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Development of Drip Flow Technique Hydroponic in Growing Cucumber

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Abstract

Hydroponics is a new branch and aspect of food crop growing that in recent years made its mark in developing country such as Nigeria. Although, its adoption has not been too encouraging. This research work aimed at developing a drip technique system of hydroponics in determination of the agronomic parameters of cucumber by comparing the yield, water and nutrient efficiency, its consumptive use and proximate and mineral composition of cucumber. The experiment was carried out in a complete randomized design with three treatments; organic substrate (coconut coir), inorganic substrate (styrofoam) and soil. These treatments were replicated five times. The vegetative growth (agronomic parameters), yield, water and nutrient, proximate and mineral composition were measured. The result showed the consumptive use as 0.0044 m^3 per day and 0.3212 m^3 as the water and nutrient use efficiency. The result also showed that organic substrate gave the highest mean plant height of 736.66 mm, highest mean stem diameter of 5.79 mm and highest mean number of leaves of 9.75 while inorganic substrate gave highest mean plant height, mean stem diameter and mean number of leaves as 336.28 mm, 4.95 mm and 7.68 respectively. Also, the highest result of control (soil) gave 301.23 mm, 5.47 mm and 7.06 for the mean plant height, stem diameter and number of leaves respectively. The yield of cucumber as compared with the different growing media showed that there is no significant difference between the growing media ($F_{crit>}$ F_{cal}) unless for the plant height and number of flowers having F_{crit} less than F_{cal}. From these results, it is advisable that drip technique system should be embraced by farmers whose primary aim of farming is for leafy vegetables and non-leafy vegetables as seen in the increase in stem diameter and plant height in the organic substrate.

Keywords: drip-flow, hydroponic, cucumber, yield, consumptive use, quality

1. Introduction

Hydroponic being a new science in engineering and agriculture refers to the technique of growing plants using nutrient solution with or without the use of growing medium such as gravel, vermiculite, rockwool, peat moss, saw dust, coir dust, coconut fibre, etc. to provide mechanical support for the root. Hydroponics as a term was derived from the Greek words *hydro'* meaning water and *ponos'* means labor which can be literally refers to as water work (Olubanjo & Alade, 2018). While some hydroponic systems operate automatically to control the amount of water, nutrients and photoperiod based on the requirements of different plants, others operate manually by changing the nutrients periodically especially when it is too acidic or basic. Due to rapid urbanization and industrialization not only the cultivable land is decreasing but also conventional agricultural practices causing a wide range of negative impacts on the environment (Kadianska, 2016). To meet year 2030 sustainable agenda of United Nations goals of zero hunger, methods for growing sufficient food have to evolve. Modification in growth medium is an alternative for sustainable production and to conserve fast depleting land and available water resources. Soilless cultivation might be considered as another alternative for growing healthy food plants, crops or vegetables, etc. (Butler & Oebker, 2006).

Agriculture without soil entails hydro-agriculture (Hydroponics), aqua-agriculture (aquaponics) and aerobic-agriculture (Aeroponics) as well as substrate culture. Various commercial and specialty crops can be grown using hydroponics including leafy vegetables, tomatoes, cucumbers, peppers, strawberries, and many more. Worldwide arable land is already less than 0.2 ha per capital at present and is expected to further shrink to

0.15 in 2050. Urbanization and industrialization has also led to a drastic decrease in per capita water availability, cultivable land and also greater decrease in conventional agricultural practices causing a wide range of negative impacts on the environment in Nigeria. To sustainably feed the world's growing population, new methods of growing sufficient food crop need to be developed (Benedito, Kotcon, & Fess, 2011). Some outdoor crops are faced with problems such as continuous soil degradation, loss of fertility, indiscriminate chemical inputs use, and above all continuous depletion of water resources of which there is a way to strike a balance in the combination of water, nutrients, and oxygen which the plant needs in order to maximize yield and quality. These problems can be managed by developing a controlled environment, regulating nutrients rate for plants, securing the farmland and so on. This will invariably maximize agricultural productivity and reduce/eradicate undue financial losses and everyone will be adequately and nutritiously fed without over exploiting the natural resources.

Hydroponics has been adapted to many situations, from outdoor field culture and indoor greenhouse culture to grow vegetables and fruits (Sharma, Acharya, Kumar, Singh, & Chaurisia, 2019).The cucumber most likely originated in India (south foot of the Himalayas), or possibly Burma, where the plant is extremely variable both vegetative and in fruit characters. It has been in cultivation for at least 3000 years. The cucumber (*Cucumis sativus* L.) belongs to the Cucurbitaceae family, one of the more important plant families. Cucumber (Cucumis sativus L.) is an edible cucurbit popular throughout the world for its crisp texture and taste. Cucumbers are often eaten as a vegetable but they are scientifically considered a fruit as they contain enclosed seeds and develop from a flower (AnamWaheed, 2017). The high water content makes cucumbers a diuretic and it also has a cleansing action within the body by removing accumulated pockets of old waste material and chemical toxins. Cucumbers help eliminate uric acid which is beneficial for those who have arthritis, and its fiber-rich skin and high levels of potassium and magnesium helps regulate blood pressure and help promote nutrient functions. The magnesium content in cucumbers also relaxes nerves and muscles. However, this crop has not much been considered for cultivation under drip flow hydroponic system in Nigeria. The aim of this research work is to determine the growth, yield rate, proximate, mineral composition and consumptive use of cucumber plant using drip flow system of hydroponic to produce the fruit.

