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# The Effect of Seed Size on the Germination and Growth of Fluted Pumpkin (Telfairia Occidentalis Hook. F.)

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**ABSTRACT**

An experiment was carried out at the Centre for Ecological Studies located at the University of Port Harcourt, Rivers State, to determine the effect of seed size on the germination and growth of fluted pumpkin (*Telfairia occidentalis*) using plastic buckets and seed of different sizes: extra small (T1=4.0cm-5.9cm), small (T2=6.0cm-6.9cm), medium (T3=7.0cm-7.9cm) and big seed (T4=8.0cm-8.9cm). Different growth parameters were analyzed in this experiment within 5 weeks.

These parameters include: germination, plant height, leaf length, number of leaves, fresh weight and dry weight of the leaf. The results showed the big seeds had the highest Germination, Plant height, fresh weight and dry weight with a value of 47.7cm, 1.62g and 0.16g respectively. The extra small seeds had the second highest germination, plant height (45.7cm) and the highest leaf length (8.4cm). The small seeds had the highest number of leaf (9.9), the leaf length was (8.2cm).

The medium seeds had the lowest value in plant height (37.2cm), number of leaves (8.6) and leaf length (7.2 cm). This study proved that the seed size affected the growth and germination of fluted pumpkin. It can be concluded that bigger seeds produce more yield than the medium, small and extra small seeds.

Keywords: Germination, Yield, Seed Size, fluted pumpkin, *Telfairia occidentalis*

## 1. INTRODUCTION

*Telfairia occidentalis* Hook. f. Also known as Fluted pumpkin is of the family Cucurbitaceae. The tropical fluted pumpkin is a dioecious and perennial creeping vine which originated from the West Africa continent precisely the south east of Nigeria before spreading to other places like Ghana, Cameroon, and Sierra Leone.

*Telfairia occidentalis* is grown primarily for its leaf, which is popular in the preparation of diverse diet such as soups, porridge etc. in many West African countries (Gill, 1988). T. *occidentalis* is characterized by its greenish broad lobed leaves and fleshy fluted gourds with hard edible seeds; it could also be used for medicinal purpose. The seeds of *T. occidentalis* are known to be edible. However, they ought to be cooked properly before consumption. The seeds can also be ground or fermented into 'Ogiri' used as condiment for making soup and sauce. Asiegbu (1987) reported that the seed oil contains about 30.1% oil and 47% protein. He also noted that the essential amino acid content in fluted pumpkin compares favourably with that of other legumes such as groundnut and soybeans. Presently, there has been an increase in the awareness on the need to include more vegetables in our diet for the maintenance of our health. Till this day, several researches have unraveled numerous reasons why the rate of producing vegetables should increase tremendously.

Despite the importance of *T. occidentalis* in Nigeria, farmers are facing a lot of problems concerning its production on the field. Fashina *et al.*, (2002) stated that, yield and quality of the leaves and seeds realized by farmers are usually lower than what is reported under experimental conditions.

In Nigeria, *T. occidentalis* can be grown in all agro ecological zones with the south eastern zone dominating the production of the plant (Ehiagbonare, 2008) and its importance in the agro-world cannot be over emphasized. *T. occidentalis* has attained an important status as a vegetable for all in Nigeria, but it has received a limited research attention by scientist on the relationship between the seed size on germination and vigor.

Seed size affects vigor, germination and seedling establishment, the viability varies from 63% for small seed (<11g) up to 89% for seeds weighing up to (22g). Germination takes about 14 days in the natural soil, but only 7 days in a sawdust medium (Odiaka and Schippers, 2004). Due to high productivity of the female plants, farmers prefer female to male plants. However, it is difficult to differentiate between the female and the male plants before the initiation of flower in thek crop, this has caused serious problems and limitation to fluted pumpkin production. Ndukwu *et al.*, (2005) reported that female plants are larger in size than those that germinate to make plants.

Studies have shown that there are differences in quality of seeds born within a pod in some Vegetable crops, due to the stage of maturity which also resulted to the difference in seed size within the pod. This study was carried out to investigate the effect of seed size on germination, seed yield and plant growth of *T. occidentalis*.

## 2.0 MATERIALS AND METHODS

### *2.1. MATERLALS USED AND THER SOURCES.*

The following materials were used for this experiment

***1. Telfairia occidentalis pods/seed***.

Two pods of *T. occidentalis* were sourced from the Faculty of Agriculture Research and Teaching Farm located at the University of Port Harcourt, Rivers State. One of the pod was immature containing 76 extra small and small seeds while the other was a matured pod containing small, medium and large seeds.

