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Comparative Effect of Single and Mixed Organic Manure on Cucumber Growth Parameters in Girei Local Government Area of Adamawa State

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ABSTRACT
The abiotic challenge facing crop production in the Tropics is the inherent low concentration of essential nutrients in the soil for crop growth and development. The objective of this research is to determine the effect of single and mixed organic manure (Cowdung, Leafcompost, and mixture of Cowdung and leaf compost) on Vine length, number of leaves, and number of branches of cucumber. the experiment was laid in a randomized complete block design (RCBD) with 3 treatments replicated 3 times, one as a control measure. Materials used include: meter rule, Soil, organic manure, Polythene bag, string, water, etc. Results were expressed as mean and standard deviation. The comparative effect was analyzed using a two-way ANOVA. The significant differences of treatments were separated at 95% LSD level. The Results revealed that the application of cow dung manure gave the highest effect in increasing vine length, number of leaves and number of branches of cucumber with the highest mean of 79.33cm, 18 leaves and 8.66 branches respectively and the control gave the least Effect on cucumber vine length, number of leaves and number of branches with the lowest mean of 17cm, 4.66 leaves and 2 branches respectively. It therefore showed that application of cow dung manure should be used to observe More and Most effective growing medium for Cucumber.

INTRODUCTION

Cucumber (Cucumis sativus) is a widely cultivated creeping vine plant in the Cucurbitaceae family that bears usually cylindrical fruits, which are used as culinary vegetables (Behrooz *et al*., 2020). Considered an annual plant, there are three main varieties of cucumber (i.e. slicing, pickling, and seedless) within which several cultivars have been created (Crane *et al.,* 2018). The cucumber is a creeping vine that roots in the ground and grows up trellises or other supporting frames, wrapping around supports with thin, spiraling tendrils (Agyarko and Asiedu, 2012). The plant may also root in a soilless medium, whereby it will sprawl along the ground in lieu of a supporting structure. The vine has large leaves that form a canopy over the fruits (Enujeke, 2013). The fruit of typical cultivars of cucumber is roughly cylindrical, but elongated with tapered ends, and may be as large as 62 centimeters (24 in) long and 10 centimeters (4 in) in diameter (Bidein *et al*., 2017). Cucumber fruits consist of 95% water. In botanical terms, the cucumber is classified as a pepo, a type of botanical berry with a hard outer rind and no internal divisions. However, much like tomatoes and squashes, it is often perceived, prepared, and eaten as a vegetable (Azarmi *et al*., 2009).

Most cucumber cultivars are seeded and require pollination. For this purpose, thousands of honey beehives

are annually carried to cucumber fields just before bloom (Chabert *et al.,* 2023). Cucumbers may also be pollinated via bumblebees and several other bee species. Most cucumbers that require pollination are self-incompatible, thus requiring the pollen of another plant in order to form seeds and fruit. Some self-compatible cultivars exist that are related to the 'Lemon' cultivar (Hardy and Rowell, 2002).

Cucumber is grown throughout Nigeria, spanning from the rainforest regions to the savannah zones. The production patterns and volumes vary significantly depending on the location. The top five cucumber-producing states in Nigeria are Plateau, Kaduna, Katsina, Kano, and Benue. Other states with notable production capacities include Enugu, Ebonyi, Akwa Ibom, Oyo, Cross River, Rivers, and Nassarawa (Adetula and Denton, 2006). Cucumber production is relatively low in Adamawa State; therefore, this study aims to develop a technique to enhance the cultivation of this important vegetable in the region. Cucumber is cultivated in every part of Nigerian agroecology. This cuts across the rainforest to the savannah zones of Nigeria with the production pattern and volume varying from place to place. The 5 highest cucumber- producing states in Nigeria are Plateau, Kaduna, Katsina, Kano and Benue. Others with high production capacity are Enugu, Ebonyi, Akwa Ibom, Oyo, Cross River, Rivers and Nassarawa (Adetula and Denton, 2006). Cucumber production is not well known in Adamawa state; therefore, his present study was conducted to create a technique that will boost the production of this important vegetable in the state.

