International Journal of Research in Agriculture and Forestry
Volume 6, Issue 10, 2019, PP 1-7
ISSN 2394-5907 (Print) & ISSN 2394-5915 (Online)

Comparative Study on the Growth and Yield of Cucumber under Three Different Seed Beds in Jos, Plateau State

O. E. Nwafor, Jauro, A.G*

Forestry Research Institute of Nigeria Ibadan, Nigeria

***Corresponding Author:** O. E. Nwafor, Jauro, A.G. Forestry Research Institute of Nigeria, P.M.B 5054, Ibadan. E-mail: emmaoddynwafor@yahoo.com*

ABSTRACT

The study was carried out in the research farm of federal college of Forestry, Jos, Plateau state to investigate the growth and yield of cucumber under three different seed beds. The treatments (seed beds) were; ridges, raised beds and flat. Zero tillage was used as control for T1, T2, T3 and T4 respectively. The treatments were laid in a Randomized Complete Block (RCBD) design, each with four replicates. Ridges were made 20cm high and 30cm wide with one (1) plant row inside, at 40cm distance apart. Raised beds of 20cm high and 3 plant rows inside spaced at 40cm distance apart. Raised beds of 20cm high and 3 plant rows inside spaced at 40cm distance was also used. Flatbed was made with three (3) plant rows inside spaced at 40cm distance and Zero tillage used as control also with 3 plant rows inside, spaced at40cm distance. T2 (raised bed) was found to have the highest performance followed by flatbed (T3) and then ridges T1. The control had the lowest performance in all the parameters assessed except flower count where the ridge treatment gave the lowest.

Keywords: *Zero tillage, Raised bed, Flat bed, Control, treatment.*

INTRODUCTION

Cucumber scientifically known as *Cucumis sativus* L belongs to the family *Curcubitaceae* together with other *Curcubitales* is the fourth most widely cultivated vegetables in the world next to tomatoes, cabbage and onions (Abiodun, 2010). Cucumber is a warm season crop. Cucurbit is said to have originated probably from the northern part of India, and then introduced to Mediterranean at an early date, but today it is cultivated in northern and southern India, South-East Asia, Central and South America, the Caribbean and most tropical areas (Gyang, 2009).

Cucumber is a creeping vine that roots in the ground and grows up trellises on other supporting frames, wrapping around ribbing with thin spiraling tendrils. The plant has large leaves that form a canopy over the fruit. The fruit is roughly cylindrical, elongated, with tapered ends and may be as large as 60cm long and 10cm in diameter. Cucumber grown to be eaten fresh (called slicers) and those intended for pickling (called picklers) are similar.

Cucumbers are mainly eaten in the unripe green form. The ripe yellow form normally becomes too bitter and sour. Cucumber is usually over 90% water. Having an enclosed seed and developing from a flower, they are scientifically classified as fruits. Much like tomatoes and squash, however, their sour-bitter flavor contributes to cucumbers being perceived, prepared and eaten as vegetables, which is the accepted culinary term (Shagufta, 2012).

Cucumber *Cucumis sativas* L are enjoyed in virtually all continents and you will find them being incorporated into all types of cuisines. They are rich in vitamins and are a source of Triterpene, phyto-nutrients called Cucubitacins contained in fresh cucumbers.

Seed beds provide less effort than starting everything in pots and of course some certain crops do not like being transplanted and are always sown where they will mature. This includes most root crops such as carrots and beetroot. It is tempting to locate a seedbed in a corner of the garden. Seedbeds can also be prepared in a greenhouse or ploy tunnel. A fine tilth is a gardener's term for the perfect soil structure for seeds. The soil should be crumbly but not dusty, how you go about preparing the perfect tilth will largely depend on the soil type you have. Sandy soil will need plenty of organic matter mixed in, such as sifted compost so that they can retain moisture well. Heavy clay or silt

soil will need breakup and either adding fine organic matter or mixing with lighter sandy soil can help to achieve this (Jeremy, 2012).

