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GROWTH AND YIELD PERFORMANCES OF CUCUMBER (*Cucumis sativus* L) AS INFLUENCED BY STAKING METHODS IN THE HUMID RAINFOREST OF UMUDIKE, SOUTHEASTERN NIGERIA

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ABSTRACT

A research with the title "Growth and yield performances of cucumber (Cucumis sativus L) as influenced by staking methods in the humid rainforest of Umudike, Southeastern, Nigeria, was conducted at the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, in 2020 and 2021 cropping seasons. It was a 2 × 4 factorial research laid out in a randomized complete block design (RCBD) replicated three times. Factor A comprised the cucumber varieties of THAII 369 and THAII 999, while factor B comprised the staking method (no-staking, trellis staking, single staking and triangular staking methods). Results, showed that number of leaves per plant for variety and staking methods for both cropping sea sons increased at 4 and 8 weeks after planting (WAP) and decreased at 12WAP due to senescence. THAII 999 produced more leaves of 14.68 and 14.76 (4WAP: 28.0 and 27.05 (8WAP) and 25.0 and 24.11 (12WAP) during 2020 and 2021 cropping seasons. Trellis staking method gave more leaves of 14.22 and 14.60 (4WAP); 31.5 and 31.11 (8WAP); 26.0 and 27.0 (12WAP) over other staking methods. Both varieties and staking methods produced more leaves at 8WAP. Vine girth and vine length per plant increased at 4, 8 and 12WAP with THAII 999 producing bigger and longer vines over THAII 369, while trellis staking gave bigger and longer vines compared with other staking methods. Dry weight per plant increased at 4 and 8 WAP with a depreciation at 12WAP due to senescence. THAII 999 and trellis staking methods produced higher dry weight values compared with THAII 369 and other staking methods respectively. THAII 999 produced higher number of fruits per plant of 0.806 and 0.765, longer fruits of 18.7cm and 20.5cm; larger fruits of 7.7mm and 6.50mm as well as fruit yield of 21.09 and 23.52 tha^{-1} during both cropping seasons. Trellis staking method also yielded highest reproductive values compared with other staking methods, during 2020 and 2021 cropping seasons. Correlation between the growth and yield attributes of cucumber revealed that fruit yield (tha^{-1}) was highly significant ($p < 0.01$) and positively correlated with fruit length ($r = 0.820^{**}$) and number of fruit per plant ($r = 0.795^{**}$). It was significantly ($p < 0.05$) and positively with vine length at 8WAP ($r = 0.419$) and number of leaves per plant at 8WAP ($r = 0.151$). Consequently, THAII 999 and trellis staking methods are hereby recommended for the cultivation of cucumber in the humid rainforest of Umudike, Southeastern, Nigeria.

Keywords: Growth, yield, cucumber, staking methods, humid rainforest

INTRODUCTION

Cucumber (*Cucumis sativus* L) is a trailing or climbing monoecious annual crop with an extensive and largely superficial root system (Remison, 2012). Cucumbers are usually over 90% water, mainly eaten in the unripe green form, because the ripe yellow form normally becomes too bitter and sour. Cucumbers are well adapted to warm climates, but will grow well at the temperature range of 21 - 28°C. Fertile soils are used for the production of cucumber, because infertile soils result in lower quality of fruits which are not often accepted by consumers (Eifediyi and Remison, 2010).

Jill (2011), reported that cucumber is a warm season crop with the ability of healing some urinary, bladder and kidney diseases, including some digestive problems like heart burn, acidity and ulcer (Garcia-closes *et al*., 2004).

