

**EFFECT OF PALM BUNCH ASH AND POULTRY MANURE ON PEPPER (*Capsicum annuum*)
PRODUCTIVITY IN OWERRI IMO STATE, NIGERIA.**

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Abstract

Field experiment was conducted at the Teaching and Research Farm of Federal University of Technology, Owerri, to determine the effects of palm bunch ash and poultry manure on the growth and yield of pepper (*Capsicum annuum*). The experiment was carried out using a 3x3 factorial in Randomized Complete Block Design with three replications. The treatments studied were palm bunch ash and poultry manure at 0, 5, and 10 tons/ha, respectively. Growth parameters were collected at 2, 4, 6 and 8 weeks after planting while the yield parameters were measured at harvest in the 12th week. Data collected were subjected to analysis of variance and significant levels were separated using Least Significant Difference (LSD @ p< 0.05). Results of the experiment showed that application of poultry manure and palm bunch ash at 10 t/ha significantly (p<0.05) increased the growth parameter of pepper from 4 weeks after planting.

Application of 10 t/ha of poultry manure + 10 t/ha of palm bunch ash recorded the highest number of fresh fruit (52) and highest number of fresh fruit length (7.02 cm).

Plant height at 2 weeks after planting was very prominent with 10t/ha interaction making the highest value of 10.30, plant height at 8 weeks was also very prominent where the 10t/ha interaction had the highest value 31.50. The number of fruits harvested was another prominent parameter. The 10t/ha interaction had the highest value of 52.70.

Combined application of poultry manure and palm bunch ash at 10t/ha increased the performances of pepper (*Capsicum annuum*) in all the parameters studied and therefore is recommended for pepper production in the studied region.

Keywords; Palm bunch ash, Pepper, Poultry manure, Soil productivity

Introduction

Pepper is botanically called *Capsicum annuum*. It is a domesticated species of plant genus *Capsicum* in the family Solanaceae (Greenleaf 1986). It originated from West Indies, Peru and Mexico. Pepper has spread throughout the tropics and sub-tropics. Other members of the family include *Lycopersicon esculentum* mill and *Amaranthus* spp. The potential uses of pepper covers food, medicine, plant-based insecticides and finances (Dagnoko *et al*, 2013). Pepper is a fruit that is

highly needed in our diet due to its richness in vitamin C.

The colourful aspect of pepper increases the visual appeal of the food making it more appetizing. The presence of Capsinoids in Pepper gives it a very strong taste (Grubben and Denton, 2004). Pepper is used in our industries as a condiment in meat processing. The fruit being sweet makes it very suitable for salad or cooked as vegetable. Pepper is rich in vitamin A. The importance of pepper in traditional medicine is highly significant due to Capsaicin, which is used in modern medicine. Pepper is the second most important vegetable after tomatoes (Nwachukwu *et al*, 2007). It plays an important role in food digestion as it contains alkaloids that aid digestion and ointment for relief of Arthritis and neuropathic pains (Nwachukwu *et al*, 2007).

The productivity of pepper has been on a decrease for many years now. This could be attributed to climatic change, poor variety, poor cultural practices, presence of pest and diseases. Better adaptable and well performing variety with improved cultural practices can boost pepper production. The use of inorganic fertilizer may not be affordable by the peasant farmers in Nigeria as a whole hence the justification of the use of organic manure for this work. Palm bunch ash and Poultry manure do not pose any environmental hazards like inorganic fertilizer that may cause nitrification in water bodies. They are eco-friendly and economical unlike NPK fertilizer that is very expensive for the resource poor farmers.

Palm bunch ash and Poultry manure are abundantly produced hence, there is a need to utilize them as raw materials which will in turn reduce environmental pollution.

Hence, the objective of this research includes to assess the performance of pepper using poultry manure and palm bunch ash and to determine the optimum poultry manure rate and palm bunch ash needed for optimum yield of pepper.

Materials and Methods;

Field experiment: The research was conducted from April to August 2018 cropping season at the Teaching and Research Farm of the Federal University of Technology Owerri. The area is located in the tropical rain forest belt of South-eastern Nigeria on Latitude 5^o 21'N and 5^o 27'N, Longitude 7^o 02'E and 7^o 15'E.

The environment has mean temperature of 31°C, mean annual rainfall of 2500 mm, relative humidity of 89% and. The soil is formed from coastal plain sand and has low organic matter content (Onweremadu *et al* 2003)

Preparation of planting material:

Fruits of *Capsicum annum* (pepper) were obtained from “Eke Onunwa Market” in Imo state. The seeds were manually removed from the fruits and were dried. The seeds were later planted in a potted nursery, allowed for 6 weeks before transplanting.

Field Preparation /Experimental Design:An experimental site measuring 270m² was mapped out and cleared with cutlass and tilled using hoe and spade. The experiment was laid out in a 3 x 3 factorial arranged in Randomized Complete Block Design (RCBD) with three (3) replications. Treatments included: 3 rates of palm bunch ash (0, 5 and 10 tons/ha) as well as 3 rates of poultry manure (0, 5 and 10 ton/ha).

