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COMPARATIVE STUDIES ON GROWTH AND EVALUATION OF SOME HARVESTED PARTS OF FLUTED PUMPKIN (*TELFAIRIA OCCIDENTALIS* HOOK F.) PLANTS

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ABSTRACT

A study was conducted to compare the growth and evaluation of some harvested parts of fluted pumpkin plants. Two field experiments in two planting seasons (2009 and 2010) were used for the study. A total of 500 plants in each planting season were studied at the Teaching and Research Farm of the Department of Crop Science, Faculty of Agriculture, University of Nigeria, Nsukka. The results showed that the male fluted pumpkin partitioned large number of their photosyntates in tendril production and subsequently slow growth and low fresh yield while, the female partitioned greater part of their photosyntates in leave production, faster growth and higher fresh yield. The total number of tendrils harvested from males during the first (2009) and second (2010) planting seasons were 261.5 and 251.6 respectively while the total number of tendrils harvested from the females during the first and second planting seasons were 78.2 and 73.1 respectively. On the contrary, number of leaves per plant was harvested from the male less than female plants, while 597.0 and 590.8 leaves per plant were harvested from the male plants during the first and second planting seasons, respectively while 712.9 and 742.3 leaves per plant were harvested from the female counterpart during the first and second planting seasons respectively. There was a significant difference ($P < 0.05$) between the male and female plants with respect to both number of leaves and tendrils per plant. More vines were also harvested from the female gender than the males.

Key words: *Telfairiaoccidentalis*, vegetative growth, yield evaluation, photosynthates.

INTRODUCTION

Fluted pumpkin is a creeping vegetative plant grown mainly for their leaves and shoots. Fluted pumpkin is a dioecious herb climbing by coiled tendrils and their root system ramifies the soil to a shallow depth Akoroda (1990). The fruits of fluted pumpkin contain many ovoid seeds for different genders of the plant. These seeds are mainly used by farmers as planting materials. The rate of leaf production, general increase in shoot and subsequent yield performance differs in the male and female fluted pumpkin partly due to their genetic make-up and the number of leaves available for photosynthesis. This contributes to the different growth performance and yield obtainable in the fluted pumpkin genders.

Fluted pumpkin is one of the most cultivated vegetable in Nigeria because of the great economic return to farmers. Harvesting of fluted pumpkin can begin at four weeks after emergence and can be done by cutting the shoot at the base close to a new shoot to allow an offshoot of another branch of the plant for frequent harvest Asiegbu (1983). Oluchukwu and Osson (1988) suggested the use of vine length as harvest indicator since different sex have different growth rate for maximum utilization and profit. The harvested leaves and shoots are sold fresh immediately after harvest for maximum profit as they cannot be stored for a long time. Fresh leaves and shoots attract higher premium than preserved ones. Harvesting of terminal shoots are encouraged for branching and optimum yield performance. The difference in growth rate of the male and female fluted pumpkin can be detected at the juvenile growth stage of the plant by means of tendril emergence Chukwurah and Uguru (2010)

Fluted pumpkin is a drought-tolerant perennial crop but it is grown as an annual crop under the West African traditional farming system. It can protect the soil surface against direct impact of rainfall and can also compete favourably with weeds. Pests and diseases of fluted pumpkin are rarely serious Williams *et al.* (1991). The growth of fluted pumpkin plant is not seriously affected by drought, weed, pests and diseases. Input with respect to these problems is minimized. Most farmers therefore cultivate this crop because of higher yield and profits expected from the harvests of the plants parts. Harvesting of the leaves and shoots can be done at about 2 – 3 weekly intervals throughout the vegetative growth of the plant. Yield characters can be identified by growth vigor, size and number of leaves, number of tendrils, and thickness of shoots. The number of leaves exposed to sunlight contributes to photosynthetic growth rate and yield in plants.