Staking according to Uguru (2011), is the provision of support on which the vine twines, with the aim of ensuring t sufficient light reaches the leaves. The author further mentioned the types of staking to include, individual or single staking, triangular (pyramidal staking) and the trellis staking. Staking of cucumber has been found to help optimize yield, while higher fruit yield was observed on trellis method than other methods (Hardly and Prowell, 2002; Hirata and Tilato, 2000; Nelson, 2005 and Paulo *et al*.,2003). The horticultural practice of staking had been reported to increase the yield of cucumber (Hard and Powell, 2002). The authors posited that the use of suitable supports in the form of stake or trellis is very important as they not only expose the leaves to sunlight for optimum photosynthesis, but also keep the fruits off the ground, thereby preventing them from being infected by soil borne pathogens.

Single or individual staking involves the placement of one stake close to one particular crop stand, and only one vine is tied to the stake. Triangular staking involves the placement of one stake at a position on the farm where more than three or four vines are tied to one particular stake. In trellis or pyramidal staking method, two strong poles or sticks are placed at opposite direction on the farm, and a strong long rope or stick used to link the two poles. Vines are subsequently linked to the strong rope or stick for support through the help of short ropes. It must be noted that in trellis staking method, the number of long poles and ropes used will vary with the size of a given farm.Rojalin*et al*. (2003) acknowledged that staking is done to increase yield, better exposure of crops to sunlight and ventilation and increased fruit yield, reduced proportion of unmarketable fruits, enhanced production of high quality fruits, prevent fruit rots, better aeration and exposes foliage to sunlight for photosynthetic activities.

Trellis method improves total and marketable yield as well as improves air circulation compared with the non-trellis treatments, which expose fruits to soil borne pathogens and other ground dwelling pests (Rojalin*et al*., 2003). Cucumber production in most part of Nigeria is fast becoming popular, probably due to its high nutritional and medicinal values, as well as a useful component ingredient in the preparation of salad and liquor drink in hotels and homes (Nweke *et al*., 2013).In view of the above, therefore, the researcher aimed at evaluating the growth and yield performances of cucumber (*Cucumis sativus* L) as influenced by staking methods in the humid rainforest of Umudike, Southeastern, Nigeria.

MATERIALS AND METHODS

This research was conducted at the Teaching and Research Farm of Michael Okpara University of Agriculture, Umudike, during 2020 and 2021 cropping seasons. Umudike is situated on latitude 05°29'N, longitude 07°23'E at an altitude of 122.0m above sea level.

The rainfall situation of the research site is bimodal in nature with the rain starting from March and short dry period in August. The next rainfall interval often commences from September to November, preparatory for the commencement of the dry season. Annual rainfall values vary between 2074.3mm to 2420.0mm, minimum and maximum temperature vary between 26°C to 34°C respectively (Asumugha*et al*., 2018).

The research was a 2 x 4 factorial laid out in a randomized complete block design (RCBD) replicated three times. Factor A comprised the cucumber varieties of THAII 369 and THAII 999, while factor B comprised the staking methods of: no staking (control), trellis staking, single staking and triangular staking methods. The varieties had three months growth duration, and were sourced from the National Seed Council, domiciled at the National Root Crops Research Institute (NRCRI), Umudike.The size of the research plot was 24.5m ×7.4m (181.3m^2) with each plot measuring 1.8m × 2.0m, 0.5m distant between plot and 1m distant between replications. The research site was mechanically ploughed and harrowed before planning was conducted on 20th April, on beds at the spacing of 90 × 40cm. Three seeds were planted per hole while thinning to one stand per hole was done at 10 days after planting (DAP). Inorganic fertilizer (NPK 15:15:15) at 150kgha^{-1} was added at 14DAP to boost crop establishment. Staking was conducted at 14 DAP, shortly after the application of fertilizer.Weeding was done twice, while the spraying of *Lamdacyhalothrin* (Karate) insecticide at 160ml per hectare was carried out at 14 DAP to control some leaf defoliating insects and was discontinued at the commencement of flower formation (Akpan and Ojimadu, 2018). Mosquito nets were also used to barricade the entire research plot against squirrels and associated destructive pests (Akpan, 2015). Data collection on growth attributes involving number of leaves per plant, vine girth per plant, vine length per plant and dry weight per plant were conducted at 4, 8 and 12WAP, while yield attributes involving number of fruits per plant, length of fruits per plant, fruits girth per plant and fruit yield were conducted every 4 – 6 days depending on the frequency of flowering and fruiting (Akpan and Ojimadu, 2018).

