



## EFFECT OF LIQUID ORGANIC MANURE AND STAKING METHODS ON THE GROWTH AND YIELD OF CUCUMBER (*Cucumis sativus* L.)

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### ABSTRACT

*The study examined the effect of liquid organic manure and staking methods on the growth and yield of cucumber within the farm practical plot of the Federal College of Forestry, Ibadan. The experiment was a 3 x 2 factorial laid out in a Randomized Complete Block Design (RCBD), six treatments (two animal manures, two staking methods and two control) namely; Liquid Poultry Manure and Staking (T1S1), Liquid Poultry Manure and Trellis (T1S2), Liquid Cow dung and Staking (T2S1), Liquid Cow dung and Trellis (T2S2), No Fertilizer and Staking (T3S1) and No Fertilizer and Trellis (T3S2) replicated three times all applied at five litres per plot. The results showed that liquid poultry manure and staking (T1S1) had the best performance in number of leaves, vine length stem diameter and yield recording the mean values of 19.33, 102.8cm, 3.30mm and 1425kg/ha respectively while no fertilizer and trellis (T3S2) performed least with the mean values of 9.33, 65.5cm, 2.73mm and 195kg/ha. The result obtained showed that although there were no significant differences among the treatments, liquid poultry manure and staking (T1S1) had the highest values in all the parameters assessed. It was therefore concluded that farmers should adopt the use of liquid poultry manure in form of foliar application and stake methods on the growth and yield of cucumber.*

**Keywords:** Liquid manure, staking, trellis, growth, yield and cucumber

### INTRODUCTION

Cucumber (*Cucumis sativus*) is one of the most popular members of the Cucurbitaceae family (Thoa, 1998). It is thought to be one of the oldest vegetables cultivated by man with historical records dating back 5,000 years (Wehner and Guner, 2004). In Nigeria, it is an important component of vegetable salads served in fast food restaurants. It is highly valued by farmers for the early and high revenue it gives. The crop is the fourth most important vegetable after tomato, cabbage and onion in Nigeria (Tatlioglu, 1997) though it has not been ranked in tropical Africa because of its limited use (Eifediyi *et al.*, 2011). Cucumber is a very good source of vitamins A, C, K, B6, potassium, pantothenic acid, magnesium, phosphorus, copper and manganese (Vimala *et al.*, 1999). The ascorbic acid and caffeic acid contained in cucumber help to reduce skin irritation and swollen. Cucumber

production is still mainly in the hands of small scale farmers in Nigeria who lack information in some important cultural practices such as staking and trellising for optimum yield of the crop. These farmers allow the vines to trail on the ground leading to the production of fruits with yellow bellis, overcrowding of the vines and subsequent attack by mould due to high humidity (Hardy *et al.*, 2002).

Organic Liquid fertilizer is produced from degradable materials like leaf, twigs, fossils, animal waste etc. These serve as manure and they increase the fertility of the soil naturally and usually applied to the plants while they are growing. It is easy to prepare and good for most vegetables (Akande *et al.*, 2010). Organic liquid fertilizer is a natural substance containing all macro and micro essential nutrients that improves the growth and productivity

of plants, enhance the natural fertility of the soil and replace the chemical elements taken from the soil by previous crops or other factors and improve the essential microorganisms in the soil. Poultry manure is not only cheap and effective but is also essential for establishing and maintaining the optimum soil physical conditions for plant growth and yield (Enujeke *et al.*, 2013). Cow dung is a good potential source of plant nutrients, but only in areas where animals are tethered or penned, so that dung can be collected. Cow dung can also be used for soil improvement. Its low nutrient value makes it safe to apply unlimited quantities (Hussan *et al.*, 2003).