They have small amounts of vitamin K and vitamin A and are about 95% water. They also have several phytonutrients (plant chemicals) called lignans. One medium unpeeled, raw cucumber has the following (Efediyi and Remison, 2010): Calories: 30, Total fat: 0 grams, Carbs: 6 grams, Protein: 3 grams, Fiber: 2 grams, Vitamin C: 10% of the recommended daily value (DV), Vitamin K: 57% of the DV, Magnesium: 9% of the DV, Potassium: 12% of the DV, Manganese: 9% of the DV. The nutritional profile of cucumbers may give them several health benefits (Efediyi and Remison, 2010).

Cucumbers consist mostly of water, and they also contain important electrolytes. They can help prevent dehydration in hot weather or after a workout. For people who do not enjoy drinking water, adding cucumber and mint can make it more attractive. Staying hydrated is essential for maintaining a healthy intestine, preventing constipation, avoiding kidney stones, and more. Cucumber is one of the most hydrating foods (Efediyi and Remison, 2010). Vitamin K helps with blood clotting, and it may support bone health. A 142-gram (g) cup of chopped, unpeeled, raw cucumber provides 10.2 micrograms (mcg) of vitamin K, according to the United States Department of Agriculture (USDA). The 2015–2020 Dietary Guidelines for Americans recommend an intake of 90 mcg a day for females aged 19 years and over 120 mcg for males of the same age. Cucumber also contains 19.9 milligrams (mg) of calcium. Adults need 1,000–1,200 mg of calcium a day, depending on sex and age. Vitamin K helps improve calcium absorption. Together, these nutrients can contribute to good bone health (Efediyi and Reminson, 2010, Bidein *et al*.,2017). As a member of the Cucurbitaceae family of plants, cucumbers contain high levels of bitter-tasting nutrients known as cucurbitacin (Wu *et al.,* 2019). Cucurbitacins may help prevent cancer by stopping cancer cells from reproducing. A 133-g cup of chopped cucumber with its skin also provides around 1 g of fiber. Fiber may help protect against colorectal cancer (Bidein *et al*., 2017). The American Heart Association (AHA) note that fiber can help manage cholesterol and prevent related cardiovascular problems (Loveman *et al.,* 2016). Reducing sodium intake and increasing potassium intake may help prevent high blood pressure. The cucurbitacins in cucumber may also help prevent atherosclerosis (Efediyi and Remison, 2010). Cucumbers may play a role in controlling and preventing diabetes (Loveman *et al.,* 2016). It contains substances that may help lower blood sugar or stop blood glucose from rising too high. One theory is that the cucurbitacins in cucumber help regulate insulin release and the metabolism of hepatic glycogen, a key hormone in the processing of blood sugar (Efediyi and Reminson, 2010). One study found that cucumber peel helped manage the symptoms of diabetes in mice, this may be due to its antioxidant content (Zhang *et al.,* 2023). Fiber, too, may help prevent and manage type 2 diabetes, according to the AHA. Cucumbers score low score on the glycemic index (GI). This means they provide essential nutrients without adding carbohydrates that can increase blood glucose (Bidein *et al*., 2017). Cucumbers may have anti-inflammatory benefits. Inflammation is a function of the immune system (Nash *et al.,* 2020). Experts believe inflammation may help trigger the development of various health conditions, such as cardiovascular disease. Diabetes, autoimmune conditions, depression, and cancer (Bidein *et al*., 2017). Some research has suggested that cucumber's nutrients may provide benefits for skin health (Murad, & N (2016)). Applying sliced cucumber directly to the skin can help cool and soothe the skin and reduce swelling and irritation. It can alleviate sunburn. Placed on the eyes, they can help decrease morning puffiness (Bidein *et al*., 2017). Cucumbers come with a natural wax on their skin, washing cucumbers after picking them takes away that wax, so producers add a synthetic wax back on before sending them to grocery stores (Jung *et al.,* 2020). The wax helps them stay shelf stable longer, but it also holds onto germs (Jung *et al.,* 2020) The wax itself isn't harmful, but peeling the skin before eating the

cucumber can lower the risk of contamination. However, the skin is where most of the nutrients live. A better option may be to buy organic and wash well before enjoying (Bidein *et al*., 2017).