Prior to the starting of the research, composite soil samples at the depth 0 – 20cm with the help of a soil augar was randomly collected for the physico-chemical analysis of their properties. Similarly, meteorological information of the site on rainfall (mm), and temperature (°C) were collated from the meteorological unit of National Root Crops Research Institute, Umudike.

Data from the growth and yield attributes of the research were subjected to analyses of variance (ANOVA) method (Gomez and Gomez, 1984), while Fisher's Least Significant difference (F-LSD) at 5% probability level was adopted to separate significant means.

RESULTS

Physico-chemical and meteorological properties of the research site

The physico-chemical properties of the research site (Table 1) showed that the textural class of the site was sandy loam with sand fraction of <80%. The pH values of 5.8 and 6.1 showed that the site was moderately acidic, while Organic carbon, Available P, Calcium, Mg and ECEC values were all moderate (Table 1)The meteorological properties of the site (Table 2), revealed that rainfall pattern was low in the dry months, while increase in rainfall pattern was noticed in wet months. The month of May recorded highest rainfall (466.1mm), while August with 444.2mm recorded highest respectively in 2020 and 2021 cropping seasons (Table 2).

Influence of staking methods and variety on growth performances of cucumber

Number of leaves per plant (Table 2) for varieties and staking methods increased at 4 and 8WAP and reduced at 12WAP during 2020 and 2021 cropping seasons. THAII 999 recorded higher number of leaves per plant of 14.68 and 14.76; (4WAP); 28.0 and 27.05 (8WAP); 25.0 and 24.11 (12WAP) compared with THAII 369 with lower values in both cropping seasons. Trellis staking method recorded highest number of leaves of 14.22 and 14.60 (4WAP); 31.5 and 31.11 (8WAP); 26.0 and 27.10 (12WAP) in 2020 and 2021 cropping seasons compared with the control with the lowest values. The varieties and staking methods produced more leaves at 8WAP (Table 3). Vine girth per plant (Table 4) for variety and staking rose at 4, 8WAP and at 12WAP in both cropping seasons. THAII 999 produced bigger vine girth values of 2.1 and 2.2mm (4 WAP); 2.3 and 2.5mm (8WAP); 2.2 and 2.2 (12WAP) compared with THAII 369 with low values. Trellis staking method gave larger vine girth values of 2.1 and 2.1mm (4WAP); 2.3 and 2.4mm (8WAP); 2.3 and 2.3mm (12WAP), over the control with the least values (Table 4).

Table 1:Physico-chemical properties of the experimental site in 2020 and 2021

Physical characteristics	2020	2021
Sand (%)	75.8	75.8
Silt (%)	10.8	25.3
Clay (%)	13.4	20.8
Textural class	Sandy-loam	Sandy-loam
Chemical properties		
pH	5.8	6.1
Organic carbon (%)	1.12	1.1
Total nitrogen (%)	0.097	0.1
Avail. P (mg Kg^{-1})	33.4	22.7
Exchangeable K (Cmol kg^{-1})	0.221	1.3
Exchangeable Ca (Cmol kg^{-1})	3.20	4.0
Exchangeable Mg (Cmol kg^{-1})	0.96	1.8
Effective cation exchange capacity (Cmol kg^{-1})	5.72	7.0
Base saturation (%)	83.21	84.9

Table 2: Meteorological properties of the research site during 2020 and 2021 cropping seasons