**2. Plastic Buckets.**

The plastic buckets were sourced from Choba Market, Port Harcourt. They were perforated with an iron for removal of excess water.

**3. Soil.**

The sandy loam soil were also sourced from the Faculty of Agriculture Research and Teaching Farm located at the University of Port Harcourt, Rivers State, the soil samples were analyzed at This analysis were done to ascertain the physiochemical properties of the soil. The following properties were analyzed: Soil pH, Phosphorus, Potassium, Nitrogen, Organic Carbon and Organic Matter.

### *2.2. EXPERIMENTAL DESIGN*

This experiment was carried out at the Center for Ecological Studies located at the University of Port Harcourt, Rivers State. The experimental design used in this research work was a completely randomized design (CRD) of four treatments with three replicates to give a total of 12 experimental units. The treatments are as follows

Treatment 1: 4.0cm - 5.9cm (Extra small seeds).

Treatment 2: 6.0cm – 6.9cm (Small seeds).

Treatment 3: 7.0cm -7.9cm (Medium seeds).

Treatment 4: 8.0cm – 8.9cm (Big seeds).

### *2.3. PREPARATION OF SETUPS*

12 plastic buckets of 10L were filled with 10kg sandy loam soil. The soil were soaked with water and allowed to sit for 24hrs to remove excess water. 3 buckets were used for each treatment. The seeds were separated from the fleshy part of the fruit by squeezing to remove excess moisture and air dried for 3 davs, A metre ruler was used to measure the seed sizes into different range (T1= 4.0cm-5.9cm, T2= 6.0cm -6.9cm, T3 =7.0cm -7.9cm, T4 = 8.0cm - 8.9cm). Three days after drying, 3 seeds were planted per buckets by placing the pointed edge were the root proceeds from into the soil, the sowing depth for each treatment was 5cm. A total of 36 seeds were sown for this study.

### *2.4. PARAMETERS OF STUDY*

The following parameters were used to assess the plant: Germination, Plant height, Leaf length, Number of leaf, Dry weight of leaf, Fresh weight of leaf.

#### *2.4.1. GERMINATION*

The germination rate were taken after 50% germination. The germination rate were Calculated 8 -10 days after planting by observing the number of plants that germinated in each treatment.

#### *2.4.2. PLANT HEIGHT*

This is the distance from the base of the plant at ground level to the apex of the highest leaf. it is measured in centimetre and the measurement were taken weekly

#### *2.4.3. LEAF LENGTH*

This was taken weekly by measuring the length from the base of the leaf to the apex.

#### *2.4.4. NUMBER OF LEAVES*

The number of leaves were calculated by counting the leaves per their arrangements on the branch and it was done weekly.

#### *2.4.5. FRESH WEIGHT OF LEAF*

The fresh weight were analyzed by weighing the leaf using a sensitive weighing balance and a foil.

#### *2.4.6 DRY WEIGHT OF LEAF*

The leaf sample were wrapped in a foil and oven dried at 106°c for 5hrs, and there after weighed using a sensitive weighing balance.

### *2.5. STATISTICAL ANALYSIS*

The analysis of variance (ANOVA) were used to determine the effect of seed size on the growth and germination of the different sizes of *T. occidentalis* from week I to week 5 after planting.

**RESULTS AND DISCUSSION**

## 3.0 PHYSICOCHEMICAL ANALYSIS

**Table 1: SOIL PROPERTIES**

| S/N | PROPERTIES | UNITS | CONCENTRATION |
|---|---|---|---|
| 1 | pH | - | 5.58 |
| 2 | Phosphorus | Mg/kg | 5.7 |
| 3 | Potassium | Mg/kg | 1.20 |
| 4 | Nitrogen | % | 2.7 |
| 5 | Organic Carbon | Mg/l | 0.00 |
| 6 | Organic matter | % | 4.0 |

### 3.1. Germination of *T. occidentalis*

The germination of different sizes of T. occidentalis took place 8 - 10 days after planting, the germination of the seeds occurred at different intervals for each size as shown in (Fig. 1). The germination rate were taken after more than 50% germination. It was observed that T1 which are the extra small seeds had only 6 seeds, only 5 seeds germinated in T2 and T3, they have no significant difference and T4 which are the big sizes had the highest germination of 9 seeds.

