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EFFECT OF POULTRY MANURE ON THE GROWTH AND YIELD PERFORMANCE OF COWPEA IN THE UNIVERSITY OF UYO SKILL ACQUISITION FARM

Saviour Okon Nsa[1], Uzembe, Faith Udenyi[2], Stephen Paulinus Robert[3], Akam Eseme Etokeren[4]
University of Uyo, Uyo, Akwa Ibom State.

Corresponding Email: stephenofhope@gmail.com

ABSTRACT

The study aimed at determining the effect of poultry manure on the growth and yield performance of cowpeas (iron beans, navy white beans then Ife brown beans varieties) in Agricultural Education Skills Acquisition Farm, University of Uyo. The study was guided by two purposes, two research questions, and two null hypotheses. The study adopted the randomized complete block design (RCBD). The parameters observed in the study were the height of the plant and the number of pods. A sample size of 300 stands from the three varieties of cowpeas was selected using a random sampling technique. A calibrated meter ruler and measuring tape were used to collect data on the height of the plant and the number of pods was determined by counting and computing using a scientific calculator. Experimental procedures were duly followed. Data collected were analyzed using means to answer research questions and analysis of variance (ANOVA) was used to test the null hypotheses at 0.05 level of significance. Results of the findings showed that poultry manure had a great effect on the height of plants and the number of pods of iron beans, navy white beans then Ife brown beans in the University of Uyo Agricultural Education Skills Acquisition Farm. Furthermore, there were significant effects on the height of the plant and the number of pods grown with poultry manure in the study area. Based on the findings of the study it is recommended that Agricultural extension workers should organize sensitization seminars and workshops for crop farmers on the cultivation of iron beans in Uyo Local Government Area thereby meeting the demands of cowpea production within and outside Uyo Local Government Area. The Ministry of Agriculture should also create awareness among teachers by giving them training on the production of cowpeas and the effect of poultry manure on cowpeas production for better yield in the Uyo Local Government Area.

Keywords: *Cowpea, growth, Poultry manure, yield performance*

INTRODUCTION

Cowpea originates from Africa and is widely cultivated in Nigeria mainly for their edible seed and are simply known as 'beans'. Cowpea is called the "hungry-season crop" because it is the first crop to be harvested before cereal crops (Heuze and Tran, 2013). Cowpea seeds are the largest contributor to the overall protein intake of several rural and urban families hence, cowpea is regarded as the poor man's major source of protein, it is known in Nigeria as "ewa" in Yoruba, "wake" in Hausa, "akidi" in Igbo, "kitan" in Obudu and "akoti" in Ibibio languages respectively.

Cowpeas are of major importance to the livelihoods of millions of people in the tropics due to their economic and nutritional importance. Its high protein content makes it extremely valuable in Tropical Africa, and it is a substitute for meat and fish. Cowpea provides protein, fiber, folate, iron, potassium, and magnesium while containing little or no total fat, trans-fat, sodium, and cholesterol (United States Department of Agriculture (USDA), Agricultural Research Service, 2012). Cowpea according to USDA, Health Services (2010), is a health-promoting nutrient. The consumption of more beans in the diet could improve overall human health and also decrease the risk of developing certain diseases, including heart disease, obesity, and many types of cancers (Adusei *et al.,* 2016). Agbogidi and Egho (2013) reported that cowpeas (beans) are rich soluble and insoluble fiber sources. Therefore, daily consumption of about 100– 135g of dry beans reduces serum cholesterol levels by 20% thereby, reducing the risk of coronary heart diseases. On average, beans provide seven or more grams of total dietary fiber per half-cup serving and have been associated with decreases in total and low-density lipoprotein (LDL) cholesterol, as well as decreasing the risk of developing coronary heart disease, metabolic syndrome, stroke, hypertension, diabetes, obesity and some gastrointestinal diseases (Julie and Kystle, (2019).

Besides its health-related benefits, Ayenlere, *et al,* (2013), reported that beans are inexpensive and considerably cheaper than rice or any other dietary fiber type of foodstuffs because, at the early stages of cowpea growth, the leaves could be used for human consumption. Adusei, *et al,* (2016) noted that cowpea seeds and leaves have a high protein content of about 24.8%, fat content of 1.9%, fiber content of 6.3%, carbohydrate content of 6.3%, and water content of 8-9%. The wider acceptability of cowpea as observed by Sheahan (2013) is because it mixes well with other recipes which is of major importance to the livelihoods of millions of people in the tropics. Its grains are a major source of plant proteins and vitamins for humans and feed for animals. The young leaves and immature pods are eaten as vegetables and also serve as a source of income and manure. The International Institute of Tropical Agriculture (IITA (2019) noted that big markets are available for selling cowpea grains and fodder across West Africa. IITA (2019) also reported that, In Nigeria, farmers who store cowpea fodders for sale at the peak of dry season have been found to increase their annual income by 25%. This serves as an income-generating avenues for other value chain actors within the cowpea chain. Cowpea ensures returns for both the marketers and producers which in turn aids the sustainability of the value chain.

