# Growth response of potato (solanum tuberosum) to pouitry dropp ings in Ilorin southern guinea savanna zone of Nigeria

# BY


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BEING A RESEARCH PROJECT SUBMITTED TO THE DEPARTMENT OF AG RICULTURAL TECHNOLOGY, INSTITUTE OF APPLIED SCIENCE (IAS), KWA RA STATE POLYTECHNIC, ILORIN KWARA STATE.

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# CERTIFICATION

This is to certify that this project work was carried out by AZEEZ SAMAD OLAMILEKAN with Matric No ND/23/AGT/PT/0072 has been read and app roved as meeting part of the requirements for the award of National Diploma (ND) in Agricultural Technology in the Department of Agricultural Technology, I nstitute of Applied Science (IAS), Kwara State Polytechnic, Ilorin.

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# DEDICATION

I dedicate this project to Almighty ALLAH my creator, my strong Pillar, my so urce of inspiration, wisdom, knowledge and understanding. He has been the source o f my strength throughout this program and on his Wine only have I soared. I also dedi cate this work to my Parents **Mr. and Mrs. Azeez** who have encouraged me all the w ay and whose encouragement have made sure that I give it all it takes to finish that which I have started.

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All praise are due to God, the beneficent,the merciful for the great things he has done and greater things he shall do. First and foremost, I thank almighty God for sparing my life to this moment and for grace and protection indefatigable zeal and knowledge, with which I started and completed the program.

My sincere gratitude goes to my parents **MR. AND MRS. AZEEZ** for their parental care,moral and financial support throughout my course of study may Almighty God bestow your peace of mind and long life to the fruit of your labour (Amen)

Special thanks goes to my supervisor in person of **MR.SOLIHU M.A** for his constructive and support towards in writing of this project may you excel in all your endeavors (Amin) and also my H.O.D **BANJOKO I.K** and to all the lecturers and all academic staff.

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## *ABSTRACT*

*This study investigated the growth response of eggplant (Solanum macrocarpon) to the application of inorganic fertilizer NPK 15:15:15 under the agroecological conditions of Ilorin, located in the Southern Guinea Savanna of Nigeria. The experiment was designed to evaluate the effects of varying rates of NPK fertilizer on key growth parameters such as plant height, number of leaves, and leaf branch. A complete randomized design (CRD) was employed with different treatment levels of NPK 15:15:15 (0 g/pot, 10 g/pot, 20 g/pot) replicated three times. Data were collected at regular intervals and analyzed using ANOVA to determine the significance of treatment effects. Results showed that the application of NPK 15:15:15 significantly enhanced the vegetative growth of Solanum macrocarpon, with the 20 g/pot treatment producing the most vigorous growth in terms of plant height and leaf production. However, higher fertilizer rates did not necessarily translate to proportional growth increases, indicating a threshold beyond which additional NPK application may not be beneficial. The study concludes that a moderate application rate of 20 g/pot of NPK 15:15:15 optimizes eggplant growth in the Ilorin Southern Guinea Savanna zone. These findings offer practical recommendations for sustainable eggplant production and nutrient management in the region.*

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# CHAPTER ONE

## Introduction

### 1.1 Background of the Study

Eggplant (Solanum macrocarpon), commonly referred to as African eggplant or garden egg, is an important vegetable crop cultivated primarily in tropical and subtropical regions. It plays a vital role in enhancing household nutrition by serving as a rich source of vitamins (A, B, and C), minerals (calcium, potassium, and iron), and dietary fiber (Schippers, 2000). Additionally, it contributes significantly to the income of smallholder farmers, particularly in Nigeria, where it is consumed in diverse traditional dishes (Olaniyi & Ojetayo, 2012).

Despite its importance, the productivity of eggplant in Nigeria remains low compared to its potential due to challenges such as declining soil fertility and suboptimal nutrient management practices (FAO, 2017). The Southern Guinea Savanna zone, which includes Ilorin, is characterized by low organic matter content and nutrient depletion in soils caused by continuous cropping and poor soil management (Olayinka & Adetunji, 2001). These challenges necessitate the adoption of improved fertility management strategies to enhance crop yields sustainably.

Fertilizers are crucial for improving soil fertility and ensuring high crop productivity. Organic fertilizers like poultry manure improve soil physical properties, increase microbial activity, and enhance long-term soil fertility (Akanbi et al., 2005). Poultry manure is particularly valued for its high nutrient content, especially nitrogen, phosphorus, and potassium, which are essential for plant growth (Eghball et al., 2002). On the other hand, inorganic fertilizers such as NPK 15:15:15 provide immediate nutrient availability, supporting rapid plant development and higher yields (Ojeniyi et al., 2012).

