

EFFECT OF COMPOST AND COW DUNG MANURE ON THE GROWTH OF *VIGNA*  
*UNGUICULATA*

BY

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A THESIS WRITTEN AND SUBMITTED TO THE DEPARTMENT OF PLANT  
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## DECLARATION

I, Emanuella Obehi OBOH, hereby declare that this research work was carried out by me in the Department of Plant Biology and Biotechnology, Faculty of Life Sciences, University of Benin, Benin City.

Signature : \_\_\_\_\_

Date : \_\_\_\_\_

## CERTIFICATION

We hereby certify that this work was carried out by (Miss) Emmanuella Obehi Oboh in the Department of Plant Biology and Biotechnology Faculty of Life Sciences, University of Benin, Benin City, Nigeria.

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Date

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External Supervisor

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Date

## **DEDICATION**

I dedicate this work to God Almighty.

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I want to specially acknowledge my great supervisor, Dr. B. O. Edegbai for his guidance, for being a father, his discipline, mastermind, constant availability, loving corrections and great show of wisdom.

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## ABSTRACT

A field experiment was conducted on the effect of the mixture of compost and cow dung manure on the growth of *Vigna unguiculata* for a period of 5 weeks. Each treatment had 3 replicates making it a total of 15 bags. Five (5) seeds were planted in each bag and germination reading was taken for 7 days after which readings for plant height, number of leaves, number of branches and girth were taken weekly for 4 weeks. At the end of germination study, control, A, B, C and D recorded 86.67%, 86.67%, 60.00%, 86.67% and 46.67% respectively. At the end of the experiment (31DAP), height values calculated for control, A, B, C and D were  $14.33 \pm 1.67$ ,  $24.67 \pm 0.44$ ,  $29.00 \pm 1.53$ ,  $30.25 \pm 1.25$  and  $34.00 \pm 3.00$  cm respectively and at the same time, the number of leaves values recorded for control, A, B, C and D were  $7.00 \pm 1.73$ ,  $23.33 \pm 3.48$ ,  $28.00 \pm 2.00$ ,  $30.50 \pm 0.50$  and  $22.50 \pm 3.50$  respectively. The results gathered for girth and number of branches were inconsistent. From data gathered, it will appear that the optimum concentration of the manure mixture for growth of *Vigna unguiculata* lies within the range of treatment C.

## CHAPTER ONE

### INTRODUCTION

With the ever increasing population of humans, depletion of the ecosystem balance and increase in crop production, plant nutrition is a very important factor to be looked into.

Farm products are more important to the human race's survival than anything else, since food and clothing are the most basic necessities (Surinder, 2011).

Fertilizers could either be organic or inorganic. Emylia and Lucretia (2017) stated that incorporating organic and inorganic fertilizers to soil will have many benefits for improving the chemical and physical status of the soil, resulting in increased crop yields, allowing land to be used continuously for crop cultivation (Basso and Richie, 2005).

Fertilizers will have to play a critical role in food production if the planet is not to go hungry.

Without expanding the use of fertilizers, no country in the world has been able to increase agricultural productivity.

Fertilizer is any natural or synthetic organic or inorganic substance that is applied to soil to provide one or more plant nutrients necessary for plant growth. Basically, fertilizers help in improving soil fertility.

According to Emylia and Lucretia (2017) organic and inorganic fertilizers provide the nutrients that plants need to grow healthy and solid. Every, however, has its own set of ingredients and provides them in various ways.

#### **1.1 INORGANIC FERTILIZERS:**

Inorganic fertilizer can also be referred to as synthetic fertilizer. It's made in a lab and contains either mineral or synthetic chemicals. Inorganic fertilizers provide a fast dose of nutrients, allowing you to feed your plants when and how you want. They are fully synthetic and dosed precisely. The most commonly used inorganic fertilizers include:

- Nitrogen fertilizers: Ammonium sulfate, Calcium nitrate, Sulfur-coated urea, urea.

- Phosphorus fertilizers: Rock phosphate, Monoammonium phosphate, Diammonium phosphate, Single superphosphate, Triple superphosphate
- Potassium fertilizers: potassium chloride, potassium sulfate, potassium-magnesium sulfate
- Calcium fertilizers: Lime, dolomite, calcium sulfate (gypsum)

Fertilizer manufacturers create a variety of variations or blends of the basic N, P, and K fertilizers to meet the specific needs of farmers and home gardeners. These formulations allow for the application of only the combinations of nutrients that are needed, avoiding the overapplication of nutrients that are already sufficient or excessive (Silva, 2000).

Despite its numerous benefits, one major disadvantage of inorganic fertilizer is the problem of unbalanced applications. With food production being a necessity for human and animal survival, it is therefore very necessary to consider the great advantages organic fertilizers have over inorganic fertilizers.