Cowpea is a leguminous crop with the ability to fix atmospheric Nitrogen. Ishiyaku, *et al*, (2013) reported that cowpeas do not require too much nitrogen fertilizer because they fix their nitrogen

from the atmosphere using nodules in their roots, therefore cowpea can fix about 240 kg/ha of atmospheric nitrogen and make available about 60-70 kg ha-1 nitrogen for succeeding crops grown in rotation with it. Cowpea adapt to poor soils and tolerate drought, high temperatures, and other biotic stresses compared to other crops. This adaptation makes its cultivation attractive to the drier parts of the savannah in Nigeria. Cowpea production in Nigeria is increasing, and consumption is also at an all-time high, raising hopes over its sustainability as a key source of plant protein for millions of Nigerians (FAO, 2017).

The chemical composition of poultry manure varies with factors such as the source of the manure, feed of the birds, age and health condition of the birds, storage, handling of the manure, and litter used (Deepa, *et al.,* 2016). Stephen *et al*. (2014) noted that Poultry waste consists of droppings, wasted feed, broken eggs, feathers, and sometimes sawdust from poultry pens. Poultry manure is an organic fertilizer that contains about 3.5% nitrogen, 1.5- 3.5% phosphorus, 1.5- 3.0% potassium, and many micronutrients (Deepa, *et al.,* 2016). The importance of poultry manure in cowpea cultivation cannot be over-emphasized; Chiamaka (2014) reported that poultry manure helps in improving the physio-chemical properties of the soil, the soil structure, nutrient retention, aeration, water holding capacity of the soil and water infiltration thereby improving the productivity and yield of cowpea. Deepa, *et al,* (2016) explain that it further stimulates the activity of microorganisms that make the cowpea plant get the macro and micro-nutrients through enhanced biological processes, increased nutrient solubility, altered soil salinity, sodicity, and pH. Compared to all other organic manures, poultry manure has higher plant nutrients. Poultry manure may be a good alternative source of nutrients in cowpea production. Msaakpa, (2016) observed that poultry droppings supply 110kg N, 90 kg $P_2O_{5,}$ and 90 kg K_2O t/ha-1 which is recommended for most leafy and fruit vegetables. Poultry manure has greater potential to amend soil degradation by positively influencing the growth and yield performance of cowpeas more than the other sources of organic manure.

Kamara, *et al,* (2018) reported that the growth and yield of cowpea vary due to the varieties of crops such as IT99K-573-1-1(SAMPEA14), IT99K-573-2-1(SAMPEA15), IT07K-292-10(SAMPEA16), IT07K-313-18(SAMPEA17), IT07K-297-13(SAMPEA18), IT08-150-12(SAMPEA19) as well as environmental factors like sunlight temperature and pH of the water, soil, and management practices which include seed rate, planting distance, weeding, fertilizer application and so on.

IT99K-573-1-1(SAMPEA14) commonly known as Navy white beans, USDA (2010) reported that they are one of the smallest white beans commonly used to make moi-moi, akara, or porridge, it is high in fiber and may help reduce symptoms of metabolic syndrome due to their high fiber content and it promotes weight loss. Navy white beans supply antioxidants to the body which fight off disease, help maintain optimum health, and help develop and keep the bones strong which is also beneficial for teeth. It takes about one and a half to two hours to cook.

IT07K-292-10(SAMPEA16) commonly known as Ife brown, according to, Igomu and Idoga (2017) asserted that Ife brown is extremely nutritious containing so many nutrients known to have positive benefits to humans. Regular consumption of Ife brown beans improves heart health, helps digestion, and promotes the development of healthy cells. It also aids in weight loss as well as reduces the risk of type 2 diabetes.

IT07K-313-18(SAMPEA17) commonly known as Iron beans, is also known as black-eyed beans which contain many nutrients and have several benefits to human health. The high level of fiber helps lower blood pressure and inflammation as well as maintain a healthy weight and support eye and skin health (USDA 2010). These are the three varieties studied in this research.