Combining organic and inorganic fertilizers is increasingly recognized as a sustainable approach to soil fertility management. This integrated nutrient management strategy not only improves nutrient availability but also mitigates some of the adverse effects associated with the overuse of chemical fertilizers, such as soil acidity and nutrient imbalance (Adediran et al., 2004). Research has shown that integrating poultry manure with NPK fertilizers can significantly enhance the growth and yield of crops, including vegetables (Isitekhale & Osemwota, 2010).

Given the abundance of poultry manure in Nigeria and the accessibility of NPK fertilizers, their combination presents an opportunity to improve eggplant production in Ilorin and other parts of the Southern Guinea Savanna. However, the specific responses of Solanum aethiopicum to these fertilizers under the prevailing agroecological conditions remain underexplored.

**Importance of Soil Fertility Management**

Soil fertility management is fundamental to sustainable agricultural practices as it directly influences crop growth, productivity, and overall ecosystem health. The primary goal is to ensure that soils provide adequate nutrients in the right proportions to s upport crop requirements throughout their growth cycles. Below are key reasons why soil fertility management is crucial:

**1. Enhancing Crop Yield and Quality**

Fertile soils supply essential nutrients, such as nitrogen, phosphorus, and potassium, which are critical for plant growth and development (Brady & Weil, 2010). Proper soil fertility management ensures higher crop yields and improved produce quality, which is vital for meeting the increasing food demands of a growing global population.

**2. Maintaining Soil Health**

Continuous cropping without replenishing soil nutrients can lead to nutrient depletion, reduced organic matter, and soil structure degradation. Fertility management practices, including the application of organic matter and fertilizers, help maintain soil health by enhancing its physical, chemical, and biological properties (Lal, 2006).

**3. Promoting Sustainable Agriculture**

Sustainable agriculture requires balanced nutrient management to minimize environmental impacts, such as nutrient runoff and soil erosion. Integrated fertility practices—combining organic and inorganic inputs—ensure sustainable production by preserving soil fertility over the long term (Adediran et al., 2004).

**4. Addressing Nutrient Deficiencies**

Different soils have varying nutrient profiles, and certain essential nutrients may be deficient in some areas. Fertility management involves diagnosing these deficiencies through soil testing and applying corrective measures to ensure optimal nutrient avai lability for crops (Ojeniyi et al., 2012).

**5. Improving Water Retention and Soil Structure**

Organic matter from compost or manure enhances soil structure, increasing its water-holding capacity and aeration. This is particularly important in drought-prone regions where efficient water use is critical for crop survival (Akanbi et al., 2005).

**6. Cost-Effective Resource Utilization**

By adopting practices like crop rotation, green manuring, and precision fertilization, farmers can optimize resource use, reducing the dependency on expensive chemical inputs while maintaining soil fertility (FAO, 2017).

**7. Mitigating Environmental Impacts**

Excessive use of synthetic fertilizers can lead to soil acidification, water pollution, and greenhouse gas emissions. Organic fertilizers and balanced nutrient application help mitigate these issues by promoting eco-friendly farming practices (Eghball et al., 2002).

**8. Supporting Ecosystem Services**

Healthy soils contribute to broader ecosystem services, such as carbon sequestration, biodiversity preservation, and the regulation of water cycles. Fertility management plays a vital role in maintaining these essential services (Lal, 2015).

## Use of Poultry Manure in Crop Production

Poultry manure is a valuable organic fertilizer widely used in crop production due t o its rich nutrient content and soil-enhancing properties. It is derived from the excreta of poultry birds and is often mixed with bedding materials such as sawdust, rice hus ks, or straw. Poultry manure has gained significant attention in sustainable agricultu re for its ability to improve soil fertility, enhance crop growth, and reduce the depend ency on synthetic fertilizers.

**Nutrient Composition of Poultry Manure**

Poultry manure is a rich source of essential plant nutrients, including:

- **Nitrogen (N):** Vital for vegetative growth and chlorophyll synthesis.
- **Phosphorus (P):** Crucial for root development and energy transfer.
- **Potassium (K):** Important for water regulation and disease resistance.
- **Micronutrients:** Contains trace elements like calcium, magnesium, and zinc, w hich support overall plant health (Akanbi et al., 2005).

The nutrient composition of poultry manure depends on factors such as the bird's die t, age, and manure handling practices (Eghball et al., 2002).

**Benefits of Using Poultry Manure in Crop Production**

1. **Improves Soil Fertility**

   Poultry manure enhances soil fertility by adding organic matter, which improves nutrient availability and cation exchange capacity (Adekiya et al., 2019).

