

**EFFECT OF POULTRY MANURE ON FOLIAR YIELD OF *Telfairia occidentalis* F.Hook  
GROWN SOLE AND INTERCROPPED WITH MAIZE, CASSAVA AND THEIR MIXTURES**

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### ABSTRACT

In Southeastern Nigeria, fluted pumpkin is dominantly grown in mixtures and sometimes sole. The study investigated the effect of different rates of poultry manure and intercropping on the yield of *Telfairia occidentalis* when grown sole and in mixture. The field was laid out in a 4 x 5 factorial arrangement fitted into a randomized complete block design and replicated three times. The treatments consisted of five levels of organic manure (0, 2.5, 5, 7.5, 10) t/ha applied on four intercrop combinations (Telfairia-sole, Telfairia and cassava, Telfairia and maize and Telfairia, cassava and maize). Yield parameters were determined at four, eight and twelve weeks after emergence (WAE). The result showed that increasing levels of poultry manure application resulted to increase in leaf yield of Telfairia. The highest number of leaves (205.3 and 349.5) and highest fresh weight (1.67 and 3.50) at 8 and 12 WAE were recorded at 7.5 and 10 t/ha of poultry manure. The best yield was recorded when 7.5 t/ha of poultry manure was applied to Telfairia, cassava and maize followed by Telfairia and maize then Telfairia and cassava. Telfairia-sole had low yield irrespective of manure rate.

**Keywords:** Poultry, Manure, Telfairia, Intercropping, Yield

### Introduction

Gutteridge and Shelton, (1994) opined that, decline in soil fertility is specifically serious in tropical regions where the soil lacks adequate plant nutrients due to leaching and erosion of topsoil by intense rainfall. They also explained that leaching and soil erosion can be controlled through intercropping and sufficient application of organic matter which can hold five times as much nutrient for plants use.

Intercropping is a practice that is quite possibly as old as settled agriculture, historians (Baker, 1970; Chang, 1983; DeWet and Harlan, 1975; Harlan *et al.*, 1976; Rindos, 1984; Turner and Miksicek, 1984) reported that intercropping probably existed early in agricultural evolution and established that intercropping is part of a process of species domestication.

In the agro ecology of southeastern Nigeria, the most common cropping system consists of growing several crops in association or in mixtures (Edje, 1979). According to Ibeawuchi, (2007), intercropping is the growing of two or more crops in proximity to promote interaction between them.

Scientists have compared nutrient uptake in crop mixtures and in sole and reported that crops extract more nutrients from the soil when grown in mixture than when grown in sole. Dalal (1974) compared maize and pigeon pea mixture with maize, and observed that the differences in growth duration of the components crops tend to minimize competition. Kassam and Stockinger (1973) shared the same view in reporting that intercropping systems were most rewarding in terms of yield of the component crops when there was a competition gap between the periods the components crops made maximum demand on the micro-environment (soil nutrient, soil moisture, light etc).

Ibeawuchi, (2007) reported that intercropping significantly reduced pest/disease infestation and thereby can play a leading role in integrated pest management. Also Nwufu and Ihejirika, (2008) reported that results of the effect of inter-cropping fluted pumpkin with cassava, maize and yam showed that inter-cropping significantly affected the yields of component crops, diseases incidence and severity because it is likely that the other crops in the mixture prevents contact between the pathogens and fluted pumpkin, thus reducing the incidence and severity of the disease and they recommended the removal of disease leaves and inter-cropping with yam, maize and cassava to reduce the incidence and severity of leaf spot disease of fluted pumpkin. In many intercropping systems, only one weeding is required to produce optimum yields instead of three or more in sole crops because the denser plant population usually found in crop mixtures may also help control weeds (FAO, 1978).

In addition to all the advantages of intercropping, it is still necessary to improve intercropping in crop production in order to attain maximum yield, since intercropping maximizes the use of soil nutrients. Also, addition of organic fertilizer in order to boost the organic matter content in the soil during intercropping is important.

Poultry manure application improves the physical properties of the soil. It significantly decreases bulk density and increases total porosity, infiltration capacity and water holding capacity. Amanullah *et al.*, (2010). Asiegbu, (1983) observed an increase in the fruit yield of eggplant with increased rates of poultry manure up to 15 t ha<sup>-1</sup>. It has been reported that poultry manure showed better performance in producing annual field crop (Akande *et al.*, 2005)

*Telfairia occidentalis* Hook f., is one of the most popular vegetable known as fluted pumpkin. It is a member of cucurbitaceae family and is one of the commonly consumed leafy and seed vegetables in Nigeria. It is a perennial climber grown for its leaves and seeds, which are very nutritious (Schippers, 2000). Distributed around the tropics (Renner *et al.*, 2007), It has been suggested that it originated in south-east Nigeria and was distributed by the Ibos, who have cultivated this crop since time immemorial, (Kayode and Kayode, 2011). The largest diversity in plant populations can currently be found in Imo state and surroundings areas in South-eastern Nigeria (Olaniyi and Odere, 2009).

