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The Effect of Cassava Peel Manure on the Growth Performance of Fluted pumpkin (*Telfairia occidentalis* Hook F.)

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ABSTRACT

Fertilization is aimed at optimizing crop growth and development especially when the right type is used with the appropriate rate and applied at the correct place and time. The effect of cassava peel manure on the growth performance of Fluted pumpkin (*Telfairia occidentalis* Hook F.) was investigated. Various treatment levels were designed by the cassava peels to decay for 1, 2, 3, 4 and 5 weeks. 0 (soil without cassava peels) was used as the control. Loam-sandy soil containing the various treatments with seedlings of *Telfairia occidentalis* were maintained for 2 months. This study revealed that there were significant (P = 0.05) increase in plant height, root length, fresh weight, and moisture content of *Telfairia occidentalis* with increase in the duration of incubation of cassava peels. Similarly, the shoot/root ratio, number of leaves and dry weight of *Telfairia occidentalis* increased with increase in the duration of incubation of cassava peels. However, these increases were not higher than the control treatment at lower duration (1, 2 and 3 weeks) of incubation of cassava peels. Therefore, this study showed that cassava peels proved effective as organic manure for *Telfairia occidentalis* when allowed to decompose for the period of composting.

Keywords: cassava peel Manure, growth, fluted pumpkin, *Telfairia occidentalis*

INTRODUCTION

Fluted pumpkin (*Telfairia occidentalis* Hook F.) is a tropical vine grown in West Africa for its leaf and the edible seeds (Kajihausa et al., 2010), hence it is generally regarded as a leafy and seed vegetable (Akanbi et al., 2007). In Nigeria, the crop is commonly grown for the leaf and seed, especially in the South-Eastern and Southern Nigeria. The succulent leaves, shoots and the seeds which are consumed as vegetables by humans and forage by livestock (Badifu and Ogunsua, 1991; Akwaowo et al., 2000) are of nutritional importance. According to Oyolu (1980) the leaves and edible shoots of the crop together contain 85% moisture, while the dry portion of what is usually consumed contains 25% carbohydrate, 11% crude protein, 3% fat, 4.32% potassium, 0.58% phosphorus, 0.56% magnesium, 0.47% caIcium and 700 ppm iron. Anti-nutrients such as phytic acid, tannin, oxalic acid, hydrocyanic acid and saponins have also been noted to be constituents of the plant (Akwaowo et al., 2000; Ajibade et al., 2006). The seeds contain 20.5, 45, 23, 2.2 and 4.8 g/100 g protein, fat, carbohydrate, fibre and total ash, respectively (Tindal, 1986; Badifu and Ogunsua, 1991) while the oil in the seeds is utilized for soap making and cooking as it is non-drying (Fashina *et al.*, 2002). Fluted pumpkin is commonly grown in mixture with some other staple food crops such as cassava, yam, maize and other tropical vegetables, although in recent times pure fluted pumpkin stands are becoming more common in Nigeria for market gardening (Schippers, 2000). The crop prefers a loose, friable soil with ample humus and shaded position.

Continuous cultivation which had replaced the traditional shifting cultivation causes soil nutrient depletion, soil structure degradation, reduced water infiltration, increased run off and erosion, thus crop production is not profitable without additional soil nutrient.

In Nigeria, farmers realize the need for soil amendments by using available resources such as crop wastes, farmyard manure and animal wastes. However, the quantity and quality required of these materials limit their use. Poor and reckless use of inorganic fertilizer changes physical, chemical and biological properties of the soils as well as reduces the fertility status of the soils (Omisore et al., 2009). Also the use of inorganic fertilizer has not been helpful under intensive agriculture because it is often associated with reduced crop yield, soil acidity and nutrients imbalance. Heavy application of inorganic fertilizers can also build up toxic concentrations of salts in the soil. Moreover, the extent to which farmers depend on this material is constrained by the unavailability of the right type of inorganic fertilizer at the right time, lack of technical know- how and lack of access to credit facility.

This necessitates research into organic wastes that are cheap, readily available and environmentally friendly that can be used as fertilizers.

The importance of organic matter in conserving soil physical, chemical and biological properties with implications on nutrient cycling, erodibility, water storage, plant vigor and resultant soil productivity has been well established (Brady and Weil, 1999). Availability of materials for compost preparation, gradual release of nutrients without being wasted through leaching and being environmentally friendly has made compost application popular among farmers. However, effectiveness of compost depends primarily on source and type of organic material, method of composting and compost maturity. Mature compost (finished compost) provides a stabilized form of organic matter and has the potential to enhance nutrient release in the soil more than the raw organic waste (Adediran *et al.*,2003). Finished compost is generally more concentrated in nutrients than the initial combination of raw materials used and can serve as an effective means of building soil fertility (Brady and Weil, 1999).

