EFFECT OF POULTRY MANURE ON THE GROWTH AND YIELD OF BAG-PROPAGATED YAM (*Dioscorea rotundata)*

BY

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DEPARTMENT OF CROP SCIENCE
FACULTY OF AGRICULTURE
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BENIN CITY

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A PROJECT SUBMITTED TO THE DEPARTMENT OF CROP SCIENCE, FACULTY OF AGRICULTURE, UNIVERSITY OF BENIN BENIN CITY IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF BACHELOR OF AGRICULTURE (B.AGRIC) IN CROP SCIENCE

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CERTIFICATION

This is to certify that this research was carried out by me: **ODUWA, GLORY ESOSA** of the Department of Crop Science, Faculty of Agriculture, University of Benin, Edo State, Nigeria.

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PROF. S. U. EWANSIHA **DATE**
HEAD OF DEPARTMENT

DEDICATION

I dedicate this work to God, whose guidance, strength, and unwavering presence have been my foundation through every step of this journey. His wisdom illuminated the path, and His grace carried me through challenges, ensuring that I continue to grow and learn.

I also dedicate this project to my family, whose love, support, and encouragement have been my greatest source of inspiration. Thank you for your sacrifices, for believing in me, for your constant motivation and for always being there. This accomplishment is a reflection of your love, faith, and encouragement.

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ABSTRACT

Yam (*Dioscorea spp*.) is a major staple crop in West Africa, particularly in Nigeria, where it serves as a vital source of food security, income, and cultural significance. Despite its importance, yam production faces numerous challenges, including declining soil fertility, high labor requirements in traditional mound cultivation, the prohibitive cost of inorganic fertilizers and security challenges across Nigeria. Bag propagation has emerged as an innovative alternative, enabling efficient soil and nutrient management, reduced pest and disease incidence, and suitability for limited land areas. Poultry manure, a nutrient-rich organic fertilizer, offers a sustainable means of enhancing soil fertility for yam production. It improves soil structure, microbial activity, and nutrient availability, thereby promoting vegetative growth and tuber yield. However, limited research exists on its application in bag-propagated yam. This study, therefore, evaluates the effect of poultry manure on the growth and yield of bag-propagated yam, aiming to identify a cost-effective and environmentally friendly practice that enhances productivity and supports sustainable yam cultivation. The experimental site was a private farm in Ogida quarters. The experiment comprised two treatments, each treatment had six (6) replications. At outset, date of planting was recorded. Number of days to sprouting, vine lengths, stem diameter, number of leaves were recorded at subsequent intervals. At harvest, tuber weight and vine weight were recorded. Data collected were analyzed using excel, the two means were compared using t-test method with the probability of 0.05 and unequal variance. Yam grown with poultry manure recorded higher vine length and greater tuber weight at harvest compared to those without manure. In conclusion, the study demonstrated that the application of poultry manure significantly improved the growth and yield of bag propagated yam.