The knowledge of growth and evaluation of some harvested parts of fluted pumpkin helps the growers to know the basic management practices needed for proper growth and high yield of fluted pumpkin. Nursery planting, field transplanting, application of organic manure, weeding and harvesting are some of the management practices to be gained by growers. This will help to significantly improve leaf yield. Presently, to our knowledge, the comparative studies on the growth and evaluation of some harvested parts of male and female fluted pumpkin is not available in the literature. This study aimed at comparing the growth vigor in the male and female fluted pumpkin after each harvest in order to obtain their total yield. Vegetative part of fluted pumpkin such as the leaves and the stems are the part preferred by the growers because of their economic importance. These parts are needed by consumers of fluted pumpkin.

MATERIALS AND METHODS

Planting and measuring materials: The planting materials used for the study consisted of eight pods of fluted pumpkin, nursery boxes, sawdust, watering can, micrometer screw guage, metre rule and weighing balance. The eight pods of fluted pumpkin used for the study were obtained from Nsukka market. The saw dust was obtained from Nsukka wood mill industry.

Experimental Location: Two field experiments in two planting seasons (2009 and 2010) were conducted under two different rainy season conditions at derived savannah agro ecological zone of Nsukka, South Eastern Nigeria. The study was conducted at the Teaching and Research Farm of the Department of Crop Science, Faculty of Agriculture, University of Nigeria, Nsukka. The zone where the experiments were sited is located at latitude 06^{o} 52^{1}N, longitude $07^{o}24^{1}$E and at altitude of 447 m. The rainfall is bimodal with an annual total of about 1, 500 mm. The ambient temperature ranges from 20^{o}C to 30^{o}C during the rainy season.

Experimental Procedures: Fluted pumpkin seeds were extracted from the pods, washed with water to remove the pulps and air dried for a period of one day. The sawdust was prepared by mixing evenly with water. The prepared saw dust was then placed inside wooded nursery boxes. The seeds were then planted in the saw dust (3 cm depth) inside nursery boxes. Each nursery box contained 20 seeds and 25 nursery boxes were used for the study. The sprouted fluted pumpkin seedlings were transplanted to already prepared field at ten days after planting under full natural sunlight. Poultry manure was applied to the field at the rate of 3 g per plant a week before ridging. A total of five hundred fluted pumpkin plants were used at each planting season. Weeding was done manually. Harvesting of the shoots starts at 4 weeks after planting and continued at 2 – weekly intervals till 12 weeks after planting. Flower and pod production were used to differentiate the females from the males. The same experimental procedure was repeated in the next planting season and the same data collected to validate the results of the study.

Data collection and statistical analysis: The data collected for each harvest were outlined as follows: number and weight (kg) of leaves, number and weight (kg) of tendrils, length (cm) and girth (mm) of shoots. The values obtained from each parameter were added together to obtain the total of the parameter to determine the level of performance of each plant. A meter rule was used to measure the length of harvested shoots; a micrometer screw guage was used to measure the girth while the harvested shoots and tendrils were weighed with a weighing balance. The data collected was analyzed to obtain the means per plant of each parameter measured. The data were statistically analyzed using the statistical analysis system package (SAS). Student's *t*-test pairing procedure outlined by Obi, (2002) was used to determine the level of significance in both genders.

RESULTS AND DISCUSSION

The *t*-test analysis showed a significant difference ($P < 0.05$) between the mean lengths of shoots, number of leaves, number of tendrils and fresh shoot weight per plant at each harvest in both genders of fluted pumpkin plants (Tables 1 – 4). Longer and thicker vines were harvested from the female plants than those of the male counterpart. At the first harvest (4 weeks after planting date), the mean shoot length (cm) obtained from the female was 74.2 cm and 76.0 cm per plant while 32.1 cm and 34.6 cm per plant was harvested from the males in the 2009 and 2010 planting seasons respectively, an indication of poor beginning by the males. The total length of harvested shoots from the male plants during the first and second planting seasons were 523.5 cm and 523.5 cm per plant respectively. The total length of harvested shoots from the female plants during the first and second planting seasons were 637.2 cm and 633.5 cm per plant respectively. There was a significant difference between the male and female fluted pumpkin with respect to the total length of harvested shoots in both planting seasons. Growth rates in plants are influenced by growth hormone production and distribution. The patterns of growth hormone production and distribution may differ in both genders of fluted pumpkin which resulted to longer and thicker shoots harvested from the female plants. The rate of increase in ribonucleic acid synthesis promotes enzyme synthesis in plants and general plant growth and this increased rate of ribonucleic acid and enzyme synthesis differs in different plant species and gender of the same species (Wareing and Philips 1986). The mean stem girth (mm) harvested from both genders