## **1.2 ORGANIC FERTILIZERS:**

According to Mohamed and Abdelnaser (2010) organic fertilizer is a valuable source of humus, as well as a carrier of macro and micro components, and it boosts the activity of beneficial microorganisms. The application of organic manure is a method of organic farming. Meena *et al.*, (2013) stated that organic farming is a method that relies on crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives, and a biological nutrient system to the greatest extent possible, rather than synthetic inputs (such as fertilizers, pesticides, hormones, feed additives, and so on).

According to Azevedo *et al.*,(2015), if the aim is to increase the soil's chemical, physical, and microbial qualities, organic fertilizer is a perfect alternative to mineral fertilizers (Grutka *et al.*, 2012).

Ayoola and makinde (2007) stated that the amount of organic matter in the soil is determined by the amount of organic material that can be added into the soil either naturally by roots, stubbles, sloughed-off root nodules, and root exudates, or artificially through the form of organic manure, also known as organic fertilizer (Agoola and Omueti, 1982).

Organic fertilizer is also known as farm-manure. Organic fertilizer according to Darren (2019) is defined as compost made from animal waste or animal and plant residues that are high in natural by-products

### 1.2.1 Types of organic manure:

- **Manure made from peanut hulls:** Peanut hulls are used to make livestock feed. It is believed to boost yield productivity and is thought to improve soil fertility. Peanut hulls used to be available all year; however, due to its widespread use in livestock feed, this form of manure is no longer readily available, and as a result, it has become very costly (Saliou and Karamoko).
- **Poultry manure:** Poultry manure is the most common form of manure, owing to the widespread practice of poultry rearing in the region. While it is expensive, it is less expensive than peanut hull manure. It increases soil fertility and the growth of the root system, as well as the vigor of the plants, making them more resistant to diseases and pest attacks. This manure quickly mineralises in the soil and generates a lot of heat.
- **Horse dung manure:** Farmers place a high value on horse dung manure. It helps to increase soil fertility, regenerate the soil, and maintain high-quality yields. It protects against the harmful effects of salinity. This manure increases the soil's ability to retain water. Horse dung manure boosts crop yield and lasts for a long time in the soil. This manure encourages the invasion of insect weeds by rehabilitating the soil. Lettuce, onion, and mint are among the crops that profit from this manure.

- **Cow dung manure:** cow dung according to Zaaman *et al.*, (2017) has long been considered the most suitable animal manure because of its high nutrient and organic matter content. Cow dung is the most significant source of bio-fertilizer, but cow urine, horn, and a cow's dead body can also be used to make effective organic fertilizer (Abhishek *et al.*, 2014). The addition of cow dung to polluted soil increases the organic carbon content, which can contribute to increased activity of beneficial soil microorganisms as well as improved soil fertility by increasing the supply of nutrients for plants (Akande *et al.*, 2006). The C: N ratio in cow dung manure indicates that it may be a good source of protein for microbes involved in organic matter decomposition (Adegunloye *et al.*, 2007). Cow dung releases nutrients slowly, allowing for less nutrient loss and more plant uptake. Cow dung manure not only provides plant nutrients, but it also enhances the physical, chemical, and biological properties of soils, increasing and conserving soil productivity (Zamil *et al.*, 2004).
- **Compost:** Compost is an excellent source of organic matter, but it also provides a variety of nutrients, including micronutrients, that are essential for crop production. Compost is nutrient-dense, making it an outstanding soil improver for increasing organic matter and soil fertility. It provides abundant growth nutrients to plants, allowing them to maintain water in the soil for extended periods of time (Darren, 2019). According to Paulin and Peter (2008), compost is made up of relatively stable decomposed organic materials that have undergone accelerated biological degradation in regulated, aerobic conditions. Compost fertilizer is produced from plant and animal waste, with the aim of repurposing plant and animal waste for crop production (Getinet, 2016). Compost manure can either be formed naturally by agents of decomposition or manufactured artificially by humans. The latter is a lot faster to prepare than the former. According to György and Szilveszter compost enhances

water infiltration, as well as run-off reduction, which reduces flooding and diffuse runoff, and root penetration, which boosts crop yield. It also improves the ability of soils to bind chemicals, buffer pollutant release, and control nutrient supply. Composting aids in the prevention of soil erosion. Soil erosion degrades water quality and can result in habitat destruction, sedimentation, and carbon depletion.

According to FAO (2015) composting allows you to convert organic waste into agricultural inputs in a sustainable manner.