CHAPTER ONE

INTRODUCTION

Yam (*Dioscorea spp.*) is one of the most important staple crops in West Africa, particularly in Nigeria, where it contributes significantly to food security as a major source of carbohydrate, income generation, and cultural practices (Aighewi *et al.,* 2009). Beyond providing essential nutrients for millions of people, yam is deeply intertwined with socio-cultural practices, serving as a special gift, ritual object, and centerpiece of vibrant New Yam Festival in various regions, elevating its status. Nigeria alone produces over 70% of the world's yam, with *Dioscorea rotundata* (white yam) and *Dioscorea alata* (water yam) being the predominant species cultivated (FAO, 2021). Traditionally, yam is cultivated on mounds or ridges, but this method is labor-intensive, land demanding and faces challenges such as soil nutrient depletion, erratic rainfall, weed infestation, and pest and disease attacks (Akinola *et al.,* 2017). Soil fertility in many yam-growing regions is declining due to continuous cultivation without adequate nutrient replenishment, leading to reduced growth and low tuber yield (Adediran and Banjoko, 2007). Moreover, the cost of inorganic fertilizers is often prohibitive for smallholder farmers, highlighting the need for sustainable, affordable alternatives. To address these challenges, alternative cultivation techniques like bag propagation have been developed. Bag propagation involves growing yam in containers or bags filled with fertile soil, offering better management of soil nutrients, moisture, and plant spacing (Opara *et al.,* 2018). This method reduces the impact of soil-borne pathogens, facilitates harvesting, and allows yam cultivation in urban or peri-urban areas where land is limited. Studies showed that yam grown in bags can achieve comparable or even higher yields than conventional field methods when proper nutrient management is applied (Opara and Umunna, 2019). Soil fertility remains a key determinant of yam productivity. Yam requires soils rich in nitrogen (N), phosphorus (P), potassium (K), and other micronutrients for optimum tuber development (Afolami *et al.,* 2016). Organic fertilizers, such as poultry manure, are increasingly being recognized as sustainable solutions for improving soil fertility, enhancing microbial activity, and providing essential nutrients for crop growth. Poultry manure has a relatively high nutrient content compared to other manures and decomposes quickly, making nutrients readily available for plants (Ayeni *et al.,* 2014). Its application has been reported to improve vegetative growth, tuber yield, and soil physical properties, including structure and water retention capacity (Afolami *et al.,* 2016; Olaniyi and Adeyemi, 2018). Despite the potential benefits of poultry manure, there is limited research on its effect in bag propagation for yam. Most existing studies focus on open-field cultivation, and the optimal rates of manure for bag-grown yam remain under-evaluated. Determining the appropriate poultry manure application rate for yam grown in bags can provide smallholder farmers with a cost-effective and environmentally friendly method to improve yam growth, yield, and quality.

1.1 Justification of the Study

Yam is a vital food security crop, but production constraints such as declining soil fertility, high cost of inorganic fertilizers, and limited arable land hinder its productivity. Bag propagation offers an innovative approach to field yam production in Nigeria necessitating an alternative method of yam cultivation across the country while poultry manure provides a sustainable nutrient source. Studying their combined effect is critical to developing practical, low-cost, and high-yielding yam cultivation systems suitable for smallholder and urban farmers.

1.2 Objective of the Study

This study was designed to evaluate the effect of poultry manure on the growth and yield of bag-propagated yam.

CHAPTER TWO

LITERATURE REVIEW

2.1 Methods of Propagating Yam

Traditionally, 'seed' yams or setts (tuber portions) are used for propagation. The yam tuber, which contains a deposit of starch, does not have dormant buds as found on a typical tuber such as potato (*Solanum tuberosum*). However, at the end of dormancy a meristematic layer of cells beneath the skin of the tuber produces sprouts, usually from the head (proximal) region (Onwueme 1973), indicating that the tuber is ready for planting. Most yam farmers use seed tubers saved from a previous crop for propagation. Due to short supply of quality seed tubers at affordable prices, replacement of stocks of seed yams, which have been infested by pests and diseases, are usually unavailable and farmers are forced to recycle poor quality seed yams with the risk of poor yields. Damage from nematodes, viruses, tuber rotting fungi and bacterial infections is a major contributor to the poor seed quality and low yields in yam. A loss in yield of up to 50 % due to viruses was reported in western Nigeria (Craig 1964, cited in Emehute *et al.*, 1998), while storage losses due to nematodes are estimated at 50 % and may be total, with *Scutelonema bradys* and *Meloidogyne spp.,* which are endemic in West Africa, being the major species responsible (Amusa *et al.* 2003). Asala *et al.* (2012) observed that the occurrence of Yam Mosaic Virus (YMV), Cucumber Mosaic Virus (CMV), Yam Mild Mosaic Virus (YMMV) and badnavirus as well as the mixed infections observed in most of the five states and the Federal Capital

Territory (FCT) of Nigeria that they surveyed could be attributed to the exchange of infected planting materials between States.

2.1.1 Traditional methods of seed yam production

In traditional yam cultivation there is no separation of seed and ware yam production. The farmer plants for a ware crop with the knowledge that seed tubers for the next crop will also be produced. The yam crop stays in the field for 8 to 10 months and the tubers are ready to grow after another 2 to 3 months after harvest when dormancy is broken. The traditional methods employed produce planting materials that are expensive and often of poor quality (Nweke*,* 1991; Aighewi, 1998). As mostly farmer-saved seed tubers are used, farmers normally select and plant their good seed tubers and sell any left over (which are usually of poor quality). Seed is only bought if there are unplanted mounds due to a shortage of planting material. Farmers' methods of production are generally characterized by low multiplication ratios (Alvarez and Hahn, 1984), with uneven and prolonged sprouting periods when planted (Otoo *et al.* 1987). Despite these challenges, traditional systems have sustained yam production through the years. They provide the assurance of obtaining seed by farmers, as different methods can be manipulated to suit different cultivars.

