature, which credits this source with a comparatively balanced nutrient supply capable of sustaining leaf production across a full growing season rather than front-loading it (Baiyeri and Tenkouano, 2007). Organomineral sources and most organic manures on the other hand reflects slower nutrient release providing adequate but not surplus nitrogen for leaf expansion (Rajapaksha *et al*., 2024; Adedayo *et al*., 2026). That the largest treatment differences emerged late, at 10 WAP rather than earlier, points to sustained nitrogen availability mattering specifically during the period that overlaps with tuber initiation

Tiller number

Tillering responded clearly to nitrogen fertilization at both sites, at Igboora, chicken manure and NPK 15:15:15 produced 9.33 and 8.33 tillers at 10 WAP respectively, against just 2.67 in the control representing a three- to four-fold increase that is hard to describe as anything other than dramatic. At Ogbomoso, chicken manure and the inorganic sources (NPK 20:10:10, urea, NPK 15:15:15) ranged from 4.00 to 5.20 tillers against 1.25–1.65 in the control

The findings supported the fact that tiller initiation is a nitrogen-sensitive process that seems to respond specifically to available nitrogen at the right developmental phase, which fast-release sources are simply better positioned to supply (Brady and Weil, 2016; Havlin *et al*., 2016; Adedayo *et al*., 2026). As with plant height, Igboora outperformed Ogbomoso across most treatments, again consistent with the fertility advantage amplifying the tillering response rather than replacing the need for it (Asante *et al*., 2014; Manu *et al*., 2022; Fadeyi *et al*., 2023), tiller numbers increased from 4 to 10 WAP suggested that tiller initiation continues throughout the vegetative window whenever nitrogen supply keeps pace (Zheng *et al.,* 2024; Wang *et al.,* 2016; Tan *et al.,* 2024).

Yield parameters

chicken manure, turkey droppings, and NPK 15:15:15 produced the largest fruit weight and diameter gains (up to 24.25 g and 13.34 mm in Igboora, versus 7.26 g and 5.83 mm at the control). Fruit diameter was significantly greater across nearly all fertilizer sources than at the control, chicken manure, sheep/goat manure, and NPK 15:15:15 recording the highest values. The superior performance of chicken manure and turkey droppings can be attributed to their high nutrient content and balanced nutrient release patterns, as reported by Ayoola and Adeniyan (2006) who found that poultry manure contains more plant nutrients than all other organic manures.

Beyond fertilizer nutrition, the intrinsic reproductive biology of the tuber itself also has a bearing on the yield levels attainable. Because tiger nut tubers used for propagation vary in size and dormancy status, and because these tuber characteristics influence subsequent sprouting vigour and downstream tuber reproduction, the planting material used, in addition to fertilizer input, contributes to the yield ceiling observed in the crop (Liu, 2024). The consistently higher tuber weights recorded at Igboora relative to Ogbomoso across nearly all fertilizer treatments therefore likely reflect a combination of more

favourable soil fertility, better nutrient-use efficiency, and this combined effect of site and nutrition on yield has direct economic relevance, since tuber yield is the principal determinant of the value tiger nut generates as an increasingly important non-traditional export and processed food commodity

CONCLUSION

Nitrogen sources significantly influenced the vegetative growth and tuber diameter in tiger nut, as chicken manure together with the inorganic sources (urea, NPK 15:15:15) delivered the most consistent advantages across both agro-ecological zones. I was observed that tuber circumference responded strongly to nitrogen fertilization, while tuber weight and number barely moved at all, suggesting nitrogen governs tuber size far more than it governs tuber initiation. This study revealed that chicken manure offers a better and promising option for producers seeking to improve tiger nut growth performance in tropical systems

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