Akinbile and Suffian (2011), reported that tillage methods have significant effect on biomass yield and growth of vegetables. Loosening of soil enables root enlongation and better uptake of nutrient below the surface due to downward movement of the absorbing roots. Afolayan *et al.* (2004) and Guerif *et al.* (2001) reported similar results that was observed; that plants in tilled plots performed better that untilled plots, especially with respect to leaf area, root density and shoot yield.

According to Momeni and Ghaffarinegad (2010), the effect of different seed bed preparation on the yield of greenhouse cucumber is significant. Furrow and flatbed increased yield significantly, compared to the ridge treatment. Components such as plant height, number of pickling fruits number of leaves, photosynthetic area (leaf area) and number of flowers showed that they all correlated with fruit yield. The number of pickling fruits was significantly more in furrow and flat bed than ridge treatment. The height of cucumber plants on flat bed was significantly higher than the other treatment.

Material and Methods

Study Area

The experiment was carried out at the premises of Federal College of Forestry Jos Plateau State. Jos is located between latitude 8º 8′ and 10º 10′ North and longitude 8º 20′ and 9º 30′ East with an average elevation of 1250m above sea level. The climate is generally humid and tropical with a mean annual rainfall of 1260mm and mean annual temperature of about 22ºC (Olowolafe and Dung, 2000).

The materials used include measuring tape, soil auger, meter rule, thread, hoes, shovel, mattocks weighing balance rakes, polythene and hand trowels.

Seeds of cucumber were purchased from the Farin Gada Market in Jos North local Government Area of Plateau State. The variety of cucumber seeds used is Pointsett 76 (an outdoor cultivar) other materials used include experimental field notebook, pen, measuring tape and centimeters rule.

The experiment is a 4 x 4 factorial experiment laid out in a Randomized Complete Block Design (RCBD). This includes four treatments (ridges, raised bed, flat bed, and zero tillage) and four blocks. The treatments were replicated four times in each of the blocks.

Pre Experimental and Post Harvest Soil Sample Analysis

Soil samples were collected before land preparation using soil auger, hand trowel and polythene bags from different locations of the experimental plot at two soil depths (0 – 15, 15 – 30cm). Soil samples collected from different locations were mixed together; air dried and packed in well labeled water and air tight transparent polythene bags.

The pre experimental soil analysis was carried out at the soil laboratory of Agricultural Services and Training Centre (ASTC), Kassa while the post harvest soil analysis was carried out at the soil laboratory of Federal University of Agriculture, Makurdi.

Experimental Plot/ Planting Method

The width of the experimental site used was 8.5m and the length 14.5m giving a gross plot of 123.25m^2.

Ridges were made of 20cm height and 30cm width and one (1) plant row with 40cm distance, flat bed was made with 3 plant rows and 40cm distance.

Parameter Investigated

Growth Parameters

Parameters including plant height, leaf count, collar girth and vine length were measured fortnightly after a week of germination.

Yield Parameters

Yield parameters such as number of fruits, fruit length and fruit weight were taken. The weight was measured using a weighing balance while the lengths with a centimeter rule.

Method of Data Collection

Vine Length (cm)

This was determined by measuring the height of the plant from the base of the main stem to the tip using a measuring tape.

Leaf Count (cm)

This was determined by counting the number of leaves from five (5) plants which were randomly sampled and tagged in each plots.

Collar Girth (cm)

This was determined by measuring round the stem at the base with thread, after which the thread was placed on centimeter rule in order to obtain the precise measurement.

Leaf Area

This was determined by adopting the method of Sharma et al., (1987) as length x broadest width x 0.6654.

Number of Fruits Per Plant

This was determined by counting, from all tagged plants that were randomly selected from each plot and the average number of fruits was determined.

Length of Fruit Per Plant (cm)

This fruits were weighed using a digital weighing balance and the measurement was done in grams (g).