1. Double harvesting or 'milking'

This is the most important traditional method of seed yam production in the yam belt of West Africa. It is a system in which the same plant of an early maturing variety is harvested twice. A first harvest is made of tubers meant for food while the shoot of the mother plant is still green. This is usually done between 4 and 5 months after shoot emergence. The mound is opened from one side; the tuber is detached from the base of the vine while keeping most roots intact and the mound is re-moulded. The plant initiates production of a new tuber from the base of the vine, which often bulks into an amorphous shape with protuberances or digitations that can be detached and planted separately at harvest. The second harvest is done at the end of the season when the plant senesces (1–3 months after the first harvest) for regenerated tubers to be used solely as seed (Onwueme, 1973). Degras (1993) noted that whereas tubers from the first harvest were often infested by nematodes (*Scutellonema bradys* and *Pratylenchus coffeae*), those of the second harvest were either slightly or not at all infested. This makes regenerated tubers better planting material than normal setts from single harvests, but the method is labour intensive and only suited to early maturing varieties. The farmer has to make a critical decision of when to do the first harvest so as to have sizeable tubers for the ware yam market without compromising the quantity of seed tubers to be obtained from the second harvest as the same photosynthetic apparatus produces both.

2. The‘Anambra’ system

This is practised in some areas close to the banks of the River Niger in Anambra, Edo and Delta States of Nigeria. This is the only region where dedicated seed yam producers are found, and generally better quality seed is produced compared to where other traditional methods of production are used. Small tuber pieces of 80–100 g are cut from post-dormant 'mother' tubers weighing 500–1000 g and planted to produce seed yams (Okonmah 1980). The setts are planted directly in the field, almost always in a mixture of other crops such as maize, cassava, cocoyam and vegetables. Some farmers may dust the cut tuber surfaces with wood ash before planting. In this system, the distance between yam plants and depth of planting depends on the density and type of other crops in the mixture and the moisture content of the soil. The challenge of the 'Anambra' system of seed yam production is the high incidence of fungal rots after planting, especially as most farmers do not treat their setts with recommended chemicals before planting (Aighewi 1998). The seed tubers produced by this system are usually planted whole and have better establishment than when cut setts are used as seed.

3. Cut setts

At planting time, yam setts can be obtained by cutting larger ware size tubers into tops, middles and bottoms each weighing 200 to 500 g. The setts are planted when cut surfaces are dry; usually after a day or two. Hence only the head portion would have a sprout and it is preferred because it establishes better and faster. It has, however, been observed that this method accounts for severe nematode damage, as infestation by *S. bradys* and *P. coffeae* is directly proportional to the age of the plant tissue, decreasing towards the growing zone of the tuber (Degras, 1993). Shoots from the middle and bottom portions take longer to emerge after planting because they are not planted with pre-formed sprouting points. Generally, tubers from the cut setts are milked or harvested after seven to 12 months depending on the variety and agro-ecology. Setts that sprout earlier have a longer growth period because the crop is harvested when the dry season sets in and plants senesce.

4. Small whole tubers sorted from a ware crop

Whole seed tubers are ideal for planting as they have no exposed parenchyma for rapid infection by fungi and they fit very well into farmers' labour management strategy of planting at the beginning of the dry season. In addition to whole seed tubers produced by double harvesting, some varieties produce 1–3 small tubers together with a large ware tuber that is used for food. The small tubers are sorted and reserved for planting. The seed sized tubers produced from a ware crop are the reason for the age long custom of using mainly farmer-saved seed in yam production. In this situation, farmers do not consider seed yam as a cost element in yam cultivation and are reluctant to adopt any method to increase seed production or improve their production practices. With this method there is usually a high risk of selecting seed sized tubers that are small due to disease, especially viruses, since the symptoms are typically not visible on the tubers (Nweke, 2014). Due to the high cost of seed tubers, most yam farmers will not contemplate roguing. Where diseased plants are not rogued, it is not possible to distinguish diseased and healthy tubers at harvest because viral symptoms are not visible on yam tubers.

