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Growth and yield responses of fluted pumpkin (*Telfairia occidentalis* hook F.) to mulching and varying seed sizes in Nsukka Enugu State Nigeria

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ABSTRACT

This experiment studied the effects of seed weight and mulching material on the growth and productivity of fluted pumpkin *(Telfairia occidentalis)*, an important leafy vegetable crop widely cultivated in southern Nigeria. The study aimed to optimize the conditions for improved fluted pumpkin cultivation in Nsukka area of Enugu State, Nigeria. A field experiment with a 2 x 3 factorial in randomized complete block design (RCBD) was conducted to evaluating two factors: seed weight (1-9.9g vs >10g) and mulching material (dry grass, black polyethylene sheet, and no mulch). Parameters measured included vine length, number of nodes and leaves, vine girth, survival count, and above-ground biomass at 5, 7, and 9 weeks after planting. The results showed that while mulch type did not significantly influence the measured agronomic parameters, seed size had a considerable impact. Larger seeds (>10g) consistently outperformed smaller seeds across all growth parameters, with significant differences observed in survival count and vegetative traits. The interaction effects revealed synergistic benefits when combining larger seeds with polyethylene mulch, enhancing leaf production, node development, and vine extension. Additionally, the combination of larger seeds with shredded grass mulch boosted vine girth and biomass accumulation, likely due to improved soil moisture conditions. The study recommends utilizing larger *Telfairia* seeds (>10g) in combination with shredded grass mulch to maximize vegetative growth development and yield. These findings provide practical recommendations to local farmers for optimizing seed quality and mulching practices in fluted pumpkin cultivation in Nsukka and regions with similar agro-ecological conditions.

Contribution/Originality: There is paucity of information on how seed size and cultural practice of mulching interact to influence the growth and yield of Fluted pumpkin in tropical environment such as Nigeria. Therefore, this work is aimed at understanding how these factors influence the performance and yield of this important vegetable crop.

1. INTRODUCTION

Fluted pumpkin (*Telfairia occidentalis* Hook F.) is a popular vegetable grown among the Igbos of southern Nigeria. It is known as "Ugu". It is believed to be native of tropical West Africa and belongs to the family *Cucurbitaceae* [1]. This vegetable crop is mostly propagated by its seeds and sometimes the young vines or shoots are used [2]. The fluted pumpkin grows in many nations of West Africa, but is mainly cultivated in south-eastern Nigeria. The plant's tender shoots and succulent leaves are used primarily in soups and herbal medicines [3]. As a

vegetable crop in many households in the southern Nigeria, it is consumed as a prominent part of daily diet. It has been reported to be a rich source of proteins, minerals and vitamins in food [4].

Mulching has been described as a technique employed to conserve soil water while at the same time improving the soil properties and features with its consequent higher plant growth and development resulting to an improved yield [5]. According to Kasirajan and Ngouajio [6] the word mulching is derived from a German word "Molsch" which literally means any material either organic or inorganic spread on the outmost cover of soil's upper surface. Mulching technique can involve the use materials such as hay, straw, grasses, leaves, polyethylene even organic manure to cover outer layer of the soil surface were the crops are grown in order to help the crop in creating a favourable growth environment [7]. It has been reported by Nithisha, et al. [5] that mulches can function as a protective barrier by preventing the direct contact of sunlight with the soil thereby regulating the soil temperature. The ability of mulching to regulate soil temperature accelerates the crops beneficial physiological processes such as germination of the seeds which invariably increases yield [5].

There are different types of mulch material that can be used for mulching, for example those that are classified as organic mulches and are always biodegradable mulches and the inorganic or synthetic mulches [5]. Organic mulches materials include crop residues, grasses, leaves mulch and all other materials from living things used for mulch. Inorganic mulches include those materials made up of non-living things which include plastic sheet mulches. Synthetic plastic mulch materials are of different types based on the quality of polymers used, for example the High-Density Polyethylene (HDPE) and Low-Density Polyethylene (LDPE) both having different qualities and features [5].

The effects of seed weight on various stages of plant growth, development and establishment have been reported by many researchers. A study that considered phylogenetic relationships (evolutionary relationships among different organisms, showing how they are related to each other through common ancestry) discovered that there was a negative correlation between seed size and seed dormancy. It also revealed that seedlings originating from larger seeds showed increased resilience to defoliation [8]. Researchers such as Krishna, et al. [9] conducted a research on the effect of seed mass on germination, seedling survival and growth in cherry. There is paucity of information on how seed size and cultural practise of mulching interact to influence the growth and yield of Fluted pumpkin in tropical environment such as Nigeria. Due to the high demand of Telfairia leaves in Nsukka, Enugu state, this research on the effect of seed weight and mulching material on the growth of fluted pumpkin *(Telfairia occidentalis)* in Nsukka is aimed at understanding how these factors influence the performance and yield of this important vegetable crop. Therefore, the specific objective of study is to evaluate the effect of seed weight of fluted pumpkin and different mulching material on the productivity of *Telfairia occidentalis* in Nsukka, Enugu state of the Southern eastern region of Nigeria.