Cassava processing generates solid and liquid residues including cassava peels. Cassava peels which are regarded in many areas in Nigeria as waste are rich in crude protein (5.29%) and fat (1.18%) (Oyenuga, 1968). Most often cassava peels are commonly found in farm locations and processing sites as heaps that are generally perceived as hazard to the environment. These materials, however, could be utilized more effectively and sustainably through recycling. Cassava peels like many organic waste materials are potential source of organic matter and plant nutrients. Management of cassava peels includes direct incorporation into the soil, feeding them to livestock, burning or processing them into a more stable organic fertilizer called compost (Rogers and Milner, 1983). The abundance, as well as cheapness of cassava peels had necessitated a research in its use by composting for Fluted pumpkin

production. Composting cassava peels eliminate the problem of waste disposal and increase the manurial value of the materials (Adediran *et al.,* 2003; Akanbi *et al.,* 2007). Poultry manure contains nutrient elements that can support crop production and enhance the physical and chemical properties of the soil (Omisore *et al.,* 2009; Iren *et al*., 2011; John *et al.,* 2011).

This study, therefore, evaluates the effects of cassava peels Manure on the Growth Performance of Fluted pumpkin.

MATERIALS AND METHODS

SOURCES AND COLLECTION OF SEEDS

The matured seeds of *Telfairia occidentalis* were sourced from Akwa Ibom State Agricultural Development Project (AKADEP). The obtained seeds were pretreated by picking out infected seeds. The viable once where used for the research.

SOURCES AND COLLECTION OF SOIL SAMPLES AND ORGANIC SUPPLEMENTS

Loamy sand soil used for this research was collected from the University of Port Harcourt Botanical garden. Organic supplement (cassava peels) where obtained from local farmers in Uyo, respectively. The cassava peels were analyzed for physico-chemical properties

(A. O. A.C. 1984).

PRE-GERMINATION STUDIES

Two kilograms of the loamy-sand were weighed using a triangular weighing balance. The treatment were obtained by mixing thoroughly 2kg of loam sand soil with cassava peels was allowed to decompose for 0.1,2,3,4, and 5 weeks. Sample with or without cassava peels were placed in perforated polyethene bags.

The seeds were removed from pods and sorted in order to select seeds of uniform size. They were sun-dried for two days to enhance germinability (Mofunanya *et al.*, 2008). Three (3) seeds of *Telfairia occidentalis* were sown directly in each perforated polythene bag containing the various treatments and after germination, thinned up to one (1) seedling per bag. Each level of treatment was replicated three times using randomized complete block design. The experimental works were maintained under light condition, the plant watered as need arose and allowed to grow for seven (7) weeks in order to determine the growth parameters of the crop.

PREPARATION OF ORGANIC MANURE

Preparation of organic manure from cassava peels refuse was carried out by sizing it into smaller particles and allowed to decay at 0,1,2,3,4 and 5 weeks.

GROWTH STUDIES

Measurement of growth parameters were obtained at the end of two (2) months. Growth parameters measured include shoot length, leaf area, root length, number of leaves, root/shoot ratio, dry weight, fresh weight and moisture content.

DETERMINATION OF FRESH WEIGHT

Plant materials were harvested and the fresh weight (g) measured using mettler p 165 weighing balance.

DETERMINATION OF DRY WEIGHT

Plant materials were dried in a Gallenkamp oven maintained at 65°c until the weight were constant. The average weight (g) of the dried plant materials were measured.

DETERMINATION OF MOISTURE CONTENT

This was expressed as: $\frac{\text{Fresh weight-dry weight}}{\text{Fresh weight}} \times \frac{100}{1}$

RESULT AND DISCUSSION

COMPOSITION OF CASSAVA PEEL MANURE

The cassava peels manure used for this study recorded a pH value of 6.32. The cassava peels manure contained mineral nutrients in a decreasing range as shown in table 3.1, potassium, calcium, magnesium, sodium, Iron, manganese, Zinc, phosphorus and copper.

The physico-chemical properties of cassava peels as found in this study showed the presence of mineral nutrients to support plant growth, which are consistent with the work of Idem and Showemimo (2006) on the characteristics of cassava peels.

