



Research Article

Yield, Disease Incidence and Severity response of Fluted Pumpkin (*Telfairia occidentalis* Hook.) To Cutting Intervals in Awka South LGA of Anambra State, Nigeria

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Abstract: An experiment to investigate the yield, disease incidence and severity response of Fluted pumpkin (*Telfairia occidentalis*) to cutting intervals was carried out at the teaching and research farm of Crop Science and Horticulture in the Faculty of Agriculture, Nnamdi Azikiwe University Awka, Anambra State, Nigeria. Fluted pumpkin pods containing the seeds were obtained locally from Eke-Awka market in Awka -South Local Government Area, Anambra State, Nigeria. Healthy *Telfairia* seeds were shade- dried for 2 days to reduce moisture and prevent decay. The experiment was a simple factorial consisting of one treatment: cutting interval in four levels of cutting at 2nd, 4th, 6th and 8th week after planting (WAP) and was laid out in a randomized complete block design (RCBD) and replicated four times. The experimental plot was divided into four blocks each containing 4 beds to give a total of 16 beds. Each bed size was 4m x 2 m and with 0.5m gap between beds. Data were collected on growth and yield parameters, which include: vine length (cm), leaf area (cm²), number of branches, weight of leaves per plot (kg) and assessment of disease incidence and severity. The results showed that cutting- interval had significant effect on leaf area, where the highest leaf area (174.80cm²) was obtained at 4th-week cutting-interval which was significantly higher than 157.10cm² obtained at 2nd -weeks cutting- interval. The second highest leaf area (172.30cm²) was obtained at 6-weeks cutting -interval, which is statistically the same with leaf area of 174.80cm² and 167.80cm² obtained at 4th-week and 8th -week cutting -interval respectively while the least (157.10 cm²) was obtained at 2nd -week cutting -interval. Cutting -interval also had significant effect on number of branches, vine length, leaf weight, disease incidence and severity where the highest disease incidence and severity (72.90% and 4.00 respectively) were obtained at 8th-week cutting- interval which were significantly higher than those obtained at 2nd -week cutting- interval. Based on the results of this investigation, it is therefore recommended that harvesting of fluted pumpkin should be done at 8th -week cutting interval for increased growth and yield since the highest yield was obtained at 8th -week followed by 6th -week. To obtain higher leaf area, the recommended cutting interval for farmers in Awka-South should be at 4th -week cutting interval. To avoid high disease incidence farmers should use 2nd -week- cutting interval in as much as adequate agronomic practices are maintained.

Keywords: *Telfairia occidentalis* cutting- intervals, growth components, yield, disease incidence and severity.

Important

Key findings:

The study found that the cutting interval significantly affected the growth and yield of Fluted pumpkin (*Telfairia occidentalis*). The highest leaf area was obtained at the 4th-week cutting interval, followed by the 6th-week interval, while the highest disease incidence and severity were observed at the 8th-week interval. Harvesting at the 8th-week interval is recommended for increased yield, while the 4th-week interval is

advised for higher leaf area.

What is known and what is new?

This study adds new insights to the cultivation of Fluted pumpkin (*Telfairia occidentalis*) by examining the effects of cutting intervals on growth, yield, and disease incidence. While the importance of proper management practices in vegetable production is known, this research provides specific recommendations for cutting intervals to optimize Fluted pumpkin yield and quality. This study contributes to the existing literature by offering practical guidance for farmers to improve their cultivation practices and ultimately enhance their yields.

What is the implication, and what should change now?

The implication of this study is that farmers cultivating Fluted pumpkin can improve their yield and quality by adopting specific cutting intervals. Harvesting at the 8th-week interval can lead to increased yield, while the 4th-week interval is recommended for higher leaf area. Additionally, using the 2nd-week interval can help avoid high disease incidence. Farmers should therefore adjust their harvesting practices based on these findings to maximize their Fluted pumpkin production

INTRODUCTION

Fluted pumpkin (*Telfairia occidentalis* Hook F.) is one of the most widely cultivated leaf vegetables in south eastern Nigeria. It has gained recognition in other parts of Nigeria especially, in the North central states. It is generally regarded as a leaf and seed vegetable [1]. It belongs to the family of Cucurbitaceae.