2. **Enhances Soil Structure**

The organic matter in poultry manure improves soil structure by increasing its wa
ter-holding capacity and reducing compaction, making it suitable for crop root d
evelopment (Olayinka & Adetunji, 2001).

3. **Increases Microbial Activity**

Poultry manure promotes microbial activity in the soil, enhancing nutrient cycling
and organic matter decomposition (Schjonning et al., 2007).

4. **Promotes Sustainable Agriculture**

Unlike synthetic fertilizers, poultry manure is biodegradable and contributes to s
ustainable agricultural practices by recycling farm waste (Adediran et al., 200
4).

5. **Cost-Effective Nutrient Source**

Poultry manure is often readily available and cost-effective compared to comme
rcial fertilizers, making it an attractive option for resource-poor farmers (Ojeniyi
et al., 2012).

## 1.2 Statement of the Problem

In Ilorin, Southern Guinea Savanna, poor soil fertility has been a limiting factor in ve getable crop production. Farmers often rely on expensive and sometimes inefficient inorganic fertilizers, which may lead to soil degradation over time. Although poultry manure is abundant and cost-effective, its use as a sole nutrient source may not meet the high nutrient demands of eggplant. Therefore, determining the optimal combination of poultry manure and NPK fertilizer is essential to improve eggplant yield and ensure sustainable soil management.

### 1.3 Justification of the Study

The study is essential for promoting sustainable agricultural practices in Nigeria. By identifying effective fertilizer treatments, the research can provide actionable recommendations to farmers, enabling them to increase eggplant production while minimizing costs and environmental impacts. The findings will also contribute to the body of knowledge on different levels of nutrient management in vegetable crops.

### 1.4 Aim and Objectives of the Study

**A i m :**

To evaluate the response of eggplant (*Solanum macrocarpon*) NPK 15:15:15 fertilize r in Ilorin, Southern Guinea Savanna, Nigeria.

**Objectives:**

:

i. To assess the effect of different levels of NPK 15:15:15 fertilizer on eggpla nt on the growth parameters,

ii. To assess the most appropriate quantity or level of fertilizer (NPK 15:15:15) for the optimum growth of eggplant

# CHAPTER TWO

## LITERATURE REVIEW

### Historical Significance

Eggplant is believed to have originated in India over 4,000 years ago (Hedge, 1991). I t was introduced to the Mediterranean by Arab traders in the 9th century (Al-Bagdad i, 1954). European explorers later introduced it to the Americas in the 16th century (He drick,

1950).

### Botanical Descriptions

Solanum melongena belongs to the Solanaceae family (Hedge, 1991). It is an annual plant characterized by its bushy growth, lobed leaves, and bright purple fruits (Kum ar et al., 2017). Eggplant can grow up to 1.5-2 meters in height, with a canopy spread of about 1 meter (Hedge, 1991).

### Importance of Eggplant

Nutritional Value: Contains antioxidants, dietary fiber, and bioactive compounds (Ku mar et al., 2017). Culinary Uses: Integral to diets in India, Middle East, and parts of E urope (Al-Bagdadi, 1954).

**Economic Value:**

Grown widely by smallholder farmers and commercial producers (Hedrick, 1950). Health Benefits: Regular intake helps lower cholesterol, improve circulation, and prevent oxidative stress (Kumar et al., 2017).

Solanum macrocarpon L. (African eggplant) belongs to the Family Solanaceae alongside with other cultivated species such as pepper, tomato and potato (Dupries and eleener, 1989); and globally there about 1000 species of the genus Solanum. Solanum macrocarpon has an African ancestry. This species (Solanum macrocarpon) has been given different local names by various authors. It is known to be "Osun' or "Igbagba" (Denton and Olufolaji, 2000) and called 'Gboma' in West Africa (Bonsu et al., 2002). African eggplant, which is one of the constituents of the Nigerian foods and indigenous medicines is highly valued. African eggplant is a very important source of plant protein and minerals. Different accessions of this crop are being cultivated by farmers, and application of fertilizer has been established to be important in their cultivation (Olaniyan and Nwachukwu, 2003). Importance of different macro elements on the growth and yield at different physiological stage has been documented (Ojo and Olufolaji, 1999; Olaniyan and Nwachukwu, 2003), the authors stated that vegetative development requires nitrogen, phosphorous for stimulation of flowering and fruit formation; and potash is essential for seed setting. The extent of Solanum macrocarpon growth response to Nitrogen fertilizer application in Nigeria has not been well stu died which however gives the reason for limited information on the agronomic recom mendation for the crop. However, effects of Nitrogen (N) rates on the growth of Afric an eggplant are well documented elsewhere (Pal et al., 2002; Sat and Saimbhi, 200 3). Regarding its nutritional value, eggplant is low in calories and is known to be am ong the healthiest fruit vegetable for its high levels of vitamins such as B6, K, and C, minerals including K, Mg, Na, P, Cu, Cr, Fe, Mn, Ni, and Zn, and its bioactive compou nds that support human health. For optimal growth, yield and fruit quality eggplant r equires an annual rainfall range of 1000–1500 mm and grows best in an altitudes r ange of 0–1600 m above sea level. Heavy rainfall disrupts both the growth of the plant and formation of flowers. The optimum temperature for pollen germination is 20–27 °C, but below 15 °C or above 30 °C, pollen is unable to germinate. For hea lthy development, eggplant prefers deep, fertile sandy loam soils that are well-drain ed, have a pH of 5.5–6.8, and contain high organic content. For this reason, it is highl y responsive to blended NPSB fertilizer and their deficiency will inhibit growth, yiel d, quality and result in low production. From those fertilizers, boron and sulfur are c rucial for fruit development, flowering, and whole plant growth, in addition to aidin g in water absorption and the metabolism of carbohydrates in plants.