2. MATERIALS AND METHODS

This experiment was conducted at the Teaching and Research Farm in the Department of Crop Science, Faculty of Agriculture, University of Nigeria, Nsukka. It is located in the derived savanna zone at latitude 6°52' N, and longitude 7° 24' E, with the altitude of 447m above the sea level.

The Fluted pumpkin (*Telfairia occidentalis*) seeds used were sourced from Ogige market in Nsukka Local Government Area, Enugu state. The well cured poultry manure used was sourced from Department of Animal Science Farm, Faculty of Agriculture, University of Nigeria, Nsukka. Other materials used include: black polyethylene bag, permanent marker, measuring tape, masking tape, electronic digital weighing scale, imiforce® insecticide (Active Ingredient: Imidacloprid 200 g / l SL).

The experiment was a 2×3 factorial experiment laid out in randomized complete block design (RCBD), with four (4) replications. The experiment consists of two (2) factors. Factor A consisting of two range of seeds, one

weighing from 1g to 9.9g (1-9.9g) and the others are seeds greater than 10g (>10g). The factor B consisting of three mulching pattern (Dry grasses, black polyethylene sheet and No mulch). The treatments are:

Shredded grass and big seed (>10 g).

Shredded grass and small seed (1-9.9 g).

Black Polyethylene sheet and big seed (>10 g).

Black Polyethylene sheet and small seed (1-9.9 g).

Control and Big seed (>10 g).

Control and Small seed (1-9.9 g).

An area of land measuring 12.5 m X 8.5 m was used for the experiments. The area mapped out were cleared, tilled and were prepared into beds. The beds were partitioned into four blocks and each block contains six plots for the treatments respectively. The plot size was 1.5 m X 1.5 m, with inter and intra row spacing of 0.5 m X 0.5 m respectively. The planting distance was 0.3 m x 0.3 m.

Organic manure of 4 kg weight was added to each bed in other to increase the fertility of the soil. The beds were levelled so that the whole nutrients will not be washed towards one end and to avoid water logging in the plots.

The *T. occidentalis* seeds were sown on 19thAugust, 2023, during the rainy season.

The seeds were planted in situ in the soil at the depth of about 3 cm at two seed per hole, but later thinned down to one per hole. A total of nine (9) seeds were planted per plot.

Data were collected on the following parameter at 5, 7 and 9 weeks after planting (WAP).

Vine length was recorded using a measuring tape.

Number of nodes was recorded by counting the nodes on the sampling plant.

Number of leaves was recorded by counting the number of leaves on the sampling plant.

Vine girth was done using a measuring tape.

Survival count was recorded by counting the number of plants per plot.

Overall above ground biomass at 9 weeks after planting was recorded using an electronic digital weighing scale.

All the data collected were analysed and the test of significance among treatments detected using the Two-Way Analysis of Variance (ANOVA) according to the procedure outlined for Randomized Complete Block Design (RCBD). The computation was with Genstat 10.3 statistical package. The graphical presentation was done using Microsoft Excel.

3. RESULTS AND DISCUSSION

Table 1 is the main effects of mulch type which indicates that at 5th weeks after planting (WAP) there were no statistical differences among the mulch types for any of the parameters at 5% probability level while the main effects of seed size, the F-LSD (0.05) values show that seed size had a significant effect on all the measured parameters (Survival Count (SC), Number of Leaves (NL), Number of Nodes (NN), Vine Girth (VG), and Vine Length (VL) at the 5% probability level. For all the parameters, the Big Seed size performed better than the Small Seed size. Table 2 shows the main effects of mulch type which indicates that at 6 WAP no statistical differences existed among the mulch types for any of the parameters at 5% probability level while the main effects of seed size, the F-LSD (0.05) values show that seed size had a significant effect on Survival Count (SC) and Vine Girth (VG) at 5% probability level. For Survival Count and Vine Girth, the Big Seed size performed better than the Small Seed size. However, seed size did not have a significant effect on the Number of Leaves (NL), Number of Nodes (NN), and Vine Length (VL).

Table 1. Effects of mulch type and seed size on the agronomic data at the 5th week after planting (WAP).