Cowpea has a wide range of growth habits, Boukar, *et al*, (2016) discussed that the growth habit of cowpea can be erect, semi-erect, prostrate (trailing), or climb depending mostly on genotype, although photoperiod and growing conditions can also affect plant stature. Enujeke, (2013) stated that plant height is an indicator of the growth performance of crops and is influenced by environmental and management factors. The height of plant of cowpea can be 29.72 cm, 16.46 cm, 82.33 cm, etc based on the variety which is also a result of poultry manure (Boukar *et al.*, 2016). Heuze and Tran (2013) observed that, for climbing varieties, V. *unguiculata* can grow up to 80 cm and up to 2 m. Cowpea has a well-developed root system (6-15 cm long and 4-11 cm broad) and alternate and are mostly grown for grain.

Addo-Quaye, *et al*, (2015) noted that pods occur in pairs forming a V mostly pending and vertical, but they can be erect. The pods are cylindrical, 2-6 cm long, and 3-12 mm broad and contain 8-20 seeds. Seeds can be white, pink, brown, or black depending on variables with respect to the shape and length of the pod and seed characteristics Quin, (2014) also observed that two or three pods per peduncle are common, and often four or more pods are carried on a single peduncle if growing conditions are very favorable. Ahmad *et al*., (2019) asserted that the number of pods in cowpea plants is greatly influenced by the application of poultry manure, the application rate per plant ranges from (22.67), (to 11.33) and significantly increases the pod length to (18.02cm).

The high demand for leguminous multipurpose crop plants is not met particularly in the southern part of Nigeria because it is not mainly cultivated there. Umeh, *et al*, (2017) posited that if all parts of Nigeria participate in cowpea production, the high demand for the plant protein will be met thus improving nutrition, contributing to food security, increasing the revenue of the producers, and creating employment opportunities as well as enhancing the efficiency of utilization of labour. Agbogidi and Egho (2013) observed that in Nigeria, cowpea is majorly produced in the North in the savannah belt whereas its yield in the South, Uyo Local Government Area of Akwa Ibom State in particular is affected by some environmental factors such as climatic and edaphic factors. In an attempt to manage soil-related factors, poultry manure has been used by most farmers basically in Uyo Local Government Area.

Stephen *et al.* (2014) observed that the application of poultry manure enhances the performance of amaranthus, while Nweke and Obasi (2013) noted that poultry manure increases the vegetative growth of garden egg and okra plants respectively. Maaz, *et al,* (2017) observed that the combined rate of farmyard manure at 10t/ha increases growth parameters such as the vine length, number of leaves as well as the fruit yield of cucumber.

Statement of the Problem

Crop production plays a major role in the economy of Nigeria. It is a significant source of food security for the people and a means of livelihood for vulnerable citizens. Consequently, raising crop productivity is an important policy goal for governments and development agencies and this is central to growth, income distribution, improved food security, and poverty alleviation among practitioners.

Cowpea commonly called beans is a major protein-rich staple crop and its uses cannot be overemphasized yet the crop is not cultivated in most parts of South-South Nigeria including Uyo Local Government Area of Akwa Ibom State. In the researcher's opinion, cowpeas do not thrive in the area due to the type of soil, types of fertilizers applied, and variations in climatic conditions such as the amount of rainfall, sunlight, etc. This has brought about over-dependence on the Northerners for the supply thereby making the commodity scarce and high in price. The impact of agricultural extension agents has not been felt in creating awareness as well as enlightening farmers on a particular variety of cowpeas to be grown and the soil management practices that would be affordable and less expensive in the Uyo Local Government Area.

The researcher therefore poses some questions like, is it that cowpea does not thrive in Akwa Ibom State soils or that no varieties do well in Akwa Ibom soils? is the soil heavily manured? is the soil strongly acidic? or low in phosphorus, potassium, and calcium? how would cultivated cowpeas respond to the application of poultry manure? These questions prompt the researcher to determine the effect of poultry manure on the growth and yield performance of cowpeas in the geographical location of Uyo with the view of recommending the highly performing variety to be grown in the study area which will help curb the high cost as well as reduce scarcity of the crop in Akwa Ibom state.

Purpose of the Study

The main purpose of this study is to determine the effect of poultry manure on the growth and yield performance of cowpeas (Ife brown beans, iron beans, and navy white beans) in Agricultural Education Skills Acquisition Farm University of Uyo. Specifically, the study sought to;

1. determine the difference in height of the three varieties of cowpea grown with poultry manure in the Agricultural Education Skills Acquisition farm at the University of Uyo.