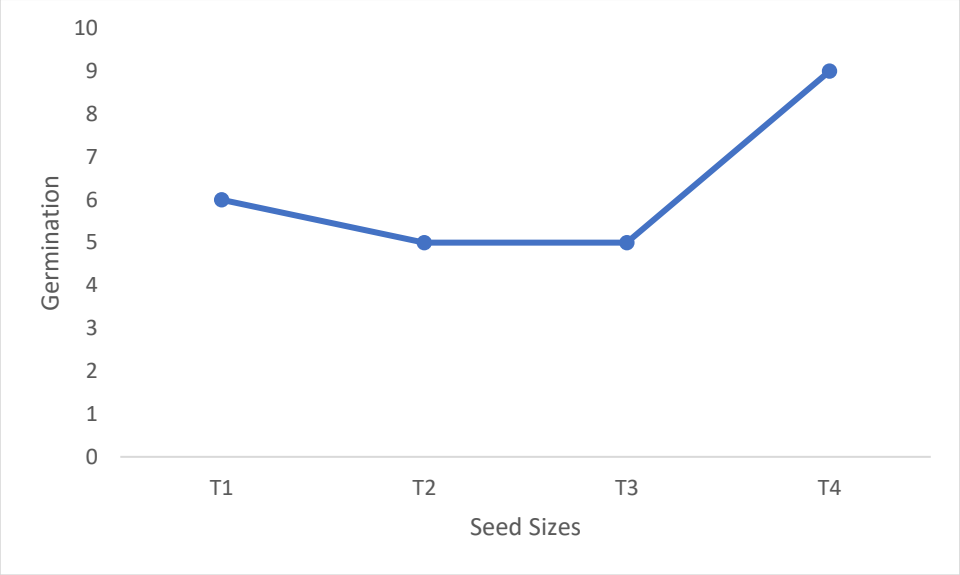


Fig. 1: Seed sizes and Germination performance of *T. occidentalis* at 10 days after Planting

### *3.2. PLANT HEIGHT*

The result in Fig. 2. at the 5th week. showed that there was a difference in the plant height. T4(Big seeds) had the highest plant height of 47.7cm, followed by TI(Extra small seeds with a value of 45.7cm, next to T2(Small seeds) with a value of 42.6cm and the lowest plant height was observed in T3(Medium seeds) 37.2cm.

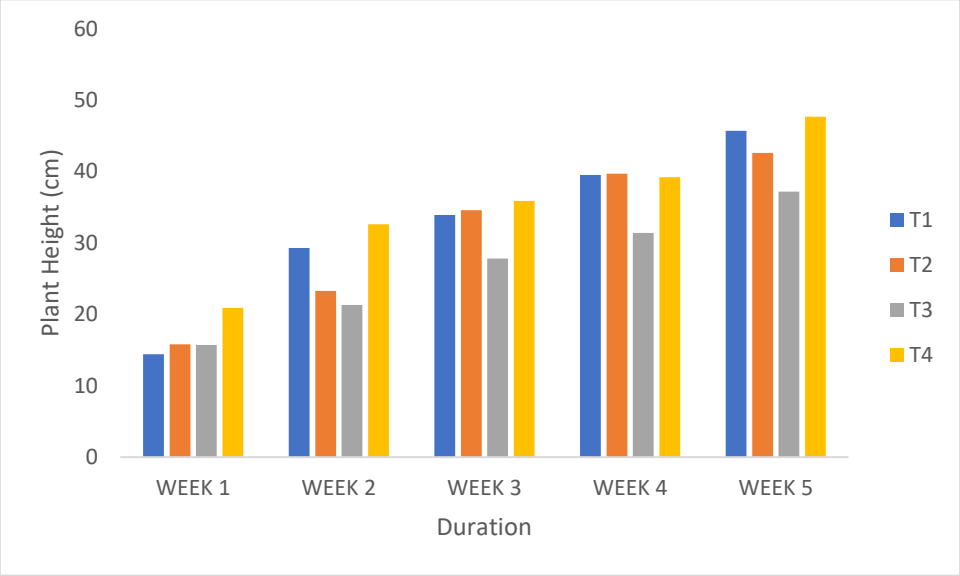


Fig. 2: Seed size and its effect on plant height

### *3.3 LEAF LENGTH*

Fig 3. showed that there was a significant difference (P=0.05) in the leaf length within week l-5.

The highest leaf length at week 5 were observed in T1 (Extra small seeds) with a value of 8.4cm, followed by T2 (Small seeds) with a value of 8.2em, next to T4 (Big seeds) with a value of 7.5cm

and the lowest leaf length were observed in T3 (Medium seeds) having a value of 7.2cm.