2.1.2 Modern methods of seed yam production

1. The minisett technique

The minisett method was developed by the National Root Crops Research Institute (NRCRI) Umudike, Nigeria (IITA, 1985), as a modification of the Anambra system by further decreasing the size of planted setts. The technique's main goal is to increase the quantity and quality of seed tubers accessible to farmers. This development was based on the idea that any tuber section can generate buds and sprout if it contains a portion of the periderm (Onwueme, 1973).

In the minisett method, 'mother seed' yams weighing 500-1000 g that have broken dormancy are sliced into smaller pieces (minisetts) weighing 25 g (Alvarez and Hahn, 1984; IITA, 1985; Kossou, 1990; Kissiedu *et al.,* 1994). The 25g recommendation sought to balance the competing needs of maximizing setts from a single tuber while maintaining an acceptable proportion of seed yams in the yield (Kalu *et al.* 1989). However, some researchers argue that larger minisett sizes than 25g would be preferable (George, 1990). While *D. rotundata's* response to the minisett technique varies greatly (Aighewi, 1998), it has been proposed that increasing the size of minisetts for certain varieties would boost their sprouting potential (Ayankanmi *et al.,* 2005).

Newly sliced minisetts are soaked in a solution containing wood ash or fungicide and insecticide, then spread out in partial shade to dry for 1-2 days (IITA, 1986). Treatment of setts prior to planting is influenced by the difficulty in obtaining chemicals, their quality, and their high cost. Wood ash has been recommended as a substitute for fungicide and insecticide, but its efficacy has been uneven (Otoo, 1992). When the rains are well established, minisetts can be planted directly in the field on ridges at a depth of 9-12 cm, with a plant spacing of 25-30 cm by 100 cm (4 stands per m^2). Alternatively, they could be pre-sprouted in beds, baskets, or boxes using topsoil, sawdust, shredded coir, or carbonated rice husk as substrates. Sprouting and tuber yields of directly planted setts are strongly influenced by variety (Ayankanmi *et al.,* 2005).

2. Production using microsetts and microtubers

In seed yam production the prefix micro is used in relative terms comparing the normal size of about 250 g to very small setts of 10 g or less. The same principles and methods used for minisetts also apply to microsetts (Alvarez and Hahn, 1984; IITA, 1985). According to Alvarez and Hahn (1984), microsett propagation with the aid of phytohormones increased the multiplication ratio of the traditional system from 1:4 to 1:90. Tuber weights of 280; 240 and 225 g were obtained with 60,000, 80,000 and 100,000 plants/ha using 7 g microsetts of genotype TDr 131 (IITA, 1985), and microsett populations could be as high as 3.4 million/ha (Otoo, 1992). Compared to other systems, the microsett technique was ranked best with regards to the number and cost of mother tubers needed for seed yam production, and the rate of multiplication (IITA, 1985). Although enormous amounts of yam could be saved using microsetts, preparation of setts could be labour intensive. Farmers may not be able to handle the small setts conveniently, and not all varieties may be suitable for use with this technique. If adequate seed treatment (fungicide/insecticide application), is not given before and after planting (mulching/irrigation), the rate of success could be low.

3. Use of vine cuttings for seed yam production

Recently, yam researchers in West Africa have been focusing on vine cuttings as an alternative to tubers in seed yam production. Rooted vine cuttings of 20 cm length with 1 to 3-nodes (Acha *et al.* 2004; Kikuno *et al.* 2007; Agele *et al.* 2010) produced mini-tubers of 50–600 g after 8 months giving a 1:30 propagation ratio. Vine cuttings for tuber production should be taken from healthy plants aged between 30 and 60 days after shoot emergence, and before tuber development starts (Okonmah 1980; Kikuno *et al.* 2007). Cuttings are rooted in a high humidity chamber or carbonized rice husk before transplanting into soil or planting directly in top soil in a garden. Scientists at the International Institute of Tropical Agriculture in Nigeria, have produced seed yam by planting vine cuttings in vertical grow bags in the screenhouse. Black polythene bags are filled with soil, tied, and then hung to poles or ropes running across the top of the screenhouse. Depending on the size of the bags, holes are pierced through to allow planting of vine cuttings. Water is supplied to the plants through irrigation pipes or watering cans and minitubers are harvested when the plants senesce. This innovation maxi- mizes the use of space in seed production.

