# EFFECT OF MEXICAN SUNFLOWER (*Tithonia diversifolia*), COWDUNG AND POULTRY DROPPINGS ON THE YIELD OF OKRA (*Abelmoschus esculentum*)

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**ABSTRACT**— Yield in plants is determined by the quality of soil and seed planted. The current research was undertaken to evaluate the effect of cow dung, poultry manure and Mexican sunflower (*Tithonia diversifolia*) on the yield parameters of Okra plant. The experiment was conducted at the Federal College of Forestry experimental farm, Jos, Nigeria. It was laid out in a Randomized Complete Block Design (RCBD) with three replicates and data collected were statistically analyzed. The result reveal that, Okra treated with poultry manure had the best performance with Number of bud (2.44), Flower number (2.44), and Fruit number (2.44), Fruit Weight (71.22g), Fruit Length (10.30cm) and Fruit Diameter (7.43cm). This was followed with *Tithonia diversifolia* which competed favorably with poultry dropping with Number of bud (2.45), Flower number (2.45), and Fruit number (2.45), Fruit Weight (62.58g), Fruit Length (9.26cm) and Fruit Diameter (7.14cm). While cow dung had the least performance with Number of bud (1.95), Flower number (1.95), and Fruit number (1.95), Fruit Weight (44.65g), Fruit Length (8. 87cm) and Fruit Diameter (6.23cm). Organic manure remains a good improver of soil fertility by activating soil biomass in terms of physical and biological properties of the soil. Though other studies have identified *Tithonia diversifolia* as an invasive plant and in most agricultural lands are been cut down or used to demarcate between farms, but it was found to compete favorably with other acquainted organic manure. It did better in improving root hair and root length in this study. It is therefore, viewed and recommended as a potential soil improver for agriculture.

**Index Terms**— Effect, Mexican sunflower, Yield, Okra.



## 1 INTRODCUTION

OKRA (*Abelmoschus esculentusL.Monech*) is a popular vegetable in tropical countries of the world and grown for its "pod" [1] (Ogeniyi and Folorunso, 2005). It is one of the most well-known and utilized species of the family Malvaceae. It is also a chief vegetable crop that can be consumed as fried or boiled or may be added to salads, soup and stews, [2]. Okra plays a significant role in human nutrition by providing carbohydrates, protein, fat, minerals and vitamins that are generally deficient in basic foods. Okra is a vegetable valued for many of its properties. The tender fruits contain minerals especially Calcium, Magnesium, Iron and Phosphorus, proteins, vitamins A and C including riboflavin as well as high mucilage [3] (Babatunde et al., 2005). Mature okra seed have been reported to be good sources of protein and oil [4] and it has been known to be very important in nutritional quality. Its ripe fruit and stem contain crude fibre, which is used in the paper industry. It ranks above other vegetable crops such as Amaranths, Lettuce, Cabbage etc, [5]. In other to increase yield to meet the growing consumer demand, the need to use renewable form of energy and reduce cost of fertilizing crops has revived the use of organic fertilizers especially legume green manure worldwide. Improvement of environmental conditions and public health are important reason for advocating increased used of organic materials [6], [7]. Hepperly, Lotter, Ulsh, Siedel and Reider (2009) [8] reported that chemical fertilizers act as beneficial input to getting higher crop productivity, but high dose chemical fertilizers is associated with reduction in soil properties and crop yields over time. While, the organic fertilizer, has positive effects in maintaining the soil properties. Manure has the capacity to improve soil conditions, such as increasing the pH in acid soils, increasing soil water-holding capacity, hydraulic conductivity and infiltration rate, and reducing soil bulk density. Manure also is a good source of plant nutrients and improves soil structure [9]. Moreover, Ould-Ahmed (Ould, Inoue and Moritani, 2010) [10] suggest that manure is an efficient compound for sandy soil with saline water irrigation. Again, the use of inorganic fertilizer has not been helpful under intensive agriculture because it is often associated with reduced crop yield, soil acidity and nutrient imbalance [6]. The extent, on which farmers can depend on this, is constrained by unavailability at the right time, high cost, lack of technical know-how and lack of access to credit [11] (Chude et al, 1999). Hence animal wastes that result to animal manure and plant waste resulting to green manure are a better alternative and a necessary option for improved okra production especially in the guinea savannah of Northern Nigeria. Poultry manure is relatively cheap, readily available and tend to be high than inorganic fertilizer in terms of yield and improvement of soil physical properties.