2. Materials and Methods

2.1 Study Areas

The experiment was carried out at Agricultural and Environmental Engineering experimental farm plot of the Federal University of Technology, Akure, Ondo State, Nigeria (7.2995^{0}N, 5.1471^{0}E). (Figure 1) As a tropical area, Akure has a high temperature throughout the year. The average daily temperature is 26 ℃ with a range between 18^{o}C and 35^{o}C. Mean annual relative humidity of about 80% andrelief is about 396 m above sea level (Odubanjo, Olufayo, & Oguntunde, 2011).

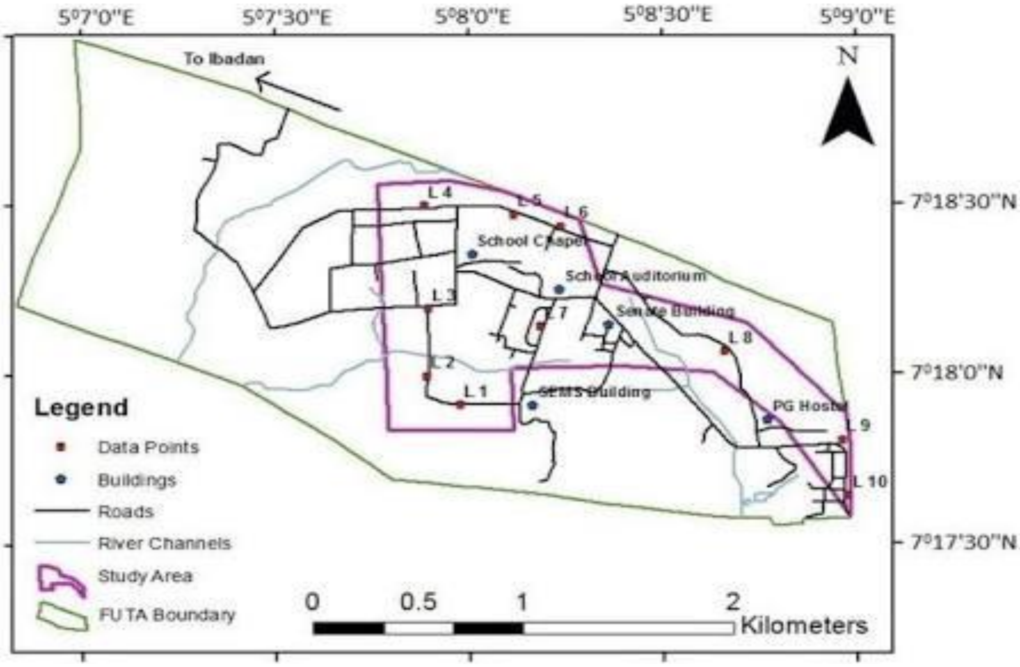
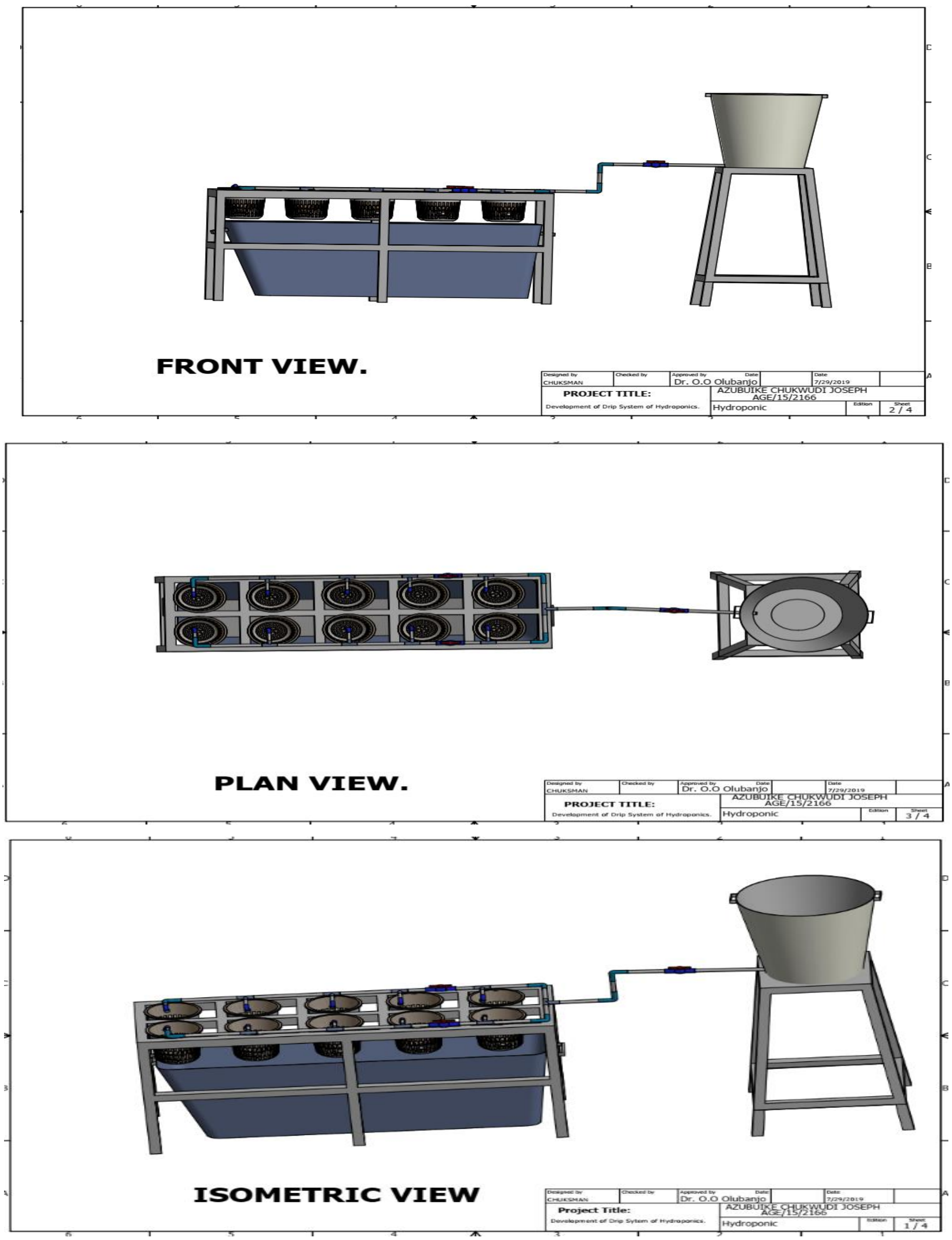


