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# GROWTH AND YIELD OF CUCUMBER (*CUCUMIS SATIVUS* L.) AS INFLUENCED BY TRELLISING AND BIOCHAR IN THE NIGERIAN GUINEA SAVANNA

MUHAMMAD F. M., A. AHMED M. A. MOHAMMED A. A. SADIQ, I. LAȚO, A. LAȚO

*Institute for Agricultural Research Ahmadu Bello University, Zaria; University of Life Sciences "King Mihai I" from Timișoara, Romania*

**Abstract:** A field trial was conducted during the wet season of 2020 at the research farm of the Institute for Agricultural Research, Ahmadu Bello University, Zaria; located at Samaru in the Northern Guinea Savanna of Nigeria. Treatments consisted of trellising; trellised and non-trellised and fertilization; control (0 t ha<sup>-1</sup>), Biochar (2 t ha<sup>-1</sup>) and NPK Fertilizer (100:50:50 kg ha<sup>-1</sup>). The treatments were factorially combined and laid out in randomized complete block design (RCBD) with three replications. The plots were marked out into 3 x 4 m in size with a spacing of 1.5 m and 2 m between plots and replicates respectively. Stand count, weed dry weight and leaf Area Index were not affected by trellising and fertilization at both sampling periods. Application of NPK at 100:50:50 kg ha<sup>-1</sup> and biochar at 2 t ha<sup>-1</sup> showed significant increase in number of branches and vine length with better results when influenced by trellising than control and non-trellised plants. There was no significant difference in the number of days to 50% flowering in cucumber with control showing the lowest days. Furthermore, Application of NPK at 100:50:50 kg ha<sup>-1</sup> and biochar at 2 t ha<sup>-1</sup> demonstrated significantly higher number of fruits, fruit length, fruit diameter, fruit weight and fruit yield with the best results as influenced by trellising. Data was collected on weed count, weed dry weight, vine length, number of leaves of plant, number of flowers, number of days to 50% flowering, plant length and plant weight. Data collected were subjected to analysis of variance (ANOVA), and means separated using Duncan Multiple Range Test.

## • Introduction

Cucumber (*Cucumis sativus* L.) is a member of the cucurbitaceae family comprised of 95 genera and 965 species (Christenhusz *et al*, 2016). Cucumber originated from India and became popular throughout the Egyptian and the Greek Roman Empire (Renner *et al*, 2007). It is botanically classified as pepo; it is a creeping vine which bears spiral tendrils and large leaves that form a canopy over the fruits. Biochar is a carbon-rich organic waste product obtained by heating biomass (pyrolysis) in a closed system under limited or no supply of oxygen.

## • Material and method

Field trial was conducted during wet season of 2020 at the Institute for Agricultural Research, Ahmadu Bello University, Zaria; situated at Samaru (11° 10' 35" N, 7° 36' 40" E, 696.1 m above sea level) in the Northern Guinea Savanna. Soil samples were randomly collected prior to sowing using soil auger of 9cm diameter and were taken at a depth of 0-30 cm across the experimental site.

The treatments were factorially combined in randomized complete block design (RCBD) and replicated three times. Border spaces of 1.5 m between the plots and 2 m between replicates were marked out into plots. The treatments consist of one rate of biochar at 2 t ha<sup>-1</sup> combined with half recommended rate of fertilizer, Full recommended rate of fertilizer at 100kg N, 50kg P<sub>2</sub>O<sub>5</sub> and 50kg K<sub>2</sub>O ha<sup>-1</sup> and a control trellised and non-trellised crops assessed. Two weeks before sowing, biochar at the rate of 2.0 t ha<sup>-1</sup> was incorporated on treatment basis by split opening the crest of the ridge to about 15cm depth and then covered with the soil after incorporation.

Inorganic fertilizer was applied through band application method at the recommended rate of 100kg N, 50kg P<sub>2</sub>O<sub>5</sub> and 50kg K<sub>2</sub>O ha<sup>-1</sup> while plots with biochar was applied with half the recommended rate. First dose (basal) application was carried out at 10 days after sowing using compound fertilizer (NPK 15:15:15) to supply 50, 50 and 50kg of N, P<sub>2</sub>O<sub>5</sub>, and K<sub>2</sub>O respectively. The remaining 50 kg N ha<sup>-1</sup> (second dose) applied in the form of urea (46% N) at 3 weeks after the basal application. Hoe weeding was carried out at 4 and 6 weeks after sowing. Incidence of pest and disease was closely monitored and control measures was taken by spraying Imidacloprid at 5.0 kg a.i ha<sup>-1</sup> and lamdacyhalothrin at 25g a.i ha<sup>-1</sup> first week after sowing. Fungicides such as ridomil gold at 1.2 kg a.i ha<sup>-1</sup> and maneb at 2.0 kg a.i ha<sup>-1</sup> as soon as fusarium wilt was observed on the cucumber plants.