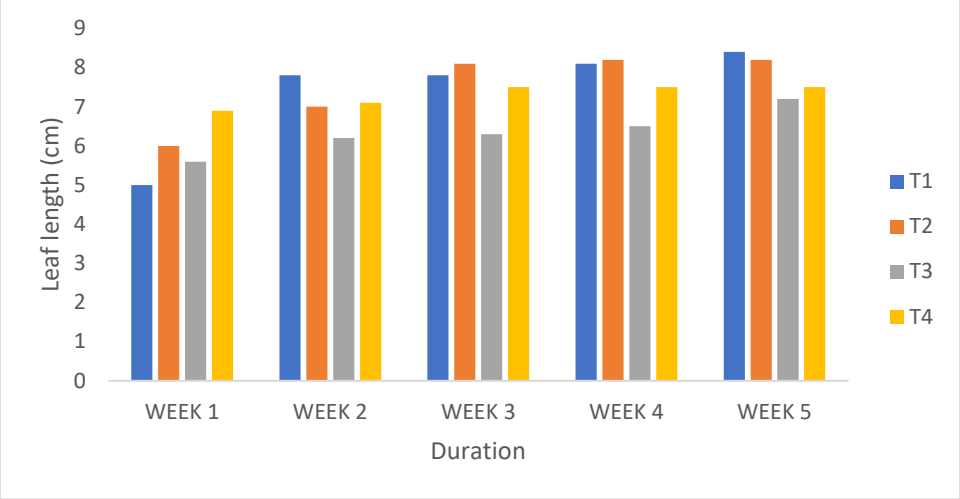


Fig. 3: Seed Size and the leaf length performance

### *3.4. NUMBER OF LEAVES*

The result in Fig. 4. showed that the seed size affects the number of leaves in *Telfairia occidentalis*. The highest number of leaves at the 5th week were observed in T2 (Small seeds) having a value of 9.9, followed by T4 (Big seeds) having 9.5, next to TI (Extra small seeds) with 8.8 and the lowest number of leaves were observed in T3 (Medium seeds) with a value of 8.6.

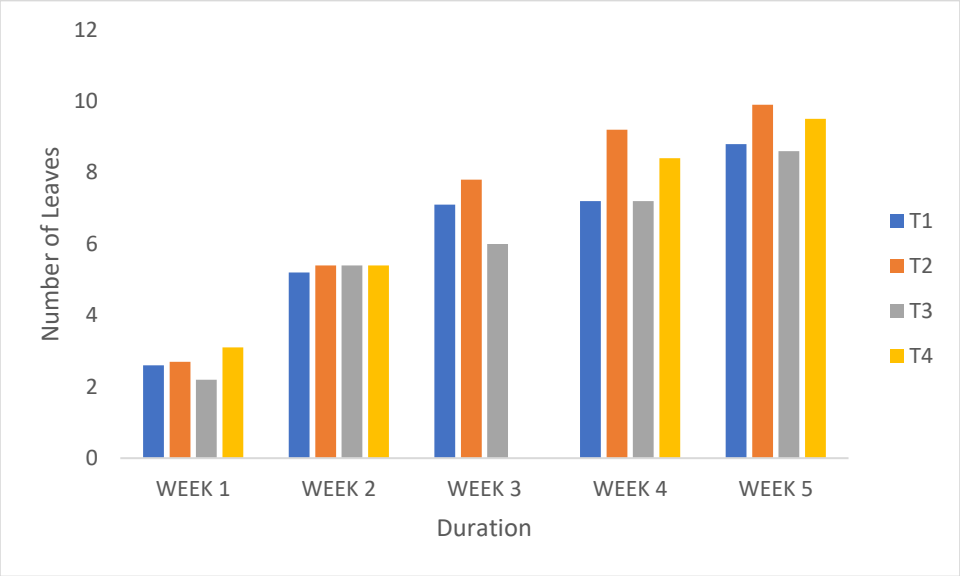


Fig. 4. Number of Leaves and the different seed sizes.

### *3.5. LEAVES FRESH WEIGHT*

The result in Fig. 5. showed that there was a slight difference in the fresh weight between T4 (Big seeds) and T3 (Medium seeds), also. T4 and T3 has more moisture content than T1 (Extra small seeds) and T2 (Small seeds) of *Telfairia occidentalis*. The highest weight of 1.62g were observed in T4, followed by T3 with a value of 1.60g. T2 with a value of 1.27g and value of 1.09g fresh weight were observed in TI.