Table 1: Mineral element and pH of cassava peels manure

Parameter (ppm)	unit
pH	6.32
Organic matter	8.2 %
Phosphorus	0.56 mg/g

Potassium	71.22 mg/g
Calcium	39.73 mg/g
Sodium	5.28 mg/g
Magnesium	28.38 mg/g
Iron	6.91 mg/g
Zinc	0.76 mg/g
Manganese	1.45 mg/g
Copper	0.16 mg/g

Effect of Cassava Peel Manure Incubated for Various Duration on the Growth Parameters of *Telfairia occidentalis*.

There were significant (P=0.05) increases in plant height, number of leaves, root length and shoot/root ratio of *Telfaira occidentalis* with increase in the duration of incubation of cassava peels. The values for the shoot length, root length and root number were comparatively higher than those of the control treatment (Table 2). Although the values for shoot/root ratio show no statistical (P=0.05) significance, the values obtained were higher than those of the control treatment at 1,2,3,4, and 5 weeks incubation of cassava peel (Table 2).

The results from this study showed wide variations in the growth data of *Telfairia occidentalis* among the various treatments. This wide trend in growth data of the crop could be attributed to the variations in incubation period used in the preparation of cassava peel manure for the various treatment.

Table 2: Plant height, leave number, root length and shoot/root ratio of *Telfairla occidentalis* grown in soil treated with cassava peel manure.

Duration of incubation (weeks)	Plant height (cm)	Number of Leaves	Root length (cm)	Shoot/root ratio
0	45.33 ± 0.10	10.33 ± 1.24	16.60 ± 0.21	2.73 ± 0.21
1	48.26 ± 1.27	11. 33 ± 1.37	16.10 ± 0.36	3.00 ± 0.33
2	48.32 ± '1.34	12.33 ± 1.25	16.30 ± 0.43	2.96 ± 0.24
3	49.40 ± 1.21	13. 00 ± 0.33	17.30 ± 0.52	2.85 ± 0.36
4	50.21 ± 1.74	14. 33 ± 0.26	17.63 ± 0.63	2.85 ± 0.12
5	52. 90 ± 1.33	15.00 ±0.17	24.43 ± 0.17	2.59 ± 0.34

Mean ± Standard Error

FRESH WEIGHT, DRY WEIGHT AND MOISTURE CONTENT OF CASSAVA PEELS TREATED SOIL

The fresh weight and dry weight of *Telfairia occidentalis* increased with increase in the duration of decomposition of cassava peels. Similarly, the moisture content of *Telfairia occidentalis* increased at 1-3 weeks of incubation of cassava peel, and thereafter decreased at 4-5 weeks of decay of cassava peels (Table 3).

The enhanced growth parameters of *Telfairia occidentalis* at lower levels of composting period may be attributed to increased decomposition of the cassava peels. This result agrees with the work of Chen and Aviad (1990) who reported that composting of organic material for a longer period enhances microbial interaction with the medium for increase mineralization process. Thus, this explains why the growth parameters of *Telfairia occidentalis* increases with increase in the period of incubation of cassava peels. In addition, decrease growth parameters of *Telfairia occidentalis* were recorded at lower levels of incubation period. This could be as a result of unmineralized component of organic manure, which could not release the needed nutrients for plant growth. This agrees with the work of Braidy and weil, (1999) who reported that organic materials used for the preparation of organic manure release the nutrient in them after being converted into a decomposed form.

Table 3: Fresh weight, dry weight and moisture content of *Telfairia occidentalis* in soil treated with cassava peel manure.

Duration of incubation (weeks)	Fresh weight (g)	Dry weight (g)	Moisture content (%)
0	4.06 ± 0.76	1.86 ± 0.21	54.19 ± 0.27
1	3.08 ± 0.52	1.44 ± 0. 31	53.23 ± 0.52
2	3.56 ± 0.40	1.57 ± 0.42	55.96 ± 0.66
3	3.92 ± 0.71	1.59 ± 0. 21	59.44 ± 0.72
4	4.36 ± 0.23	1.92 ± 0.47	55.96 ± 0.82
5	4.40 ± 0.49	2.01 ± 0.29	54.318 ± 0.46

Mean ± standard error

CONCLUSION

This study shows that increased incubation period for cassava peels to enhance high decomposition could serve as a rich source of organic nutrient for the growth of *Telfairia occidentalis*. Thus, the use of cassava peels in an undecomposed form may not release the needed nutrient for plant growth.

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