## • Results and discussions

Table 1: Physical, chemical and biological characteristics (0-30cm) of soils at the experimental site during the 2020 wet season.

Soil Characteristics	Values
Particle size distribution (g kg <sup>-1</sup> )	
Clay	120
Silt	420
Sand	460
Textural Class	Loam
Chemical Composition	
pH (1:2.5) in water	5.88
pH (1:2.5) in 0.01M CaCl <sub>2</sub>	24.96
Organic carbon (g kg <sup>-1</sup> )	15.61
Total Nitrogen (g kg <sup>-1</sup> )	1.81
Available Phosphorus (mg kg <sup>-1</sup> )	9.58
Exchangeable Bases (cmol kg <sup>-1</sup> )	
Calcium (cmol kg <sup>-1</sup> )	2.85
Magnesium (M)	0.51
Potassium (P)	0.18
Sodium (Na)	0.21
Aluminium Hydrogen (Al-H)	0.22
Cation Exchange Capacity (C.E.C)	3.97

Analysed at the Department of Agronomy, Ahmadu Bello University, Zaria (2020).

Table 2: Effects of Fertilization and Trellising on Weed dry weight and weed cover score of Cucumber during the 2020 rainy season at Samaru.

Fertilization (F)	Weed cover score		Weed dry weight (g)	
	4 WAS	6 WAS	4 WAS	6 WAS
Control	6.00a	4.50a	45.13a	29.717a
Biochar (2 t ha <sup>-1</sup> )	5.00b	3.67b	29.20b	20.53b
NPK (100:50:50 kg ha <sup>-1</sup> )	3.83c	3.00c	20.08b	13.18c
SE±	0.255	0.161	3.134	1.657
Trellising (T)				
Trellised	5.89a	4.45a	42.41a	28.49a
Non-trellised	4.00b	3.00b	20.53b	13.80b
SE±	0.208	0.132	2.559	1.353
Interaction				
F x T	NS	NS	NS	NS

Means followed by the same letter(s) within a column in each treatment group are not significantly different at 5% probability level according to Duncan's Multiple Range Test (DMRT). NS= Not Significant, WAS= Weeks After Sowing and SE± = Standard Error

Table 3: Effects of Fertilization and Trellising on Number of branches and Vine length of Cucumber during the 2020 rainy season at Samaru.

Fertilization (F)	Vine length(cm)		Number of branches	
	4 WAS	6 WAS	4 WAS	6 WAS
Control	45.75b	66.42c	4.42b	5.00c
Biochar (2 t ha <sup>-1</sup> )	92.46a	139.58b	6.29a	8.03b
NPK (100:50:50 kg ha <sup>-1</sup> )	112.50a	186.67a	7.75a	9.71a
SE±	8.476	3.017	0.464	0.364
Trellising (T)				
Trellised	93.72	163.11a	8.14a	10.53a
Non-trellised	73.42	98.67b	4.17b	4.67b
SE±	6.920	2.634	0.379	0.297
Interaction				
F x T	NS	NS	NS	NS

Means followed by the same letter(s) within a column in each treatment group are not significantly different at 5% probability level according to Duncan's Multiple Range Test (DMRT). NS= Not Significant, WAS= Weeks After Sowing and SE± = Standard Error

Table 4: Effects of Fertilization and Trellising on Number of fruits, Fruit length, Fruit weight and Fruit Yield of Cucumber during the 2020 rainy season at Samaru.

Fertilization (F)	Number of fruits	Fruit length	Fruit weight		Fruit yield
			4 WAS	6 WAS	
Control	4.17c	10.83c	162.50c	3.62c	
Biochar (2 t ha <sup>-1</sup> )	10.93ab	19.33b	350.35b	10.93b	
NPK (100:50:50 kg ha <sup>-1</sup> )	13.50a	19.50a	497.00a	12.49a	
SE±	0.396	0.959	6.518	0.709	
Trellising (T)					
Trellised	10.15a	17.56a	372.81	9.17	
Non-trellised	8.33b	14.11b	362.11	8.94	
SE±	0.286	0.766	6.948	0.771	
Interaction					
F x T	NS	NS	NS	NS	

Means followed by the same letter(s) within a column in each treatment group are not significantly different at 5% probability level according to Duncan's Multiple Range Test (DMRT). NS= Not Significant, WAS= Weeks After Sowing and SE± = Standard Error

• **Conclusions.** In conclusion, trellising produced healthier fruits and higher yields than non-trellised. NPK application at 100:50:50 kg/ha gave the highest yields and biochar produced similar yields to NPK which can perform better with increasing rate. Biochar poses as an organic sustainable agricultural product that can revive and conserve the soil while also acting as a fertilizer but does little on weed suppression. Trellising is also a profitable cultural practice that can ensure healthy fruits and high yields.

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