Most people wash, slice, and toss their cucumbers into a salad before this is done, it is important to soak them in salt water first, that will lower the amount of water in them and keep the cucumbers from making salad dressing watery (Jiang *et al.,* 2020). The peel of a cucumber is still very much edible. In fact, it will add fiber and vitamin A to one's diet (Efediyi and Reminson, 2010).

Collen and James (2014) conducted a study to investigate the effects of Cow dung manure on the growth rate and fruit yield of cucumber (*Cucumis sativas* L.). There are few risks to eating cucumbers, one concern may be the pesticides growers use on them (Feng *et al.,* 2021). Before eating, make sure the skin is peeled off or it is washed in warm running water to be sure the cucumber is safe to enjoy. A field experiment was conducted at University of Zimbabwe Farm, under dry land conditions during the 2006-2007 season, laid in a randomized complete block design with 4 treatments replicated 5 times (Dunjana *et al.,* 2014). Clay soils were used while Cow dung manure was applied to all the soils at levels of 0 t/ha, 5 t/ha, 10 t/ha, and 20 t/ha. Cow dung manure was broadcasted using a spreader and growth measurements were taken as from 4 weeks after crop emergence and at 2 weeks subsequent intervals up to the senescence of the vines (Hasid *et al.,* 2021). Results showed that vine length, number of branches, leaf number, both female and male flowers per main vine and total fresh yield significantly increased ($p<0.05$) with an increase in the amount of Cow dung manure applied (Khatun *et al.,* 2023). Cow dung manure application rate of 20 t/ha gave the highest growth rate and fruit yield followed by 10 t/ha and then 5 t/ha, the control treatment gave the least of all the rates. The study showed that application of 20 t/ha of Cow dung manure enhances the production of *C. sativus* crop (Musara & Chitamba, 2014).

Leaf compost manure can have several positive effects on cucumber plants, including vine length, number of branches, and number of leaves (Esmaielpour *et al.,* 2020). The organic matter in leaf compost manure provides essential nutrients and improves soil structure, which can promote healthy plant growth (Masmoudi *et al.,* 2018). Several studies have shown the benefits of using compost manure on plant growth. For example, a study by Karami *et al.,* (2012) found that the application of compost increased the length of cucumber vines and the number of branches. Additionally, a study by Lazcano *et al.,* (2008) demonstrated that compost application led to an increase in leaf number in cucumber plants. Therefore, this present study aimed to compare the effects of applying single (Cow dung and leaf compost) and mixture of organic manures on the growth parameter of cucumber.

MATERIALS AND METHODS

Study Area

The study was carried out in the Botanical Garden of the Department of Plant Science, Modibbo Adama University Yola, Adamawa State which is situated between latitude 9°20`00`` and 9°21`30``N and longitude 12°29`00``E and 12°30`30``E (Figure 1). Modibbo Adama University Yola (MAU Yola) is in Girei local government area of Adamawa state which falls under Sudan savannah type of vegetation. The local government has a population of 129,855 people (NPC, 2006) and with total land mass of about 2186 km^2 (Adebayo and Tukur 1999). It has tribes such as the Fulbe or Fulani, Hausa's, Mbula; however, with substantial number of Bwatiye people dwell in villages such as Greng, Ntado, goron wanamo, and Labondo within the Girei local government area. The local government shares boundaries with Song local government in the north, Fufore local government in the east while River Basin acts as a physical boundary between the local government, Yola North, and Yola south local government in the south and Demsa local government areas in the west (Adebayo and Tukur, 1999). Adamawa has a tropical climate with distinct dry and wet season. The rainfall begins in April and ends in October while dry season commences in November and ends in March. It has a minimum average temperature of 20.5°C and a maximum temperature of up to 40°C (Adebayo and Zemba, 2020).

