Asian Plant Research Journal

3(3-4): 1-6, 2019; Article no.APRJ.54827
ISSN: 2581-9992

Effect of Seed Position in the Pod on the Germination and Development of *Telfairia occidentalis*

K. U. Ekwealor[1], C. F. Iroka[1*], V. C. Okezue[1], W. C. Anyanele[1] and H. N. Eze[1]

[1]Department of Botany, Nnamdi Azikiwe University, Awka, Nigeria.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/APRJ/2019/v3i3-430071
Editor(s):
(1) Dr. Nesreen Houssien Abou-Baker, National Research Centre, Egypt.
Reviewers:
(1) Semirian Campos Amoêdo, National Institute of Amazonian Research, Brazil.
(2) Lilian Dada Simon, Federal University Gashua, Nigeria.
(3) Aba-Toumnou Lucie, University of Bangui, Central African Republic.
Complete Peer review History: http://www.sdiarticle4.com/review-history/54827

Original Research Article

Received 07 January 2020
Accepted 12 March 2020
Published 04 May 2020

ABSTRACT

This study was aimed at investigating the effect of seed location in the pod on the germination and development of *Telfairia occidentalis* and to identify the portion of the seed pod that contain more female plants. This study was conducted at the Department of Botany experimental garden, Nnamdi Azikiwe University, Awka during the 2019 planting season. There was five different seed location in the pod, the far-head (FH), near-head (NH), middle (M), far-tail (FT) and near-tail (NT) regions which were treated with poultry manure. The results of this study revealed that the location of seed in the seed pod of fluted pumpkin affects germination and vegetative growth. The growth parameter data results showed that the seeds located in the middle section of a pod of fluted pumpkin are far much better than those seeds collected from the head section in terms of length of vine, stem girth, a number of nodes number of leaves, leaf area, percentage of germination, fresh weight and dry weight. The results provide an important tool for the improvement of the yield of fluted pumpkin and also a foundation for numerous researches yet to come.

**Corresponding author: E-mail: harlyz14@yahoo.com;*

Keywords: Telfairia occidentalis; Cucurbitaceae; germination; growth; fluted pumpkin; seed; head; middle; tail; position.

1. INTRODUCTION

Telfairia occidentalis Hook. f. is a tropical vine growing mainly for the leaves which constitute an important component of the diet of many people in West African countries [1] and it is also cultivated for its edible seed. Common names for the plant include Fluted gourd, fluted pumpkin, Ugu (in the Igbo language), and Ikong-Ubong (in the Efik/Ibibio language). Fluted pumpkin belongs to the gourd or calabash family *Curcurbitaceae* and it is a crop of commercial importance grown across the lowland humid tropics of West Africa. Major producing countries include Nigeria, Ghana, and Sierre Leone [2].

It is mainly propagated by seeds obtained from the mature fluted gourds of the previous harvest, and cultivated from the beginning of the rainy season, although it can be more profitable in the dry season given adequate irrigation [3]. It is dioecious with male and female flower borne on different plants. It has a hardy nature and being fairly resistant to drought [3]. The plant is usually grown trellised. It needs well-drained soil, some water and some sunlight. The vines climb up to 1.5 metre. The flower is white and dark purple. The male sex of fluted pumpkin is difficult to know until after flowering, which takes about four months after planting. This is a major constraint to its production. The female leaves are preferred by house wives and are therefore highly demanded [4]. The edible parts include the young vines or shoot, leaves, seeds and petioles. The leaves and tender stems are consumed as potherbs; the seeds are eaten as nut or milled and used as soup thickener.

T. occidentalis is traditionally used by an estimated 30 to 35 million indigenous people in Nigeria including the Efik, Igbo, and Urhobo. However, it is predominantly used by Igbo ethnic group for food sources and traditional medicine. A recurring subject in the Igbo's folklore, the fluted gourd is noted to have healing properties and was used as a blood tonic, to be administered to the weak or ill [5,6].