Telfairia occidentalis is widely cultivated for its palatable and nutritious leaves. The leaves when compared with other tropical vegetables have high nutritive value. It is a high climbing perennial with partial drought tolerance and parenting root system [2]. The leaf has a high nutritional, medicinal and industrial values being rich in protein (29 %), fat (18 %), minerals and total available vitamins (20 %) [2,4]. The stem, leaf blade and petiole are covered with multi-cellular hairs which probably help confer on the plant drought resistance [5]. It is a dioecious plant, the male and female plants being separate with no gradation of sexes [6].

In Nigeria, the crop is commonly grown for the leaf and seed, especially in the South-eastern region. The succulent leaves, shoots and the seeds which are consumed as vegetables by humans and foraged by livestock (Badifu and Ogunsua, 1991 [4] are of nutritional importance. The leaves and shoots, used as food and pasture, are ready for harvest after a month of germination, and subsequent harvest occur every 2–4weeks [7]. Fluted pumpkin is one of the most widely cultivated leaf vegetables in southeastern Nigeria. The leaf finds herbal use in the treatment of anemia and diabetes [6]. Protein and oil contents of the seed are 30.1% and 47%, respectively [6]. The seed oil could be used for the preparation of margarine and pomade as well as for use as carrier for drugs [6]. Despite its importance, increasing relevance and high demand, the production, quality and market value of fluted pumpkin is affected by a number of pests and diseases [8,9]. Of these, leaf spot caused by a variety of fungi (Nwufo, 1992; Nwufo and Ihejirika, 2008; Madunagu *et al.*, 2008; Akan, 2010; Godwin- Esein *et al.*, 2015) [10-14] is the most prevalent. Leaf spot may be white, brown, gray, translucent or concentric.

Pumpkin production is still at subsistence level in many homes in Nigeria. Most farmers lack information on the right harvest schedule and cutting intervals for optimum yield of this vegetable. Recommendations on cutting regime have mostly been derived from extrapolation from practices obtainable in other vegetables. To ascertain the cutting schedules a planned field plot experiment that would provide the necessary data for valid recommendations was needed. These considerations prompted the present studies.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at teaching and research farm of Crop Science and Horticulture in the Faculty of Agriculture, Nnamdi Azikiwe University Awka, Anambra State (6°15'N and 7°6'E). The site has an average rainfall of 1810.3mm per annum and a mean minimum and maximum temperature of 27°C and 27.3°C respectively and a relative humidity of 72.3% (Uko *et al.*, 2018) [15]. The soil textural class is sandy loam.

Planting and planting materials

Fluted pumpkin pods containing the seeds were obtained locally from Eke-Awka market, Awka- North Local Government Area of Anambra State, Nigeria. Healthy *Telfairia* pods were processed for seeds which were shade dried for 2 days to reduce moisture and prevent decay. The fluted pumpkin seeds were sown on the flat beds with

the spacing of 1 m x 1 m at one seed per stand. After planting, emergence was observed after 2 weeks after planting.

Experimental Design and Treatments

The experiment was laid out in a randomized complete block design (RCBD) and replicated four times. The conventional tillage operations which include land clearing and preparation of beds were carried out to prepare the seedbeds. The land was cleared and beds were constructed. The experimental land was divided into four blocks each containing 4 beds to give a total of 16 beds. Each bed size was 4m x 2m and with 0.5m gap between beds. The blocks were spaced 1m apart to ease movement during cultural operations. A bed contained 8 plants. The treatment involve 4 cutting intervals which are 2nd, 4th, 6th and 8th weeks after planting (WAP). The organic fertilizer used was poultry manure which was applied at the equivalent weight of 3.2 kg per plot.

Land Preparation

The experimental site was slashed, ploughed and harrowed using cutlass and hoe. The plot consisted of flat beds measuring 4 m x 2 m with inter-plot spacing of 0.5 m and a space of 1.0 m between the blocks. Poultry manure was cured under shade for a week, thoroughly mixed, measured, applied on the bed and was incorporated into the soil.

Irrigation: The experimental field was irrigated by the natural rainfall.

Weed control: Weeds were controlled by manual hoe weeding at two weeks interval, in order to kept the plots clean. Weeding was done manually at 3 and 5 weeks after planting using hoe and cutlass.

Harvesting: Harvesting was done on different intervals at 2nd, 4th, 6th and 8th weeks after planting. The vines were cut with a sharp knife. Harvesting was done in the evening to prevent the vegetables from wilting excessively.