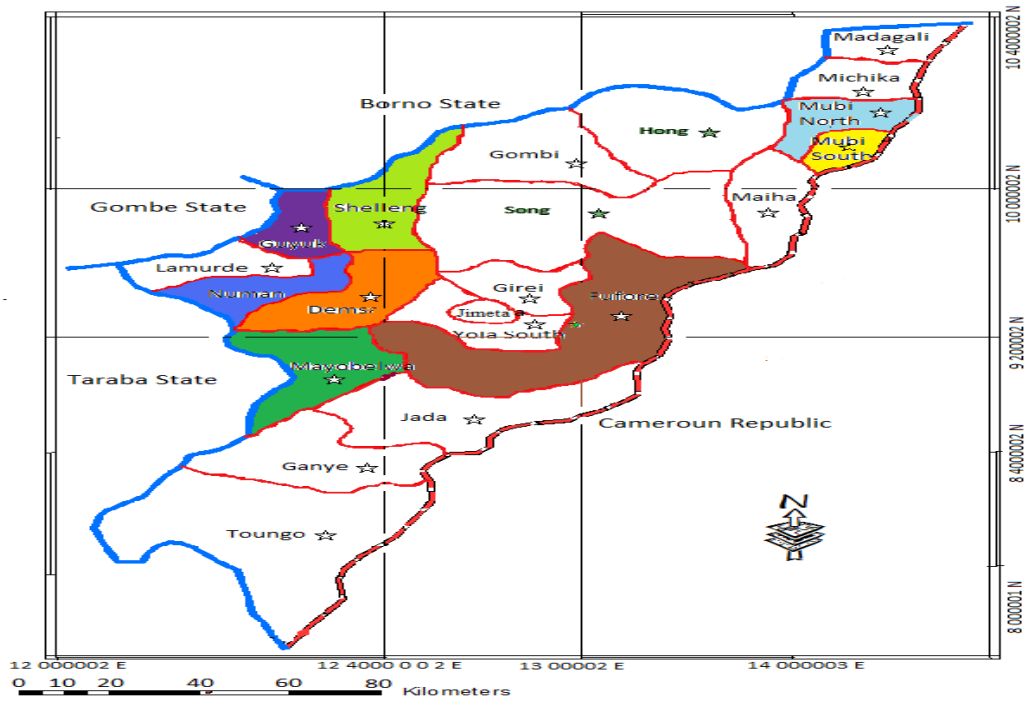

Figure 1: Adamawa State Map

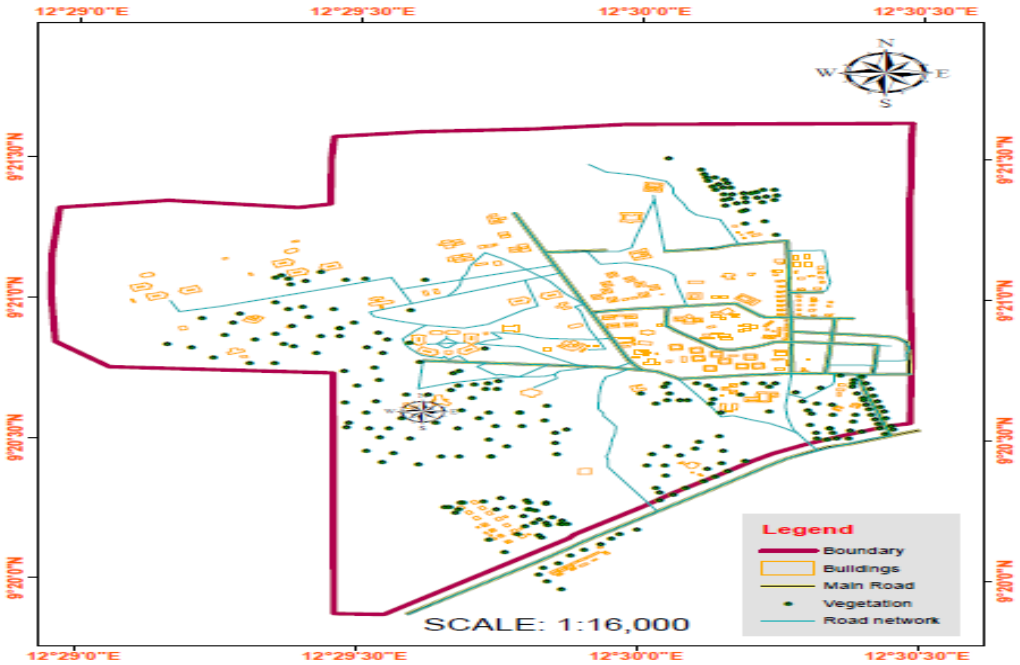

Figure 2: Map of Modibbo Adama University Yola (GIS Unit, 2015)

Seed Collection and Viability Test

Cucumber seed was purchased from the Jimeta Modern Market and taken to Modibbo Adama University Yola, Department of Plant Science for viability test using cold water, The seeds was soaked in 1litre beaker containing 80 ml distil water for 30 minutes, The viable seeds that sunk down to the bottom of the beaker were collected and used for the experiment while seeds that floats on top of the water were discarded (Hartmann, *et al.*, 2011).

Soil Collection and Treatment for Seedling Tray

Soil Samples were collected from MAU, Yola Botanical Garden, and taken to the preparation room. They were

cleaned by removing plastics and other harmful particles and rock pebbles of bigger sizes.

Manure Collection, Mixture and Raising of Seedling

The cow dung was collected from Girei cow and sheep market, leaf compost was made locally at Home using leaves of different plants, it was then collected in black polythene bags and taken to MAU Botanical Garden for use. Finally, manure and soil sample were mixed in 1:1.2 ratios (Dachung *et al.,* 2023).

Experimental Design

The experiment was laid in a randomized complete block design (RCBD) with 3 treatments (Cow dung, Leaf compost manure and mixture of cow dung and leaf compost manure) replicated 3 times, one as control measure, giving a total of 36 experimental units.

Data Collection

Vine length, number of leaves and branches were used as the indicator parameter of the comparative effect of different treatments. A meter rule was used along with string to measure vine length, while the number of leaves and branches were physically counted at 1,2,3 and 4 weeks after transplanting.

Data Analysis

