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Effect of spacing on growth and yield of fluted pumpkin, *Telfaria occidentalis* (Hook f.) in Okigwe, Nigeria

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ABSTRACT

A field experiment was conducted during the cropping season of 2017 to determine the most suitable plant spacing for optimum growth and yield of fluted pumpkin, *T. occidentalis* in Okigwe, Nigeria. The experiment was laid out in a Randomized Complete Block Design with three replications. The experimental treatments consisted of 40 cm × 40 cm (T_1), 50 cm × 50 cm (T_2), 60 cm × 60 cm (T_3), and the standard spacing of 100 cm × 100 cm (T_4) which served as control treatment. Data were collected on some growth and yield parameters at 2, 4, 6 and 8 weeks after planting (WAP). Analysis of variance was conducted on the data collected and significant means were separated using Fischer's Least Significant Difference (F-LSD) at 5 % significance level. The results revealed that plant spacing had no significant effect (P>0.05) on number of leaves, branches and vine length. Leaf area and the number of nodes per plant were significantly (P < 0.05) influenced by plant spacing. Standard spacing of 100 cm × 100 cm (T) and spacing of 60 cm × 60 cm (T) ranked first and second with 10.86 and 9.70 nodes per plant, and 33.40 cm^2 and 33.03 $cm^2$for leaf area respectively. Fresh and dry matter yields performed in the order $T_4>T_3>T_2>T_1$.

Keywords: Plant spacing, *Telfairia occidentalis,* vine length, yield

INTRODUCTION

Fluted pumpkin, *Telfairia occidentalis* (Hook. f.) originated from West Africa's high – rainfall forest belt. The largest diversity in plant populations can currently be found in south-eastern Nigeria (Schippers, 2002). The leaves and seeds are very nutritious and frequently consumed by 35 million people, including in Western Cameroon and Benin, where the immature edible seeds are preferred rather than the leaves (Egbekan, *et al*, 1998). In Nigeria, the Igbos calls it "ugu" and the Yorubas use the name ugwu. In Cameroon, it is referred to as ekobon (Odiaka, 2001).

Plant spacing is an important agronomic practice which varies from one crop to another. It is a common practice by farmers to ensure good yield and harvest. Good spacing enhances plant development and growth, with improved consequential yield. Odiaka, (2001) and Odiaka *et al.* (2008) had documented the benefits of good spacing on crop yield. However, farmers in southeast Nigeria practice different plant spacing on *T. occidentalis* with varying results in terms of shoots, leaf, and pod yield. This disparity necessitated the desire to conduct this experiment adopting different plant spacing methods in order to ascertain the most suitable plant spacing for fluted pumpkin, *T. occidentalis* in Okigwe agroecological zone of Nigeria for optimum growth and yield performance.

MATERIALS AND METHODS

The experiment was conducted at the Vegetable Research Farm of NIHORT Mbato Outstation, Okigwe, Nigeria. The site was cleared manually with cutlasses, pulverized and planting beds of dimension 3m x 3m ($9m^2$) were made with hand hoes. The experimental treatments consisted of 4 plant spacing dimensions; 40 cm × 40 cm (T_1), 50 cm × 50 cm (T_2), 60 cm × 60 cm (T_3) and 100 cm × 100 cm (T_4) laid out in Randomized Complete Block Design (RCBD) and replicated 3 times. The following agronomic parameters: number of leaves, vine length, collar diameter, number of branches,

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number of nodes, and leaf area (cm^2) were collected at 2, 4, 6 and 8 weeks after planting (WAP) using the method described by Obiefuna *et al.* (2012), while fresh and dry weights were collected at harvest from two (2) randomly selected plants. Data collected were subjected to Analysis of Variance (ANOVA) using Microsoft Excel Package 2007 Edition. The means were separated using Fisher's Least Significant Difference (F-LSD) at 5% significance level.