The *Telfairia* young shoots and leaves are the main ingredients of a Nigerian soup, *edikang ikong*. Apart from ranking as one of the three most widely eaten vegetables in homes and restaurants across Nigeria (Abiose, 1999), the fresh leaf extract serves as high value, cheap and fast remedy tonic for anemic and convalescent persons in view of its high ferrous content which is about 700 ppm (Schippers, 2000). The purpose of this research is to evaluate the yield of *Telfairia occidentalis* intercropped with cassava and maize.

## 2. Materials and Methods

The experiment was conducted in 2011 cropping season at the Teaching and Research Farm, School of Agriculture and Agricultural Technology, Federal University of Technology Owerri, Imo state. Owerri is in the humid forest zone of Southeastern Nigeria and it is located on latitude 5° 27' 50.23" North and longitude 7° 02' 49.33" (Nwosu and Adeniyi, 1980).

### 2.1 Land Preparation

The land measuring 42 x 42 meters was cleared manually and tilled to make seed bed. The bed 4m long and 2m wide constitutes a treatment plot. The distance between each plot was 0.5m while the distance between the blocks was 1.0m. Cured poultry manure was measured and applied according to treatment. The soil samples randomly collected from the experimental site were analysed before the experiment.

### 2.2 Treatments and Experimental Design

20 treatments were laid out in a 4 x 5 factorial arrangement fitted into a randomized complete block design. Treatments consisted of four production systems (*Telfairia* sole, *Telfairia* and cassava, *Telfairia* and maize, and *Telfairia*, cassava and maize) and five levels of poultry manure; 0, 2.5, 5.0, 7.5 and 10t/ha respectively and replicated three times.

### 2.3 Planting and planting materials

The seeds of *Telfairia*, maize (Oba 2) and cassava cuttings (NR 8082) were collected from the genetic resource unit of Department of Crop Science, Federal

University of Technology, Owerri. The healthy *Telfairia* pods were processed for seeds which were shade dried for 2 days to reduce moisture and prevent decay. In both sole and intercrops, *Telfairia* was spaced 2.0 x 2.0m, cassava was cut 20cm and planted at 1.0x1.0 and maize was sown at 0.75x0.25m respectively. Weeding was done manually at 5 and 12 weeks after planting using hoe.

### 2.4 Yield

Yield parameters are; fresh weight harvest, number of leaves and vine length.

Numbers of leaves were collected by counting and recording. Vine length was taken at four weeks interval. This was done by using a meter rule to measure the plant from the soil surface to the node of the youngest fully open leaves. Fresh weight was obtained by harvesting from each treatment and weighing using an electronic weighing balance to weigh those that were not up to 250g and a weighing scale for those that were above 250g. Weighing was done at each harvest (4,8 and 12 WAE).

### 2.5 Statistical Analysis

Statistical analyses of the data were carried out using GENSTAT and SPSS (Genstat, 2012). The means were statistically separated using F-LSD at a significance level of  $p \leq 0.05$ .

## 3. Results and Discussion

Growth parameters did not differ significantly between treatments during the first harvest at 4 weeks after emergence (WAE.). There was also no significant difference between treatments at 8 WAE except the fresh weight harvest which recorded significant difference between treatments as seen in Table 1, where *Telfairia* and maize intercrop recorded the highest (1.41kg) fresh weight followed by *Telfairia* and cassava intercrop (1.26gk) while poultry manure rate of 10 t/ha recorded the highest fresh weight (1.49gk) followed by (1.48gk) at 7.5 t/ha. Poultry manure and intercrop did not record any significant effect on number of leaves even at 8WAE, but at 12 WAE a significant effect was recorded where application of poultry manure at the rate of 7.5 t/ha, gave the highest (281.4) number of leaves followed by (281.1) at 10 t/ha while the least (240.3) was recorded at 0.0 t/ha. The intercrop effect was also significant at 12WAE where *Telfairia* and cassava intercrop (314.3) recorded the highest number of leaves, followed by *Telfairia* and maize intercrop (280.9) as seen in Table 2. Vine length also did not record any significant result at 4 and 8WAE but at 12 WAE poultry manure recorded the highest vine length (277.8cm) at 7.5 t/ha followed by (277.0cm) at 10 t/ha while the least (253.6cm) was recorded at 0.0 t/ha. The intercrop recorded the highest vine length (312.3cm) at *Telfairia* and cassava intercrop, followed by (312.3cm) *Telfairia*, cassava and maize intercrop. The high fresh weight

of Telfairia at poultry manure rate of 7.5 and 10 t/ha could be as a result of the high number of leaves at these same treatments and the frequency of harvest which is in line with the findings of Asiegbu (1983) that frequent harvest (3 or 4 weeks interval) yields more edible leaves than infrequent harvest (6 or 8 weeks interval). The findings also shows that the higher the rate of poultry manure applied the higher the yield, this corresponds with the report of (Awodun 2007) that application of poultry dropping promotes the production of Telfairia leaves. At 12