Figure 1. Map of the Study Area

2.2 Experimental Unit and Design

The plastic substrates holder in this study was 25cm diameter and 20cm depth. Nursed seedlings was transplanted into the substrate holder on 05th August, 2019 which contains the substrates (coconut coir and styrofoam) between 7:30am and 8:05am. The seed was obtained from International Institute of Tropical Agriculture, Ibadan (IITA). Seedlings were transplanted after two weeks of emergence with the soil be shaken off. The nutrients were mixed. The mixing proportion was according to Mccall & Nakagawa, (1970) and Olubanjo & Alade, (2019). The diagrams in figure 2 explained the design of the experimental units.



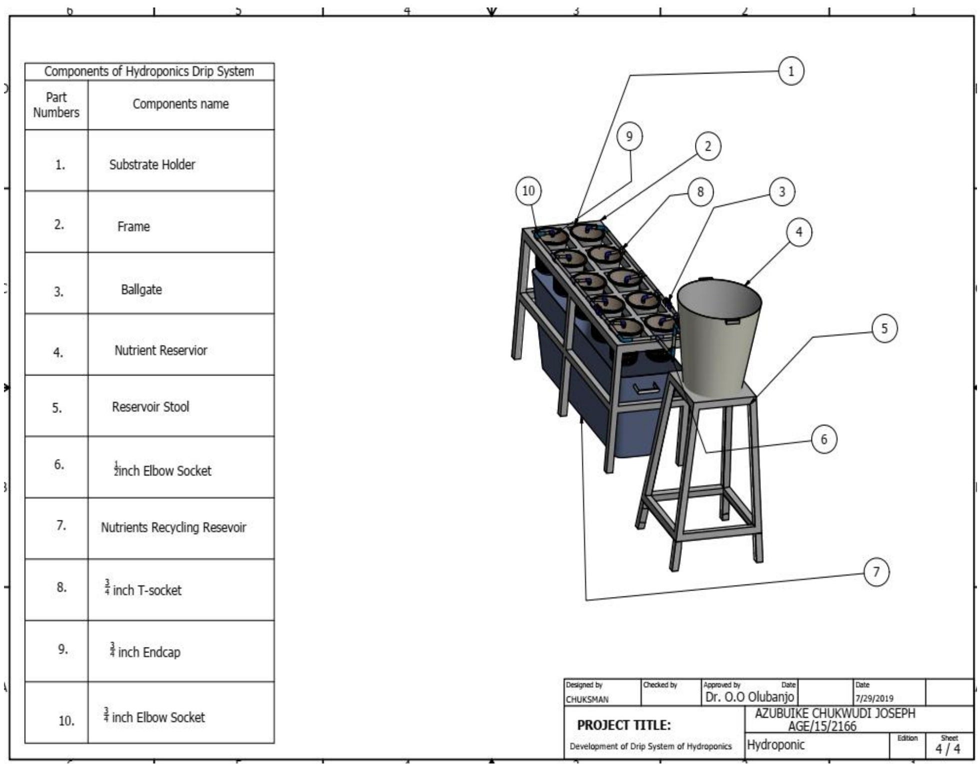


Figure 2. Orthographic and exploded view of the planting unit

3. Results and Discussion

3.1 Elemental Chemical Composition of Coconut Coir

The elemental composition of the substrate was done in the chemistry laboratory of the Federal University of Technology, Akure. Below were the results obtained from the test.

Table 1. Elemental Composition of Coconut Coir

Elements	Composition(Mg/litres)
Calcium (Ca)	5.96
Manganese (Mn)	0.18
Potassium (K)	3.74
Iron (Fe)	0.00BLD
Phosphorus (P)	0.00BLD
Nitrogen (N)	0.28
Protein	1.75

3.2 Agronomic Parameters of Cucumber

Agronomy parameters taken were leaf length, stem diameter, leaf width, number of flowers, plant height and the date. The mean of these values are presented in the table below.

Table 2. Mean Values of Agronomic Parameters from Control Experiment (Soil)

	Mean stem diameter (mm)	Mean leaf length (mm)	Mean leaf width (mm)	Mean number of leaves	Mean plant height (mm)	Mean number of flowers
Plant 1	4.34666667	95.6666667	100.1	5.3333333	204.6	0.9
Plant 2	5.47166667	125.333333	130.8666667	7.06666667	301.2333333	1.166667
Plant 3	4.21333333	110.6666667	120.5666667	7.06666667	295.0333333	1.3
Plant 4	4.14333333	83.63333333	85.66666667	5.56666667	173.4	0.9333333
Plant 5	4.43166667	103.0333333	109.1333334	5.66666667	186.8666667	1.0666667

Table 3. Mean Values Agronomic Parameters from Organic Substrate (Coconut Coir)

