Effect of different organic media on growth and yield of pumpkin (*Telfairia occidentalis* L) at different prevailing wind's speed, heights and directions

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Abstract
Pumpkin's (*Telfairia occidentalis*) growth parameters using two organic manure sources were investigated with respect to different prevailing wind directions and heights. Fluted pumpkin variety (*Telfairia occidentalis*), two organic media and three different heights of prevailing wind were used in the research. The fluted pumpkin was staked. Three different heights of wind level measured were 0 m, 1 m, and 2 m, each at 900 to the direction of the prevailing wind. Organic treatments were six, namely 5 tons/ha of Cocoa Husk (CH5), 10 tons/ha of Cocoa Husk (CH10), 5 tons/ha Poultry Manure (PM5), 10 tons/ha Poultry Manure (PM10), 5 tons/ha Poultry Manure + Cocoa Husk (PM5CH5) and 10 tons/ha Poultry Manure + Cocoa Husk (PM10CH10). The treatments were assigned into a randomized complete block design with three replicates each. Parameters measured were number of leaves, stem girth and vine length. The result revealed a highly significant variety by treatment interaction between prevailing wind directions and different organic manure. The highest number of leaves and stem girth were recorded at PM10CH10 and at 2 m wind height. There was linear increase in the growth parameters, in the yield components and in the cumulative yield from 0 m to 1 m and to 2 m wind heights in all the organic manure treatments. It was concluded that using different organic manure and at wind heights for pumpkin affect its performances via yield components and cumulative yields.

Keywords: cocoa husk, fluted pumpkin, leaves, poultry manure, yield components

Introduction

Telfaria occidentalis (fluted pumpkin) is one of the popular and widely grown vegetable crops in Nigeria. The leaves of the plant is very useful as it contains high content of Fe in the young tender fluted pumpkin leaves, this was given by experts as the basis for which the leaf extract is administered traditionally as blood tonic in treatment of anemia and to convalescing patients (Okokon *et al.,* 2012).

Wind is one of the most ubiquitous environmental stresses, plants' responses to wind and their underlying mechanisms is an interesting study. This is because plant responses to mechanical movement themselves are complicated and also because wind entails not only mechanical effects, but also changes in leaf gaseous and heat exchange (Smith and Ennos, 2003). Mechanical stress may results in the production of thicker and stronger plant structures that will resist larger forces (Yusuke and Niels, 2011)

Williams and Joseph (2006) reported that wind increases transpiration so that water deficits are liable to occur sooner and stomatal closure may then reduce photosynthesis. These motions involve bending and sometimes torsional strains within the stem of the plant. If these strains are higher

than normal, failure may appear within the plant tissues, then lodging appears and may reduce the farm yield (Farquhar *et al.*, 2003). Even when the wind load does not induce failures and lodging, plant motion as a result of wind movements can influence the growth and the quality of the crop (Lamidi *et al.*, 2015). Since pumpkin is very important not only to the final consumers but also to generate more income for farmers, it is therefore become necessary to investigate a way of boosting vegetative productivity of pumpkin under different wind speeds, wind heights and directions as an avenue to increasing food supply.

Materials and Methods

The field experiments were conducted at the Teaching and Research Farm of the College of Agriculture, Osun State University, (Latitude 7^0, 52'28.37''N and Longitude 4^0, 18'13.76'E) Ejigbo campus in 2019. The growth and yield of fluted pumpkin variety (*Telfairia occidentalis*) were evaluated using two organic media (cocoa husk, poultry manure) at six different treatments, three different heights of the prevailing wind and three different orientations of the prevailing wind in the research. The fluted pumpkin was staked. Three different heights of wind level used were 0 m, 1 m, and 2 m, each at 70^0, 80^0 and 90^0 orientations to the direction of the prevailing wind. Organic media treatments were six, namely 5 tons/ha of Cocoa Husk (CH5), 10 tons/ha of Cocoa Husk (CH10), 5 tons/ha Poultry Manure (PM5), 10 tons/ha Poultry Manure (PM10), 5 tons/ha Poultry Manure + Cocoa Husk (PM5CH5) and 10 tons/ha Poultry Manure + Cocoa Husk (PM10CH10). The treatments ($3 \times 6 \times 3 = 54$) were assigned into a randomized complete block design with three replicates each.

Parameters measured were number of leaves, stem girth and vine length. Also measured was the yield of the pumpkin. The characters were subjected to analysis of variance and the means were separated using Duncan Multiple Range Test at 5% level of significance.

Results and Discussion

Results of the pre-cropping soil analysis are presented in Table 1. The soil was sandy loam with low organic matter content and pH around the neutral range.

Table 1. Physical properties of the soil

PARAMETERS	VALUE
Chemical Properties	
pH (H_2O)	6.40
Org. Carbon (%)	0.52
Total N (ppm)	0.41
Available P (mg/kg)	1.67

Na^{+}(Cmol/kg)	0.18
K^{+}(Cmol/kg)	1.22
Ca^{2+}(Cmol/kg)	1.22
Mg^{2+}(Cmol/kg)	0.69
Bulk density (cm^3)	1.2
Physical characteristics	
SILT %	25.00
CLAY %	15.00
SAND %	60.00
Textural Class	Sandy Loam

Table 2: Mean values of performance characteristics of different organic media on fluted pumpkin