2.1.3 Alternative and innovative method of yam propagation

1. Bag propagation

Yam farming in bags is an innovative and sustainable agricultural practice that replaces the traditional method of planting directly in the soil with the use of specially designed cultivation bags. These bags, often made from durable, UV-resistant materials such as woven polypropylene or thick plastic, are filled with a well-prepared growing medium typically a blend of loamy soil, organic compost, and sand to provide the yam plants with adequate aeration, drainage, and essential nutrients (Njoku *et al.,* 2023). This method offers several advantages over conventional yam cultivation. By using bags, farmers can control soil quality, reduce the incidence of pests and diseases common in open-field farming, and make more efficient use of limited space making it particularly suitable for urban and peri-urban agriculture. The bags can be arranged in open fields, greenhouses, or even backyards, as long as they are placed in areas with adequate sunlight and optimal temperature conditions for yam growth, generally between 25°C and 30°C. Additionally, bag cultivation allows for easier monitoring of plant development, targeted irrigation, and reduced weeding requirements. This practice not only enhances productivity but also supports year-round yam production in areas where traditional farming may be hindered by poor soil fertility or seasonal weather limitations

2.2 Types of Yam

There are many species of yam that are cultivated, but the five most commonly cultivated throughout the humid tropics of Africa including Southern Africa are describe below:

1. *Dioscorea rotundata* (White Yam)

Dioscorea rotundata, commonly known as white yam, is characterized by tubers that are roughly cylindrical in shape with smooth, brown skin. The flesh is typically white and firm, making it a popular staple. This species is widely cultivated by many small-scale farmers across Botswana, Malawi, Mozambique, Zambia, and Zimbabwe.

The plant is a large vine, with shoots that can reach lengths of 10 to 12 meters. The tubers generally weigh between 2.5 to 5 kilograms, but some exceptional tubers can weigh as much as 25 kilograms. The growth cycle for white yam ranges from 7 to 12 months before harvest. White yam holds significant importance as a staple food crop in Nigeria, and research indicates its potential use beyond food, particularly in livestock feed and industrial starch production (Ayanwuyi *et al.,* 2011).

2. *Dioscorea cayennensis* (Yellow Yam)

Dioscorea cayennensis known as yellow yam, is distinguished by its yellow flesh, which results from the presence of carotenoids in the tubers. The skin of yellow yam tubers tends to be less grooved than that of white yam but is otherwise similar in external appearance. This species exhibits a longer vegetative growth period and a shorter dormancy period compared to white yam. Yellow yam requires high and fairly consistent rainfall, making it a marginal crop in most Southern African regions. Despite this, small fields of yellow yam cultivation exist in many countries within the region (Wilkin, 2001). The vines of yellow yam are large, growing up to 10 to 12 meters. *Dioscorea rotundata* and *Dioscorea cayennensis* comprise over 200 cultivated varieties, reflecting their agricultural diversity.

3 *Dioscorea alata* (Water Yam)

Dioscorea alata L. is called "water yam", "winged yam", and "purple yam" and was first cultivated in Southern Asia. Although it is not grown in the same quantities as the African yams, it has the largest distribution worldwide of any cultivated yam, being grown in Asia, the Pacific islands, Africa, and the West Indies (Mignouna, 2003). D. alata is easily found in Angola, Malawi, Mozambique, and Zambia. Smaller quantities of water yam are produced compared to the white and yellow African yam. However, it has square, winged vines and the tuber shape is generally cylindrical, but can vary. The tuber flesh is white and watery in texture.