It is a good source of minerals and human nutrition; vitamin, mineral salt, protein and oil. The protein from the fluted pumpkin is relatively deficient in the sulphur-containing amino acids, methionine and cysteine. They are also low in crude fibre, a rich source of folic acid, calcium, zinc, potassium, cobalt, copper, iron, and also have medicinal value [4]. The extract from the leaves is used for haemoglobin formation. Despite this importance of the crop as a green vegetable in Nigeria there have been the biology and yield characteristics of the crop [7,8,9].

This study, therefore, seeks to investigate the effect of seed location in the pod on the germination and development of *Telfairia occidentalis* and also to identify the portion of the seed pod that contain more female plants.

2. MATERIALS AND METHODS

2.1 Study Area

This study was conducted at the Department of Botany experimental garden, Nnamdi Azikiwe University, Awka, during the 2019 planting season.

2.2 Experimental Design

The experimental design was a randomized complete block design. Five different seed location in the pod i.e. the far-head (FH), near-head (NH), middle (M), far-tail (FT) and near-tail (NT) regions which were treated with poultry manure.

2.3 Seed Collection

The seeds used in the study were collected from one mature pod of *Telfairia occidentalis* plant. The weight of the pod was recorded. The pod was cut into five halves/section, far-head, near-head, middle, far-tail and near-tail (the stigmatic scar indicated the tail, while the stalk joint indicates the head). The seeds were extracted from the fruit pod, and washed thoroughly to remove surrounding metrical tissues. The weight of the seeds from each section/part was recorded.

2.4 Experimental Layout

Large polythene bags were doubled and punched at several points at the bottom and filled with soil. The holes were to facilitate effective drainage and aeration. A total of 15 bags were divided into three. Each group was further divided into its corresponding head, middle and tail treatment. They all contained 3.5 kg of topsoil and 0.4 kg of poultry manure. The manure added to the bags were mixed properly with the soil,

watered and allowed to undergo ammonification and sedimentation before planting of seeds.

Four seeds were sown in each bag at a well-spaced point just below soil surface levels in each bags and watering were done in two days interval before germination after which it was changed to once a day after germination. Other cultural practices like weeding and staking were done to all the treatments at regular intervals.

2.5 Data Collection

Vegetative development and growth were measured after germination. The readings were taken at weekly intervals beginning from the first week after germination. Thirty samples were drawn from 60 plants by picking randomly through a chance dip out of every 28 plant represented by a piece of paper.

The observations were made on the following parameter;

- 1st germination
- % germination
- Vine length per week
- Stem girth per week
- Number of node per week
- Number of leaves per week
- Leaf area per week.

The difference in yield of the different sections was analysed based on these parameters.

2.6 Statistical Analysis

Data collected were analyzed using confidence interval at 95%, one way analysis of variance and mean separation using Statistical Package for social sciences (SPSS) version 21.

3. RESULTS

From the Table 1, seeds collected from the middle (M) and far tail section (FT) showed the highest percentage of germination followed by the near tail section. The far head (FH) and near head (NH) section showed the lowest percentage of germination.

Table 2 shows that the middle region has the highest vine length with the mean of 142.85±.19.15. Statistically the ANOVA for the length of vine shows that the experiment is highly significant among plants from the different seed locations with the significant difference of 0.000 which means that $p < 0.05$. Using multiple comparisons, there is no significant difference between the near-head and far-head and also between the far-tail and near-tail but there is significant difference between the middle region and other regions of the fluted pumpkin.

Table 3 shows that the middle has the highest number of leaves with the mean of 65.28±.10.93 while the near-head has the lowest number of leaves with the mean of 3.50±1.29. Statistically, the ANOVA for number of leaves showed that the experiment is significant among the plants from different seed locations with a significant difference of 0.000 ($p < 0.005$). Using multiple comparisons, there is no significant difference between the far-head and the near-tail, near-tail and the far-tail, far-tail and the middle region but there is a significant difference between the near head region and another region of the fluted pumpkin.