RESULTS

Effect of different plant spacing on the number of leaves and branches of *T. occidentalis*

The results presented in Tables 1 and 2 show the number of leaves and branches of *T. occidentalis* as influenced by plant spacing. No significant difference ($P>0.05$) existed among the treatment means. Results however showed that there was a steady increase in the number of leaves and branches as the plants grow. The highest number of leaves (21.29) was obtained from plants sown at 100 cm × 100 cm (T_4) spacing, followed by T_3 (18.48) and T_2 (18.29) while the lowest number of leaves was recorded from T_1 (17.67). *T. occidentalis* in T_4 recorded the highest number of branches (2.60). This was closely followed by T_3 (2.24). However, no significant difference ($P>0.05$) was found between the treatment means for (T_1) and (T_2) plant spacing as both of them recorded the same number of branches per plant per plot respectively (Table 2).

Effect of plant spacing on vine length

Main vine length and diameter of *T. occidentalis* are presented in Tables 3 and 4. Analysis of variance indicated that non-significant variation exists in vine length and diameter at 6 and 8 WAP. At 6 WAP, results showed that longest vine length was observed in T_4 (122.00 cm) while T_3 had 115.59 cm, followed by 108.06 cm recorded from T_1, and T_2 (107.31 cm) in that order respectively (Table 3). At 8 WAP, the vine lengths were 110.00, 130.43, 134.57 and 139.58 cm in T_1, T_2, T_3 and T_4 respectively (Table 4) with the mean vine length ranging from 109.03 to 130.79 cm, and with T_4 spacing performing the best. The vine diameter at 6 WAP ranged from 0.30 to 0.34 cm, while at 8 WAP, the vine diameter ranged from 0.33 to 0.41 cm (Table 4). Similar trend was also observed on vine diameter with T_4 recording the highest vine diameter at 6 WAP (0.34 cm) and 8 WAP (0.41 cm) respectively. The order of performance regarding vine diameter was T_4 (0.38 cm) > T_3 (0.35 cm) > T_2 (0.34 cm) > T_1 (0.33 cm) [Table 4].

Effect of spacing on the number of nodes and leaf area

Plant spacing had significant effect ($P < 0.05$) on the mean number of nodes. The number of nodes per plant per plot was highest in T_4 (10.86), followed by T_3 (9.70), and then T_1 (8.1), while T_2 was found to have the least (7.8). The leaf area (cm^2) per plant per plot was highest in T_4 (33.40cm^2), and it then statistically significantly decreased progressively to 30.03, 28.86 and 17.94cm^2 in T_3, T_2 and T_1 respectively (Table 5).

Effect of plant spacing on the yield components of *T. occidentalis*

Fresh yield and dry matter yield of *T. occidentalis* as influenced by plant spacing are presented in Table 6. Analysis of variance conducted on the treatment means revealed that plant spacing did not have significant effect ($P>0.05$) on fresh and dry matter yields of *T. occidentalis*. Fresh yield was highest in T_4 (1148.88$kgha^{-1}$), followed by T_3 (1137.5$kgha^{-1}$), T_2 (1037 $kgha^{-1}$) while the lowest fresh yield (1000.0 $kgha^{-1}$) was obtained in T_1 (Table 6). Dry matter yield of *T. occidentalis* was highest (298.40 kg/ha) in *T. occidentalis* spaced at 100 cm x 100 cm (T_4), T_3 closely ranked second in dry matter yield with 289.55 kg/ha, T_2 had 287.10 kg/ha, while T_1 had a dry matter yield of 262.50 kg/ha (Table 6).

Table 1: Number of leaves of *T. occidentalis* as influenced by different plant spacing

Plant spacing	Number of leaves				
	2WAP	4WAP	6WAP	8WAP	Mean
T1	7.99	15.00	21.70	26.00	17.67
T2	7.50	15.87	22.27	27.52	18.29
T3	8.00	14.96	21.24	29.72	18.48
T4	9.45	18.00	24.44	33.21	21.29
Mean	8.24	15.96	22.41	26.73	17.67
LSD 0.05	1.75	2.98	3.72	12.33	

WAP: Weeks after planting; T1: 40 x 40cm; T2: 50 x 50cm; T3: 60 x 60cm; T4: 100 x 100cm

Table 2: Number of branches of *T. occidentalis* as influenced by different plant spacing

Plant spacing	Number of branches				
	2WAP	4WAP	6WAP	8WAP	Mean
T1	0.9	1.33	2.04	3.37	1.97
T2	0.85	1.23	2.00	3.79	1.97
T3	1.3	1.92	2.29	3.43	2.24
T4	1.38	2.05	2.88	4.10	2.60
Mean	1.11	1.63	2.30	3.67	1.97
LSD 0.05	0.58	0.30	0.40	1.22	