4 *Dioscorea bulbifera* (Air Potato)

Dioscorea bulbifera L. is commonly found in farmers' fields and home gardens in Africa and Asia. This species develops very long vines and produces tubers underground, but the bulbils (aerial tubers) that grow at the base of its leaves are the most important food products. These are about the size of potatoes (hence the name air potato), weighing from 0.5 to 2 kg. Some varieties can be eaten raw while some require soaking or boiling for detoxification before eating. It is not grown much commercially since the flavor of other yams is preferred by most people. This yam is popular in household gardens mainly because it produces a crop after only 4 months of growth and continues producing for the life of the vine as long as 2 years. Moreover, the bulbils can be easily harvested for eating after boiling at any time (Kay, 1987). In 1905, the air potato was introduced to Florida in the United States and has since become an invasive species in much of the state. Its rapid growth crowds out native vegetation, and it is very difficult to remove since it can grow back from the tubers and new vines can grow from the bulbils even after being cut down or burned (Schultz, 1993).

5 *Dioscorea dumetorum* (Bitter Yam)

"Bitter yam" *Dioscorea dumetorum* (kunth) pax, is popular as a vegetable in parts of West Africa; one reason being that their cultivation requires less labor than other yams. The wild forms of this species are very toxic and are sometimes used to poison animals when mixed with bait. They have also been used for criminal purposes (Kay, 1987). The tubers are used as a famine food after washing and drying to remove toxins.

2.3 Poultry Manure as Fertilizer

Poultry manure is widely recognized as an effective organic fertilizer in yam cultivation due to its rich nutrient content and soil-enhancing properties. It is a valuable source of essential nutrients such as nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), and magnesium (Mg), which are crucial for the healthy growth and development of yam tubers (Akinola *et al.,* 2014).

2.4 Benefits of Poultry Manure in Yam Propagation

1. Improved Soil Fertility and Structure

Poultry manure improves soil organic matter, which enhances soil texture, aeration, and moisture retention capacity. This leads to better root development and tuber formation in yams (Ezekiel and Ogban, 2018). The improved soil environment also promotes beneficial microbial activity that supports nutrient cycling.

2. Enhanced Nutrient Availability

The gradual release of nutrients from poultry manure ensures a sustained supply of essential elements throughout the yam growth cycle. Nitrogen is critical for vegetative growth; phosphorus promotes root development and tuber initiation, while potassium enhances tuber size and quality (Ogunlela and Oyetayo, 2017).

3. Increased Yam Yield and Quality

Studies have shown that yam plots treated with poultry manure produce significantly higher tuber yields compared to control or with inorganic fertilizers application alone (Ibeawuchi *et al.,* 2012). Poultry manure increases both the yield and also the nutritional quality of yam tubers by enhancing carbohydrate content and reducing tuber defects.

4. Eco-friendly and Sustainable Practice

Using poultry manure reduces reliance on synthetic fertilizers, minimizing environmental pollution and promoting sustainable agricultural practices. Organic fertilizers such as poultry manure contribute to long-term soil health and prevent the degradation commonly associated with chemical fertilizers (Adebayo *et al.,* 2015).

5. Cost-effectiveness for Smallholder Farmers

Poultry manure is often readily available and affordable for yam farmers, especially in regions where poultry farming is prevalent. This accessibility makes it an economically viable option to boost yam productivity (Nwosu and Okpara, 2019).

CHAPTER THREE

MATERIALS AND METHODS

3.1 Experimental Site

The experiment was conducted on a private farm located in Ogida Quarters, Benin City, Edo State, at an elevation of 162 meters above sea level. The approximate latitude and longitude of Ogida quarters is 6.36 ^N and 5.60^ S. The area experiences a bimodal rainfall pattern with an annual mean of 2,679 mm and an average temperature of 25.7 °C. It lies within the tropical lowland rainforest zone. The rainy season in this location usually begins in March and extends through September to November.

3.2 Materials

The materials used includes;

1. Sandy loam soil for propagation.
2. Yam (*Dioscorea rotundata*), purchased from Ugbogiobo market in Ovia North East Local Government Area, Edo State.
3. Poultry manure(deep litter)obtained from my Aunt's poultry farm
4. Bags purchased from uselu market in Benin City.
5. Z-Force powder (active ingredient: Mancozeb 80% WP) for fungal disease control and Royachloprid (active ingredient: Chlorpyrifos 20% EC) for insect pest control.

6. Bamboo sticks, hoe, spade, watering cans, twine, weighing scale were also used during the course of the study.

3.3 Experimental Treatments

The experimental design comprised two treatments, namely Control (no manure) and Treatment (with manure). Each treatments has six (6) replications.