	Mean stem diameter (mm)	**Mean leaf length (mm)**	**Mean leaf width (mm)**	**Mean number of leaves**	**Mean plant height (mm)**	**Mean number of flowers**
Plant 1	4.05862069	117.1034483	123.6551724	8.13793103	407.655172	1.965517241
Plant 2	4.27931035	90	94.72413793	5.37931035	219.448276	1.24137931
Plant 3	5.7862069	137.6206897	141.0689655	9.34482759	574.827586	2.551724138
Plant 4	5.57586207	148.6206897	150.4827586	9.75862069	736.655172	2.172413793
Plant 5	4.56206897	130.3448276	139.8275862	8.20689655	374.62069	1.620689655

Table 4. Mean Values of Agronomic Parameters from Inorganic Substrate (Styrofoam)

	Mean stem diameter (mm)	**Mean leaf length (mm)**	**Mean leaf width (mm)**	**Mean number of leaves**	**Mean plant height (mm)**	**Mean number of flowers**
Plant 1	4.28793103	93.2068966	101.862069	5.75862069	262.3448276	0.5862069
Plant 2	4.9724138	144.37931	151.965517	7.482758621	297.2068966	1.1379310
Plant 3	4.0948276	91.5517241	97.3448276	4.689655172	126.4827586	0.9310345
Plant 4	4.6258621	123.62069	125.827586	7.689655172	336.2758621	1.7241379
Plant 5	3.9611111	77.0740741	79.259259	5.296296296	124.8518519	0.8076923

Table 5. Comparison between the Mean Stem Diameter for Control Experiment, Organic Substrate and Inorganic Substrate

	Mean stem diameter for control (mm)	**Mean stem diameter for organic substrate (mm)**	**Mean stem diameter for inorganic substrate (mm)**
Plant 1	4.346666667	4.05862069	4.287931034
Plant 2	5.471666667	4.279310345	4.972413793
Plant 3	4.213333333	5.786206897	4.094827586
Plant 4	4.143333333	5.575862069	4.625862069
Plant 5	4.431666667	4.562068966	3.96111111

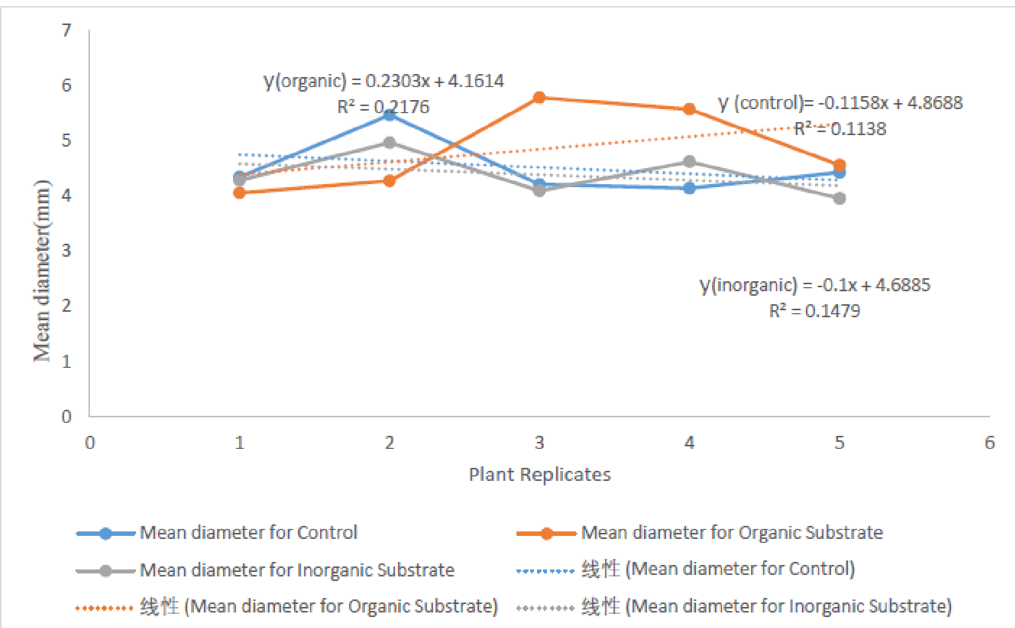


Figure 3. Graph showing relationship between the treatments stem diameters (mm)

Table 6. Analysis of variance (Anova) table showing relationship between the treatments and stem diameters (mm)

SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Mean diameter for Control	5	22.60667	4.521333	0.294858		
Mean diameter for Organic Substrate	5	24.26207	4.852414	0.609551		
Mean diameter for Inorganic Substrate	5	21.94215	4.388429	0.169079		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	0.570933	2	0.285466	0.797773	0.472833	3.885294
Within Groups	4.293947	12	0.357829			
Total	4.86488	14				

Anova: Single Factor

The result from Figure3 shows that cucumber stem is enhanced in organic substrate than other substrate media used in the experiment. This result is seen in the value of R^2 (i.e. 0.2176) which is greater than the R^2 in the inorganic and control experiment which is 0.1479 and 0.1138 respectively. These conform with the result of Eifediyi & Remison (2010).

Also, from the value of $F_{calculated}$ and $F_{critical}$ in the Anova table shown in table 6, it showed that there is no significant difference between the stem diameters of the substrate media having $F_{calculated}$ as 0.7977 and $F_{critical}$ as 3.885. These results agreed with the findings of Olaniyi & Fagbayide (1999); Olaniyi, Akanbi, Adejumo, & Akande (2010); Olubanjo & Alade (2019).