WAE, the intercrop recorded the highest fresh weight (2.67kg); highest number of leaves (314.3) and highest vine length (312.3cm) at Telfairia and cassava mixture. These findings concur with the statement made by Enyi, (1973) that intercropping has been reported to have yield advantage over sole cropping and these advantages can occur as a result of complementary use of growth resources such as nutrients, water and light. The interaction recorded no significant difference between treatments.

**TABLE 1: Effect of Poultry Manure Rates and Intercropping System on Fresh weight harvest (kg) of *Telfairia* at 4, 8 and 12WAE**

Intercrop	MANURE RATE t/ha					Mean
	0.00	2.50	5.00	7.50	10.00	
<b>4 WAE</b>						
Telfairia (sole)	0.15	0.25	0.17	0.26	0.30	<b>0.23</b>
Telfairia + Cassava	0.24	0.14	0.16	0.28	0.27	<b>0.22</b>
Telfairia + Maize	0.16	0.10	0.12	0.14	0.32	<b>0.17</b>
Telfairia+Cassava+maize	0.29	0.11	0.18	0.27	0.29	<b>0.23</b>
<b>Mean</b>	<b>0.21</b>	<b>0.15</b>	<b>0.16</b>	<b>0.24</b>	<b>0.29</b>	
LSD (0.05) for manure rate		=	N.S			
LSD (0.05) for intercrop		=	N.S			
LSD (0.05) for manure rate X intercrop		=	N.S			
<b>8 WAE</b>						
Telfairia (sole)	0.80	0.93	1.23	1.37	1.47	<b>1.16</b>
Telfairia+Cassava	0.94	1.00	1.37	1.50	1.50	<b>1.26</b>
Telfairia+Maize	1.00	1.11	1.53	1.73	1.67	<b>1.41</b>
Telfairia+Cassava+maize	0.83	0.87	1.17	1.33	1.33	<b>1.11</b>
<b>Mean</b>	<b>0.89</b>	<b>0.98</b>	<b>1.33</b>	<b>1.48</b>	<b>1.49</b>	
LSD (0.05) for manure rate		=	0.18			
LSD (0.05) for intercrop		=	0.16			
LSD (0.05) for manure rate X intercrop		=	N.S			
<b>12 WAE</b>						
Telfairia (sole)	1.40	1.90	2.70	3.00	2.90	<b>2.38</b>
Telfairia+Cassava	1.50	2.10	2.90	3.50	3.30	<b>2.67</b>
Telfairia + Maize	1.50	1.90	2.80	3.10	3.20	<b>2.50</b>
Telfairia+Cassava+maize	1.40	1.70	2.60	2.90	2.70	<b>2.26</b>
<b>Mean</b>	<b>1.46</b>	<b>1.89</b>	<b>2.73</b>	<b>3.15</b>	<b>3.02</b>	
LSD (0.05) for manure rate		=	0.38			
LSD (0.05) for intercrop		=	N.S			
LSD (0.05) for manure rate X intercrop		=	N.S			

**TABLE 2: Effect of Poultry Manure Rates and Intercropping System on Number of Leaves of *Telfairia* at 4, 8 and 12WAE**