### **1.3 METHODS OF COMPOSTING:**

Composting which is basically the decomposition of organic and inorganic matter occurs in two major methods:

- Anaerobic composting
- Aerobic composting

**1.3.1 Anaerobic Composting:** This is a method of composting that occurs in the absence of oxygen. According to FAO (2003) decomposition occurs in anaerobic composting when oxygen (O) is absent or in short supply. The term "anaerobic composting" refers to the putrefactive breakdown of organic matter by reduction in the absence of oxygen, resulting in the release of end products such as CH<sub>4</sub> and H<sub>2</sub>S (Harold, 1956). Anaerobic microorganisms dominate in this process of composting and produce intermediate compounds such as methane, organic acids, hydrogen sulphide, and other substances. This method does not need any maintenance and does not require turning. Anaerobic composting contains a considerable amount of methane which can be very odorous (powerknot, 2012). Since anaerobic destruction of organic matter is a reduction process, when humus is applied to the soil, it undergoes some aerobic oxidation. This oxidation is insignificant, occurs quickly, and has little bearing on the material's use on the soil (Harold, 1956).

**1.3.2 Aerobic Composting:** Living organisms that use oxygen feed on organic matter and produce cell protoplasm from nitrogen, phosphorus, some biomass, and other required nutrients in aerobic composting. Most of the biomass is used as an energy source by the species and is then burned and exhaled as carbon dioxide (Harold, 1956). Aerobic composting mimics natural decomposition by using oxygen and bacteria. Aerobic composting is a method that can be used for any form of organic waste, including waste that is high in nitrogen. Plant matter, such as grass clippings and leaves, promote the growth of a form of bacteria that generates high temperatures of up to 160 degrees Fahrenheit. Aerobic composting works easily, but it necessitates a lot of upkeep because moisture and temperature must be closely monitored. To ensure adequate air circulation, aerobic composting must be turned every few days. This composting method works well outdoors and can handle a large number of materials (Powerknot, 2012).

#### **1.4 COWPEA (*Vigna unguiculata*)**

According to Wang (2015), cowpea (*Vigna unguiculata* L. Walp.) is an important subsistence legume crop that provides a valuable source of protein for the rural and urban poor, as well as livestock, while also fixing nitrogen and improving soil fertility. It is widely grown in many parts of the world, particularly in sub-Saharan Africa, Europe, Latin America, and parts of Asia and the United States. In Nigeria, legumes have a diverse range of high-protein diet options (Ikhajiagbe *et al.*, 2019).

According to Jafar (2017), cowpeas are a drought-resistant and warm-weather crop. It has the ability to adapt to drier tropics where other food legumes fail. It can also fix atmospheric nitrogen through its root nodules, and it thrives in poor soils of more than 85% sand and less than 0.2 percent organic matter.

#### **1.4.1 Botanical description:**

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Fabales
Family	Fabaceae
Subfamily	Faboideae
Tribe	Phaseoleae
Sub-tribe	Phaseoleae
Genus	Vigna
Section	Catiang
Species	unguiculata
Botanical varieties	1. Vigna unguiculata unguiculata var. Unguiculata 2. Vigna unguiculata unguiculata var. Spontanea

#### **1.4.2 Common names:**

- Cowpea (English)
- Lubia (Arabic)
- Neube (French)
- Koso (Moru)
- Loputu (Bari)
- Akuem (Dinka)
- Ngor (Acholi)
- Osu (Madi)

- Amodoro (Latuka)

(Ngalamu *et al.*, 2014).

### **1.4.3 Description:**

The cowpea, *Vigna unguiculata* (L.) Walp., is an annual herbaceous legume grown for its edible seeds or fodder. Cowpeas are herbaceous annuals with a tap root that are either upright, prostrate, or ascending, and almost all are glabrous (OECD, 2015). They are mostly grown for food, but a limited percentage (roughly 10%) are grown as green leafy vegetables and fodder in Africa, or as fresh pods in eastern Asia (Boukar *et al.*, 2015).

Cowpea (*V. unguiculata*) can reach a height of 80 cm, and climbing cultivars can reach a height of 2 m. It has an extensive root structure. The first pair of true leaves are simple and opposite, and the subsequent leaves are trifoliate with oval leaflets (6-15 cm long and 4-11 cm broad) and alternate, indicating epigeal germination. Flowers appear in alternating pairs on thickened nodes at the tip, with cushion-like extrafloral nectaries between each pair. The flower is very large. Pods develop in pairs in a V shape, often pending and vertical but sometimes erect. They're cylindrical, 2-6 cm long, and 3-12 mm wide, with 8-20 seeds inside. White, pink, brown, or black seeds are available (Heuzé *et al.*, 2013).