Table 7. Comparison between the Mean Leaf Length for Control Experiment, Organic substrate and Inorganic substrate

	Mean leaf length for control (mm)	**Mean leaf length for organic substrate (mm)**	**Mean leaf length for inorganic substrate (mm)**
Plant 1	95.6666667	117.1034483	93.20689655
Plant 2	125.333333	90	144.3793103
Plant 3	110.6666667	137.6206897	91.55172414
Plant 4	83.63333333	148.6206897	123.6206897
Plant 5	103.0333333	130.3448276	77.07407407

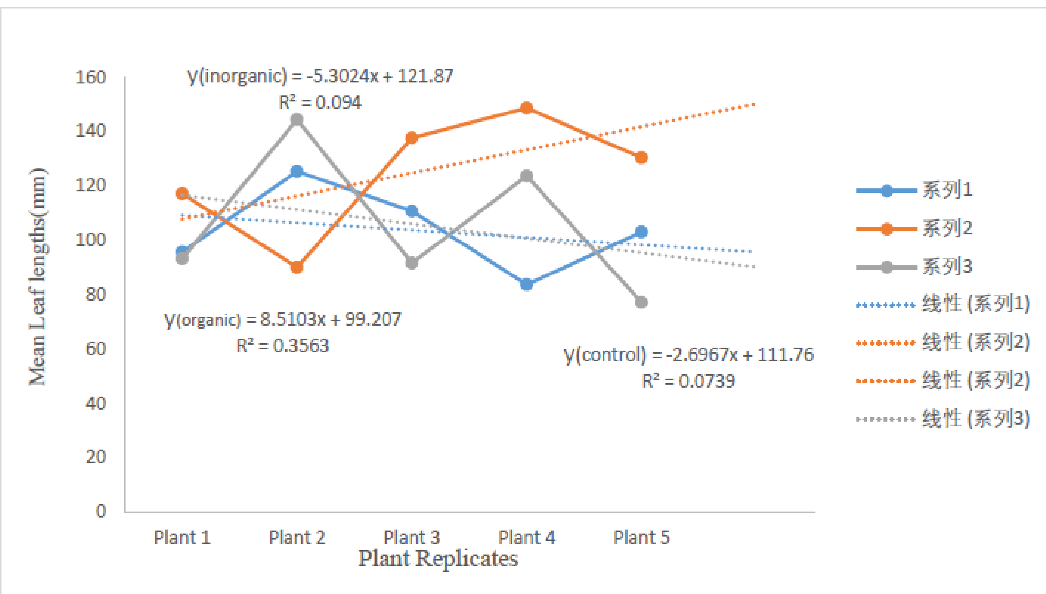


Figure 4. Graph showing relationship between the treatments and leaf lengths (mm)

Table 8. Analysis of variance (Anova) table showing relationship between the treatments and leaf length (mm)

SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Mean Leaf Length for Control	5	518.3333	103.6667	246.045		
Mean Leaf Length for Organic Substrate	5	623.6897	124.7379	508.1995		
Mean Leaf Length for Inorganic Substrate	5	529.8327	105.9665	748.145		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1336.088	2	668.044	1.333963	0.29983	3.88529383
Within Groups	6009.558	12	500.7965			
Total	7345.646	14				

The results from the Fig 4 shows that the organic substrate have a greater value for leaf length compare to the other two growing media (inorganic and soil). It has value of R^2 as 0.3563 compare to that of inorganic substrate (i.e. R^2 is 0.094) and control experiment (i.e. R^2 is 0.0739). The yield from the experiment was in agreement with the report of Murwira & Kirchman (1993).

The value of $F_{critical}$ and $F_{calculated}$ as shown in the Anova table (Table 8) shows that there is no significant difference between the leaf length in the growing media. This has been corroborated through 1.3339 and 3.8852 as values for $F_{calculated}$ and $F_{critical}$ respectively. This result agreed with the works of Eifediyi & Remison (2010); Adenawoola & Adejoro (2005) who observed that organic material can improve the growth and yield of cucumber.

Table 9. Comparison between the Mean Leaf Widths for Control Experiment, Organic Substrate and Inorganic Substrate

	Mean leaf width for control (mm)	**Mean leaf width for organic substrate (mm)**	**Mean leaf width for Inorganic substrate (mm)**
Plant 1	100.1	123.6551724	101.862069
Plant 2	130.8666667	94.72413793	151.9655172
Plant 3	120.5666667	141.0689655	97.34482759
Plant 4	85.66666667	150.4827586	125.8275862
Plant 5	109.1333334	139.8275862	79.25925926

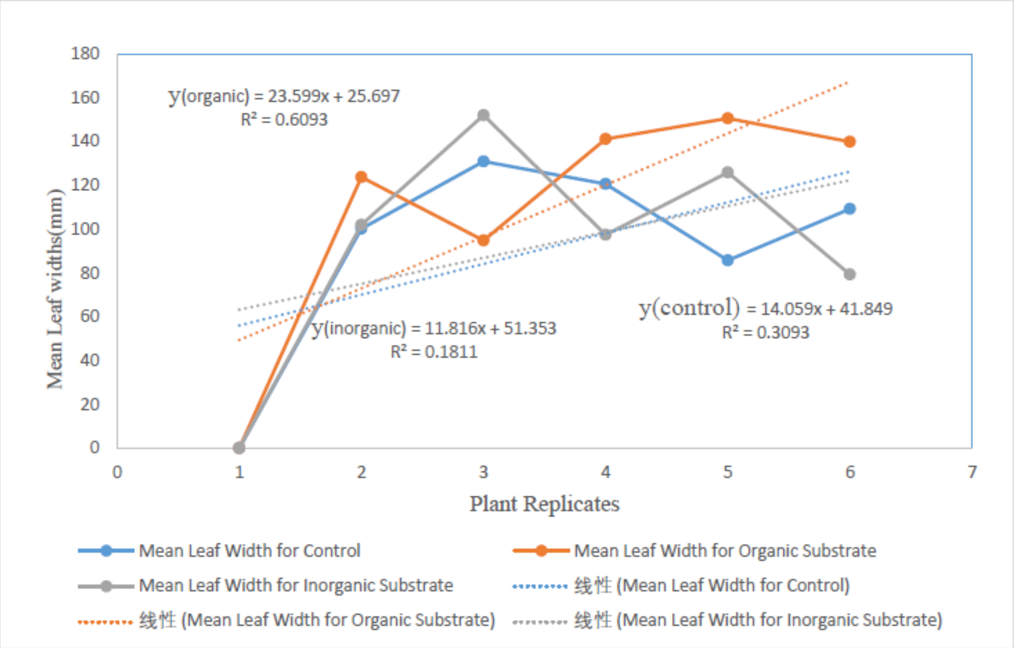


Figure 5. Graph showing relationship between the treatments and leaf widths (mm)