STATISTICAL ANALYSIS

The data collected on the growth and yield of cucumber were subjected to analysis of variance (ANOVA) technique (Steel *et al.*, 1997). Subsequently, the significant means were separated by the Least Significant Different (LSD) method (Jilani, *et al.*, 2009).

PHYSICAL AND CHEMICAL SOIL PROPERTIES

Physical soil properties such as textural class and percentage of sand, silt and clay as well as chemical properties such as pH, Total nitrogen, organic matter, available phosphorus, potassium, calcium, magnesium, sodium and cation exchange capacity were determined at pre experiment and post harvest soil analysis.

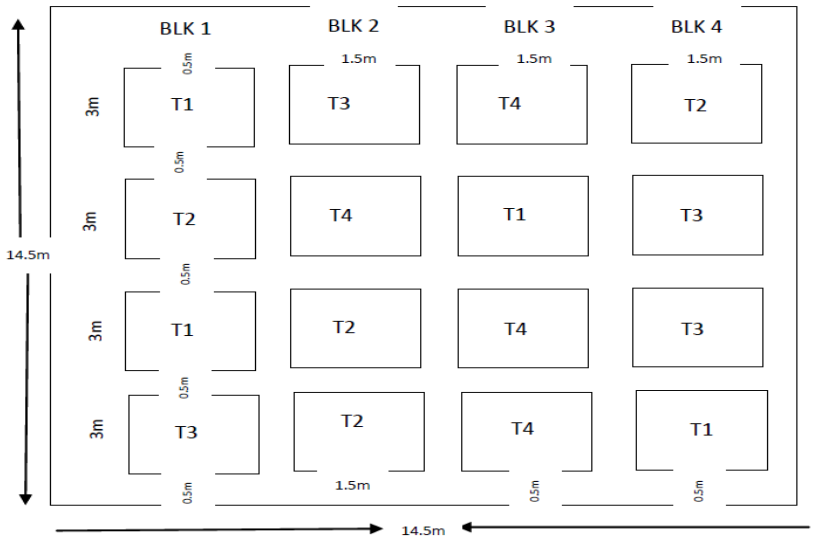

Fig1. *Experimental Layout*

TI = Ridges, T2 = Raised bed, T3 =Flat bed, T4 = Control

Table1. *Chemical characteristics of soil at the Experimental site before Planting and After harvest*

Period of Sampling	Soil sampling depth(cm)	Ph (H20)	OM (%)	N (%)	P (ppm)	Ca	Mg	K	Na	CEC m Mol/ 100g	Zn	Fe	Cu	Mn	B	S
Before 0.60	0	15	6.43	2.28	0.066	22.4	4.20	1.88	24	0.96	6.50	4.10	2.60	2.10	1.10	1.90
Sowing 0.50	0	30	6.49	1.93	0.56	30.8	3.90	1.82	10	0.96	6.40	4.20	2.90	2.21	1.40	2.10
Before 0.70	0	15	6.30	1.32	0.064	4.70	4.19	1.87	0.33	0.56	6.90	4.26	3.07	2.55	1.51	2.15
Sowing 0.56	0	30	6.11	1.08	0.055	4.02	3.86	1.76	0.27	0.65	6.70	4.40	3.20	2.31	1.62	1.87

Source: *Agricultural services and training center, Kassa and Soil Laboratory of Federal University of Agriculture, Makurdi, (2016).*

KEY: *CEC = Cation exchange capacity (Mmol/100g), PPM = Part per million, OM = Organic matter (%)*

RESULT AND DISCUSSION

Results

Table 1 shows the chemical characteristics, it revealed that the soil is slightly acidic with pH values of 6.43 at 0 – 15cm depth, 6.49% at 0.3cm depth and 6.30% at 0 – 15cm depth, 6.11% at 0 – 30cm depth for pre-experimental and post harvest analysis respectively. Organic matter 2.28% at 0 – 15cm depth, 1.93% at 0 – 30cm and 1.32% at 0 – 15cm depth, 1.08% at 0 – 30cm depth for pre-experimental and post harvest soil analysis.