## MATERIALS AND METHODS

### Study Area

The experiment was carried out within the farm Practical experimental plot of Federal College of Forestry, Ibadan. The climatic condition of the area is tropically dominated by rainfall pattern from 1400 mm – 1500 mm. The average temperature is about 32°C, average relative humidity of 80 – 85% and the ecological climatic conditions of the area experiences rainfall with two distinct seasons: dry season from November to March and rainy season from April to October (FRIN, 2017).

### Sowing of Cucumber Seeds

Cucumber seeds (Market more variety) was procured at Jubaili Agrotech, along Jericho, Ibadan. Prior to the sowing, soil samples and liquid organic manure were taken to the soil laboratory to determine the physical and chemical properties. Eighteen beds were made manually with hoe and staking was erected three weeks after planting. Two seeds of cucumber were sown per hole at a depth of 2.0cm and spacing of 50cm x 50cm. Seedlings were later thinned to one, two weeks after planting and a total number of twelve seedlings were left growing per plot, two plant stands were tagged for data collection. Fifty kilograms of poultry and cow dung manure were packed into a big sack separately, securely tightened and hung on an iron rod and then

suspended in a 200 litres container of water for a period of 48hours. The mixture was aerated by manual agitation twice daily to allow manure dissolve completely in water after which the mixture was filtered in order to separate the liquid from the solid part. Five (5) litres of liquid organic manure were sprayed per plot with the use of knapsack sprayer on the leaves of cucumber using foliar application method twice a week three weeks after planting prior to flowering. The experiment was a 3 x 2 factorial in Randomized Complete Block Design (RCBD) having six treatments replicated three times as follows; Liquid Poultry Manure and Staking (T1S1), Liquid Poultry Manure and Trellis (T1S2), Liquid Cow dung and Staking (T2S1), Liquid Cow dung and Trellis (T2S2), No Fertilizer and Staking (T3S1) and No Fertilizer and Trellis (T3S2) respectively.

### Data collection and analysis

Assessment of growth parameters was done weekly commencing from fourth week after sowing. The parameters assessed were: vine lengths (cm), number of leaves, stem Diameter and fruit weight of cucumber. Data collected was subjected to Analysis of Variance using General Statistical Software Package (GENSTAT) and significant means were separated using Duncan New Multiple Range Test (DNMRT) at 5% level of significance.

## RESULTS

The physio-chemical properties of the soil of the study area are as shown in Table 1. The result showed that the soil is sandy loam consisted of 90.7% sand, 5.94% clay and 3.39% silt. The soil is acidic with a pH of 6.89. The organic matter and organic carbon content are 2.20% and 1.28% respectively. The exchangeable cations were low in status with values of 3.04cmol/kg Ca, 1.29cmol/kg for Mg, Na(0.67cmol/kg) and K (1.55cmol/kg). The total nitrogen and available phosphorus values obtained were 0.58 and 5.97.

**Table 1: Physio-Chemical properties of the Soil**

<b>Parameters</b>	<b>Values</b>
pH	6.89
<b>Exchangeable cations(cmol/kg)</b>	
Ca	3.04
Mg	1.29
Na	0.67
K	1.55
Exch. Acidity(cmol/kg)	0.68
ECEC (cmol/kg)	2.14
Total N (%)	0.58
Organic Carbon (%)	1.28
Organic Matter (%)	2.20
Available Phosphorus	5.97
<b>Exchangeable micronutrients(mg/kg)</b>	
Mn	6.24
Cu	0.52
Zn	2.89
<b>Particle size distribution</b>	
Sand (%)	90.7
Silt (%)	3.39
Clay (%)	5.94
Textural class	Sandy loam

Table 2 shows the result of the chemical properties of the liquid manure used. The result shows that the pH of both liquid manure used was alkaline with pH value of 8.29. Total nitrogen (3.117g/mL) of the liquid poultry manure was higher than the cow dung

values of 1.876g/mL. Other nutrients analysed such as the organic carbon, organic matter, Phosphorus, Calcium Magnesium and potassium all recorded higher values in liquid poultry manure when compared with cow dung.