Application of readily available, environmental friendly organic fertilizers such as cow dung, poultry droppings and Mexican sunflower in farming systems will reduce the cost of production hence increased returns to the farmer. Therefore, the aim of this project is to determine the effect of cow dung, poultry droppings and *Tithonia diversifolia* on the yield of okra (*Abelmoschus esculentum*)

# 2 METHODOLOGY

## 2.1 Study area

The research was carried out at Federal College of Forestry experimental farm, Jos, Nigeria. It lies within the Northern Guinea Savannah Zone of Nigeria, it lies on latitude 8°30'N and longitude 8°20' and 9°30'E of the equator and covers an area of 1,695km with an average altitude of about 1,200meters above sea level. It enjoys a fairly moderate annual rainfall, characterized by two seasons; dry and wet season, and minimum annual rainfall of 1179.02mm with an average temperature 22°C.

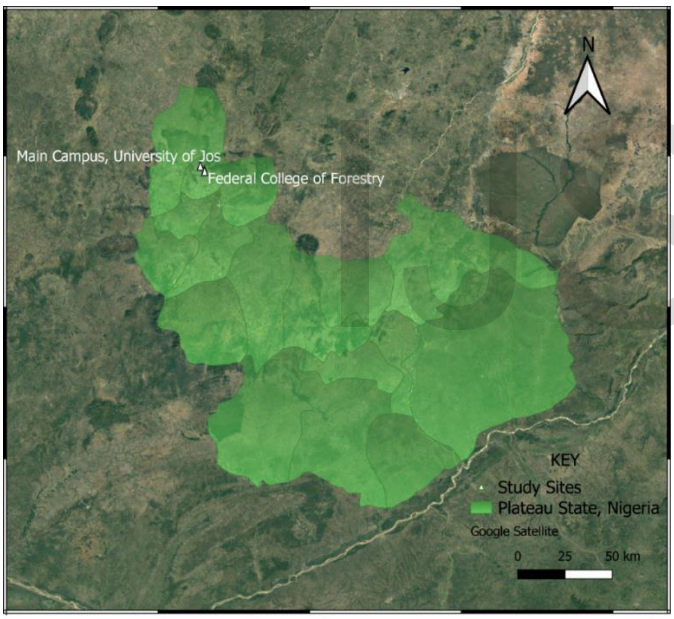
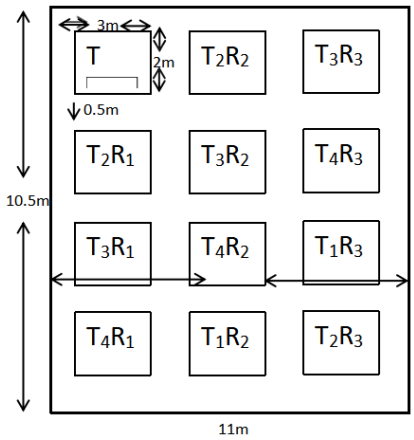



Fig. 1. Map Showing study site Federal College of Forestry Jos Plateau State, Nigeria

## 2.2 Sampling

A Randomize Complete Block Design (RCBD) was used as the experimental design for this study with four treatments replicating three times having a total of twelve observation plots. The experimental bed measured 3m × 2m giving a total of 6m2. Hence a total net plot of 72m and a gross plot of 104.5m2.




To determine the diameter of the fruits, five fruits from the tagged plants in the net plot were taken and their diameters measured with Vernier caliper and the average was recorded for each treatment. The lengths of five fruits were taken from the net plot and from the pots, these were measured using meter rule and the average was recorded for each treatments. Fresh fruits harvested from the tagged plants in the net plot at five days interval and were counted and recorded per plant basis. Values were thereafter summed up from first to last harvest and recorded as per treatment. Fresh fruits harvested from the tagged plants in the net plot were weighed using electronic balance and the average recorded for each treatment.

Soil samples were collected from the experimental site in zigzag pattern from 0 to 30 cm depth of soil using an auger. Then all samples were mixed together in order to get one composite sample weighing 1 kg for determination of selected soil properties.

## 2.3 Weather Parameter

Weekly readings of the weather parameters such as temperature, rainfall, relative humidity, sunshine hours and wind direction were collected at Federal College of Forestry, Jos Meteorological station and their average readings was used to determine some ecological characteristics

## 2.4 Determining soil parameter

The composite soil sample was dried and crushed to pass through a 2 mm size sieve for the analysis of pH, texture. For the determination of total nitrogen and organic carbon, the soil sample was made to pass through 1 mm pore size sieve.

The soil samples were analyzed for soil texture, pH, organic carbon, total N and available P. Soil pH was measured from a suspension 1:2.5 soil-water ratio using an electrode pH

meter at Agricultural Services and Training Center (ASTC) Vom.

### 2.5 Data Analysis

The data were subjected to a two-way Analysis of Variance (ANOVA) appropriate to randomized complete block design technique using the SPSS computer software programme, version 30.0. Where significant difference existed between the treatment means, comparison of the means was done using the Duncan Multiple Range Test (DMRT) at 5% probability level.