Table 10. Analysis of variance (Anova) table showing relationship between the treatments and leaf widths (mm)

SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Mean Leaf Length for Control	5	546.3333	109.2667	308.8139		
Mean Leaf Length for Organic Substrate	5	649.7586	129.9517	480.8196		
Mean Leaf Length for Inorganic Substrate	5	556.2593	111.2519	793.7885		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	1302.496	2	651.2482	1.233875	0.325598	3.885294
Within Groups	6333.688	12	527.8073			
Total	7636.184	14				

The values of R^2 in the graph (Figure5) which are 0.6093, 0.1811 and 0.3093 for organic, inorganic and control experiment respectively show that cucumber have a higher leaf width in organic substrate having greater leaf widths compare to the other two growing media. There is also no significant between the leaf lengths of the substrates media. This has been justified in the Analysis of Variance table (Table 10) with $F_{calculated}$ and $F_{critical}$ as 1.2338 and 3.8885 respectively. This was in agreement with Fuchs, Rauche, & Wicke. (1970) and Ayoola & Adeniyan, (2006) who reported that nutrients from mineral fertilizers enhanced the establishment of crops while those from the mineralization of organic matter promoted yield when manures and fertilizers were combined.

Table 11. Comparison between the mean for number of leaves for control experiment, organic substrate and inorganic substrate

	Mean number of leaves for control	**Mean number of leaves for organic Substrate**	**Mean number of leaves for Inorganic substrate**
Plant 1	5.3333333	8.137931034	5.75862069
Plant 2	7.06666667	5.379310345	7.482758621
Plant 3	7.066666667	9.344827586	4.689655172
Plant 4	5.566666667	9.75862069	7.689655172
Plant 5	5.666666667	8.206896552	5.296296296

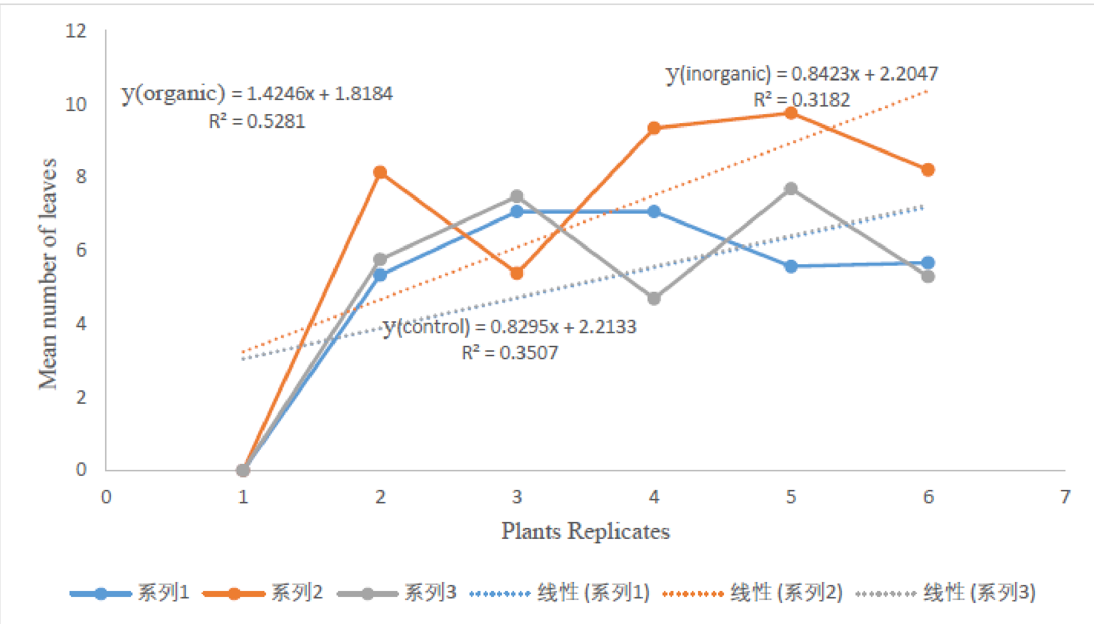


Figure 6. Graph showing relationship between the treatments and number of leaves

Table 12. Analysis of variance (Anova) table showing relationship between the treatmentsand number of leaves

SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Mean Number of leaves for Control	5	30.7	6.14	0.730222		
Mean Number of leaves for Organic Substrate	5	40.82759	8.165517	2.923543		
Mean Number of leaves for Inorganic Substrate	5	30.91699	6.183397	1.78895		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	13.38901	2	6.694503	3.689979	0.05636	3.885294
Within Groups	21.77086	12	1.814239			
Total	35.15987	14				

Anova: Single Factor

Organic substrate yielded more leaves. This is seen in Figure 6 with R^2 as 0.5281 compare to 0.31282 and 0.03507 of R^2 for the inorganic and control experiment. This may be due to potential nutrient in the coconut coir. This agrees with the results of Enujeke, (2013). Also, there is little significant difference between the three substrates media having $F_{calculated}$ as 3.6899 and $F_{critical}$ as 3.88529 in the Anova table (Table 12). However, the result was similar to the findings of Majanbu, Ogunlella, & Ahmed(1996) and Ibrahim, Amans, & Abubakar (2000) who reported that genetic constitution of crop varieties influences their growth characters.