### **1.4.4 Origin/Distribution:**

It's difficult to pinpoint the exact location of a crop's center of origin. De Candolle (1886) believed that a cultivated plant's roots could be found in the wild. However, it is unknown how much the current wild *v. unguiculata* varieties and subspecies contributed to the origin and diversity of cowpea (Ngalamu *et al.*, 2014). Ngalamu *et al.*, (2014) stated that The growth life cycle of *V. unguiculata* changed from perennial to annual during the evolution process. The exact place or area where the cowpea was first domesticated is unknown. However, the wild species' widespread distribution across Sub-Saharan Africa (SSA),

especially in West Africa, suggests that they may have been domesticated anywhere in the continent (Ng, 1995).

#### **1.4.5 Nutritional content:**

Lyngdoh *et al.*, (2017) stated that around 25% protein, 63.6% carbohydrates, 1.9% fat, 6.3% fiber, 0.00074% Thiamine, 0.00042% Riboflavin, and 0.0028% Niacin are contained in mature cowpea seeds (Davis *et al.*, 2000). Its grain is nutrient-dense and a low-cost protein source for both rural and urban consumers.

Even the leaves of the cowpea seed can contain 9 times the calories, 15 times the protein, 90 times the calcium, and thousands of times more vitamin C and beta-carotene. Cowpea also works well with a variety of cereal crops (Ibitoye and Olomide, 2016).

#### **1.4.6 Method and process of propagation:**

Cowpeas are cultivated directly from seed. The ground should not be flooded, but rather well drained. Current fallow weeds, bushes, and shrubs in the site are manually cut down or slashed with a tractor during land preparation, and fallen trees should be removed. Plowing and harrowing with a disc plough and harrow should be done after that. Enable 4 to 6 days between operations to improve soil tilth, which is essential for seed germination. After harrowing, the land can be ridged or left as flat seedbeds.

The type of variety and growing trend will decide both inter-row and intra-row spacing. In comparison to the upright growing pattern, trailing forms will need more space between plants and rows. Plant populations of 200 000 to 300 000/ha with 30 to 50 cm inter-row spacing are favored for grain production over wider rows (70 to 100 cm), which may be ideal for trailing varieties.

Cowpeas should be planted in lower rainfall areas of South Africa late November to early December for the best yield. 3 to 4 cm deep is the recommended depth for planting the seed. Early-planted crops have elongated internodes, are less upright, vegetative, and yield less than those planted at the optimal time. Farmers manipulate the date of planting for a variety of purposes. The reasons for this include avoiding periods of high pest load or planting cowpea at a time when the crop can be harvested during a period of dry weather.

#### **1.4.7 Importance of Cowpea:**

- **Provision of wholesome food:** Cowpeas are nutritious in all parts used for food (fresh leaves, immature pods, and grains), providing protein, starch, vitamins, and minerals. The grain contains 22-23 percent protein (compared to 2% in cassava and 10% in maize), as well as a significant amount of thiamine (vitamin B1), riboflavin (vitamin B2), and niacin (vitamin B3), and is higher in iron and calcium than cereals. Cowpea leaves contain a lot of beta-carotene and ascorbic acid (vitamin C).
- **Cowpea is used as a cover crop.** Cowpea spreading indeterminate and semi-determinate bushy growth provides ground cover, suppressing weed growth and protecting soil erosion caused by running water during heavy rains. The temperature of the soil is also reduced by a full ground cover.
- Cowpea is an essential food crop that helps to ensure food security and improve the diet quality of rural populations. This is due to its high protein content, which includes a high amount of lysine and tryptophan.
- **Atmospheric nitrogen fixation:** Cowpea roots fix atmospheric nitrogen as a legume, thus increasing or raising the nitrogen content of the soil in which it grows. As a result of cowpea production, the nitrogen content of the soil increases by around 40–80 kg/ha. Cowpeas grown in a mixture of cereals (maize, sorghum, or millets) can boost

cereal crop yields. Cowpea can be grown before or after a crop in rice farming to increase food production from a given land area. It can also be grown in rotation with rice right after rice harvest, replenishing soil fertility for the next crop to be planted on the same plot of land.

**AIM:** To study the effect of compost and cow dung on the growth and germination of *Vigna unguiculata*.

## **CHAPTER TWO**

### **MATERIALS AND METHODS**

#### **2.1 Study Area**

The work was carried out at the stipulated student project site behind the faculty of life sciences complex, university of Benin, benin, edo state Nigeria.

#### **2.2 Source of Seed**

The seeds of *Vigna unguiculata* were purchased from Ekosodin, Benin City, Edo state.

##### **2.2.1 Source of Soil**

The soil sample used was obtained from Capitol, university of benin. The area had been undisturbed for about a decade.

##### **2.2.2 Source of Manure**

The compost manure used for the experiment was obtained from the waste site at the University of Benin food court. The poultry manure used was obtained from the university of benin livestock farm.