Nitrogen, 0.066% at 0 – 15cm depth, 0.56% at 0 – 30cm and 0.064% at 0.15cm, 0.055% at 0 – 30cm depth for pre-experimental and post harvest analysis respectively. Potassium (k), 24 at 0 – 15cm depth, 10 at 0 – 30cm, and 0.33 at 0 – 15cm depth, 0.27% at 0 – 30cm depth for pre-experimental and post harvest soil analysis.

Table2. *Physical characteristics of soil at the Experimental site before Planting and After harvest*

Period of Sampling	Sand	Silt	Clay	Textural Class
Before Sowing	83.84	10.0	6.16	Sandy loam
	79.84	12.0	8.16	Sandy loam
After Sowing	77.5	11.2	11.5	Sandy loam
	79.84	12.4	13.2	Sandy loam

Source: *Agricultural services and training center, Kassa and Soil Laboratory of Federal University of Agriculture, Makurdi, (2016).*

Table 2 shows the physical characteristics of the experimental site before planting and after harvest. The physical characteristics revealed that the soil is sandy loam with 83.84% sand, at 0 – 15cm depth, 79.84% at 0 – 30cm depth and it is 77.5% at 0 – 15cm depth and 79.84 at 0 – 30cm depth for pre-experimental and post harvest soil analysis respectively.

Silt 10% at 0 – 15cm depth, 12% at 0 – 30cm depth and 11.2% at 0 – 15cm depth and 12.4% at 0 – 30cm depth for pre-experimental and post harvest soil analysis respectively. Clay, 6.16% at 0 – 15cm depth, 8.16% at 0 – 30cm depth, and 11.5% at 0 – 15cm, 13.2% at 0 – 30cm depth for pre-experimental and post harvest analysis respectively.

Table3. *Meteorological Data for Production period*

Months	Mean Rainfall (mm)	Mean Temperature (^{O}C)	Mean Relative Humidity (%)
March	0.69	30.49	31.84
April	11.40	29.9	62.6
May	9.1	28.13	62.84

Source: *Met Station Federal College of Forestry Jos, (2016).*

METEOROLOGICAL DATA

Table 3 shows the meteorological data of the period of production. The relative humidity changed drastically from 31.84% in the month of March, 62.6% in the month of April and remained fairly stable in the month of May with 62.84%. The highest rainfall was observed in the month of April with 11.40cm followed by the month of May with 9.1mm while the month of March had the lowest rainfall of 0.69mm. The temperature was fairly stable throughout the period with 30.49^{O}C in March as the highest observed temperature followed by April 29.9^{O}C in April while the month of May, had the lowest temperature of 28.13^{O}C.

Table4. *Influence of different types of seed beds on the mean number of leaves produced by Cucumis sativus*

Treatment	2WAG	4WAG	6WAG
T1	5.33^{bc}	8.00^{a}	15.33^{bc}
T2	6.67^{a}	8.00^{a}	19.33^{a}
T3	5.67^{ab}	7.00^{ab}	18.67^{ab}
T4	4.33^{c}	5.33^{b}	14.67^{c}
SE±	0.33	0.73	1.05

Means in the same column having the same superscript are not significantly different (P>0.05)

NUMBER OF LEAVES

Table 4 shows the influence of different types of seed beds on the mean number of leaves produced by *Cucumis sativus*, at 2,4,6 weeks after germination. T_2 (Raised bed) record the highest mean number of leaves of 6.67, 8.00 and 19.33 for 2,4 and 6 weeks respectively while T_4 (control) recorded the least mean leaves number of 4.33, 5.3 and 14.67 at 2,4,and 6 weeks respectively.