Mulch type	NL	NN	VG	VL
Control	97	32.8	2.288	129.1
Polyethylene sheet	110.1	36.5	2.288	109.4
Shredded grass	112.5	37.5	2.275	121.4
LSD (0.05)	NS	NS	NS	NS
Seed size				
Big seed	130.6	42.2	2.533	134.8
Small seed	82.5	28.9	2.033	105.2
LSD (0.05)	21.65	8.09	0.4166	24.87

Note: LSD (0.05) = Least significant difference at 5% probability level, NS = Not significant, SC = Survival count, NL = No of leaves, NN= Number of nodes, VG= Vine girth (cm), VL= Vine length (cm).

Table 2. Effects of mulch type and seed size on the agronomic data at the 7th week after planting (WAP).

Mulch type	NL	NN	VG	VL
Control	210	59.6	4.2	189.1
Polyethylene sheet	204	63.9	4	167
Shredded grass	186	60.1	3.9	168
LSD (0.05)	NS	NS	NS	NS
Seed size				
Big seed	220	67.2	4.43	189.4
Small seed	180	55.2	3.64	160
LSD (0.05)	NS	NS	0.571	NS

Note: LSD (0.05) = Least significant difference at 5% probability level, NS = Not significant, SC = Survival count, NL = No of leaves, NN= Number of nodes, VG= Vine girth (cm), VL= Vine length (cm).

Table 3 shows is the main effects of mulch type and indicates that there were no significant differences among the mulch types for any of the parameters at 5% probability level while the main effects of seed size, The LSD values show that seed size had a significant effect on Number of Nodes (NN) and Vine Girth (VG) at the specified probability level. Considering the Number of Nodes and Vine Girth, the Big Seed size performed better than the Small Seed size. However, seed size did not have a significant effect on Survival Count (SC), Number of Leaves (NL), Vine Length (VL), and Above Ground Biomass (AGB). Table 4 shows the effect of mulch types and seed size on the growth of fluted pumpkin at 5, 7, and 9 weeks after planting. The table shows that the survival count was the same for big seeds across all mulch types, with 9 plants surviving. For small seeds, the survival count was slightly lower (6.08-6.75) compared to big seeds, with minor differences across mulch types.

Table 3. Effects of mulch type and seed size on the agronomic data at the 9th week after planting (WAP).

Mulch type	NL	NN	VG	VL
Control	263	81.1	5.3	237.9
Polyethylene sheet	250	85.6	5.14	202.5
Shredded grass	225	81.4	5.43	203.4
LSD	NS	NS	NS	NS
Seed size				
Big seed	266	92	5.85	223.8
Small seed	226	73.4	4.73	205.4
LSD	NS	14.73	0.549	NS

Note: LSD (0.05) = Least significant difference at 5% probability level, NS = Not significant, SC = Survival count, NL = No of leaves, NN= Number of nodes, VG= Vine girth (cm), VL= Vine length (cm).

Table 4. Interaction effects of seed size and mulch type on survival count per plot.

Mulch type	Seed size	Weeks after planting (WAP)		
		5	7	9
Control	Big	90	90	70
Control	Small	68	68	60
Polyethylene sheet	Big	90	80	80
Polyethylene sheet	Small	50	45	45
Shredded grass	Big	90	90	90
Shredded grass	Small	65	60	60
LSD (0.05)		17.49	30.8	34.3

Note: LSD (0.05) = Least significant difference at 5% probability level.

Figure 1 shows the effect of mulch types and seed size on the growth of fluted pumpkin at 5, 7, and 9 weeks after planting on the above ground biomass. The table further showed that the interaction of big seed size and control recorded significantly ($0 < 0.05$) higher at 9 WAP with a value of 1239g. The small seed and polythene sheets had the lowest values at 439g, but were similar to small seeds in the control treatment. This study aligns with findings from Rashid, et al. [10] in cucumber, where bigger seeds produced more vigorous seedlings. The interaction effects revealed advantages of polyethylene mulch combined with larger seeds for enhancing leaf production, nodes, and vine extension. This agrees with report made by Ibarra-Jimenez, et al. [11] that the use of plastic mulch is associated with a higher increase in yield of cucumber productivity.