#### **2.3 Weighing Balance**

The Camry Emperor (44lbs × 20oz – 20kg × 50kg), made in China was employed in the measurement of soil samples.

#### **2.4 Measuring Tape**

A 100cm (Butterfly brand; made in China) was used to determine the height of stems in centimetre (cm).

## **2.5 Digital Camera**

A Nikon D330 camera was used to capture the plants at different stages of growth.

## **2.6 Paper**

A plain paper was used for the tracing of leaves in the determination of leaf area.

## **2.7 Planting Bags**

Planting bags purchased from Ringroad market, Benin city, Edo state were used.

## **2.8 Experimental setup**

There were four treatments with three replicates and five seeds were planted per bag; this was done in order to carry out germination study. The soil was treated with a mixture of compost and poultry manure in the following proportions; 3%, 6%, 9%, 12% and control. A code was used to identify each treatment in the order 'control', 'A', 'B', 'C', and 'D' respectively. For each treatment, the manure and soil were mixed before filling each bag with 10kg of soil. This was done to ensure a homogenous mixture within each treatment. Watering was done regularly; in the evening or early in the morning. This was practiced so that the plants would have enough water before transpiration occurs. Germination study was observed for seven days after planting. The plants were reduced to plants per bag after thinning. Stem height, girth, number of leaves and number of branches were taken at a 7 days interval.

### **2.8.1 Germination Study**

Germination percentage is the estimate of viable seeds. It is calculated as

$$GP = \frac{\text{number of seeds germinated}}{\text{total number of seeds plant}} \times 100$$

### **2.8.2 Thinning**

In order to prevent overcrowding, the number of plants was reduced by uprooting the plants and leaving just one plant in the planting bag.

### **2.8.3 Measurement of Stem height**

The height of the stem was measured from the point the plant emerged from the soil to the terminal bud. This was done on a 7 days interval for 4 weeks.

### **2.8.4 Number of leaves**

The number of leaves on the plant was counted and recorded once in 7 days for 4 weeks. This was done by visual counting.

### **2.8.5 Measurement of Girth**

The girth of the plant was measured 5cm from the point of emergence. A measuring tape was used to determine the girth of the plant. The measurement of girth was observed once in seven days for four weeks.

### **2.8.6 Number of Branches**

The number of branches was done by visually counting the branches on the plant. This was done once in 7 days for 4 weeks.

## **2.9 Statistical Analysis**

The values obtained as presented on the tables are those of mean, standard error and ANOVA of each treatment taken 7DAP interval for 35 days.

## CHAPTER 3

### RESULTS

Table 1 shows the effect of the mixture of compost and cow dung manure on the germination of *Vigna unguiculata*. The germination study was done and recorded over a period of 7 days. The values recorded for control, A, B, C and D three days after planting were 33.33%, 33.33%, 0%, 6.67% and 0% respectively. However, at the end of germination study (seven days after planting) control, A, B, C and D recorded 86.67%, 86.67%, 60.00%, 86.67% and 46.67% respectively. There was significant difference between the treatments and control. Germination was inhibited in all the treatments compared to control.

Table 2 shows the effect of the mixture of compost and cow dung manure on the height of *Vigna unguiculata*. There was an increase in the values recorded for height of control and other treatments throughout the experiment. At 7DAP, control was  $7.43 \pm 0.83$ cm while A, B, C and D were  $8.17 \pm 0.60$ cm,  $7.83 \pm 0.44$ cm,  $7.50 \pm 0.58$ cm and  $9.17 \pm 0.83$ cm respectively. At the end of the experiment (31DAP), control, A, B, C and D were  $14.33 \pm 1.67$ ,  $24.67 \pm 0.44$ ,  $29.00 \pm 1.53$ ,  $30.25 \pm 1.25$  and  $34.00 \pm 3.00$  cm respectively. However, there were deaths recorded within treatments C and D. There was significant difference between the treatments and control. Growth was enhanced in manure treated plants.

**Table 1: Effect of compost and cow dung on the germination (%) of *Vigna unguiculata***

TIME/ TREATMENT	DAY3	DAY 4	DAY 5	DAY 6	DAY 7
A	0.00±0.00	66.67±6.67 <sup>a</sup>	80.00±11.54 <sup>a</sup>	86.67±13.33 <sup>a</sup>	86.67±13.33 <sup>a</sup>
B	60.00±11.54 <sup>a</sup>	33.33±6.67 <sup>d</sup>	66.67±6.67 <sup>b</sup>	73.33±13.33 <sup>b</sup>	73.33±13.33 <sup>b</sup>
C	0.00±0.00	40.00±0.00 <sup>c</sup>	66.67±6.67 <sup>b</sup>	66.67±6.67 <sup>c</sup>	66.67±6.67 <sup>c</sup>
D	20.00±20.00 <sup>b</sup>	46.67±13.33 <sup>b</sup>	53.33±17.64 <sup>c</sup>	60.00±20.00 <sup>ac</sup>	60.00±20.00 <sup>ac</sup>
E	0.00±0.00	26.67±6.67 <sup>e</sup>	46.67±17.64 <sup>d</sup>	46.67±17.74 <sup>d</sup>	46.67±17.74 <sup>d</sup>

