

Cottage Tiger Nut (*Cyperus Esculentus*) Production for Small Household Consumption: A Trial of Mobile-Urban Farming System

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Abstract

Tiger nuts are essential nuts and locally grown food source for fighting malnutrition in places like Africa. The nut is of high quantity of starch, fiber content and rich in minerals and vitamins, especially vitamins C and E. Besides, there are many important amino acids coupled with some B-complex vitamins. Tiger nut is known to control some health-related problems. However, there is inadequate information on its production under cottage or mobile gardening system. Hence, this study evaluated the yield of tiger nut using inorganic and organic fertilizers using polythene bags. An open space of building's corridor was used for the experiment between February and May 2020, at School of Vocational Education Building complex of Michael Otedola College of Primary Education Noforija-Epe, Lagos State. Experimental treatments applied are: No Fertilizer Application (NFA-0), (NPK; 3g, 5g), and Poultry Manure (PM; 15g and 30g) per 5kg soil, respectively. The experiment was laid in Complete Randomized Design (CRD), and the treatments were replicated thrice. Data on growth parameters; plant height (PH cm) Number of leaves (NL), Tillers per Plant (TP) were collected bi-weekly. The yield parameters observed are: Fresh Nutrient weight (FNw g/kg), biomass weight leaves (Bw g/5kg) and number of nuts. The plant height (PH), Plant Tiller (PT) and Number of Leaves (NL) values does not show a major significant yield under NFA while polythene bags with the application of different levels of organic and inorganic fertilizer shows a major significant yield in terms of number of nut and tiger nut weight. It can be concluded that the application of either organic or chemical fertilizers (Poultry Manure) at any of the levels between 15g to 30g for poultry and 3g to 5g NPK per 5kg polythene bag are more appropriate for tiger nut production at any open space at home. In conclusion, it is recommended that tiger nut can be produced for small household consumption under the potting conditions at home.

Background to the Study

In most areas where agricultural land becomes a serious constraint, the use of cottage gardening or farming becomes means of raising crops. Plants are raised in polythene bags or pots not for aesthetic purpose but for small household consumption. Hence, cottage gardening (potting of crops) is gradually shifting from experimental trials for research purpose into household crop production of ephemeral or annual crops. Potting crops need the correct moisture, light levels, soil mixture, temperature, and humidity as in the field. A more precise knowledge of the natural vegetation area of a plant is therefore required for maintenance (Ayoola and Makinde, 2007). In recent years urban farming has become more pronounced where everyone knows how to raise one crop or the other using any available space at home; such as on the terrace or balcony or corridor. Any space is suitable for creating our own garden using pots or containers of any desirable capacity applying the fundamental principles of crop production.

Tiger nut (*Cyperus esculentus Lativum*) is an edible perennial sedge plant and is a lesser known root vegetable that produces sweet nut like tubers (Chukwuma, Obiama, and Christopher, 2010). This tuber is rich in energy content such as starch, fat, sugar, and protein. Tiger nut is widely used for animal (feed) and human consumption (Olugbemi and Onibon, 2019). The tubers or nuts are mainly used to make drinks or beverages for refreshment drink of dairy that is milky in appearance (Udeozor, 2012). In Nigeria, tiger nut is well grown in the middle belt and the northern regions where it is sold locally for consumption. The tuber grows freely and is consumed widely in Nigeria and other parts of West Africa. In recent times, attentions have been directed towards the use of organic manure because of the rising cost of inorganic fertilizers coupled with their inability to give the soil the desired sound health (Ayoola and Makinde, 2007). The nuts can grow downward to about 30cm depth into the soil, but considerable number of the nuts are found around the region of 10 to 20cm (top soil) deep round about the parent plant including the tillers. From field preliminary trial showed that either of the fertilizers are good for tiger nut production provided all other agronomic parties are observed (Olugbemi and Onibon, 2018).