	2020			2021		
Months	Rainfall (mm)	Temperature		Rainfall (mm)	Temperature	
		Max.	Min		Max.	Min
January	75.4	32	22	0.00	33.4	21.5
February	87.8	33	24	43.7	33.9	23.2
March	40.8	33	22	138.8	33.2	23.4
April	92.8	32	22	28.7	32.2	23.5
May	466.1	31	23	249.2	31.9	23.4
June	239.4	29	23	281.8	30.5	24.2
July	280.5	30	22	114.9	30.0	24.0
August	237.1	34	23	444.2	29.6	23.3
September	318.0	30	22	425.3	29.8	22.9
October	184.8	30	23	165.1	31.0	23.6
November	99.5	32	23	147.4	31.6	23.5
December	30.8	32	22	0.00	32.7	21.8

Source: National Root Crops Research Institute, Umudike

Table 3: Effect of staking methods and variety on number of leaves per plant of cucumber at 4, 8 and 12 WAP during 2020 and 2021 cropping seasons

Cucumber varieties	Number of leaves/plant					
	4WAP		8WAP		12WAP	
	2020	2021	2020	2021	2020	2021
THAII 369	13.9	14.2	26.7	26.65	22.9	21.60
THAII 999	14.68	14.76	28.0	27.05	25.0	24.11
LSD (p<0.05)	n.s	n.s	n.s	n.s	2.39	2.19
Staking methods						
No staking	13.37	13.59	23.4	23.06	21.9	20.3
Trellis staking	14.22	14.60	31.5	31.11	26.0	27.10
Single staking	14.08	13.80	30.7	23.41	23.3	22.46
Triangular staking	14.08	13.98	23.7	30.65	23.1	22.21
LSD (p<0.05)	n.s	n.s	n.s	n.s	n.s	n.s
Variety x staking methods	0.04	n.s	n.s	n.s	4.78	4.81

Table 4: Effect of staking methods and variety on vine girth of cucumber at 4, 8, and 12WAP during 2020 and 2021 cropping seasons

Cucumber varieties	Vine girth per plant (mm)					
	4WAP		8WAP		12WAP	
	2020	2021	2020	2021	2020	2021
THAII 369	2.0	2.0	2.2	2.4	2.1	2.2
THAII 999	2.1	2.2	2.3	2.5	2.2	2.2
LSD (p<0.05)	n.s	n.s	0.07	0.09	n.s	n.s
Staking methods						
No staking	2.0	2.0	2.1	2.3	2.1	2.1
Trellis staking	2.1	2.1	2.3	2.4	2.3	2.3
Single staking	2.1	2.0	2.3	2.4	2.1	2.2
Triangular staking	2.1	2.0	2.2	2.3	2.2	2.2
LSD (p<0.05)	n.s	n.s	0.10	0.12	n.s	n.s
Variety x staking methods	n.s	n.s	n.s	n.s	n.s	n.s

Table 5: Effect of staking methods and variety on vine length per plant of cucumber at 4, 8 and 12WAP during 2020 and 2021 cropping seasons

Cucumber varieties	Vine length per plant (cm)					
	4WAP		8WAP		12WAP	
	2020	2021	2020	2021	2020	2021
THAII 369	48.9	46.71	144.0	148.7	160.3	161.11
THAII 999	64.3	66.80	225.4	228.11	184.9	186.4
LSD (p<0.05)	10.72	11.80	n.s	n.s	n.s	n.s
Staking methods						
No staking	51.1	50.12	124.2	120.4	120.6	121.5
Trellis staking	62.2	60.80	333.1	330.4	221.2	223.5
Single staking	60.1	60.4	154.0	152.10	177.2	175.11
Triangular staking	52.9	51.08	127.4	126.5	171.4	170.5
LSD (p<0.05)	n.s	n.s	n.s	n.s	n.s	n.s
Variety x staking methods	21.43	n.s	n.s	n.s	n.s	n.s

Vine length per plant (Table 5), for variety and staking method increased at 4, 8 and 12WAP with longer vines recorded at 12WAP. THAII 999 gave longer vine values of 64.3 and 66.80 cm (4WAP); 225.4 and 208.11cm (8WAP); 184.9 and 186.80cm (4WAP); over THAII 369 with lower values. Trellis staking method produced longer vines values of 62.2 and 60.80cm (4WAP); 333.1 and 330.4cm (8WAP); 221.2 and 223.5 cm (12WAP) over the control with the least values during 2020 and 2021 cropping seasons (Table 5).