Mean±SE followed by the superscripts in column are significantly different (p<0.05)

**Table 2: Effect of compost and cow dung manure on the height (cm) of *Vigna unguiculata***

TIME / TREATMENT	10DAP	17DAP	24DAP	31DAP
Control	7.43 ± 0.83 <sup>bc</sup>	9.83 ± 1.30 <sup>d</sup>	11.83 ± 0.92 <sup>d</sup>	14.33 ± 1.67 <sup>d</sup>
A	8.17 ± 0.60 <sup>a</sup>	14.10 ± 0.31 <sup>b</sup>	18.83 ± 1.22 <sup>c</sup>	24.67 ± 0.44 <sup>c</sup>
B	7.83 ± 0.44 <sup>b</sup>	14.90 ± 0.12 <sup>a</sup>	21.53 ± 1.53 <sup>a</sup>	29.00 ± 1.53 <sup>b</sup>
C	7.50 ± 0.58 <sup>c</sup>	11.90 ± 0.70 <sup>c</sup>	19.6 ± 1.93 <sup>b</sup>	30.25 ± 1.25 <sup>b</sup>
D	9.17 ± 0.83 <sup>a</sup>	13.23 ± 2.43 <sup>a</sup>	19.13 ± 2.19 <sup>bc</sup>	34.00 ± 3.00 <sup>a</sup>

Mean±SE followed by the superscripts in column are significantly different (p<0.05)

The effect of the mixture of compost and cow dung manure on the number of leaves in *Vigna unguiculata* is presented in Table 3. There was a steady increase in the number of leaves for the control and all other treatments used in the course of the experiment. At 10DAP, control was  $3.67 \pm 0.33$ , while the A, B, C and D were  $3.67 \pm 0.33$ ,  $4.00 \pm 0.00$ ,  $4.00 \pm 0.00$  and  $4.00 \pm 0.00$  respectively. At the end of the experiment (31DAP), the values recorded for control, A, B, C and D were  $7.00 \pm 1.73$ ,  $23.33 \pm 3.48$ ,  $28.00 \pm 2.00$ ,  $30.50 \pm 0.50$  and  $22.50 \pm 3.50$  respectively. There were significant differences between the treatments and control. There was a steady increase in the number of leaves as the concentration of the manure mixture increased until treatment C after which treatment D had a significant decrease in the number of the leaves of the plants as compared to treatment C. It would appear that the optimum quantity for growing *Vigna unguiculata* lies within treatment C after which it begins to have adverse effect

TIME / TREATMENT	10DAP	17DAP	24DAP	31DAP
Control	3.67 ± 0.33 <sup>b</sup>	4.33 ± 0.33 <sup>b</sup>	5.33 ± 0.33 <sup>e</sup>	7.00 ± 1.73 <sup>c</sup>
A	3.67 ± 0.33 <sup>b</sup>	6.33 ± 0.33 <sup>a</sup>	13.0 ± 1.00 <sup>d</sup>	23.33 ± 3.48 <sup>b</sup>
B	4.00 ± 0.00 <sup>a</sup>	6.33 ± 0.33 <sup>a</sup>	15.33 ± 1.45 <sup>c</sup>	28.00 ± 2.00 <sup>a</sup>
C	4.00 ± 0.00 <sup>a</sup>	6.67 ± 0.33 <sup>a</sup>	18.00 ± 0.00 <sup>a</sup>	30.50 ± 0.50 <sup>a</sup>
D	4.00 ± 0.00 <sup>a</sup>	6.33 ± 0.33 <sup>a</sup>	13.33 ± 3.76 <sup>b</sup>	22.50 ± 3.50 <sup>b</sup>

Mean±SE followed by the superscripts in column are significantly different (p< 0.05)

The effect of the mixture of compost and cow dung manure on the girth of *Vigna unguiculata* is shown in Table 4. There was an increase in the values recorded for girth in control and other treatments throughout the course of the experiment. At 7DAP, control was  $1.73 \pm 0.15$ , while the A, B, C and D were  $1.50 \pm 0.60$ ,  $1.47 \pm 0.15$ ,  $1.60 \pm 0.00$  and  $9.30 \pm 7.85$  cm respectively. At the end of the experiment, control, A, B, C and D were  $1.70 \pm 0.12$ ,  $2.73 \pm 0.15$ ,  $2.80 \pm 0.12$ ,  $2.95 \pm 0.05$  and  $2.65 \pm 0.15$  cm respectively. There were significant differences between the various treatments. The results obtained were inconsistent with manure concentration.