Poultry manure, sometimes called dung is an excellent soil amendment that provides nutrients for growing vegetable crops and also improves soil quality due to its high organic matter content combined with available nutrients for plant growth. Moreover, there is limiting information about the use of organic fertilizers for the cultivation of tiger-nut especially under cottage or mobile farming systems (Olugbemi and Ogunseisin, 2018).

Tiger nut is not a real nut; despite its name, tiger nut is a tuber. However, its chemical composition shares characteristics with tubers and with nuts. This is one of the characteristics that makes it suitable for soft drink production (Adgidzi, 2010). The tiger nut drink when compared with other soft drinks, is not just a refreshing drink but also very healthy. According to Belewu and Abodunrin (2006), it contributes to the reduction in cholesterol and increasing high density Lipoprotein. Its content of vitamin E also split

up the cholesterol because it has an antioxidant effect over fats, which are ideal for coronary heart disease. Chukwuma, Obioma, and Christopher (2010), reported that *Cyperus esculentus* was help in preventing heart, thrombosis and activates blood circulation, responsible for preventing and treating urinary tract and bacterial infection, assist in reducing the risk of colon cancer (Adejuyitan, Otunola, Akande, Bolarinwa and Oladokun., 2009).

The drink from this nut has been found to reduce or prevent diabetics and cholesterol or lose weight, due its high quantity of fiber content. Tiger nut drink has been found to be good for preventing arteriosclerosis, since its consumption can help prevent heart problems and thrombosis and activate blood circulation (Chukwuma, Obioma, and Christopher, 2010). It could also be recommended for those who have problems with digestion, flatulence, and diarrhea because it provides some digestive enzymes like catalase, lipase, and amylase (Adejuyitan, 2011). Tiger nut drink is also said to be recommended for those who have heavy digestion, flatulence, dysentery and diarrhea because it provides a lot of digestive enzymes diuretic, stimulant and tonic in addition to being thirst quencher (Udeozor, 2012). Tiger nut drink is said to be rich in minerals, like phosphorus, calcium and magnesium, iron and in vitamin C and E which are essential for body growth and development (Bamishaiye and Bamishaiye, 2011). Its energetic value (100 cal/100g) makes it a very good energetic drink. A very important point is that it does not contain lactose or gluten (Belewu and Abodunrin, 2006).

In light of all these nutritional and medical usefulness, can it be raised in small polythene bags at corridor for small household consumption? In attempt to answer this question, the main objective of this study was to access the growth and yield of tiger nut cultivated in 5kg polythene bag capacity of soil at building corridor.

Materials and Methods

Experimental location: The experiment was conducted at Michael Otedola College of Primary Education., using the Vocational Education Building complex; Outside Agricultural Science Education Laboratory, located on 6.6⁰N and 4.0⁰E. The college is located on the northern shore of the Lagos lagoon, about 32 kilometres south of Ijebu Ode, Lagos state.

Land preparation for soil samples collection: Soil samples were collected at a depth of 0 – 25 cm with the use hoe and shovel from the college Teaching and Research farm of the College. The soil samples were air dried and gravels were removed.

Soil sample collection for laboratory analysis: Soil samples collected were bulked into composite, air-dried, crushed and sieved with 0.5mm mesh for soil physical and chemical laboratory analyses (Table 1).

Experimental materials and procedures: (1) the tiger nuts were sourced from Hausa hawker and the best and viable nuts were selected for sowing. The fertilizers used are NPK 15-15-15 and Poultry dung. The nuts were sown at two per polythene bag and latter

thinned to one seedling per stand. (ii) Each polythene bag was filled with 5 kg soil and the poultry manure was applied to two weeks before sowing and NPK fertilizer was applied two weeks after sowing.