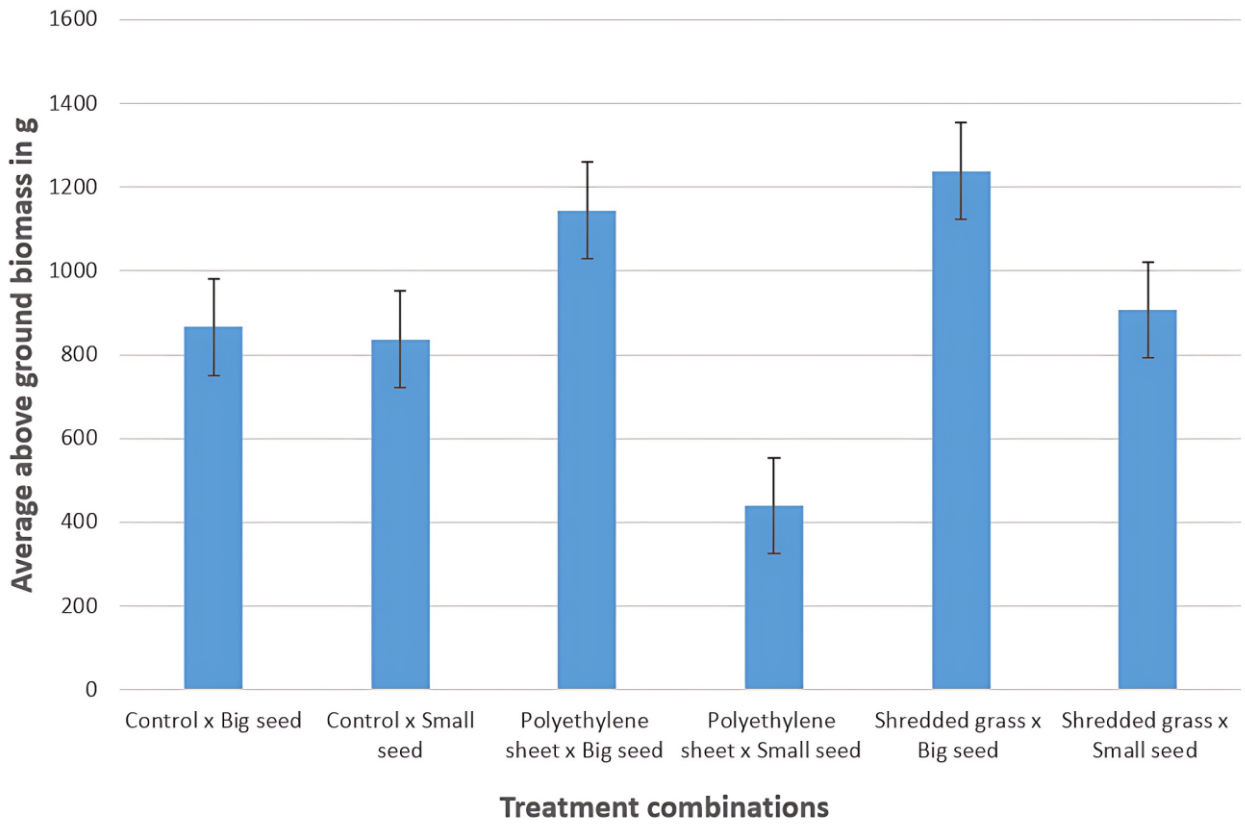

Figure 1. Effects of seed size and mulch type on average above ground biomass (g) per plant at 9th week after planting.

Data from this experiment showed that big seed continually had an advantage over the small seeds with a significant difference in survival count and vine girth. However, the effects on leaf number, nodes, and vine length were less pronounced. The interaction data showed that polyethylene mulch retained its benefits for leaf production, nodes, and vine elongation when combined with larger seeds, this was in accordance with Zhang, et al. [12] who reported that black polythene mulches increase soil temperature when compared to bare soil, aiding early crop

establishment of rice growth in non-flooded condition. Overall, the data across the three time points consistently demonstrated the growth-promoting effects of larger seeds, which became more pronounced as the crop progressed towards the reproductive phase. The benefits of mulching, especially with polyethylene, were also evident throughout the vegetative growth stages when combined with larger seeds.

4. CONCLUSION

Utilizing larger *Telfairia* seeds consistently performed better throughout the crop cycle due to their inherent bigger vigour and growth advantages over smaller seeds. Employing the use of shredded grass as a mulch type in combination with larger *telfairia* seeds is the best way to maximize leaf development, node formation, vine extension, and overall biomass accumulation. This combination can accelerate vegetative growth and provide a head start for subsequent reproductive development. Shredded grass is also recommended due to its biodegradable organic nature. It is also readily available and inexpensive for local farmers. It is environmentally friendly, using shredded grass mulch reduces waste rather than the need for the comparative synthetic mulches. Based on the findings from the experiment, fluted pumpkin seeds that are greater than 10 g mulched with shredded grasses are hereby recommended to farmers for a better yield in a similar environment to that of Nsukka area, of Enugu State Nigeria.

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