Table5. *Influence of different types of seed beds on the mean Vine Lengths of Cucumis sativus*

Treatment	2WAG	4WAG	6WAG
T1	7.24^{c}	31.33^{a}	94.67^{bc}
T2	11.32^{a}	33.33^{a}	112.67^{a}
T3	9.23^{b}	30.33^{a}	93.10^{ab}
T4	7.07^{c}	24.67^{b}	63.17^{c}
SE±	0.60	1.51	125.50

Means in the same column having the same superscript are not significantly different (p>0.05)

MEAN VINE LENGTHS

Table 5 shows the influence of different types of seed beds on the mean vine lengths of *Cucumis sativus* at 2,4 and 6 weeks after germination. T_2 (Raised bed) gave the highest mean vine lengths of 11.32, 33.33 and 112.67 at 2,4 and 6 weeks respectively while T_4 (Control) recorded the least mean vine lengths of 7.07, 24.67 and 63.17 for 2,4 and 6 weeks respectively.

Table6: *Influence of different types of seed beds on the mean Collar Girth of Cucumis sativus*

Treatment	2WAG	4WAG	6WAG
T1	1.99^{b}	2.96^{b}	2.62^{ab}
T2	2.47^{a}	3.37^{a}	2.77^{ab}
T3	2.48^{a}	3.05^{b}	3.03^{a}
T4	1.50^{c}	2.63^{c}	2.40^{b}
SE±	0.06	0.05	0.18

Means in the same column having the same superscript are not significantly different (p>0.05)

MEAN COLLAR GIRTH

Table 6 shows the influence of different types of seed beds on the mean Collar girth of *Cucumis sativus* at 2,4 and 6 weeks after germination. T_3 (flatbed) gave the highest mean collar girth of 2.48 and 3.03 at 2 weeks and 6 weeks. T_2 (Raised bed) gave the highest mean collar girth of 3.37 at the second week, while T_4 (Control) recorded the least mean collar girth in all the weeks.

Table7. *Influence of different types of seed beds on the mean Leaf Area of Cucumis sativus*

Treatment	2WAG	4WAG	6WAG
T1	28.72^{ab}	90.76^{a}	103.69^{a}
T2	34.92^{a}	113.56^{a}	118.99^{a}
T3	28.10^{ab}	100.27^{a}	107.01^{a}
T4	22.00^{b}	57.33^{b}	71.55^{b}
SE±	2.36	9.50	9.85

Means in the same column having the same superscript are not significantly different (p>0.05)

MEAN LEAF AREA

Table 7 shows the influence of different types of seed beds on the mean leaf area of *Cucumis sativus* at 2, 4 and 6 weeks after germination. T_2 (Raised bed) gave the highest mean leaf area of 34.92, 113.56 and 118.99 at 2,4 and 6 weeks respectively, while T_4 (Control) recorded the least mean leaf of 22.00, 57.33 and 71.55 for 2,4 and 6 weeks respectively.

Table8. *Influence of different types of seed beds on the mean Flower Count, Fruit Count, Fruit Length and Fruit Weight produced by Cucumis sativus*

Treatment	FIC (8WAG)	FrC (9WAG)	FL(10WAG)	FW (10WAG)
T1	4.67^{a}	1.67^{bc}	15.10^{bc}	294.13^{a}
T2	7.00^{a}	2.00^{a}	19.40^{a}	411.90^{a}
T3	6.67^{a}	1.67^{b}	16.33^{b}	314.50^{a}
T4	5.33^{a}	1.33^{c}	13.50^{c}	119.53^{b}
SE±	0.71	0.29	0.68	35.02

Means in the same column having the same superscript are not significantly different (p>0.05)

MEAN FLOWER COUNT, FRUIT COUNT, FRUIT LENGTH AND FRUIT WEIGHT

Table 8 shows the influence of different types of seed beds on the mean flower count, fruit count, fruit length and fruit weight produced by *Cucumis sativus* at 8,9, 10 and 10 weeks after germination respectively. T_2 (Raised bed) gave the highest mean flower count, fruit count, fruit length and fruit weight of 7.00, 2.00, 19.40 and

411.90 respectively. T1 (ridges) gave the least mean flower count of 4.67 while T_4 (Control) recorded the least means of 1.33, 13.50 and 119.53 for fruit count, fruit length and fruit weight respectively.