varied at the first, second and third harvest but the differences were not significant ($P > 0.05$) in both planting seasons (Tables 2 and 4). Statistical difference was recorded at the peak (8, 10 and 12 weeks after the planting date) of the plant growth in both planting seasons. The total stem girth harvested from the male plants during the first and second planting seasons were 38.2 mm and 37.0 mm, respectively. The total stem girth harvested from the female counterpart during the first and second planting seasons were 53.3 mm and 50.6 mm, respectively. Though the total stem girths obtained from the male and female plants in both planting seasons varied, the difference were statistically non – significant (Tables 2 and 4). This may indicate that the same amount of the products of photosynthesis may probably be partitioned to the stem girths of the male and female fluted pumpkin.

The number of leaves harvested from both genders differed significantly ($P < 0.05$) throughout the study period in both planting seasons. More number of leaves was harvested from the female plants than those of the male counterpart. At the first harvest (4 weeks after planting), the mean number of leaves obtained from the male plants were 47.8 and 52.0 leaves per plant in the first and second planting seasons, respectively (Tables 1 and 4). From the male plants, 19.7 and 18.8 leaves per plant were harvested at the first harvest (4 weeks after the planting date) during the first and second planting seasons, respectively. This is an indication of poor harvest with respect to number of leaves in this gender of fluted pumpkin (Tables 1 and 4). Prior to flower production (10 weeks after planting), 217.3 and 203.9 leaves per plant was harvested from the male gender at the first and second planting seasons respectively while 231.5 and 231.6 leaves were harvested from the female counterpart at the first and second planting seasons respectively. The total numbers of leaves harvested per plant from the male fluted pumpkin during the first and second planting seasons were 597.0 and 590.8 leaves respectively while that of the female counterpart were 712.9 and 742.3 leaves, respectively. These results indicated that significant difference ($P < 0.05$) existed between the male and female fluted pumpkins in respect of leaf production with the females producing more leaves than the males. These mean that the female fluted pumpkin exposed more number of leaves to sunlight than the males. Leaves are site of food production in plants and fluted pumpkin being a leafy vegetable partitions greater amount of photosynthetic products to their leaves. The more number of leaves exposed to sunlight by the females the greater the amount of foods (leaves, stem, pods and seeds) produced by them leading to higher rate of shoot elongation and more shoot harvested. The more number of leaves produced by the females suggested that greater amount of photosynthetic products were partitioned to them than the male counterpart. Leaves are known to originate from periclinical divisions of cells on the flank of the plant apex thus small protuberance formed can give rise to future primordial and the number of layers involved in this division varies in different species and sexes of the plant. In grasses, the periclinal divisions begin in the outermost layer of the tunica while in monocot and dicot plants, periclinal divisions begin in the layer below the tunica. The extent to which the tunica and corpus partakes in the initiation of the primordial varies greatly in different plant species and gender. When the leaf primordial initiates at the apex of the stem, leaves start to develop Wareing and Philip (1986). Variation in leaf number therefore depends on species, varieties and gender.