**Table 2: Chemical properties of the liquid poultry and Cow dung manure used**

<b>Parameters</b>	<b>Poultry values</b>	<b>Cow dung values</b>
pH	8.29	8.29
Total N (g/100mL)	3.117	1.876
OC (g/100mL)	26.89	22.58
OM (g/100mL)	46.36	38.92
NH <sub>4</sub> -N (mg/L)	3765	3426
NO <sub>3</sub> (mg/L)	406	359
Total P (g/100mL)	1.589	1.367
Ca (g/100mL)	2.618	2.106
Mg (g/100mL)	0.378	0.297
K (g/100mL)	2.756	2.159
Na (g/100mL)	0.957	0.876
S (g/100mL)	0.335	0.294
Cu (mg/L)	328	289
Fe (mg/L)	1942	1792
Zn (mg/L)	251	223
Mn (mg/L)	263	237

Table 3 shows that organic liquid poultry manure and staking (T1S1) performed best at week seven with mean value of 102.8 while no fertilizer and trellis (T3S2) had the least performance with values of 65.5. Although no significant differences was

observed among the treatments from week four to five but there was significant difference among the treatments from week five to week seven in the vine length of cucumber.

**Table 3: Effect of organic liquid manure and staking methods on the vine length of Cucumber**

Treatment	Weeks After Planting			
	4	5	6	7
Liquid Poultry Manure + Staking	85.5	89.8	97.5	102.8
Liquid Poultry Manure +Trellis	85.7	91.2	96.3	98.8
Liquid Cow dung + Staking	76.0	80.3	87.3	89.8
Liquid Cow dung +Trellis	62.8	64.8	70.2	72.2
No Fertilizer +Staking	68.2	69.3	70.0	70.8
No Fertilizer +Trellis	62.3	63.2	64.0	64.5
LSD Fertilizer (0.05)	NS	NS	7.51NS	7.23NS
LSD Staking (0.05)	NS	NS	7.51NS	7.23NS
LSD F. Staking (0.05)	11.9NS	12.8*	13.0*	12.5*

**Key:** T1S1= Liquid Poultry Manure and Staking, T1S2= Liquid Poultry Manure and Trellis, T2S1= Liquid Cow dung and Staking, T2S2= Liquid Cow dung and Trellis, T3S1=No Fertilizer and Staking, T3S2= No Fertilizer and Trellis.

The result of Table 4 shows that organic liquid poultry manure and staking (T1S1) produced the highest number of leaves at week seven with mean

values of 19.3 while no fertilizer and trellis (T3S2) had the least performance in the number of leaves having 9.33.

**Table 4: Effect of organic liquid manure and staking methods on number of leaves of cucumber**

Treatment	Weeks After Planting			
	4	5	6	7
Liquid Poultry Manure+Staking	13.1	16.2	19.3	19.3
Liquid Poultry Manure +Trellis	12.0	14.5	18.0	18.0
Liquid Cow dung + Staking	9.17	12.3	16.2	17.0
Liquid Cow dung +Trellis	11.5	14.2	18.2	18.7
No Fertilizer +Staking	10.2	11.3	11.5	11.5
No Fertilizer +Trellis	7.50	7.67	8.33	9.33
LSD Fertilizer (0.05)	NS	1.96NS	1.99NS	1.81NS
LSD Staking (0.05)	1.52NS	1.96NS	1.99NS	1.81NS
LSD F. Staking (0.05)	2.65NS	3.39*	3.45NS	3.13NS

Table 5 shows that organic liquid poultry manure and staking (T1S1) performed best in plant stem diameter with mean values of 3.30 while the least performance was observed in no fertilizer and trellis (T3S2) with mean value of 2.73.

Table 6 shows that liquid poultry manure and staking (T1S1) had the mean value of 1425 kg/ha which signifies that it performed best in yield at harvest while the least performance was observed in no fertilizer and trellis (T3S2) with mean value of 195kg/ha.