Table 13. Comparison between the mean plant heights for control experiment, organic substrate and inorganic substrate

	Mean plant height for control (mm)	**Mean plant height for organic substrate (mm)**	**Mean plant height for inorganic substrate (mm)**
Plant 1	204.6	407.6551724	262.344828
Plant 2	301.2333333	219.4482759	297.206897
Plant 3	295.0333333	574.8275862	126.482759
Plant 4	173.4	736.6551724	336.275862
Plant 5	186.8666667	374.6206897	124.851852

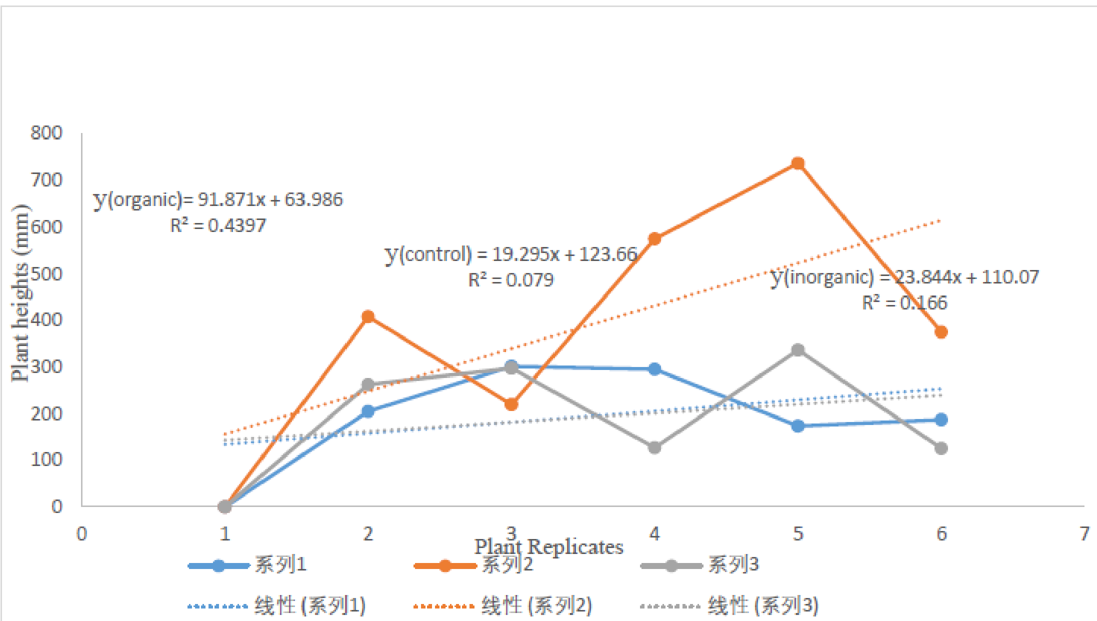


Figure 7. Graph showing relationship between the treatments and plant heights (mm)

Table 14. Analysis of variance (Anova) table showing relationship between the treatmentsand heights (mm)

SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Mean Plant height for Control	5	1161.13	232.227	3746.94		
Mean Plant height for Organic Substrate	5	2313.27	462.644	39395.3		
Mean Plant height for Inorganic Substrate	5	1147.12	229.434	9656.94		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	17912	2	89570.6	5.08921	0.0259	3.8853
Within Groups	21119	12	17599.3			
Total	39031	14				

Anova: Single Factor

The growth as regard the height have dwindling form especially for the control (R^2 =0.079) as shown in fig 7. This may be cause by nutrient deficiency in the soil medium or presence of insect pests in soil or inability to trap sunlight for photosynthetic use. In the case of organic medium, the growth was rapid especially for (P5). This increase in height may be as a result of nutrient concentration on the growing medium (coconut coir) or the ease of trapping of nutrients by the root. There is a significant difference between the plant heights which have 5.08928 and 3.8853 as $F_{calculated}$ and $F_{critical}$ respectively. This result agreed with the works of Eifediyi & Remison (2010); Adenawoola & Adejoro (2005) who observed that organic materials can improve the growth and yield of cucumber and was also in agreement with Ayoola, (2010) who reported that nutrients from mineral fertilizers enhanced the establishment of crops while those from the mineralization of organic matter promoted yield when manures and fertilizers were combined.

Table 15. Comparison between the Mean Number of Flowers for Control Experiment, Organic Substrate and Inorganic Substrate

	Mean number of flowers for control	**Mean number of flowers for organic substrate**	**Mean number of flowers for inorganic substrate**
Plant 1	0.9	1.965517241	0.586206897
Plant 2	1.166667	1.24137931	1.137931034
Plant 3	1.3	2.551724138	0.931034483
Plant 4	0.93333333	2.172413793	1.724137931
Plant 5	1.066666667	1.620689655	0.807692308