The number of tendrils harvested from both genders also differed significantly ($P < 0.05$) throughout the study period in both planting seasons. More number of tendrils were harvested from the males than those of females. At the first harvest (4 weeks after planting), the mean number of tendrils harvested from the male gender was 18.5 and 16.2 tendrils per plant in the first and second planting seasons, respectively while 4.3 and 4.3 tendrils per plant was harvested from the female gender in the first and second planting seasons respectively. At the peak of the plant's growth for the male gender (8 weeks after planting), 44.4 and 44.2 tendrils per plant were harvested from the males at both planting seasons respectively. Similarly at the peak of the plant's growth for the female gender (10 weeks after planting date) 19.0 and 15.1 tendrils per plant was harvested from the females in the first and second planting seasons respectively. The total number of tendrils harvested per plant from the male plants during the first and second planting seasons was 261.5 and 78.2 respectively. In the same vein, the total numbers of tendrils harvested per plant from the female fluted pumpkin during the first and second planting seasons were 78.2 and 73.1 respectively. The results indicated that the male gender partitioned a large amount of their photosythates in tendril production and subsequent slow growth while the female counterpart partitioned amount of their photosynthates in leaf production and subsequent faster growth. The leaves have more surface area exposed to sunlight for photosynthesis than tendrils. Therefore the males with more number of tendrils than number of leaves produced less food during photosynthesis which resulted to less number and thinner shoots harvested from them. In contrast, the female fluted pumpkin with less number of tendrils than number of leaves produced more food during photosynthesis which resulted to thicker and more number of shoots harvested from them.

The overall yield (shoot weight kg) per plant of the fresh edible part of the plant harvested from the females was more than that obtained from the male counterpart. The fresh leaves harvested more from the females are preferable than the tendrils harvested more

from the males. Farmers are more interested in the leaves and shoots than tendrils for economic purpose. The leaves are the most consumed part of the plant and are also the main target by the growers. The difference in the sex chromosome in the male and female plants as revealed by Uguru and Onovo (2010) may be suggested as the reason for the different total harvest obtained from different genders of fluted pumpkin in this study. The difference in the sex chromosome in fluted pumpkin results to different growth rate, yield and other morphological characteristics obtainable in the plant. Most of the products of photosynthesis produced by the males were partitioned to tendril production as against leave and stem growth. This lead to low fresh yield obtained from the male plants. This is because tendrils are of low benefit to consumers. The females partitioned large number of their photosynthates to leave production, faster growth rate and higher fresh yield. This was revealed by the more number of leaves harvested from the female plants. Famers prefer the female plants to the male plant because of the quick growth and high economic return (Ajibade *et al.*, 2004). Fresh leaves and shoots of fluted pumpkin are beneficiary to consumers and are of high demand.

Table 1. Mean shoot length (cm), number of leaves and tendrils harvested from the male and female fluted pumpkin in 2009.

Week	Length of shoot (cm) produced by males	Length of shoot (cm) produced by females	*t* 0.05	Number of leaves produced by males	Number of leaves produced by females	*t* 0.05	Number of tendrils produced by males	Number of tendrils produced by females	*t* 0.05
4	32.1	74.2	9.0*	19.7	47.8	4.7*	18.5	4.3	2.6*
6	106.7	117.6	15.1*	42.3	57.8	12.0*	29.8	4.9	5.4*
8	111.8	127.0	24.0*	107.7	148.9	14.3*	44.4	9.3	12.1*
10	135.0	141.4	20.0*	217.3	231.5	18.8*	77.1	19.0	17.6*
12	137.9	177.3	51.0*	210.0	226.9	26.3*	91.7	40.7	24.5*
Total	523.5	637.2	23.8*	597.0	712.9	15.2	261.5	78.2	12.4*

*indicate a significant difference with P < 0.05 by *t*-test (n = 500)

Table 2. Fresh shoot weight (kg) and stem girth (mm) harvested from the male and female fluted pumpkin in 2009

Week	Fresh shoot weight (kg) from males	Fresh shoot weight (kg) from females	*t* 0.05	Stem girth (mm) from males	Stem girth (mm) from females	*t* 0.05
4	3.02	5.74	1.2*	5.9	6.5	0.04ns
6	4.14	6.80	1.5*	6.5	7.4	0.14ns
8	7.0	9.91	1.7*	7.0	8.3	0.15ns
10	10.0	15.4	1.8*	8.8	13.5	1.70*
12	13.1	20.0	2.1*	10.0	17.6	1.81*
Total	37.26	57.85	1.80*	38.2	53.3	0.77ns

ns and * indicate a non-significant and a significant difference with *P < 0.05* by *t*-test, respectively (n = 500)