Results were expressed as mean and standard deviation. The comparative effects of organic fertilizer treatments of planting on cucumber growth rate were analyzed using a two-way ANOVA. The differences of significant treatment means were separated at 95% LSD level.

RESULTS AND DISCUSSION

The results of the effect of different soil amendments (Cow dung, Leaf compost, and mixture of Cow dung and leaf compost) is in table 1. The result show a significant ($p<0.05$) difference among the treatments where cow dung has the best impact on the vine length across the weeks, cow dung gave highest impact at week four (4) after transplanting with 79.33 cm and control has the least impact with 17cm mean vine length.

Table 2 Shows the effect of the different soil amendments on the number of leaves of cucumber over a period of one month. The result showed that there is no Significant ($p>0.05$) differences among the treatments (Cow dung, leaf compost, mixture of Cow dung and leaf compost) on the number of leaves of cucumber across the weeks except for Cow dung at 4 weeks after transplanting (WAT). The highest number of leaves was produced from the application of Cow dung with an average of 18 leaves, the control however gave the least effect with on average of 4.66 leaves at $p<0.05$ level of significance.

The effect of the different soil amendments on the number of branches produced in the bioassay specie is shown in table 3. The result indicated that there is no significant ($p>0.05$) difference between all the treatments (Cow dung, Leaf compost and mixture of Cow dung and leaf compost) in number of branches at WK1, WK2, and WK3, however at WK4 the result showed significant ($p<0.05$) difference in application of Cow dung manure compared to the application of Leaf compost manure and mixture of Cow dung and leaf compost manure. Cow dung has the highest effect with an average of 8.66cm branches and control has the least effect with an average of 2 branches across the weeks.