## 3 RESULTS

Table 1. Showing bud formation, flower number, fruit number, fruit weight, fruit length and fruit diameter of *Abelmuscus esculentum* under different treatment.

| Treatments | Bud formation | Flower Number | Fruit Number | Fruit Weight | Fruit Length | Fruit Diameter |
|---|---|---|---|---|---|---|
| Cowdung | 1.95±0.7$^{c}$ | 1.95±0.7$^{c}$ | 1.95±0.7$^{c}$ | 44.65±5.1$^{c}$ | 8.87±2.8$^{a}$ | 6.23±0.4$^{c}$ |
| Poultry Droppings | 2.44±1.0$^{a}$ | 2.44±1.0$^{a}$ | 2.44±1.0$^{a}$ | 71.22±13.0$^{a}$ | 10.30±2.1$^{a}$ | 7.43±0.7$^{a}$ |
| *Tithonia diversifolia* | 2.25±0.9$^{b}$ | 2.25±0.9$^{b}$ | 2.25±0.9$^{b}$ | 62.58±11.4$^{b}$ | 9.26±2.4$^{a}$ | 7.14±0.7$^{b}$ |
| Control | 1.42±0.6$^{d}$ | 1.42±0.6$^{d}$ | 1.42±0.6$^{d}$ | 29.84±10.6$^{d}$ | 8.03±6.2$^{a}$ | 4.93±0.4$^{d}$ |

Source: (Field work, 2017). *Means in the same columns having the same superscripts are not significantly different (p≥0.05)*



### 3.1 Bud formation

Bud formation varied from 1.42 in control treatment to 2.44 in treatment with poultry droppings. Significant difference exists between *Tithonia diversifolia* 2.25 and cowdung 1.95.

The result also indicates interaction effects between the treatments applied and weeks, as the week goes by the number of bud increases (Figure) respectively.

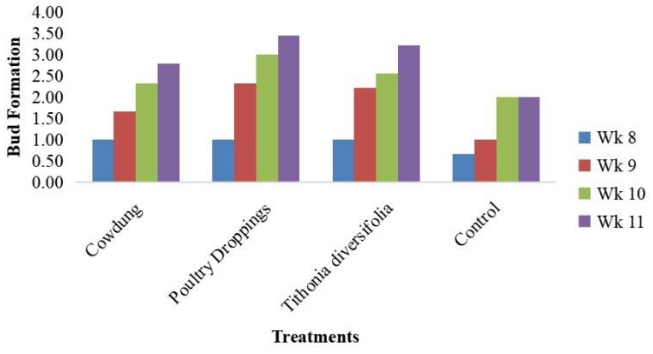



Fig. 2. Multiple bar charts showing the mean bud formation of *Abelmoschus esculentus* under different treatments.

### 3.2 Flower Number

Flower number varied from 1.42 in control treatment to 2.44 in treatment with poultry droppings. Significant difference exists between *Tithonia diversifolia* 2.25 and cowdung 1.95.

The results also indicate interaction effects between the treatments applied and weeks, as the week goes by the number of flower increases.

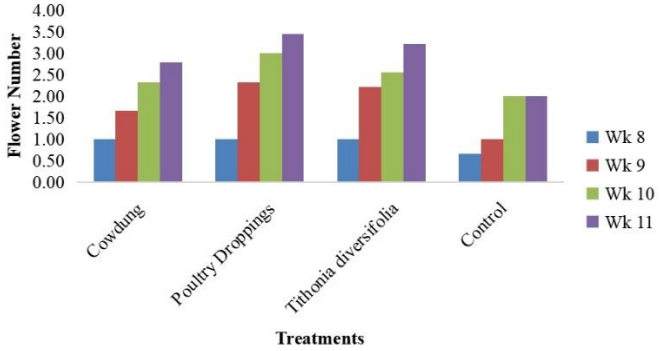



Fig. 2. Multiple bar charts showing the mean flower number of *Abelmoschus esculentus* under different treatments.

### 3.3 Fruit Number

Fruit number varied from 1.42 in control treatment to 2.44 in treatment with poultry droppings. Significant difference exists between *Tithonia diversifolia* 2.25 and cowdung 1.95.

The results also indicate interaction effects between the treatments applied and weeks, as the week goes by the number of bud increases.

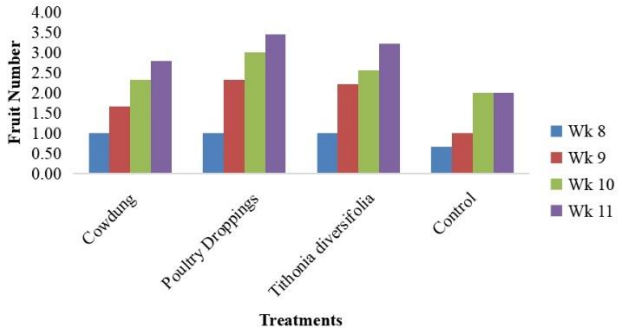



Fig. 3. Multiple bar charts showing the mean fruit number of *Abelmoschus esculentus* under different treatments.