Data Collection: The data were collected on the growth and yield parameters. Observation and measurement of growth characters were done at intervals of two weeks beginning from 2nd week after planting (WAP). Parameters measured include;

Vine length (cm): Vine length of three selected plants per plot were cut and measured using a meter rule. The vines were cut 20cm above the ground comprising of two or more leaves and the average was recorded.

Leaf area (cm²): This was obtained using a graphical method. Each leaf was placed on a graph sheet with pin at the edge to keep the leaf in a static position. The mapped-out boxes were counted and recorded.

Number of branches: The number of branches per plant were carefully counted from the three selected plants at 2WAP to 8WAP and the average per plot was determined and recorded.

Weight of leaves per plot: The weight of the harvested pumpkin shoot was weighed after harvesting with an electronic balance scale, the data gotten was recorded per plot.

Assessment of Disease Incidence and severity: Assessment of disease incidence and severity was carried out in the experimental farm at 2nd, 4th, 6th and 8th WAP. Disease incidence was accessed by visual observation of the diseased pumpkin plants in the sample. The Percentage disease incidence of the plant was determined according to Snedecor and Cochran (1994) as follows

$$\text{Disease incidence} = \frac{\text{Number of diseased plants}}{\text{Total number of plants sample}} \times \frac{100}{1}$$

Severity of diseases on the other hand was assessed by recording the extent or degree of the disease in the infected plants of the sampled plots in the field. A five-point scale of 0-5 was used (IRRI, 2006) where

0= No infection

1= 1-20% of plants infected

2= 21-40% of plants infected

3= 41-60% of plants infected

4= 61-80% of plants infected

5= 81-100% of plants infected.

Soil and Manure Analysis: Soil samples were collected from the research field before layout of the experiment for the determination of the soil properties. This was done to determine the initial soil chemical and physical properties from the experimental field.

Laboratory Analysis of diseased plant: (Collection of infected specimens); The specimens were randomly collected from the diseased plants. The affected leaves were cut, packaged in a brown sterile envelope and taken to the pathology laboratory of Crop science and Horticulture of Nnamdi Azikiwe University Awka for analysis.

Reagents: Reagents used includes: Ethanol, Lactic acid, Methylated spirit and Potato dextrose agar (PDA).

Sterilization: The working area was first surface sterilized using Methylated spirit. The Fluted pumpkin specimen collected were washed in tap water, cut into sections with a sterilized blade and then surface sterilized with 10% ethanol for 5 minutes and then rinsed twice in a sterile distilled water.

Preparation of Potato Dextrose Agar (PDA): Ten grams of PDA was weighed using an electronic scale and was carefully poured into a conical flask and 250ml distilled water was added and stirred properly. The flask was corked with cotton wool wrapped in an aluminum foil. Water was added into the autoclave and the conical flask containing the PDA was placed inside it and then covered. This was heated at a temperature of 120°C, for 20-25mins. The PDA was brought out and allowed to cool a little and 5ml of it was dispensed into each of the 9cm petri dishes with two drops of lactic acid to prevent the growth of bacteria.

Incubation of the Infected Specimen: The infected specimen was picked with an inoculating loop and placed at the center of the petri dishes containing the PDA and then covered and masking tape was used to wrap it round and then labelled according to the date and the variety. While inoculating, the air around was sterilized by keeping the spirit lamp lighted. The inoculated media was checked on daily basis and growth was observed on the third day. This was sub-cultured three times to obtain pure-cultures which were preserved for microscopic identification of the fungal organisms.

Microscopic Identification of the Fungal Organisms: Resulting pure cultures were used for the identification of the fungal organisms, and this was done with the aid of a compound microscope. Slides were prepared by using a syringe to put a drop of water after which, the pure culture was teased on it and then covered with the slide cover. These were viewed under the microscope with a magnification of x100. The fungi were identified using illustrated pictures of fungi by Barnett and Hunter (1994) [16]. Micrographs of identified pathogen were taken.

Data Analysis: Data collected were subjected to Analysis of Variance (ANOVA) for Randomized complete Block Design (RCBD) using GensStat 7.0 DE version (2007). Mean separation was done using Fisher's Least Significant Difference (F-LSD) at 5% level of probability.

RESULTS AND DISCUSSION

Effect of cutting- interval on the yield of *Telferia Occidentalis* at 2nd, 4th, 6th and 8th weeks after planting (WAP).