Experimental treatments and design: The treatments were five levels of two fertilizers materials: No Fertilizer Application (NFA-0), (NPK; 3g, 5g), and Poultry Manure (PM; 15g and 30g) per 5kg soil, respectively. The polythene bags were placed in an open (laboratory corridors) corridors space for field conditions requirements. The bags were arranged in complete randomized design (CRD) and the treatments were replicated three times given a total unit of fifteen (15) polythene bags per each corridor given a total of forty-five (45) polythene bags. Manual weeding and irrigation were carried out on each polythene bag regularly through the experiment.

Data collection and analysis: The growth parameters such as plant height, number of leaves per plant were collected bi-weekly after sowing. At harvest, the following data were collected: fresh nuts, shoot weight and biomass weights. All data collected were analyzed using analysis of variance (ANOVA $\alpha_{0.05}$) and mean treatments were subjected to standard error.

Results and Discussion

Table 1: The chemical and physical properties of soil used for the experiment

Parameters	Values
pH (Cl)	6.4
Organic C (g kg ⁻¹)	1.4
Total N (g kg ⁻¹)	0.34
Available P (mg kg ⁻¹)	55.1
Exchangeable Bases (cmol kg⁻¹)	
K	0.65
Ca	26.50
Na	0.38
Mg	2.82
Particle size distribution (g kg⁻¹)	
Sand	726.0
Clay	140.0
Silt	134.0
Textural class	<i>Sandy loam</i>

The chemical properties of the soil used for the experiment was slightly acidic with moderate organic carbon and low nitrogen and high P as recommended for crops (Table 1). The exchangeable bases, K, Ca, Na and Mg were low with exception of Ca. The soil is classified under low nutrient status based on these chemical dynamics. The physical characteristics of the same soil, with high level of sand (726 g/kg) with low levels of clay

and silt 140 and 134 g/kg respectively, both properties described the soil to be sandy loam soil. The textural classification showed that the soil is well drained and suitable for tiger nut cultivation (Table 1).

Table 2: Growth parameters of tiger nut as influenced by two types of fertilizers at 4 and 8 weeks after sowing

Fertilizer types	Number of tiller		Number of leaf		Plant height (cm)	
	4 WAS	8WAS	4 WAS	8WAS	4 WAS	8WAS
NFA-0	10	11	32	39	23	27
NPK 3g/5 kg soil	11	13	40	78	25	29
NPK 5g/5 kg soil	11	12	38	91	24	31
PM, 15g/ 5kg soil	9	12	34	43	24	28
PM, 30g/ 5kg soil	8	14	27	56	19	33
Standard Error (df = 44)	±2.0	±0.3	±1.9	±0.6	±1.3	±0.2

Legend: PM = Poultry Manure (15g and 30g/5kg of soil)
 NFA-0 = No fertilizer application (control)
 WAS = weeks after sowing

The growth parameters as shown in the Table 1 reflected the effects of the two fertilizers on the growth of tiger nut. However, at 4 WAS, the highest number of tillers were observed under the NPK fertilizer application and the control experiment (10, and 11) while the tiger nut plant under poultry manure applications showed reduced number of tillers (Table 2). More so, at 8 WAS, the plant increased in number of tillers (14) under poultry manure application and reduced (11) under NO fertilizer application.

Similarly, it was observed that number of leaf of tiger nut at 4 WAS ranges from 27-40 and at 8 WAS it ranged from 39-91. It was observed that the plant heights of tiger nut followed the same pattern in their responses to the two fertilizer applications, with the highest values (25 and 33) under NPK and poultry manure applications at 4 and 8WAS respectively (Table 2).

The yield parameters show that the application of the either fertilizer is very promising for raising tiger nut through this medium. The number of nut per 5kg of soil ranged from 20 to 62 under no fertilizer application (NFA- 0) and NPK 15 -15 -15 fertilizer application. As the NPK application increased the biomass production increased significantly compared to other biomass yields under poultry manure application. However, the main economical yield of interest is the nut, this was observed to increased significantly under NPK (3g/5kg soil), with the highest yield of 79g per 5kg of soil followed by the yield obtained (67g/5kg soil) under 5g/5kg of soil. These yields were significantly higher when compared to the yields obtained under the two levels of poultry manure application (Table 2).