DISCUSSIONS

The treatment has shown significant effect on both the growth and yield parameters of cucumber as opposed to the result found by Ologede et al. (2012), which showed that seedbeds had no significant effect on rhizome yield and other yield parameters. But agrees with the findings of Akinbile and Suffian (2011) who reported that tillage and seed bed preparation methods have significant effect on the biomass yield and growth of vegetables.

Raised beds have shown the highest performance in all the parameters assessed, both growth parameters and yield parameters. This agrees with the findings of Bruns and Young (2002) who reported that raised beds increased yield of soyabean over flat beds.

The observed early emergence and higher vine length and of course growth of Cucumber in raised bed treatment corroborates with the reports of HumeSeeds (2012); raised beds aid in seedling emergence because the soil dries out and warms up quicker.

Other growth parameter such as leaf area and leaf number. Raised bed showed highest performance. This also implies that the growth parameters all correlate with the eventual yield of the crop. This fact has been supported by Momeni and Ghaffarinegad (2010) who reported that components such as plant height, number of leaves, photosynthetic area, number of flowers and number of pickling fruit showed that they are correlated with fruit yield.

On the basis of yield performance raised bed showed highest yield performance also in concurrence with the findings of Aaron and Hans (2013), whose result showed that yield of soyabean was significantly increased on raised beds.

Generally the result appear to show raised bed having performance followed by flat bed, this can be related to the findings of Momeni and Ghaffarenegad, (2010), who found out that flatbed had the highest performance of greenhouse cucumber amongst ridges and furrow. The control which was undisturbed (no bed preparation) gave the least performance. Afolayan et al. (2011) and Guerif et al. (2001) reported similar results that plants in tilled plots performed better than untilled plots especially with respect to leaf area, root density and shoot yield.

- Thompson and Morgan (2013) reported that raised beds have following advantages:
- Good drainage and warmer soils
- Prevent soil compaction as you do not need to walk on the soil surface in
- Order to maintain your plants.
- Raised beds have bigger volume and required less watering.
- Raised beds have easier access

CONCLUSION AND RECOMMENDATION

In conclusion the important of choosing the right seed bed for the production of cucumber as any other vegetables cannot be overemphasized. In other to achieve good productivity and high yield of the crops, cucumber as a vegetable needs proper seed bed preparation and management. A bed which keeps the seeds of the crop from being washed away and also creates suitable environment for root penetration and crop stand.

RECOMMENDATION

On the basis of the parameters assessed in this research work, raised bed has shown the greatest mean effect on the crop (cucumber). In terms of the growth parameters: Germination percentage, leaf count, leaf area and collar girth and also in yield parameters: flower count, fruit length and fruit weight.

Therefore, preparation of raised bed is recommended for cucumber production for best yield on the basis of these findings and other related literatures. The raised bed creates an environment which raises the crop above the flat ground which could be waterlogged or washed off. It also gives an environment for root development and if well prepared to small clod sizes, raised beds offer food friable for the performance of the crop.

This agrees with Panda (2007) who stated that; the primary purpose of tillage is often to reduce aggregate or clod sizes. Aggregates must be small enough around the seed and seedling root to prevent undue drying of the soil to provide sufficient soil solution and to provide adequate aeration, besides root contact. Yet, the aggregate should be so finely decided as to encourage severe surface crusting when dry. Aggregate of soil particles and arrangements of the aggregates

within the soil have a large influence on consistency and moisture relationship of the soil. But adequate drainage should be provided when raised beds.

Further research in the area should be carried out and tested in other ecological zones, and the research should last only through period of either rainy season (rain fed) or dry season (irrigation farming).