Dry weight per plant (Table 6) for variety and staking methods increased at 4 and 8 WAP and depreciated at 12WAP during both cropping seasons. THAII 999 produced higher dry weight values of 54.17 and 52.0g (4WAP); 95.0 and 94.4g (8WAP); 25.4 and 23.8g (12WAP) over THAII 369 with lower values in both cropping seasons. Trellis method gave highest dry weight values of 55.0 and 53.4g (4 WAP); 116.7 and 100.8g (8WAP); 35.0 and 33.9g (12WAP) compared with the control with the least values. Both variety and staking

methods recorded more dry weight at 8 WAP during 2020 and 2021 cropping seasons (Table 6).

Table 6: Effect of staking methods and variety on the dry weight per plant of cucumber at 4, 8 and 12WAP during 2020 and 2021 cropping seasons

Cucumber varieties	Dry weight per plant (g)					
	4WAP		8WAP		12WAP	
	2020	2021	2020	2021	2020	2021
THAII 369	39.17	41.8	87.0	85.13	13.8	12.6
THAII 999	54.17	52.0	95.0	94.4	25.4	23.8
LSD (p<0.05)	n.s	n.s	n.s	n.s	n.s	n.s
Staking methods						
No staking	35.8	34.8	60.7	62.5	11.7	11.4
Trellis staking	55.0	53.4	116.7	100.8	35.0	33.9
Single staking	40.83	41.8	96.7	94.8	17.5	15.1
Triangular staking	55.0	53.11	90.0	92.7	14.2	12.6
LSD (p<0.05)	n.s	n.s	n.s	n.s	n.s	n.s
Variety x staking methods	n.s	n.s	n.s	n.s	n.s	n.s

Table 7: Effect of staking methods and variety on some yield attributes of cucumber during 2020 and 2021 cropping seasons

Cucumber variety	Number of fruits per plant		Length of fruits of per plant (cm)		Fruits girth per plant (mm)		Fruit yield (tha^{-1})	
	2020	2021	2020	2021	2020	2021	2020	2021
THAII 369	0.414	0.501	12.5	13.9	7.1	5.11	11.49	13.04
THAII 999	0.806	0.745	18.7	20.5	7.7	6.50	21.09	23.52
LSD (p<0.05)	0.23	0.31	1.87	1.98	n.s	n.s	4.77*	5.07*
Staking methods								
No staking	0.189	0.368	8.7	9.5	6.7	5.8	5.25	6.4
Trellis staking	1.074	2.118	21.5	22.4	8.3	8.3	27.22	30.6
Single staking	0.430	0.511	15.9	18.3	7.9	7.9	11.95	10.8
Triangular staking	0.747	0.609	16.3	17.7	8.0	7.2	20.74	22.3
LSD (p<0.05)	0.32	0.48	2.6	3.05	n.s	n.s	6.74*	7.12*
Variety × staking methods	n.s	n.s	n.s	n.s	n.s	n.s	n.s	n.s

Effects of staking methods and variety on yield performances of cucumber

The yield performances of cucumber (Table 7) revealed that THAII 999 yielded higher number of fruits per plant of 0.806 and 0.765; longer fruits values of 18.7 and 20.5 cm; bigger fruits girth of 7.7mm and 6.50mm and fruit yield of 21.09 and 23.52 tha^{-1} compared with THAII 369 with lower yield in 2020 and 2021 cropping seasons. Trellis staking method recorded highest fruits of 1.074 and 2.118; longer fruits of 21.5 and 22.4cm; bigger fruit girth of 8.3 and 8.3mm and fruit yield of 27.22 and30.6 tha^{-1} over the control with least values (Table 7).