<b>Intercrop</b>	<b>MANURE RATE t/ha</b>					<b>Mean</b>
	<b>0.00</b>	<b>2.50</b>	<b>5.00</b>	<b>7.50</b>	<b>10.00</b>	
<b>4WAE</b>						
Telfairia (sole)	18.8	22.0	23.8	29.9	28.1	<b>23.3</b>
Telfairia + Cassava	34.0	20.2	26.6	29.1	25.9	<b>27.2</b>
Telfairia + Maize	27.9	25.4	22.8	27.6	37.7	<b>28.3</b>
Telfairia+Cassava+maize	25.5	28.2	27.0	29.7	28.4	<b>27.8</b>
<b>Mean</b>	<b>26.6</b>	<b>24.0</b>	<b>25.0</b>	<b>29.1</b>	<b>28.5</b>	
LSD (0.05) for manure rate		=	N.S			
LSD (0.05) for intercrop		=	N.S			
LSD (0.05) for manure rate X intercrop		=	N.S			
<b>8 WAE</b>						
Telfairia (sole)	129.0	130.7	157.0	171.7	138.3	<b>145.3</b>
Telfairia + Cassava	134.0	156.3	164.3	185.3	132.3	<b>154.5</b>
Telfairia + Maize	141.3	168.0	188.7	195.3	167.7	<b>172.2</b>
Telfairia+Cassava+maize	148.0	161.3	177.0	205.3	153.0	<b>168.9</b>
<b>Mean</b>	<b>138.1</b>	<b>154.1</b>	<b>171.8</b>	<b>189.4</b>	<b>147.8</b>	
LSD (0.05) for manure rate		=	N.S			
LSD (0.05) for intercrop		=	N.S			
LSD (0.05) for manure rate X intercrop		=	N.S			
<b>12 WAE</b>						
Telfairia (sole)	227.3	230.0	234.0	257.3	254.0	<b>240.5</b>
Telfairia+cassava	277.0	292.0	302.0	349.0	351.7	<b>314.3</b>
Telfairia + Maize	258.7	269.0	276.3	302.3	298.3	<b>280.9</b>
Telfairia+Cassava+maize	198.3	201.0	203.7	217.0	220.3	<b>208.1</b>
<b>Mean</b>	<b>240.3</b>	<b>248.0</b>	<b>254.0</b>	<b>281.4</b>	<b>281.1</b>	
LSD (0.05) for manure rate		=	19.29			
LSD (0.05) for intercrop		=	17.26			
LSD (0.05) for manure rate X intercrop		=	N.S			

**4. Conclusion**

Poultry manure is an effective and efficient source of organic matter which improves soil nutrients and boosts the yield of Telfaria production since the highest fresh weight, number of leaves and vine length were recorded on plots that received the highest rate of poultry manure. Intercropping also

improved yield of Telfairia as it provided a good ground cover where by weeds were suppressed, pests and diseases were reduced in the intercrop and nutrient uptake was high, therefore Telfairia is better grown in intercrop than in sole crop and at poultry manure rate of 7.5 t/ha which gave the best yield as recorded in the findings.

**TABLE 3: Effect of Poultry Manure Rates and Intercropping System Vine Length (cm) of *Telfairia* at 4, 8 and 12WAE**

<b>Intercrop</b>	<b>MANURE RATE t/ha</b>					<b>Mean</b>
	<b>0.00</b>	<b>2.50</b>	<b>5.0</b>	<b>7.50</b>	<b>10.00</b>	
<b>4WAE</b>						
Telfairia (sole)	100.2	83.7	73.2	81.1	76.6	<b>83.0</b>
Telfairia + Cassava	87.2	56.8	72.2	79.4	92.1	<b>77.6</b>
Telfairia + Maize	69.7	80.2	56.7	79.0	72.3	<b>71.6</b>
Telfairia+Cassava+maize	64.3	54.7	55.9	57.4	62.1	<b>58.9</b>
<b>Mean</b>	<b>80.4</b>	<b>68.8</b>	<b>64.6</b>	<b>74.2</b>	<b>75.8</b>	
LSD (0.05) for manure rate		=	N.S			
LSD (0.05) for intercrop		=	N.S			
LSD (0.05) for manure rate X intercrop		=	N.S			
<b>8 WAE</b>						
Telfairia (sole)	155.3	142.5	184.0	157.2	159.4	<b>159.7</b>
Telfairia + Cassava	145.3	143.2	169.0	157.1	155.3	<b>154.0</b>
Telfairia + Maize	135.0	143.3	176.3	158.3	212.7	<b>165.1</b>
Telfairia+Cassava+maize	171.2	163.3	191.0	199.7	165.5	<b>178.1</b>
<b>Mean</b>	<b>151.7</b>	<b>148.1</b>	<b>180.1</b>	<b>168.1</b>	<b>173.2</b>	
LSD (0.05) for manure rate		=	N.S			
LSD (0.05) for intercrop		=	N.S			
LSD (0.05) for manure rate X intercrop		=	N.S			
<b>12 WAE</b>						
Telfairia (sole)	210.7	215.7	211.0	227.0	217.3	<b>216.3</b>
Telfairia + Cassava	298.3	301.7	311.7	324.3	325.3	<b>312.3</b>
Telfairia + Maize	225.0	228.7	236.7	258.7	259.7	<b>241.7</b>
Telfairia+Cassava+maize	280.3	276.3	294.0	301.0	305.7	<b>291.5</b>
<b>Mean</b>	<b>253.6</b>	<b>255.6</b>	<b>263.3</b>	<b>277.8</b>	<b>277.0</b>	
LSD (0.05) for manure rate		=	13.89			
LSD (0.05) for intercrop		=	12.40			
LSD (0.05) for manure rate X intercrop		=	N.S			

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