Table 4 shows that the middle region has the highest number of nodes with the mean of 24.85± 3.02 while the near-head has the lowest number of nodes with the mean of 3.50± 0.57. Statistically, the ANOVA number of nodes showed that there is no significant difference between the number of nodes of the different seed locations with a significant difference of 0.157 ($p > 0.05$). Using multiple comparisons, there is no significant difference between the different regions of the fluted pumpkin.

Table 5 shows that the near-tail region has the highest leaf area with the mean of 72180.46 ± 7.83 while the near-head has the lowest leaf area with a mean of 5.47 ± 0.55. Statistically, the ANOVA for leaf area showed that there is a significant difference between the leaf area of the different seed locations having a significant difference of 0.000 ($p < 0.05$). Using multiple comparisons, there is no significant difference between the far-tail, near-head and the middle region, the near-head, middle and the far-head region but there is a significant difference between the near-tail and other regions of the fluted pumpkin.

Table 6 shows that the middle region of the fluted pumpkin has the highest stem girth with the mean 5.05±0.05 while the far head region has the lowest stem girth with the mean 0.46±0.16. Statistically, the ANOVA of the stem girth showed that there is a significant difference between the leaf area of the different seed locations having a significant difference of 0.000 ($p < 0.05$). Using multiple comparisons, there is

no significant difference between the far-head and near-tail, near-tail and far-tail but there is a significant difference between the near-head and other region and also between the middle regions compared with another region of the fluted pumpkin.

Table 1. Percentage (%) germination

Replicate	FH	NH	M	FT	NT	Total
1	25	25	50	50	25	175
2	25	50	50	50	50	200
3	50	50	75	75	75	250
Total	100	125	175	175	150	

Table 2. The mean length of the vine of fluted pumpkin

Seed position	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Far head	10.46±2.65	27.80±4.20	35.42±5.62	46.82±5.41	69.80±7.59	88.82±8.79
Near head	8.02±2.49	20.42±2.54	26.35±4.68	45.27±6.10	71.27±6.28	97.02±10.16
Middle	13.50±1.71	38.72±10.69	76.35±19.18	117.42±17.91	142.85±19.15	165.00±19.05
Far tail	14.32±3.01	39.40±9.54	62.57±11.61	78.10±12.44	107.02±23.80	124.45±23.43
Near tail	10.41±0.98	29.87±4.44	48.42±7.11	97.30±20.52	121.57±19.42	140.42±17.42
Total	11.73±3.04	32.55±9.80	53.13±20.76	82.16±30.92	107.81±32.92	128.04±32.25
P-value	0.001	0.002	0.000	0.000	0.000	0.000

Table 3. Mean number of leaves of fluted pumpkin

Seed position	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Far head	3.80±1.78	15.00±7.07	21.40±5.36	28.80±8.34	38.40±9.91	57.16±11.76
Near head	3.50±1.29	8.00±1.82	16.50±2.38	19.75±1.89	26.75±4.99	44.50±5.00
Middle	9.71±3.14	22.00±4.16	32.71±7.38	46.57±7.41	65.28±10.93	80.42±10.73
far tail	8.42±2.76	20.28±4.60	28.71±8.17	38.71±6.55	55.14±7.40	71.14±7.24
near tail	7.33±1.50	17.33±3.20	24.50±6.22	37.16±7.62	50.66±5.75	70.50±4.84
Total	7.03±3.27	17.48±6.21	25.86±8.24	35.96±10.89	49.86±15.04	67.16±14.32
P-values	0.000	0.001	0.005	0.000	0.000	0.000