**Table 5: Effect of organic liquid manure and staking methods on the stem diameter of cucumber**

Treatment	Weeks After Planting			
	4	5	6	7
Liquid Poultry Manure + Staking	2.38	2.78	3.15	3.30
Liquid Poultry Manure +Trellis	2.43	2.76	3.00	3.08
Liquid Cow dung + Staking	2.50	2.71	3.02	3.08
Liquid Cow dung +Trellis	2.38	2.70	2.85	2.96
No Fertilizer +Staking	2.61	2.70	2.78	2.87
No Fertilizer +Trellis	2.48	2.53	2.60	2.73
LSD Fertilizer (0.05)	0.13*	0.12NS	0.15NS	0.13NS
LSD Staking (0.05)	0.13NS	0.12NS	0.15NS	0.13NS
LSD F. Staking (0.05)	0.22NS	0.20NS	0.25NS	0.24NS

**Table 6: Effect of organic liquid manure and staking methods on the yield of cucumber**

Treatments	Yield (kg/ha)
Liquid Poultry Manure + Staking	1425
Liquid Poultry Manure +Trellis	1010
Liquid Cow dung + Staking	442
Liquid Cow dung +Trellis	610
No Fertilizer +Staking	275
No Fertilizer +Trellis	195
LSD Fertilizer ( 0.05)	NS
LSD Staking ( 0.05)	NS
LSD F. Staking (0.05)	NS

## DISCUSSION

The study revealed that liquid poultry manure and staking method recorded highest values in all the parameters assessed in terms of vine length, numbers of leaves, stem diameter and yield of cucumber while no fertilizer and trellis had the least performance. Poultry manure contains essential nutrient elements with high photosynthetic activities and thus promotes root and vegetable growth (John *et al.*, 2004). Deskissa *et al.*, (2008) emphasized that manure enable soils to hold more water, improve the drainage, organic acids that help dissolve soil nutrients and then made available for the crops. Ghanbarian *et al.*, (2008) reported that poultry manure contains higher nitrogen and phosphorous as compared to other manures, while Garg and Bahl (2008) indicated that poultry droppings readily supply phosphorous to plants than other organic waste. Dauda *et al.*, (2005) and Nweke *et al.*, (2014) reported an increase in plant growth following poultry manure application.

The increase in the number of fruits differs significantly with the application of poultry manure than other treatments applied. The results could be due to higher number of leaves which may have increased fruit production (Nweke *et al.*, (2014). Staking is done to increase yield, better exposure of plant to sunlight and ventilation. Egun (2007) recommended raised platform staking method for increasing pod yield and enhanced marketable value for cucumber and fluted pumpkin. Okonmah (2011) reported that staking increases fruit yield, reduces the proportion of unmarketable fruit, enhances the production of high quality fruits, prevent diseases of fruit rot, allows better aeration and exposes the foliage to sunlight for photosynthetic activities. Amina *et al.*,2012 noted the staking of tomatoes and other fruit crops for higher yield and good quality fruit with higher market value. The yield parameters assessed were found to be higher on the staked treatment than that of trellis. Hardy *et al.*,(2002) also affirmed that staking improves the colour and lower the incidence of yellow bellies in watermelon.

## CONCLUSION AND RECOMMENDATION

This study shows liquid poultry manure and staking methods recorded highest values in the vine length, stem diameter, number of leaves and yield of *Cucumis sativus* while no fertilizer and trellis recorded least although the experiment showed no significant difference in all the treatment applied. Farmers should therefore adopt the use of liquid poultry manure in form of foliar application and

stake method for the growth and yield of cucumber. This study recommends the need for more research on varying levels of liquid organic manure application (generated from cow dung and poultry) on cucumber. In addition, researchers are also advised to adopt a lower ratio of mixture of organic manure and water compared to the one adopted in this study.

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