Correlation between the growth and yield attributes of cucumber

The correlation analysis (Table8) revealed that fruit yield (tha^{-1}) was highly significant (p<0.01) and positively correlated with fruit length (r = 0.820**) and number of fruits per plant (r = 0.795**). Fruit yield (tha^{-1}) was also significantly (p<0.05) and positively correlated with vine length at 8WAP (r = 0.419), number of leaves at 8WAP (r = 0.151) and fruit girth (r = 0.160). Fruit yield (tha^{-1}) was significant (p<0.05) and negatively correlation with vine girth (r = 0.029) at 8WAP.

Vine girth at 8WAP was significant (p<0.05) and positively correlated with vine length at 8WAP(r = 0.331). Number of leaves at 8WAP was significant (p<0.05) and positively correlated with vine length at 8WAP (r = 0.365) and highly significant (p<0.01) and positively correlated with vine girth at 8WAP (r = 0.516**).

Fruit girth was highly significant (p<0.01) and positively correlated with vine girth (r = 0.547**) and number of leaves at 8WAP (r = 0.522**).

Table 8: Correlation association between the growth and yield attributes of cucumber as influenced by staking methods

	Traits	1	2	3	4	5	6	7	8
1.	Vine length @ 8WAP	-							
2.	Vine girth @ 8WAP	0.331	-						
3.	No. of lvs @8 WAP	0.365	0.516**	-					
4.	Biomass dry wt/pint @ 8WAP	0.149	0.619**	0.277	-				
5.	Fruit length	-0.219	-0.085	0.002	-0.340	-			
6.	No. of fruits/plant	-0.166	-0.279	-0.253	-0.414*	0.834**	-		-
7.	Fruit girth	0.294	0.547**	0.522**	0.135	0.004	-0.045	-	-
8.	Fruit r/d (tha^{-1})	0.419	-0.029	0.151	0.283	0.820**	0.795**	0.160	-

* correlation is significant at the 0.05 level (2-tailed), ** correlation is significant at the 0.01 level (2-tailed)

DISCUSSION

Physico-chemical and meteorological properties of the research site

The sandy loam textural class coupled with the sand fraction of <80% as well as pH values of 5.8 and 6.1 conformed with the recommendation of Remison (2012) for soils capable of sustaining cucumber production. Remison (2012) opined that although cucumber can be grown on a wide variety of soils, the most suitable are those classified as loams, sandy loams, and some silty loans, all with a high organic matter content.

The annual rainfall range of 2068.5mm – 2160.8mm as well as temperature range of 32°C - 22°C were within the recommendations of Remison (2012). The author added that very high temperature causes flower sterility, while very high humidity encourages leaf diseases, which may affect flowering.

Effect of staking methods and variety on growth performances of cucumber

Number of leaves was not significantly ($p>0.05$) affected by variety at 4 and 8WAP in 2020 and 2021 cropping seasons. It was significantly ($p<0.05$) affected by variety at 12 WAP in both cropping seasons. The parameter did not significantly ($p>0.05$) influence staking methods at 4, 8 and 12WAP in both cropping seasons. Variety x staking method (interactions), significantly ($p<0.05$) affected number of leaf per plant at 4 WAP in 2020 as well as at 12WAP in both cropping seasons. The reduction in number of leaves at 12 WAP caused by senescence was earlier reported by Akpan and Ojimadu, (2018). Nweke *et al*. (2013) reported more number of vines for staked cucumber than unstaked.The possession of more leaves by THAII 999 alongside other staked cucumbers suggest that they will be able to accumulate more photosynthates which will enhance their yield potentials compared with THAII 369 and other unstaked stands.