REFERENCES

[1] Abiodun, O.A. (2010). Comparative Study on Nutritional Composition of Four Melon Seeds varieties. Parkistan *Journal of Nutrition.* 9:9 905 – 908

[2] A folayan, S.O., O. Babalola and J.C. Igbeka, 2004. Effect of tillage on soil physical Properties, growth and yield of Amaranth. *Afr. Crop Sci. J.,* 12: 141 – 151

[3] Akinbile, C.O. (2010). Behavioural pattern of upland rice agronomic parameters to variable water supply in Nigeria. J. Plant Breed. Crop Sci., 2: 73 – 80 Irrigat. Sci., 42: 199 – 206.

[4] Akinble, C.O. and Suffian, M.Y. (2011). Effect of tillage methods and fertilizer application On *Amaranthus curentus* in Nigeria. *International Journal of Agriculture,* 6: Pp. 280 – 289.

[5] Christopher, O.A. and Mohd, S.Y. (2011). Effect of Tillage Methods and Fertilizer Applications on *Amaranthus curentus* in Nigeria. *International Journal of Agricultural Research,* 6: 280 – 289.

[6] Field Survey, (2013). Visual observation and interview by the author at reconnaissance survey. Gopalakrishanan, T.R. (2007). Vegetable Crop. Pages 109 – 112, published.

[7] Guerif, J Richard, G., Durr, C., Marchet, J.M., Recous, S. and Roger-Estrade, J. (2001).A review of tillage effects on crop residue management, seedbed conditions and seedling establishment. *Soil Tillage Res.*, 61: 13 – 32.

[8] Gyang, K.D. (2009). Effect of Variety and different manures on the growth, development and yield of cucumber in Jos Plateau State. A B.Sc project submitted to the Department of Plant Science, University of Jos.

[9] Hume seeds, (ED) (2012). http://www. Hume seeds.com/nogrow. htm. Kareem, I.A. (2004). Effect of the Rattle Tree (*Albizialebbeck)* on soil nutrients and Irish Potatoes yield on the Jos Plateau. (Ph.D) Thesis (Unpublished) Pp. 13 – 23

[10] Malik N. Mahmoo (2010) Horticulure. Published by Biotech books 2010 Delhi. Pp 517 – 520.

[11] Momeni, D. and Ghaffarinegad, A. (2010). Effect of different methods of seed bed preparationon greenhouse cucumber. *Journal of Science and Technology,* 1(3): Pp. 43 – 50.

[12] Okot F. (2004). How to make a good nursery bed. Published by New Vision, 25th July, 2012.

[13] Olowolafe, E.A. and Dung, J.E. (2000). Soils derived from Biotite Granites on Jos the Plateau, Nigeria: their Nutrients status and management for Sustainable Agriculture. ELSEVIER Science; Resources, Umudike; Umuahia, Abia State, Nigeria pp 234.

[14] Panda, S.C. (2007) Crop Production and Tillage. Published by Agrobios (India) Pp170.

[15] Shagufta (2012). International Encyclopedia of Agriculture Volume 7 – Vegetable and Crop Production. Published by S.B. Nangia APH Publishing Corporation, Pp 68 – 69.

[16] Sharma, A.N. Chaudhari, D.N. Paraya, R.P. Shah R. M. (1987) Determination of Leaf Area in Cowpea.

[17] Sheryl, K. L., John, O. and Clarence, J.S. (2003). Stale bed as a weed management Alternative For machine Harvested Cucumbers *Cucumissativus:* Weed Science Society American, 17(4): 724 – 730.

[18] Steel, R.G., Torrie, J.H. and Dickie, D.A. (1997). Principles and procedures of statitics: A biometric approach, (3rd edition) McGraw – Hill Publishing Company Toronto.

[19] Williams, C.N., Uzo J.O., Peregrine W.H. (1991). Vegetable Production in the tropics published by Longman group. UK. Limited. Pp 83 87. Department of Primary Industries, (2010)

Citation: *O. E. Nwafor, Jauro, A.G, "Comparative Study on the Growth and Yield of Cucumber under Three Different Seed Beds in Jos, Plateau State", International Journal of Research in Agriculture and Forestry, 6(10), 2019, pp 1-7.*