Table 1 shows that there was significant ($p < 0.05$) effect of cutting- interval on leaf area where the highest leaf area (174.80cm²) was obtained at 4th -weekly cutting interval which was significantly higher than 157.10cm² obtained at 2nd -weekly cutting -interval. This was followed by leaf area of 172.30cm² obtained at 6th-weekly cutting -interval. This is statistically the same with leaf area of 174.80cm² and 167.80cm² obtained in 4th -weekly and 8th -weekly cutting- intervals respectively while the least (157.10cm²) was obtained at 2nd -weekly cutting-interval.

Cutting interval also had significant ($p < 0.05$) effect on number of branches, where the highest number of branches (15.33) was obtained at 8th-weekly cutting interval followed by 9.08 obtained at 6th -weekly cutting-interval while the least (2.29) was obtained at 2nd -weekly cutting- interval (**Table 1**).

Table 1 also show that there was significant ($p < 0.05$) effect of cutting- interval on vine length where the highest vine length (95.40cm) was obtained at 8th -weekly cutting- interval followed by 95.00cm obtained at 6-weekly cutting interval while the least (58.00cm) was obtained at 2nd-weekly cutting- interval. The vine length at 2nd, 4th and 8th-weekly cutting -interval are statistically the same (**Table 1**) Also there was significant ($p < 0.05$) effect of cutting interval on leaf weight where the highest leaf weight (0.40 kg) was obtained at 8th-weeklycutting-

interval followed by 0.37kg while the least (0.09kg) was obtained at 2nd -weekly cutting interval. The leaf weight of 0.40kg is significantly higher than 0.31kg and 0.09kg obtained at 4th -weekly and 2nd-weekly cutting- intervals respectively.

The growth parameter obtained were observed to increase in time and age of the cutting- interval. The leaf area had its highest value at 4th-weekly cutting interval and a reduction was observed at 6th weekly followed by 8th weekly.

Table 1: Effect of cutting interval on the yield parameters of *Telferia occidentalis* at 2nd, 4th, 6th and 8th weeks after planting

Cutting intervals Weeks after planting (WAP).	Leaf area (cm ²)	Number of branches	Vine length (cm)	Leaf weight (kg)
2	157.10	2.29	58.00	0.09
4	174.80	5.06	87.40	0.31
6	172.20	9.08	93.00	0.37
8	167.80	15.33	95.40	0.40
F-LSD _{0.05}	13.49	0.89	16.89	0.06

Effect of cutting- interval on yield, disease incidence and severity at 2nd, 4th, 6th and 8th weeks after planting

Table 2. shows that there was significant ($p < 0.05$) effect of cutting interval on yield, disease incidence and severity of fluted pumpkin. Table 2 shows that there was significant ($p < 0.05$) effect of cutting- interval on disease incidence where the higher disease incidence (72.9%) was obtained at 8-weekly cutting interval followed by 62.50% obtained at 6th -weekly cutting interval while the least (0.00%) was obtained at 2nd -weekly cutting-interval. It was also observed that disease severity increased with number of cutting- interval and the age of the plant. There was also significant ($p < 0.05$) effect of cutting- interval on disease severity where the highest disease incidence (4.00%) was obtained at 8th -weekly cutting- interval followed 3.56% obtained at 6th-weekly cutting-interval while the least (1.00%) was obtained at 2nd -weekly cutting interval. Generally, disease severity increased with the age of the plant and cutting- interval.

Table 2: Effect of cutting interval on yield, disease incidence and severity at 2nd, 4th, 6th and 8th weeks after planting

Cutting interval Weeks after planting (WAP).	Yield (tha ⁻¹)	Disease incidence (%)	Disease severity (%)
2	0.11	0.00	1.00
4	0.39	21.50	1.75
6	0.47	62.50	3.56
8	0.50	72.90	4.00
F-LSD _{0.05}	0.07	13.27	0.57