Table 3: Yield parameters of tiger nut at harvest as influenced by two types of fertilizers

Fertilizer types	Number of nut/pot	Biomass weight (g/pot)	Nut weight (g/pot)
NFA-0	20	27	32
NPK 3g/5kg soil	62	36	79
NPK 5g/5kg soil	58	46	67
PM, 15g/ 5kg soil	44	27	50
PM, 30g/ 5kg soil	38	40	53
Standard Error (df = 44)	±0.7	±0.9	±3.8

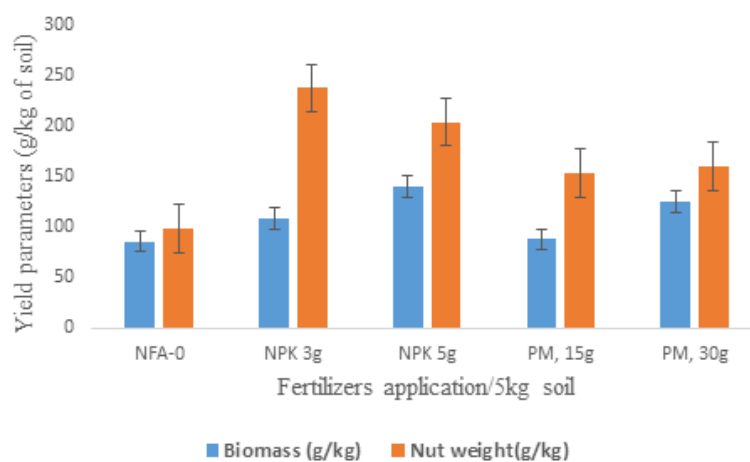
Legend: PM = Poultry Manure (15g and 30g/5kg of soil)
NFA-0 = No fertilizer application (control)

Table 4: Total fresh biomass and tiger nut yield at harvest as influenced by two types of fertilizers

Fertilizer types	Biomass weight (g/unit)	Nut weight (g/unit)
NFA -0	85.6	98.4
NPK 3g/5 kg soil	108.3	237.3
NPK 5g/5 kg soil	139.4	203.6
PM, 15g/ 5kg soil	87.7	153.2
PM, 30g/ 5kg soil	125..2	159.8

Legend: PM = Poultry Manure (15g and 30g/5kg of soil)
NFA-0 = No fertilizer application (control)

Figure 1: Tiger nut total biomass and nut yields from each unit (5 kg soil per pot)



Legend: PM = Poultry Manure (15g and 30g/5kg of soil)
NFA-0 = No fertilizer application (control)

The total biomass and nuts yields of tiger nut under this medium with two types of fertilizers proved that with the containers that can contain healthy soils of moderately nutrients levels can be used to produce fresh tiger nut for small household consumption. This is in line with the findings of Olugbemi and Onibon (2019). This medium with completing the two fertilizers was in agreement with Ayoola and Makinde, (2007) for the use of organic and inorganic fertilizers in production of crops.

The nut yield is the important for man and livestock feeding. Hence, with containers that can contain about 5 kg of soil at the total number of 25kg for 5 containers, an average nut yield of 2- 3 kg of tiger nut can be obtained without necessarily a land area for small quantity production under NPK fertilizer application.

However, with the same quantity and containers under application of dried cured poultry manure, is capable of yielding between 1.5 to 2 kg tiger nut, using the available space at building corridor or any space that receive solar radiation for photosynthesis with regular moderate moisture. This practice is advantageous since the soil (medium) can be carefully selected to be soil and other inputs that are free from contaminants for healthy tiger nut production. This source of tiger nut production is healthy and free from impediments such as chemicals or pesticides residues that are injurious to man's health.

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