WAP: Weeks after planting; T1: 40 x 40cm; T2: 50 x 50cm; T3: 60 x 60cm; T4: 100 x 100cm

Table 3: Effect of plant spacing on main vine length

Plant spacing	Main vine length (cm)		
	6WAP	8WAP	Mean
T1	108.06	110.00	109.03
T2	107.31	130.43	118.87
T3	115.59	134.57	125.08
T4	122.00	139.58	130.79
Mean	113.24	128.65	109.03
LSD 0.05	24.12	34.87	

WAP: Weeks after planting; T1: 40 x 40cm; T2: 50 x 50cm; T3: 60 x 60cm; T4: 100 x 100cm

Table 4: Effect of plant spacing on diameter of vine length

Plant spacing	Diameter of vine length (cm)		
	6WAP	8WAP	Mean
T1	0.32	0.33	0.33
T2	0.30	0.37	0.34
T3	0.33	0.37	0.35
T4	0.30	0.34	0.32
Mean	0.32	0.37	0.35
LSD 0.05	0.16	0.06	

WAP: Weeks after planting; T1: 40 x 40cm; T2: 50 x 50cm; T3: 60 x 60cm; T4: 100 x 100cm

Table 5: Effect of plant spacing on the number of nodes and leaf area

Plant spacing	Number of nodes per plant per plot	Leaf area (cm^2) per plant per plot
T1	8.10	17.94
T2	7.80	28.86
T3	9.70	30.03
T4	10.86	33.40
Mean	9.12	27.56
LSD 0.05	**1.33***	**4.99***

*Statistically significant; T1: 40 x 40cm; T2: 50 x 50cm; T3: 60 x 60cm; T4: 100 x 100cm

Table 6: Cumulative yield components of *T. occidentalis* as affected by plant spacing

Plant spacing	Yield ($Kgha^{-1}$)	
	Fresh	Dry matter
T1	1000.00	262.50
T2	1037.50	287.10
T3	1137.50	289.55
T4	1148.88	298.40
Mean	1058.33	279.71
LSD 0.05	487.50	150.00

T1: 40 x 40cm; T2: 50 x 50cm; T3: 60 x 60cm; T4: 100 x 100cm

DISCUSSION

Plant spacing improved the growth and yield components of *T. occidentalis* in Okigwe, Nigeria. Results affirmed the earlier report of Akanbi *et al.* (2006) that plant spacing is an important agronomic practice that enhances growth, vigor and the overall development of a crop. The results of this study also validates the earlier recommendation of 1m x 1m as standard plant spacing for *T. occidentalis* production and optimum yield by NIHORT Report, (2010). *T. occidentalis* planted at the spacing of 40 cm x 40 cm (T_1) produced fewer fresh and dry matter yields. Ogbonna, (2009) who studied seed position in pod and effect on sex growth and yield of *T. occidentalis* reported no significant difference on harvestable/edible yields as influenced by sex ratio of *T. occidentalis*. It is a known fact that having more female plants on the field is considered more profitable since they also produce seeds. In the recent past, some efforts have been made by Anyim and Akoroda, (1983) to establish criteria for judicious selection of suitable planting distance for *T. occidentalis* cultivation as a way of enhancing the proportion of female plants in the field with the overall objective of improving the yield of the plant and better land area utilization. The performance of plants planted at 1m x 1m could be attributed to the fact that well-spaced plants had more space for growth and development, thus, the highest yields were recorded in plants spaced at T_4.

CONCLUSION

The results showed that *T. occidentalis* planted at 1m x 1m spacing had the highest mean number of leaves and branches as compared to other spacing used. This suggests that good planting distance should be used to obtain better yield in *T. occidentalis* production. However, the findings from this study showed that there was no significant difference ($P>0.05$) in the number of branches and leaves per plant per plot in all the evaluated plant spacing. Whereas, the planting distance had no significant effect ($P>0.05$) on the main vine lengths and collar diameter of *T. occidentalis*, both the fresh and dry matter yields were highest in plants spaced at T**4**, and with the order of performance being $T_4>T_3>T_2>T_1$.

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Nil.

Conflict of interest

None declared.

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