Table 4. Mean number of nodes in fluted pumpkin

Seed position	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Far head	3.80±1.30	8.20±2.28	11.40±2.60	18.00±1.58	24.00±3.08	47.00±3.87
Near head	3.50±0.57	7.25±1.70	10.75±0.95	16.50±0.57	21.75±1.70	45.00±2.44
Middle	3.71±1.25	8.71±2.62	13.28±4.15	16.71±4.88	24.85±3.02	49.42±3.40
Far tail	3.28±1.11	7.00±2.51	10.14±1.95	12.57±2.57	17.85±4.18	33.00±3.41
Near tail	4.16±0.75	9.00±3.03	11.00±3.03	14.00±1.63	18.00±1.65	30.00±7.66
Total	3.56±1.03	7.87±2.62	11.45±3.10	15.62±3.34	21.83±4.16	42.58±7.75
P-value	0.671	0.281	0.319	0.037	0.007	0.000.

Table 5. Mean leaf area of fluted pumpkin in (cm^2)

Seed position	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Far head	8.68±2.06	16.22±2.06	23.80±5.45	46.64±11.15	56.76±11.75	65.04±10.88
Near head	5.47±0.55	9.72±0.98	21.65±4.33	35.27±5.52	54.12±9.92	70.55±5.71
Middle	9.92±1.57	16.70±3.41	25.75±4.34	34.94±6.50	48.18±9.03	64.57±5.99
Far tail	5.45±1.94	11.82±4.69	19.17±4.53	27.15±7.50	52.54±17.91	68.00±12.97
Near tail	8.63±0.89	20.45±3.98	37.30±10.13	57.38±9.10	72.18±7.83	85.68±5.68
Total	7.52±2.38	15.25±5.19	25.65±8.69	39.76±13.43	56.50±14.21	70.67±11.61
P-value	0.000	0.001	0.000	0.000	0.021	0.003

Table 6. Mean stem girth of fluted pumpkin in (cm)

Seed position	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Far head	0.46±0.16	1.34±0.37	1.76±0.16	2.04±0.05	3.38±0.23	4.02±0.10
Near head	0.60±0.11	1.05±0.57	1.62±1.50	1.97±0.05	2.62±0.35	3.40±0.20
Middle	1.44±0.18	2.20±0.25	3.05±0.12	3.24±0.20	4.28±0.25	5.05±0.05
Far tail	0.84±0.26	1.57±0.31	2.05±0.12	2.64±0.35	3.38±0.33	4.67±0.38
Near tail	0.61±0.98	1.31±0.33	2.06±0.45	2.81±0.50	3.45±0.48	5.13±0.28
Total	0.90±0.40	1.55±0.48	2.18±0.57	2.62±0.55	3.51±0.61	4.57±0.65
P-value	0.00	0.0	0.00	0.00	0.00	0.000

4. DISCUSSION

From the study it is observed that the location of seed in the seed pod of fluted pumpkin affects its germination and vegetative growth. Seed position in fruit has been reported to affect the quality of seed of pumpkin. Ogbonna [10] observed differences of pod portions on number of sprout per portion. The effect of seed position on vigour performance was reported by Aremu and Akinwale [11]. The authors observed significant differences in seedling vigour trait among the three seed positions (anterior, middle and posterior portions) examined and found that seedlings from the anterior position had best vigour performance. Ogunmefun [12] and Adeyemi and Odiaka [13] reported considerable variations in pod sizes of fluted pumpkin for seed metric and physiological quality traits. The authors concluded that pod characteristics could be used as an index of selection for good seed quality in pumpkin.

Exploring seed positions in fruit of pumpkin may provide a judicious way of selecting high quality seeds to pumpkin farmers in order to enhance better land area utilization and more leaves production and thereby improve their livelihoods.

During germination the plants from the middle and far-tail region germinated first after 12 days of planting, followed by the near-tail. The plants from the far and near-head grew sluggishly and were the last to germinate. The growth parameter data results showed that the seeds located in the middle section of a pod of fluted pumpkin are far much better than those seeds collected from the head section in terms of length of vine, stem girth, number of nodes number of leaves, leaf area, percentage of germination, fresh weight and dry weight. The seed collected from the middle section is also better than the seeds collected from the far and near-tail section but just with a slight difference. The reason for this is that the middle section and the tail section contain more of female plants than the head section. Also, it is observed by Whittaker [14] and Emebiri and Nwufo [15] that female plants regenerate, much better, at the onset of the rainy season, than the male plants, they also live longer and survive severe dry season better than the male plants.