Table 5 shows the effect of the mixture of compost and cow dung manure on the number of branches in *Vigna unguiculata*. The number of branches increased across the gradient of time on each treatment including the control. The values for control, A, B, C and D were  $2.00 \pm 0.00$ ,  $3.33 \pm 0.33$ ,  $3.67 \pm 0.67$ ,  $4.67 \pm 0.33$  and  $3.67 \pm 0.33$  respectively at 10DAP. At the end of the experiment, the number of branches in control, A, B, C and D were  $6.33 \pm 1.45$ ,  $22.67 \pm 3.52$ ,  $25.00 \pm 2.65$ ,  $30.67 \pm 0.00$  and  $22.0 \pm 4.00$  respectively. There were significant differences between the various treatments. The results obtained increased with increase in manure concentrations until treatment C after which there was a decrease in the number of branches in treatment D.

**Table 4: Effect of compost and cow dung manure on the girth (cm) of *Vigna unguiculata***

TIME / TREATMENT	10DAP	17DAP	24DAP	31DAP
Control	1.73 ± 0.83 <sup>b</sup>	1.90 ± 0.58 <sup>b</sup>	2.07 ± 0.07 <sup>e</sup>	1.70 ± 0.12 <sup>d</sup>
A	1.50 ± 0.60 <sup>b</sup>	1.97 ± 0.09 <sup>cd</sup>	2.33 ± 0.07 <sup>d</sup>	2.73 ± 0.15 <sup>bc</sup>
B	1.47 ± 0.15 <sup>c</sup>	2.07 ± 0.07 <sup>c</sup>	2.50 ± 0.06 <sup>c</sup>	2.80 ± 0.12 <sup>b</sup>
C	1.60 ± 0.00 <sup>c</sup>	2.33 ± 0.09 <sup>a</sup>	2.80 ± 0.06 <sup>a</sup>	2.95 ± 0.05 <sup>a</sup>
D	9.30 ± 7.85 <sup>a</sup>	1.83 ± 0.17 <sup>d</sup>	2.40 ± 0.10 <sup>b</sup>	2.65 ± 0.15 <sup>c</sup>

Mean±SE followed by the superscripts in column are significantly different (p< 0.05)

**Table 5: Effect of compost and cow dung manure on the number of branches of *Vigna unguiculata***

TIME / TREATMENT	10DAP	17DAP	24DAP	31DAP
Control	-	2.00 ± 0.00	3.67 ± 0.67	6.33 ± 1.45
A	-	3.33 ± 0.33	10.0 ± 1.15	22.67 ± 3.52
B	-	3.37 ± 0.67	12.67 ± 1.76	25.00 ± 2.65
C	-	4.67 ± 0.33	16.67 ± 0.33	30.00 ± 0.00
D	-	3.67 ± 0.33	9.33 ± 1.86	22.00 ± 4.00

Mean±SE followed by the superscripts in column are significantly different (p< 0.05)



**Plate 1: Effect of the treatments on *Vigna unguiculata* two weeks after planting**



**Plate 2: Effect of the treatments on *Vigna unguiculata* four weeks after planting**

## CHAPTER FOUR

### DISCUSSION

The result for germination Table 1, shows the effect of compost and cow dung manure on the germination on *Vigna unguiculata*. There was significant adverse effect of treatments on germination. This could have been as a result of the increase in the concentration of the mixture of compost and cow dung manure in the soil. The use of organic manure increases the amount of nitrogen in the soil. Nitrogen, which aids in the germination process of seeds, when in excess, may adversely affect germination rate of seeds. This result did not agree with the findings of Naishima *et al.*, (2018) which stated that the germination rate of *Eucalyptus camaldulensis* increased with increase in concentration of cow dung manure thereby implying a positive effect of cow dung manure on germination.

Table 2 shows the effect of the mixture of compost and cow dung manure on the height of *Vigna unguiculata*. The height showed an increase along the concentration gradient with time. It showed that increase in the concentration of the mixture of compost and cow dung manure had a positive effect on the height of *Vigna unguiculata* as shown in the experiment. This correlated with an experiment carried out by Usman (2015) on ‘cow dung, goat and poultry manure and their effects on the average yield and growth of tomato crop’. The experiment showed that the height of plants increased with increase in concentration of manure. This also agreed with a study carried out by Afriyie and Amoabeng (2017) that showed a consistent increase in the height of radish (*Raphanus sativus* L.) with response to increase in concentration of compost.