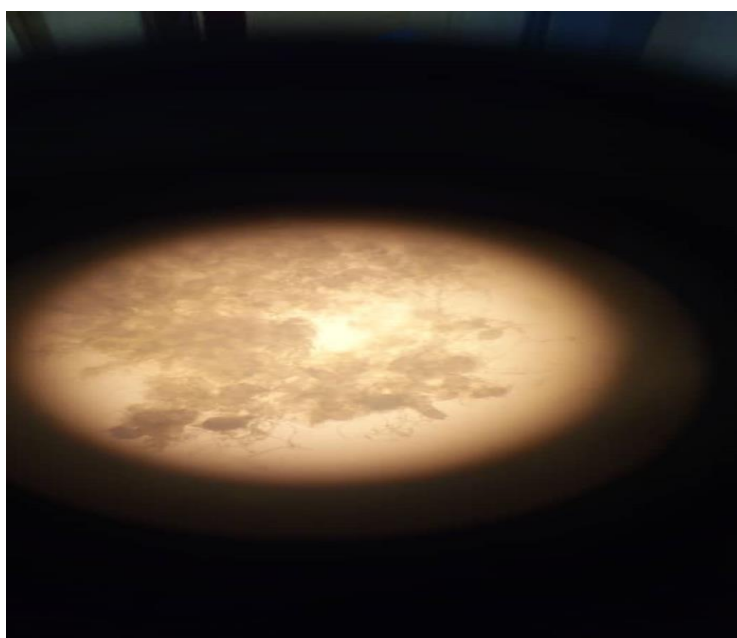
Isolation and identification of fungi organism associated with fluted pumpkin in the field.

The result of isolation and identification showed that the fungal organism isolated was identified as *Aspergillus spp* (Plate 2). The identification was based on the growth characteristics and fruiting bodies of the fungus confirmed using illustrated pictures of fungi by Barnett and Hunter (1999) [16].



Magnification x $\frac{3}{4}$

Plate 1: Pure culture of *Aspergillus* spp isolated from fluted pumpkin



Magnification x 100

Plate 2: Micrograph of *Aspergillus* spp obtained from infected pumpkin plant

From this study, the effect of cutting intervals gave a higher number of branches, leaf weight and vine length at 8th -week cutting- intervals. The reason for the low yield experienced in weeks two and four could have been as a result of cutting shock compared to other vines which were not cut until week eight. This is in disagreement with the report of Asiegbu (1983) [17], who reported that higher leaf yield and number of branches was as a result of frequent harvest schedule of *Telfairia occidentalis*. He also observed that greater branching resulting from more frequent removal of apical dominance with cutting of the terminal buds allowed for more flushes and this also corroborates the findings by Ossom, (1986) [18] on fluted pumpkin in which reduced harvest interval caused profuse branching resulting in more vines and leaf growth but this is contrary to the finding of this investigation, where more branching and vine length were obtained at the 8th weekly cutting interval. This calls for more investigation.

The disease incidence and severity of *Telfairia occidentalis* was observed more at the 8th weekly cutting-intervals. This could be as a result of the pumpkin plants being at older age in the field thereby making them more susceptible to disease infection which is similar to Iwuagwu *et al.*, (2013) [19], who discovered that *Telfairia occidentalis* disease were infected in the field before it proceeded to the store.

CONCLUSION

From this investigation it could be observed that there was significant effect of cutting interval on leaf area, where the highest leaf area (174.80cm²) was obtained at 4th -weekly cutting interval which was significantly higher than 157.10cm² obtained at 2nd -weekly cutting interval. The second highest leaf area (172.30cm²) was obtained at 6th -weeks cutting interval, this is statistically the same with leaf area of 174.80cm² and 167.80cm² obtained in 4th -weekly and 8-weeks cutting interval respectively while the least was obtained at 2nd -weekly cutting interval. There was significant effect on the number of branches, vine length, leaf weight, disease incidence and severity where the highest was obtained at 8th -weekly cutting interval which was significantly higher than that obtained at 2nd -weekly cutting interval. The cutting intervals had significant effect on disease incidence and severity where the highest and lowest was obtained at 8th -weekly and 2nd -weekly respectively which was as a result of the age of the plant where its resistance to diseases reduces as the plants age increase.

Recommendations

Based on the results of this investigation, it could therefore be recommended that harvesting of fluted pumpkin should be done at 8th and 6th -weekly cutting interval for increased growth and yield since the highest yield was obtained at 8th -weeks followed by 6th -weekly. Also, to obtain a higher leaf area, the recommended cutting intervals for farmers in Awka south should be at 4th -weekly cutting interval. To avoid high disease incidence farmers should use 2nd -weekly cutting interval in as much as adequate agronomic practices are used.

Conflict of Interest

The authors declare that they have no conflict of interest.

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Ethical approval: The study was approved by the Institutional Ethics Committee of Nnamdi Azikiwe University

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