# CHAPTER 3

## 3.0 MATERIALS AND METHODS

### 3.1 Effect of Inorganic fertilizer (NPK 15:15:15) on growth of garden egg.

**3.1.2 Site Description** e experiment was carried out in the nursery garden of the De partment of Agricultural Technology, Institute of Applied Science, Kwara State P olytechnic Ilorin, Ilorin, Nigeria. Ilorin is in the Southern Guinea Savanna agro ec ological zone of Nigeria.

### 3.1.3 Preparation of Planting Materials

The seeds were obtained from a reputable source at the department of Agrono my Faculty of Agriculture University of Ilorin, Ilorin. These seeds were subjected to germination test, before planted.

### 3.1.4 Experimental Design and Plot layout

The potted experiment was laid out in completely randomized design (C R D) with three treatments replicated five times. These treatments include: 0g, 10g, 30 g and Control making 12 experimental units were involved.

### 3.1.5 Planting

Planting was carried out in May/ June, 2025 during the later part of early rainy season. Seeds were sown at the rate of one seed per hole at 2cm deep: a total of five seeds per bucket were planted to give five stands. Five litres buckets capacity were used, properly perforated to allow drainage. They were filled with soil ¾ size of the buckets size.

### 3.1.6 Agronomic practices

Weeding was done manually by hand pulling weed, plants were irrigated using watering can once in a day for the first week and later followed by every two (2) days interval to avoid water logging.

### 3.1.7 Data Collection

Data were collected on the following parameters: plant height, stem girth, and number of leaves per plant. Number of branches: The number of branches

was also counted on the plants that were tagged

i. **Mean Plant height**: This was taken on the plants from each polythene bag at four weeks after planting using a meter tape. The measurement was taken on each of the plant from the base to the upper most shoot/ leaves.

ii. **Number of leaves per plant**: This was done by counting the leaves on each plant

iii. **Number of branches**: The number of branches was also counted on the plants that were tagged

iv. **Stem Girth**: This was determined by vernier caliper.OR, stem diameter was measured five centimeters above ground level using micrometer screw gauge and converted to girth using the following formula:

where, G is the stem girth, D is the stem diameter and π is a constant (π = 22/7).

### 3.1.8 DATA ANALYSIS

All data collected were subjected to Analysis of Variance (ANOVA). The analys is was done according to the completely randomized design using SPSS analytical Software. OR All data collected were subjected to analysis of variance using the procedure GLM of SAS (SAS Institute, 2010). Where there was significant F-test, treatment means were separated using the Standard Error of Differences (SED) test at 5% probability level.

# CHAPTER FOUR

## 4.0 Results and Discussion

### 4.1 Results

Effects of NPK 15:15:15 on garden egg plant (Solanum macrocarpon) in Southern Guinea Savanna of Nigeria.

### 4.2 Analysis of data

Table 1: Effect of NPK 15:15:15 on garden egg plant height (cm).

| treatments | Weeks After Sowing (WAS) | |
|---|---|---|
| | 4 | 6 |
| NPK 15:15:15 (g) | | |
| 0 | 7.77a | 10.33a |
| 10 | 8.83b | 11.33b |
| 20 | 9.33c | 12.17c |
| se± 0.05 | 1.212 | 1.573 |

Means followed by the same letter within a treatment group are not significantly diff erent at 0.05 level of probability

Table 2. Effect of NPK 15:15:15 on garden egg leaf numbers.

| treatments | weeks after sowing (was) | |
|---|---|---|
| | 4 | 6 |