2. determine the difference in a number of pods of the three varieties of cowpea grown with poultry manure in the Agricultural Education Skills acquisition farm at the University of Uyo.

Research Questions

This study was guided by two research questions as follows;

1. what is the difference in the height of the plant of the three varieties of cowpea grown with poultry manure in Agricultural Education Skills Acquisition Farm University of Uyo?
2. what is the difference in the number of pods of the three varieties of cowpea grown with poultry manure in the Agricultural Education Skills Acquisition Farm University of Uyo?

Hypotheses

Two hypotheses were tested at a .05 level of significance

1. There is no significant difference in the height of the plant of three varieties of cowpea grown with poultry manure in the Agricultural Education Skills Acquisition farm at the University of Uyo.
2. There is no significant difference in the number of pods of the three varieties of cowpea grown with poultry manure in the Agricultural Education Skills Acquisition farm at the University of Uyo.

METHODOLOGY

The experimental design, known as randomized complete block design (RCBD) was adopted for the study. Randomized complete block design (RCBD) is the standard design for agricultural experiments where similar experimental units are grouped into blocks or replicates (Clewer and Scarisbrick, 2011). Thus the design was suitable for the research study. The study was conducted at the Agricultural Education Skills Acquisition Farm in the University of Uyo. The population of the study consisted of seven hundred and fifty (750) stands of the three varieties of cowpeas. A sample of three hundred (300) cowpeas stands from the three varieties were used for the study. Using a simple random sampling technique in selecting three hundred (300) cowpea stands from the three varieties which were navy white, Ife brown, and iron beans randomly selected from the three blocks. A calibrated ruler and measuring tape were used to collect data on height, while the number of pods was determined by counting and computing using a scientific calculator. Experimental Procedures were carried out in the following order: Site selection; Soil Test; Land Preparation; Planting Operations; Application of treatments; Weeding; Measurement and Harvesting.

The data collection was done with the help of a briefed research assistant on collecting the data at two weeks, four weeks, and six weeks on the height of the cowpea plant, Subsequent data collection were collected at eight weeks, ten weeks, and twelve weeks on the two variables such as height of cowpea plant and number of pods of cowpeas. The instruments used in taking measurements were the measuring tape and the use of hand for counting. Data collected were

analyzed using mean to answer research questions while null hypotheses were tested using Analysis of variance (ANOVA) at a .0.5 level of significance.

RESULTS

Research Question 1

What is the difference in the height of the plant of the three varieties of cowpea grown with poultry manure in the Agricultural Education skill acquisition farm at the University of Uyo?

Table 1: Mean effect of poultry manure on the heights of Navy White, Ife-Brown, and Iron Beans varieties of cowpea.

Varieties	Number of Plants	Mean	Std. Deviation
Navy White	100	104.14	71.63
Ife-Brown	100	101.53	72.54
Iron Beans	100	135.13	71.27
Total	**300**	**156.86**	

Results in Table 1 show the mean score for the height of plants of the three varieties of cowpea grown with poultry manure. It indicates that the mean height of the Navy White variety is 104.14cm, Ife-Brown has a mean height of 101.53cm, and Iron Bean variety is 135.13cm. This implies that Iron Beans performed better in terms of height followed Navy white variety and Ife-Brown showing the least mean score in height.

Hypothesis 1: There is no significant difference in the height of plants of the three varieties of cowpea grown with poultry manure in an Agricultural Education skill acquisition farm in the University of Uyo.

Table 2: Analysis of Variance showing difference in the height of cowpeas grown with poultry manure

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.
Between Group	69843.75	2	34921.87	6.77	.001
Within Group	1531718.71	297	5157.30		
Total	1601562.46	299			

The result in Table 2 indicated that the calculated F-value was 6.77 and the F-Sig .001 at 2 and 297 degrees of freedom and 0.05 level of significance. Since the F-Sig value of .001 is less than the p-value of .05 the null hypothesis is rejected. Hence, there is a significant difference in the height of plants of the three varieties of cowpea grown with poultry manure in the Agricultural Education Skill acquisition farm at the University of Uyo.

Research Question 2
What is the difference in the number of pods of the three varieties of cowpea grown with poultry manure in the Agricultural Education skill acquisition farm at the University of Uyo?

Table 3: Mean effect of poultry manure on the number of pods of Navy White, Ife-Brown, and Iron Beans varieties of cowpea.