Table 1: Plant vine length (cm) response to cucumber growth at Different growth medium

Treatments	Week 1	Week 2	Week 3	Week 4
Cowdung	20^{a}	33.66^{a}	64^{a}	79.33^{a}
Leafcompost	11^{b}	22.33^{b}	33.66^{b}	44.33^{b}
Mixture of Cowdung and leafcompost	11^{b}	28.66^{c}	55.33^{c}	67.33^{c}
Control	9.66^{b}	17^{ab}	24.33^{ab}	36^{ab}
LSD 0.05	4.76	4.76	4.76	4.76

Standard error (SE) 3.85±5.046

*Means having the same letters are not significantly different at $p<0.05$

Table 2: Number of leaves (cm) response to cucumber growth at Different growth medium

Treatments	Week 1	Week 2	Week 3	Week 4
Cowdung	6^{a}	10^{a}	11.6^{a}	18^{a}
Leafcompost	4.66^{a}	6.60^{a}	7.33^{a}	11.33^{b}
Mixture of Cowdung and leafcompost	5.33^{a}	8.33^{a}	9.33^{a}	14.66^{b}
Control	4.66^{a}	6.33^{a}	8^{a}	12.66^{b}
LSD 0.05	4.76	4.76^{a}	4.76	4.76

Standard error (SE) 9.05±0.95

*Means having the same letters are not significantly different at $p<0.05$

Table 3: Number of branches (cm) response to cucumber growth at Different growth medium

Treatments	Week 1	Week 2	Week 3	Week 4
Cowdung	3[a]	6.33[a]	8.66[a]	16[a]
Leafcompost	2[a]	4.33[a]	5.66[a]	9.33[b]
Mixture of Cowdung and leafcompost	2.33[a]	5[a]	7[a]	10.66[b]
Control	2[a]	3[a]	5[a]	9[b]
LSD 0.05	4.76	4.76	4.76	4.76

Standard error (SE) 6.21±0.95

*Means having the same letters are not significantly different at p<0.05

The Result obtained on the comparative effect of single and mixed organic manure (Cow dung, leaf compost and mixture of Cow dung and leaf compost) on cucumber growth parameter shows there's significant effect on the vine length (cm) of cucumber from the application of Cow dung compared to using Leaf compost, mixture of Cow dung and leaf compost and the control at 1 week after transplanting (WAT) at a level of significance P≤0.05. The Result showed that Cow dung manure has the highest effect which agrees with (Collen and James, 2014), who investigate the effect of Cow dung on the growth rate and fruit yield of cucumber and obtained result that Vine length, number of branches and number of leaves for both female and male flowers per main vine and total fresh yield significantly increased (p≤0.05) with increase in the amount of Cow dung applied.

Mixture of Cow dung and leaf compost manure Have little or no significant effect from the Application of Cow dung, Leaf compost and control on cucumber number of leaves at p≤0.05 level of significance. The study disagrees with the study by Ajayi (2019), who found that the combination of cow dung and leaf compost manure led to significant improvements in cucumber vine length, number of leaves, and number of branches compared to using cow dung or leaf compost manure alone.

The Study demonstrated that Leaf compost had no significant difference from the other treatments and control on cucumber number of branches across the weeks at p≤0.05 and Karami *et al.,* (2012), opposes this study with results that showed that application of compost increased the length of cucumber vines and the number of branches.

CONCLUSION

Application of cow dung manure had significant difference in increasing vine length of Cucumber Compared to the leaf compost and mixture of cow dung and leaf compost manure. However, these findings suggest that leaf compost and mixture of cow dung and leaf compost manure can positively impact cucumber vine length, number of branches, and number of leaves by providing essential nutrients and improving soil conditions. it's important to note that the specific effects may vary depending on factors such as the composition of the compost, soil type, and environmental conditions.

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