In Table 3, the results obtained for the effect of the mixture of compost and cow dung manure on the number of leaves of *Vigna unguiculata* shows a steady increase along the gradient with time. This shows that the mixture of compost and cow dung manure had a positive effect on

the number of leaves of *Vigna unguiculata* in terms of growth and multiplication. With treatment D however, the experiment showed a significant decrease in the number of leaves relative to that of treatment C. This implied optimum concentration level of the compost and cow dung mixture to be treated C. This correlated greatly with an experiment carried out by Usman (2015) on ‘Cow Dung, Goat and Poultry Manure and Their Effects on the Average Yields and Growth Parameters of Tomato Crop’. The experiment showed a consistent increase in the cow dung mixture. In another experiment carried out by Zaman *et al.*, (2016) on ‘effect of cow dung as organic manure on the growth, leaf biomass yield of *Stevia rebaudiana* and post harvest soil fertility’, it showed that the number of leaves increased significantly across the gradient with time.

Data for girth (Table 4) showed that there was no exact pattern to the increase in girth across all treatments. Nonetheless, there was a steady increase in the size of the girth with time across all treatments, except for control where there was reduction 17DAP. This must have been due to nutrient deficiency in the soil considering that no manure mixture was added to the soil. An experiment carried out by Garjila *et al.*, (2017) showed that in 2014 and 2015, the impact of different rates of cow dung manure on stem girth was largely significant. The girth showed steady increase across the gradient. In another experiment carried out by Isaac and Amhakhian (2016) on ‘Effects of Organic Manure on the Growth Parameters and Yield of Okra in Anyigba, Kogi State, North Central, Nigeria’, it showed a steady increase in the stem girth with time when cow dung manure was applied. These observations however did not correlate with an experiment carried out by Eleduma *et al.*, (2020) where there was a consistent increase in the stem girth across all treatments including control.

In Table 5, there was a slow and slight increase in the branching across all treatments with no particular pattern to this increase. Branching did not occur until 10DAP and it only occurred in some treatments. It may not be correct to suggest that the mixture of compost and cow dung at different concentrations had a particular order of influence on the branching of *Vigna unguiculata* as the branching was somewhat proportional to the entire growth of the plant. However, it was observed that the plants with the highest number of leaves had the highest number of branches.

## 4.1 CONCLUSION

Using a mixture of compost and cow dung manure increased the overall growth of *Vigna unguiculata* until it got to a point where it probably became excess and then adversely affected the growth of the plant. However, this observation and overall experiment is quite inconclusive considering that the yield of this plant was not studied due to time constraint.

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## APPENDIX

Anova table showing the effect of compost and cow dung manure on the germination of *Vigna unguiculata*

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<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
TREATMENT	6165.333	4	1541.333	3.481928	0.013847	2.557179
Columns	34752	4	8688	19.62651	9.18E-10	2.557179
Interaction	5248	16	328	0.740964	0.739665	1.850315
Within	22133.33	50	442.6667			
Total	68298.67	74				

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Anova table showing the effect of compost and cow dung manure on the height of *Vigna unguiculata*

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
TREATMENT	409.1817	4	102.2954	2.678077	0.045394	2.605975
Columns	1754.422	3	584.8073	15.31016	8.75E-07	2.838745
Interaction	220.049	12	18.33742	0.480071	0.914579	2.003459
Within	1527.893	40	38.19733			
Total	3911.546	59				

Anova table showing the effect of compost and cow dung manure on the girth of *Vigna unguiculata*

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
TREATMENT	1.077333	4	0.269333	0.874932	0.487479	2.605975
Columns	6.353333	3	2.117778	6.879625	0.000762	2.838745
Interaction	3.293333	12	0.274444	0.891536	0.562476	2.003459
Within	12.31333	40	0.307833			
Total	23.03733	59				

Anova table showing the effect of compost and cow dung manure on the number of leaves of *Vigna unguiculata*

<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
TREATMENT	521.0667	4	130.2667	3.812683	0.010203	2.605975
Columns	2335.65	3	778.55	22.78683	9.13E-09	2.838745
Interaction	536.2667	12	44.68889	1.307967	0.252143	2.003459
Within	1366.667	40	34.16667			
Total	4759.65	59				

Anova table showing the effect of compost and cow dung manure on the number of branches of *Vigna unguiculata*

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<i>Source of Variation</i>	<i>SS</i>	<i>df</i>	<i>MS</i>	<i>F</i>	<i>P-value</i>	<i>F crit</i>
TREATMENT	10.9	4	2.725	3.802326	0.01034	2.605975
Columns	71.91667	3	23.97222	33.44961	5.49E-11	2.838745
Interaction	7.5	12	0.625	0.872093	0.580441	2.003459
Within	28.66667	40	0.716667			
Total	118.9833	59				

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