5. CONCLUSION

Fluted pumpkin is an important leafy vegetable for mankind, serving as a good source of vitamins, minerals and dietary fibre. As such, there is need to discover improved mechanism and various cultural practices by which the yield and production of the plant can be maximised. From the research, observations have been made a results drawn from which we concluded that the middle, far-tail and near-tail regions contain more female plants than the head section if planted in an ideal soil media containing poultry manure, for nitrogen and other essential elements, the yield can indeed be maximised. This research will provide an important tool for the improvement of the yield of fluted pumpkin and also a foundation for numerous researches yet to come.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Fagbemi TNF, Eleyinmni AF, Akpambang O. Nutritional composition of fermented fluted pumpkin (*Telfairia occidentalis*) seeds for production of 'ogiri ugu'. Fermented Foods and Beverages: General 2005 IFT Annual Meetings. New Orleans, Louisiana; 2005.
2. Essien AI, Ebana RUB, Udo HB. Chemical evaluation of the pod and pulp of the fluted pumpkin (*Telfairia occidentalis*) fruit. Food Chemistry. 1992;45(3):175–178.

3. Akoroda MO. Ethnobotany of *Telfairia occidentalis* (Curcurbitacae) among Igbos of Nigeria. Economic Botany. 1990;29-39. JSTOR 4255209
4. Ajibade SR, Balogun MO, Kupolati MD. Sex differences in biochemical contents of *Telfairia occidentaslis* Hook. F. Journal of Food, Agriculture and Environment. 2006; 4(1):155-156.
5. Odiaka NI. Survey on the production and supply of *Telfairia occidentalis* in Makurdi, Benue State Nigeria. Crop Production Department, University of Agriculture, Makurdi, Nigeria; 2001.
6. Ogar EA, Asiegbu JE. Effect of fertilizer rates and cutting frequency on the marketable vegetable and pod yields of in fluted pumpkin in Southern Nigeria. Agroscience. 2005;4(1):66-69.
7. Okoli BE, Mgbeogu CM. Fluted pumpkin (*Telfairia occidentalis),* West African vegetative crop. Economic Botany. 1983; 37(2):145-149.
8. Nwufo MI, Emebiri LC. Pod rot of fluted pumpkin (*Telfairia occidentalis* Hook.F.) in Imo State, Nigeria. International Biodeterior. 1990;26(1):63-68.
9. Gill LS. Taxonomy of flowering plants. Africana Fep. Publishers limited, Ibadan; 1988.
10. Ogbonna PE. Pod variation and type effects on sex, growth and yield in fluted pumpkin. African Crop Science Journal. 2008;16:185-190.
11. Aremu CO, Akinwale OB. Origin and seed positional effects on sex ratio of *Telfaira occidentalalis* hook F. grown in savanna agro-ecology. International Journal of Plant Breeding and Genetics. 2012;6:32-39.
12. Ogunmefun F. Effect of pod size and seed location in pods on seedling growth and development in fluted pumpkin. Project Report. Department of Plant Breeding and Seed Technology, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria; 2013.
13. Adeyemo MO, Odiaka NI. Early seedling growth of fluted pumpkin as affected by seed and pod sizes under nursery and field conditions. Nigerian Journal of Horticultural Science. 2005;8:35-42.
14. Whitaker TW. Cucurbits of potential economic importance: Biology and utilization of the *Cucurbitaceae.* Cornell University Press, Itheca; 1990.
15. Emebiri LC, Nwufo MI. Occurrence and detection of early sex-related differences in *Telfairia occidentalis*. Sexual Plant Reproduction. 1996;9(3):140–144.

Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/54827