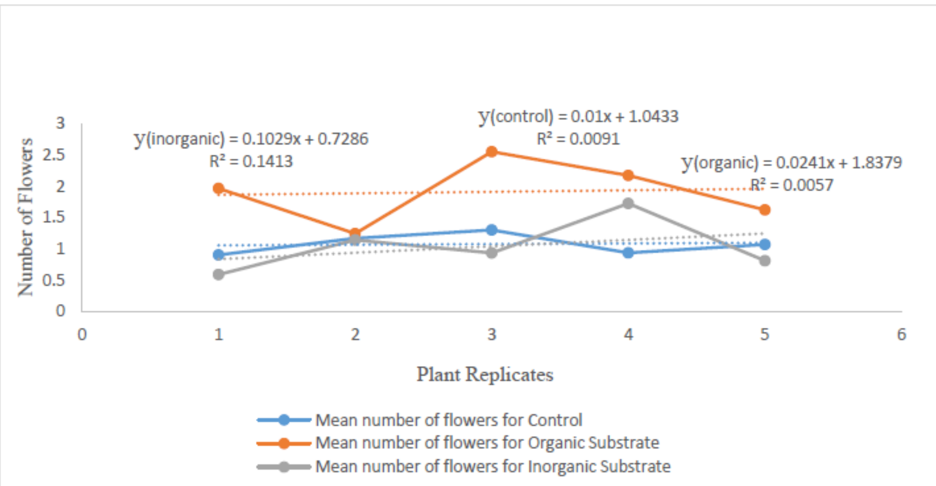


Figure 8. Graph showing relationship between the treatments and number of flowers

Table 16. Analysis of variance (Anova) table showing relationship between the treatments and number of flowers

SUMMARY						
Groups	*Count*	*Sum*	*Average*	*Variance*		
Mean number of flowers for Control	5	5.366667	1.073333	0.027444		
Mean number of flowers for Organic Substrate	5	9.551724	1.910345	0.253627		
Mean number of flowers for Inorganic Substrate	5	5.187003	1.037401	0.187342		
ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	2.439852	2	1.219926	7.813133	0.00672	3.8853
Within Groups	1.873654	12	0.156138			
Total	4.313506	14				

Anova: Single Factor

3.3 Consumptive Use of Water and Nutrients Solution for Cucumber (CU)

The consumptive use of water as seen in the experiment was approximately 4.5 litres (0.0045 m^3). This was seen in the change in nutrient level. The nutrient which was released for the plants at 9:05am on July 07th 2019. This nutrient reservoir gate was locked at same time the following day (July 08th, 2019). It was found that the nutrient used was 0.0045 m^3, after subtracting the volume of the nutrient collected and the one remaining in the reservoir from the total volume of nutrients initially mixed.

Volume of nutrient initially in the reservoir before release (V_1) =30 litres (0.03 m^3)

Volume of nutrient left in the reservoir after locking the valve (V_2) =7.2 litres (0.0072 m^3)

Volume of nutrient that drained from the substrate (V_3) = 18.4 litres (0.0184 m^3)

Volume of nutrient used per day considering both minor and major losses (V_4)

$$V_4 = V_1 - (V_2 + V_3)$$

V_4 = 0.03 - (0.0072 + 0.0184)

V_4 = 0.0044 m^3per day

3.4 Water and Nutrients Use Efficiency (WUE) of Cucumber

The amount of water required by the plant (cucumber) from the day of transplanting (04th August,2019) to the day of harvest (09th October, 2019) was approximately 33 litres of water neglecting any losses either due to pipe material, irrigation accessories used and human factor when recycling the nutrient. This was done by taking the level of nutrient solution in the reservoir every week of the experiment and doing the necessary subtraction. The level of nutrient from the day of release was noted and subsequent drop in volume were taken up to the day harvest. In order to get the flow rate of water, the nutrient solution drop was observed for 48 hours after the day of 1st release.

$$\text{Flowrate (Q)} = \frac{V}{T}(m^3/s)$$

V is volume dropped (m^3), T is time (seconds)

Volume dropped = 2.5 litresi.e (0.0025 m^3)

$$\text{Hence, flowrate} = \frac{0.0025}{48\times60\times60} = 1.447 \times 10^{-8}\, m^3/s$$

WUE= CU × number of days for maturity (73days)

WUE= 0. 0044 × 73

WUE= 0.3212 m^3

3.5 Proximate and Nutrients Composition of Cucumber Fruit Obtained from the Different Growing Media (Organic, Inorganic and Control)

The proximate analysis was carried out to determine the percentage of ash content, crude fibre, crude fat and crude protein. This is shown in Table 17.

Table 17. Proximate and nutrients composition of cucumber

Growing media	% Ash content	% Crude fat	% Crude fibre	% Crude Protein
Organic (coconut coir)	16.64	8.27	13.64	0.44
Inorganic (styrofoam)	16.72	6.64	10.52	0.45
Control (soil)	15.79	6.63	12.11	0.47

The result from the proximate and nutrient composition showed that the percentage of ash content range from 15.79% to 16.72%, the crude fat range from 6.63% to 8.27% with organic substrate having the highest percentage. The percentage of crude is between 10.52% to13.64% and that of crude protein is between 0.44% to 0.47%. This shows that cucumber has low protein content. The results for the mineral analysis of organic substrate agrees with Abbey et al., (2017). This may be due to the similarity in environmental condition of the study area or the similarity in soil nutrient composition of Abbey Nwanchoko, & Nkiroma (2017) and nutrient composition of coconut coir in this study. The result of proximate analysis of soil also is in line with Adeyi, (2010) and Makinde & Eyitayo (2019).

4. Conclusion

The experiment has clearly showed that hydroponics system of growing cucumber has greater yield of fruit compare to soil medium. Use of organic substrate yielded more results than other growing media, the results in different table presented in the write up has corroborated this fact, there is greater growth rate (especially in heights of cucumber in hydroponics compare to soil), hence the need for practice hydroponics. Cucumber in drip system of hydroponics also showed that there is conservation of nutrients and water although there may be transmission of diseases which could be from greenhouse surrounding. The proximate and nutrient composition of cucumber was found to be in accordance with the standard nutrient of cucumber.

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