S/n	Treatment	Vine length, cm	Number of Leaves	Stem girth, cm
1.	Control	154.00^{bc}± 0.29	109.80^{a}± 0.24	1.50^{a}± 0.04
2.	CH5	331.60^{ab}± 0.19	159.30^{a}± 0.21	1.60^{a}± 0.03
3.	CH10	355.00^{ab}± 1.21	192.00^{a}± 0.22	1.70^{a}± 0.04
4.	PM5	112.80^{c}± 0.37	158.50^{a}± 0.22	1.60^{a}± 0.05
5.	PM10	185.60^{bc}± 0.24	127.80^{a}± 0.22	1.70^{a}± 0.02
6.	PM5CH5	319.00^{ab}± 0.12	161.00^{a}± 0.23	1.60^{a}± 0.01
7.	PM5CH10	219.00^{b}± 0.32	130.00^{a}± 0.24	1.70^{a}± 0.02
8.	PM10CH5	152.40^{bc}± 0.32	154.80^{a}± 0.23	1.50^{a}± 0.04
9.	PM10CH10	394.00^{a}± 0.44	196.80^{a}± 0.27	2.00^{a}± 0.03

Means on the same row with different superscripts are significantly different. ($P<0.05$),

Table 3: Mean values of yields of fluted pumpkin as a result of effects different organic media on the crop.

S/N	Treatment	Yield, kg
1.	Control	1.20± 2.08
2.	CH5	0.63± 1.10
3.	CH10	2.73± 0.75
4.	PM5	1.40± 2.09
5.	PM10	0.88± 1.53
6.	PM5CH5	0.80± 1.39
7.	PM5CH10	0.13± 0.23
8.	PM10CH5	0.00± 0.00
9.	PM10CH10	0.00± 0.00

Growth and yield parameters. The growth performance of *Telfairia occidentalis* is displayed in Table 2. The vine length ranged from 112.80± 0.37 to 394.00± 0.44 cm showing that the tallest plant was obtained with applications of PM10CH10 (394± 0.44 cm) compared to other treatments. There were no statistical differences in vine length among treatments CH_{10} (355 cm), CH_5 (331.6 cm), PM_5CH_5 (319.00± 0.12). Also, PM_{10} (185.60± 0.24) and Control (154.80± 0.23) have values that are not statistically different. Combining PM_{10} and CH_{10} at a ratio of 10:10 for application resulted in a higher number of leaf of the crop than other treatment ratio, although barren in term of fruiting at the end of the experiment. The barrenness could be because the pumpkin is a male plant.

Table 4. Weekly mean values of wind speed, maximum and minimum temperatures between 0 and 3m in knots

Weeks	Wind speed, in knots	Max. Temperature, ^oC	Min. Temperature, ^oC
1	6.00 ± 1.17	34.84 ±1.94	23.40±1.54
2	7.00 ± 1.61	34.59 ± 1.36	22.64±1.00
3	6.70 ± 1.24	33.94 ± 1.98	23.51±0.74
4	6.20 ± 1.55	34.90 ± 0.79	21.97±0.79
5	6.01 ± 1.57	32.27 ± 1.68	22.60±1.24
6	6.20 ± 1.11	31.17 ± 0.77	22.56±1.33

7	7.30 ± 1.86	31.06 ± 1.50	22.43±0.84
8	6.20 ± 1.16	30.53 ± 1.59	22.31±1.09
9	6.80 ± 2.01	31.13 ± 0.82	22.43±0.95
10	8.00 ± 1.21	30.19 ±1.72	22.20±0.79
11	8.00 ± 1.06	29.33±1.20	21.91±0.48
12	7.00 ± 2.32	30.19 ± 1.65	22.03±0.45
13	6.57 ± 1.13	30.61 ± 0.55	22.26±0.41
14	8.57 ±2.23	29.80 ±0.96	21.94±0.55
15	7.57 ±1.90	29.77 ±1.81	21.90±0.35
16	8.86 ±2.54	30.47 ±0.44	22.10±0.48
17	7.43 ±1.90	30.20 ±0.70	22.44±0.32
18	7.29 ±1.38	31.49 ±1.58	21.97±0.80
19	8.00 ±2.86	30.21 ±1.46	22.27±1.11
20	7.00 ±1.21	30.59 ±2.06	22.34±1.21
21	6.00 ±1.86	31.54 ±1.22	21.97±0.96
22	7.00 ±1.57	32.00 ±0.70	20.50±0.71

Note: Wind direction = EW

Source: Meteorological station

Effect of different height of wind movement on yield of pumpkin. According to the result, $PM_{10}CH_{10}$ with the longest vine (394.00± 0.44 at 2 m wind height) had highest number of leaves but could not fruit, thus have lowest order of harvest values of 0 kg at harvest, Table 3. $PM_{10}CH_5$ have the same eventuality with $PM_{10}CH_{10}$, barren! The barrenness could not be due to loss of stalk or leaves or flowers, this is because there were no lodging of the crops in any way throughout the period of the research. This was ascertained from the wind speeds which were low in the period. Only wind speed at more than 50 km h^{-1} leads to lodging of crops and all the wind speeds recorded were less than 50 kmh^{-1}, Table 4. Also, the long vine and higher number of leaves got could have been possible also maybe because of the genetic factor, or the ecological conditions that respond additively to lowest wind speed, 6.00 ± 1.17 at 3 m in knots and accompanying 23.40±1.54 temperature in the research. The leaves from observations by more than 10 people at the same time were adjudged to be healthy (Akoroda and Adejoro, (1990).), this could also be as a result of the wind movements at low heights to the ground surface which were moderate as recorded and could have helped to increase these growth of leaves, stem girth and other yield parameters.

Conclusion

Organic fertilizer application is very essential for plant growth and yield, as it contained essential plant nutrients. Wind speeds at various wind heights affect the performances of the pumpkin via growth parameters, yield components and their cumulative yields.

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