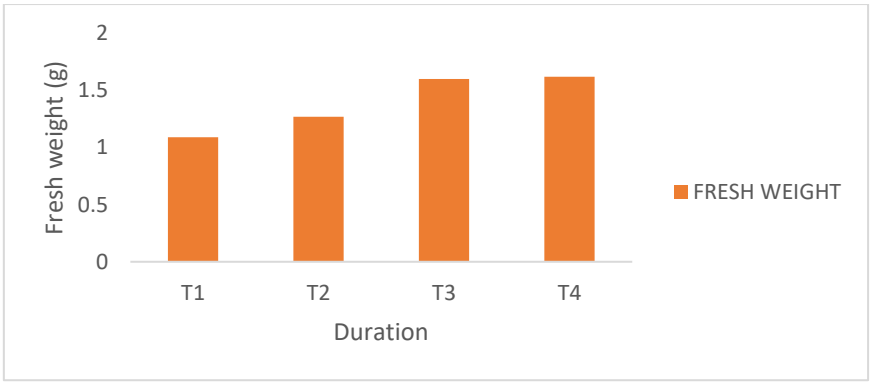


Fig. 5: Leaves fresh weight of the different seed size

**LEAVES DRY WEIGHT**

There was effect in the dry weight as shown in Fig.6. The highest mean value of 0.16g were observed in T4 (Big seeds), followed by T3 (medium seeds) with a mean value of 0. 14g. next to T2 (small seeds) with a mean value of 0.09g and the lowest mean value of 0.03g were found in Tl (extra small seeds).

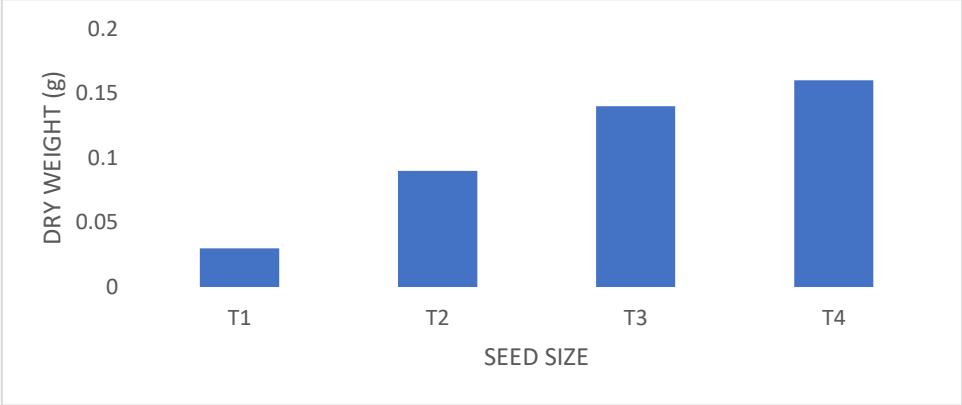


Fig. 6: The effect of seed sizes on the leaves Dry weight

### *4.1. DISCUSSION*

During the planting of seeds for this study, a total of 9 seeds were sown in each treatment. In (Fig. 1.), T4 (big seeds) had the highest germination of 9 seeds, this result is in line with the reports; germination and establishment counts increase as the seed size increases in fluted pumpkin (Schippers, 2000), Variation in seed size within a species may affect seed germination

(Schaal, 1980; Weis, 1982), germination rate (Weis. 1982: Zhang and Maun, 1990). The results showed that the big seeds had the highest value in germination performance, plant height, fresh weight and dry weight more than the extra small seed, small seed and medium seeds, this could be as a result of the large embryo and high food reserve for supply of energy. These results support the report of (Giles, 1990) which states that the size of the seed is known to affect the fitness of the plant growing from it: larger seeds often have higher fitness.

The small seed had the highest number of leaves seen in (Fig..4.), The number of leaves were shown to have been affected by the seed size with the fact that all the treatments did not develop equal number of leaves. Although, it was pointed out that the number of leaves may not

be a good index for measuring potential properties of the plant (Mckersie and Thomas, 1999). The dry weight of leaf were affected by the seed size. The bigger seeds produced more dry weight than the other sizes. This is attributed to the high seed weight and protein possessed by the bigger seeds.

### *4.2 CONCLUSION*

This study proved that the seed size affects the growth and germination of *Telfairia occidentalis*. It can be concluded that bigger seeds produce more yield than the medium, small and extra small seeds,

### *4.3. RECOMMENDATON*

For mass production of fluted pumpkin, it is advisable that large seeds should be used. During the process of planting and growth, it was seen that the plant experienced problems with pest, insects and excess water, so to prevent loss. the seeds should be cleaned with insecticides or pesticides and the plant should be sown between the seasons of less rain and drought

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