### 3.4 Fruit Weight

Fruit weight varied from 29.84g in control treatment to 71.22g in treatment with poultry droppings. However, significant difference exists between *Tithonia diversifolia* 62.58g and 44.65g.

The results also indicate interaction effects between the treatments applied and weeks, as the week goes by, the weight of fruits increases.

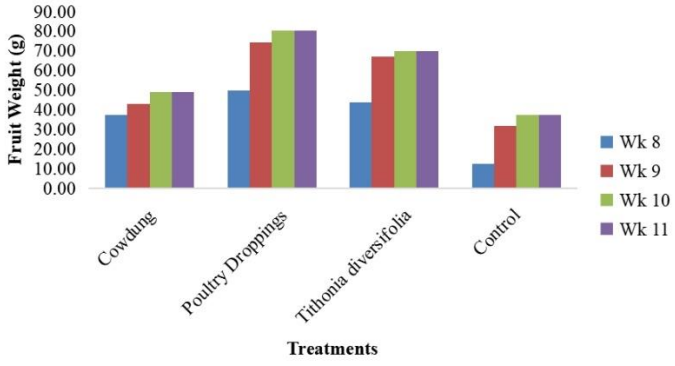



Fig. 4. A multiple bar chart showing the mean fruit weight of *Abelmoschus esculentus* under different treatments.

### 3.5 Fruit Length(cm)

Fruit length varied from 8.03cm in control treatment to 10.30cm in treatment with poultry droppings. However, significant difference did not exist in all the treatment.

The result also indicates interaction effects between the treatments applied and weeks, as the week goes by the length of fruits increases.

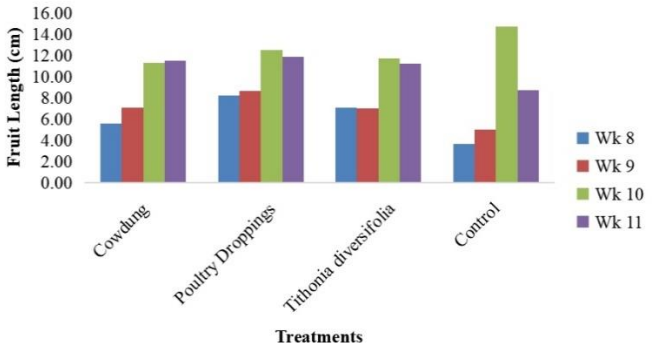



Fig. 5. Multiple bar charts showing the mean fruit length of *Abelmoschus esculentus* under different treatments.

### 3.6 Fruit Diameter (Cm)

Fruit diameter varied from 4.93cm to 7.43cm in treatment with poultry droppings 7.43cm. significant difference exists between *Tithonia diversifolia* 7.43cm and cowdung 6.23cm.

The results also indicates interaction effects between the treatments applied and week, as week goes by the diameter of fruits increases.

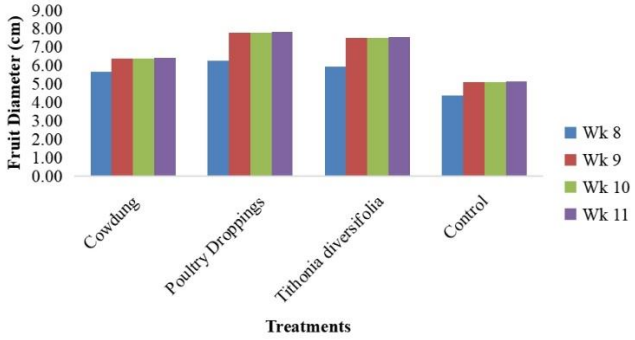



Fig. 6. A multiple bar chart showing the mean fruit diameter of *Abelmoschus esculentus* under different treatments.

# 4 DISCUSSION

The effects of poultry manure, *Tithonia diversifolia* and cow dung were significantly different on the growth and yield of okra as evident in the parameters evaluated. The least performance of the control treatment was a reflection of soil nutrient deficit. This is in consonance with Babatola(2006), [12] and Sanjeet et al, (2010) [13].The result obtained in this study shows that there is justification in practice according to Olabode et al,[14] Stated that Mexican sunflower (*T.diversifolia*) is a potential soil improver for crop productivity as seen in the study, it competed favorably with the poultry manure. The overall plant performance shows that there is significant difference in yield parameters, this result corroborates with the findings of Bayu et al. (2006) [15] and Olabode et al, (2007) [16] Organic manure improves soil fertility by activating soil biomass.

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