Varieties	Number of Stands	Mean	Std. Deviation
Navy White	100	9.64	2.00
Ife-Brown	100	9.00	2.22
Iron Beans	100	12.87	2.06
Total	**300**	10.50	2.69

Results in Table 3 show the mean score for a number of pods of three varieties of cowpea. It indicates that the mean for a number of pods of the Navy White variety is 9.64cm, for Ife-Brown 9.00cm, and 12.87cm for Iron Beans.

Hypothesis 2: There is no significant difference in the number of leaves of the three varieties of cowpea grown with poultry manure in an Agricultural Education skill acquisition farm in the University of Uyo.

Table 4: Analysis of Variance showing the difference in the number of leaves of cowpeas grown with poultry manure

Source of Variation	Sum of Squares	Df	Mean Square	F	Sig.
Between Group	186876.55	2	93438.27	7.16	.001
Within Group	3875770.68	297	13049.73		
Total	4062647.23	299			

The result in Table 4 indicates that the calculated F-value is 7.16 and the F-Sig .001 at 2 and 297 degrees of freedom and 0.05 level of significance. Since the F-Sig value of .001 is less than the p-value of .05 the null hypothesis is rejected. Hence, there is a significant difference in the number of leaves of the three varieties of cowpea grown with poultry manure in the Agricultural Education skill acquisition farm at the University of Uyo.

DISCUSSION OF FINDINGS

Effect of Poultry Manure on the Height of the Three Varieties of Cowpea

The findings of the study showed that poultry manure has a greater growth effect on the height of iron beans followed by navy white beans and Ife brown beans in the University of Uyo Agricultural Education Skills Acquisition Farm. Also, there is a significant difference in the height of iron beans, navy white beans, and Ife brown beans grown with poultry manure in the University of Uyo Agricultural Education Skills Acquisition Farm with Iron beans being responsible for the significant difference in the height of plant of cowpeas.

This is so because poultry manure is an excellent organic material and it contains essential plant nutrients such as nitrogen, phosphorus, and potassium. Poultry manure or litter serves as a soil amendment increasing the soil organic matter content thereby causing massive growth in the height of cowpea plants of the three varieties especially in the iron beans. The finding aligns with the findings of Stephen *et al.* (2014) who observed that the application of poultry manure enhances the performance of amaranthus, and the findings of Maaz, *et al,* (2017) who observed that the combined rate of farmyard manure at 10t/ha increase growth parameters such as the vine length, number of leaves as well as the fruit yield of cucumber.

Effect of Poultry Manure on the Number of Pods of the Three Varieties of Cowpea

The findings of the study show that poultry manure has a greater growth effect on the number of pods of iron beans followed by navy white beans and Ife brown beans in the University of Uyo Agricultural Education Skills Acquisition Farm. Also, there is a significant difference in the number of pods of iron beans, navy white beans, and Ife brown beans grown with Poultry Manure in the University of Uyo Agricultural Education Skills Acquisition Farm with Iron beans being responsible for the significant difference in the number of leaves of cowpea. The significant difference in response to poultry manure by the number of pods might be a result of improved nutrient supply, as well as positive manipulation of soil physical properties such as moisture retention, soil structure, and aeration. This is in agreement with the findings of Ahmad *et al*., (2019) who asserted that the number of pods in cowpea plants is greatly influenced by the application of poultry manure and significantly increases the pod length to (18.02cm).

CONCLUSION

Poultry manure had a greater growth effect on the iron beans in terms of height of plant, and number of pods. Poultry manure also had a good growth effect on the navy white beans in all the parameters particularly height of plant, number of branches, number of leaves, length of leaves, and number of pods, followed by Ife brown beans with a lower growth rate on all the parameters grown in University of Uyo Agricultural Education Skills Acquisition Farm. Furthermore, there is

a significant effect on the height of the plant and the number of pods grown with poultry manure in the study area.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are made:

1. Agricultural extension workers should organize sensitization seminars and workshops for crop farmers on the cultivation of iron beans in the Uyo Local Government Area thereby meeting the demands of cowpea production within and outside Uyo Local Government Area.
2. The Ministry of Agriculture should also create awareness among teachers by giving them training on the production of cowpeas and the effect of poultry manure in cowpeas production for better height and length yield.
3. Agricultural extension workers should organize sensitization seminars and workshops for farmers and the public on the use of poultry manure in the cultivation of cowpeas to enhance growth and yield especially in the vegetative and pods production in Uyo Local Government Area.

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