Vine girth per plant was not significantly ($p>0.05$) affected by variety at 8WAP in both cropping seasons. Vine girth per plant was significantly ($p<0.05$) affected by staking methods at 8WAP, while at 4 and 12WAP were not significantly ($p>0.05$) influenced by staking methods. Vine girth varied non significantly ($p>0.05$) with variety x staking methods (interaction) during both cropping seasons. Increased in vine girth at 4, 8 and 12WAP suggested that cucumber girth will increase with age irrespective of the variety. The tendency of cucumber girth increasing with age was earlier reported by Akpan and Ojimadu (2018) and Akpan (2015).

Vine length per plant was significantly ($p<0.05$) affected by variety at 4WAP, while 8 and 12WAP were not significantly ($p>0.05$) affected in 2020 and 2021 cropping seasons. Vine length per plant varied non-significantly ($p>0.05$) with staking methods during both cropping seasons. The parameter was significantly ($p<0.05$) affected by variety × staking method (interactions) at 4WAP in 2020 cropping season. The increase in vine length at 4, 8 and 12 WAP suggested that cucumber vines length will increase with age, as earlier reported by Akpan and Ojimadu (2018). Akpan (2014) also reported increase in cowpea vine length, with age irrespective of the variety.

Dry weight per plant was not significantly ($p>0.05$) affected by variety and staking methods during 2020 and 2021 cropping seasons. Dry weight for both variety and staking methods dropped at 12WAP due to senescence with higher dry weight recorded at 8WAP. The parameter varied non-significantly ($p>0.05$) with variety, staking methods as well as variety x staking methods (interactions) in both cropping seasons. Akpan and Mba (2016) reported higher dry weight for cowpea at 8WAP and a drop in values at 12WAP while attributing the drop to senescence. The growth performances of staking methods were statistically similar in both cropping seasons.

The good performances of staking over non-staking was earlier reported by Nweke *et al*. (2013). Hardy and Rowell (2002), reported that trellis staking performed better than other methods.

Effects of staking methods on yield performance of cucumber varieties

The evaluated yield parameters involving number of fruits per plant, length of fruits per plant and fruits yield were significantly affected ($p<0.05$) by variety while fruit girth per plant varied non-significantly ($p>0.05$) with the variety during both cropping seasons. Fruit girth per plant equally varied non-significantly ($p>0.05$) with staking methods while number of fruits per plant, length of fruits per plant and fruit yield varied significantly ($p<0.05$) with staking methods. The yield parameters were not significantly affected by variety x staking methods (interaction) during both cropping seasons. The increased yield performances of the staked over non-staked treatments were reported by Nweke *et al*. (2013). The improved performance of trellis staking over other staking methods was also reported by Hardy and Rowell (2002) who attributed improved yield performances to trellis staking. Rojalin*et al.* (2021), opined that staking plays a very important role in growth and quality of Cucubitaceae and that trellis method improves air circulation around plants, help reduce foliar disease problems as well as enhances cucumber harvesting. Asante (1996) maintained that staked or trellis not only expose the leaves to sunlight for photosynthesis, but also keep the fruits off the ground, thereby preventing them from being infected by soil borne pathogens. The improved yield performance of THAII 999 over THAII 369 is attributed to the possession of more leaves, larger and longer vines as well as higher adaptive potentials to the agro-ecosystem over THAII 369.

The similarities in both growth and yield values could be attributed to the similarities in soil and weather information as observed in 2020 and 2021 cropping seasons.

CONCLUSION

It could be deciphered from the research that cucumber will perform vegetatively and reproductively better when staked than un-staked as trellis staking gave best results over other staking methods. THAII 999 performed better than THAII 369 because it was more adaptive than THAII 369 to the research site. Although the growth performances of the staking methods were statistically similar, trellis staking was better than other methods and the control. From the foregoing therefore, THAII 999 and trellis staking methods are recommended for the production of cucumber in the humid rain forest of Umudike, Southeastern, Nigeria.

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