Table 3. Mean shoot length (cm), number of leaves and tendrils harvested from the male and female fluted pumpkin in 2010 planting season

Week	Length of shoot (cm) produced by males	Length of shoot (cm)produced by females	*t* 0.05	Number of leaves produced by males	Number of leaves produced by females	*t* 0.05	Number of tendrils produced by males	Number of tendrils produced by females	*t* 0.05
4	34.6	76.0	9.5*	18.8	52.0	4.9*	16.2	4.3	2.4*
6	104.9	115.7	14.2*	43.0	64.4	12.7*	31.7	3.2	4.0*
8	113.5	133.0	25.3*	112.6	147.0	15.1*	44.2	9.1	12.0*
10	134.9	149.8	23.5*	203.9	231.6	17.5*	65.0	15.1	17.4*
12	135.6	159.0	48.7*	212.5	257.3	27.2*	94.5	41.4	24.5*
Total	523.5	633.5	24.4*	590.8	742.3	15.5*	251.6	73.1	12.1*

*indicate a significant difference with P < 0.05 by *t*-test (n = 500)

Table 4. Fresh shoot weight (kg) and stem girth (mm) harvested from the male and female fluted pumpkin in 2010.

Week	Fresh shoot weight (kg) from males	Fresh shoot weight (kg) from females	*t* 0.05	Stem girth (mm) from males	Stem girth (mm) from females	*t* 0.05
4	3.01	6.02	1.7*	5.8	6.4	0.03ns
6	5.56	8.34	1.8*	6.1	6.9	0.08ns
8	8.10	12.0	2.1*	7.0	8.2	1.00ns
10	10.01	19.42	2.5*	8.1	12.9	1.67*
12	12.73	24.1	2.8*	10.0	16.2	1.79*
Total	39.41	69.88	2.2*	37.0	50.6	0.91ns

ns and * indicate a non-significant and a significant difference with $P < 0.05$ by *t*-test, respectively (n = 500)

REFERENCES

Ajibade, S. R, M. O. Balogun, O. O. Afolabi, and M. D. Kupolati (2004). Sex difference in biochemical contents of *Telfairia occidentalis* Hook F. Proc. Gen. Soc.Nig. 30: 246-249.

Akoroda, M. O. (1990). Ethnobotany of *Telfairia occidentalis* (curcubitacae) among Igbos of Nigeria. Econ. Bot. 44(1): 29-39.

Asiegbu, J. E. (1983). Effects of methods of harvest and interval between harvest on edible leaf yield in fluted pumpkin. Scientia Hortic; 21:129-136.

Chukwurah, N. F. and M. I. Uguru (2010). Juvenile morphological markers for maleness in fluted pumpkin (*Telfairia occidentalis* Hook F.). J. Tropic. Agr, Food, Envt and Ext. 9 (2) 90-96.

Obi, I. U. (2002). Statistical methods of detecting differences between treatment means and research methodology issues in laboratory and field experiments 2nd Ed., AP Express Publication Ltd; Nsukka, Nigeria, 198p.

Oluchukwu, J. A. and E. M. Ossom (1988). Effect of management practice on weed infestation, yield and nutrient concentration of fluted pumpkin (*Telfairia occidentalis* Hook F.) J. Trop. Agric. 65(4):317-320.

Uguru, M. I. and J. C Onovo (2010). Gender in fluted pumpkin (*Telfairia occidentalis* Hook F.). Intl. J. Plant Breed., 4 (1): 7-12.

Wareing, P. F. and Philips I. D. J. (1986) Growth and differentiation in plant. 3rd Ed Pergamon Press Tokyo, Toronto pp 343.

Williams, C. N, J. O. Uzo and W. T. H. Peregrine (1991).Vegetable production in the Tropics. Macmillan Press Ltd London 305ppx.