3.4 Cultural Practices

3.4.1 Bag and media preparation

Each bag was perforated with a pair of scissors to enhance aeration and ensure adequate drainage. This practice was adopted to prevent waterlogging, which could adversely affect tuber formation. The growth medium was prepared by mixing cured poultry manure with topsoil at a ratio of 1:1, after which the mixture was thoroughly homogenized and used to fill the perforated bags. This medium served as the substrate for planting the yam seedlings.

3.4.2 Pest control and weed management

Z-force powder mixed in Royachloprid solutions was used to treat the yam seedlings before planting: this was done to repel insects and prevent fungal infections on the seedlings. Hand weeding was carried out within the bags four weeks after planting, while weeds growing around the bags were removed with a hoe as the need arose.

3.4.3 Manure application

Following weeding at four weeks after planting, poultry manure was applied using top dressing method.

3.5 Data Collection

At outset, date of planting was recorded. At four weeks after planting, number of days to sprouting, vine length, number of leaves and stem diameter were recorded. Number of day to sprouting, numbers of leaves were obtained by counting: Vine length and stem diameter were measured with a measuring tape.

3.6 Statistical Analysis

The data collected were analyzed using excel (2021), the two means were compared using t-test method at a probability of 0.05 with unequal variance.

CHAPTER FOUR

RESULTS

4.1 Comparison of Yield Variables for Control and Fertilizer Treatments after Yam Harvest

The results of the yield variable for both treatments are shown in Table 1. It was observed that there was a significant difference in both tuber weight and vine weight. The fertilized plot produced higher values than the control plot in both situations

4.2 Growth Variables of Yam at Five Weeks after Planting

The results of growth variables of both treatments are shown in Table 2. It was observed that there was no significant difference in number of days to sprouting while, vine length, stem diameter and number of leaves were all significantly different.

Table 1: Comparison of yield variables for control and fertilizer treatments after yam harvest

Variables	Control	Fertilizer	P value	Significance
Tuber weight (kg)	1.54	3.74	0.004	*
Vine weight (kg)	2.0	3.35	0.024	*

* = highly significant at 0.05 level of probability

Table 2: Growth variables of yam at five weeks after planting

Variables	**Control**	**Fertilizer**	**P value**	**Significance**
No of days to sprouting	14.00	14.83	0.23	ns
Stem diameter (cm)	1.4667	1.88	0.00059	*
Vine length (cm)	100.19	122.21	0.013	*
No of leaves	22.83	29.5	0.003	*

*= highly significant at 0.05 level of probability
ns = Not significant

CHAPTER FIVE

DISCUSSION

At harvest, it was observed that the bags treated with poultry manure produced yam tubers with higher weights compared to the control bags without manure. This clearly indicates that poultry manure had a positive effect on the growth and yield performance of the bag-propagated yam. In contrast, the yams grown without poultry manure showed relatively poor performance. Their growth was slow, leaves were smaller and tuber formation was limited. This poor performance can be linked to nutrient deficiency in the growth medium.

Poultry manure application, on the other hand, improved soil nutrient balance and created a more favorable growth environment in the bag system. The manure not only supplied nutrients but also improved soil texture and structure, enabling better aeration and root penetration. Organic matter from poultry droppings enhances microbial decomposition, releasing nutrients gradually and ensuring steady plant nourishment throughout the growing period. This is particularly beneficial in bag propagation systems, where the soil volume is restricted, and nutrient leaching is more likely to occur.

5.1 Conclusion

The study demonstrated that the application of poultry manure significantly improved the growth and yield of bag-propagated yam. Plants grown with poultry manure recorded higher vine length, larger leaf area, and greater tuber weight at harvest compared to those grown without manure.

5.2 Recommendations

Based on the findings of this study, it is recommended that poultry manure be used as an organic fertilizer for yam cultivation, particularly in bag or container propagation systems where soil fertility and nutrient availability are limited. Its application not only improves yield and growth performance but also promotes soil rejuvenation and sustainability. Farmers and researchers are encouraged to adopt poultry manure as a sustainable and cost-effective soil amendment to enhance nutrient availability and promote healthy yam development.

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