Planting;Pepper seedlings were transplanted one seedling per hole at the spacing of 60 x 60 cm inter and intra row spacing in a 2 x 2m bed with 1m spacing to give 9 plants per plot and plant population of 22500/ha.

Sample	Poultry manure	Palm bunch ash
pH(H ₂ O)	6.6	9.5
Nitrogen (%)	20.8	2.4
Organic carbon (%)	16.8	12
Organic matter (%)	28.9	7.9
Calcium (%)	0.21	15.8
Magnesium (%)	0.17	0.7
Phosphorous (%)	24.82	16.9

Statistical Analysis: Data collected were subjected to analysis of variance (ANOVA) procedure as described by Wahua (1999). Mean separation was done using fishers Least Significant Difference (LSD 0.05) probability

Effects of palm bunch ash and poultry manure on plant height 2 weeks after planting

Result showed that there was significant (p<0.05) difference on the plant height at 2 weeks after planting with application of poultry manure and palm bunch ash when compared to the control plots. Soils amended with palm bunch ash increased pepper height than poultry manure and increasing the rates of both poultry manure and palm bunch ash increased the height of pepper. Among all the treatments, combined application of palm bunch ash and poultry manure recorded higher pepper height than when the manures were applied separately. Soils amended with 10t/ha

Weeding; Weeding and removal of debris were manually done by hoeing at 2, 4, 6 and 8 weeks after planting (WAP).

Data collection: Data were collected from 4-tagged plants per plot selected at random. The parameters measured were as follows

Plant height (cm): The plant height at 2, 4, 6 and 8 weeks after planting (WAP) were determined using meter rule.

Fresh fruit yield: The matured and ripped fresh pepper were plucked and weighed using weighing balance in gram (g).

Discussion;

Chemical composition of manures used in the study

Some chemical properties of the poultry manure and palm bunch ash used in the study are presented in Table 1 below. Results showed that the manures contain different concentrations of plant nutrient elements and the concentrations are high enough to improve soil quality for pepper production. Therefore, admixture of the poultry manure and palm bunch ash improved soil P^H and increase pepper growth and yield.

PBA +10t/ha PM recorded the highest plant height of 10.3 cm and this was followed by application of 10 t/ha PBA + 0t/ha PM which recorded the plant height of 8.87cm.

Increase in the height of pepper with application of the manures could be attributed to the macro nutrient concentration in the manures applied as well as the improvement in the fertility level of the soil.

Palm bunch ash acts as a liming material that will reduce the acidity of the soil and applying it in combination with poultry manure will help to reduce the acidity of the soil thereby helping to increase the availability of nutrient elements to plants for absorption. This also is in agreement with the work of Master (2011) who stated that manure and compost have received much interest and their positive impact

on plant height, soil structure stability; nitrogen and carbon content have been reported

Effects of palm bunch ash and poultry manure on plant height 2 weeks after planting

Palm bunch ash (PBA) (t/ha)	Poultry manure			Mean
	0t/ha	5t/ha	10t/ha	
0	5.67	6.07	6.87	6.20
5	8.07	7.97	7.13	7.72
10	8.87	8.30	10.30	8.10
Mean	6.20	7.72	9.16	

LSD_(0.05) poultry manure (PM) = 0.86

LSD_(0.05) palm punch ash (PBA) = 0.86

LSD_(0.05) PM x PBA=1.49

PM = poultry manure, PBA = palm bunch ash, x = interaction between PM and PM

Effect of Palm bunch ash and Poultry manure on plant height at 8 weeks after planting (cm)

Result showed plant height at 8 weeks after planting. Poultry manure (PM), palm bunch ash (PBA) and their interactions showed significant difference. Poultry manure showed highest value of 25.0cm at 10t/ha. The palm bunch had also 28.10cm at 10t/ha. The interaction made the highest value of 31.50 cm at 10t/ha. The progressive increase in height with the addition of the

organic manures shows that the amendments supplied the plant nutrients such as Carbon, Nitrogen, Phosphorus, and Calcium. This agrees with Amanullah *et al* (2008) who stated that poultry manure (PM) has been proved to be a good supplement for chemical fertilizers. Also, Egrinya *et al* (2001) and Mullins (2002), reported that organic manure not only contains Nitrogen, but also other elements like Phosphorus, potassium, Sulphur, Calcium, and micronutrients

Effect of palm bunch ash and poultry manure on plant height at 8 weeks after planting (cm)

Palm bunch ash (PBA)(t/ha)	Poultry manure			Mean
	0	5	10	
0	12.10	20.10	25.00	19.06
5	20.00	24.30	28.70	24.30
10	28.10	24.40	31.50	28.00
Mean	20.10	22.9	28.40	

LSD_(0.05) for poultry manure (PM)=6.58

LSD_(0.05) for palm bunch ash (PBA)=6.8

LSD_(0.05) for PMXPBA=11.40

Effect of palm bunch ash and poultry manure on fresh fruit length (cm)

Table below, showed the effect of PM and PBA on fresh fruit length. Results showed that there was a

significant difference in the fresh fruit length when compared to control. Application of 10 ton/ha PM + 10 t/ha PBA recorded the highest fresh fruit length of 7.20 cm Application of PMA increased fresh fruit length

more than PM application (Table below). The significant difference on the fresh fruit length was due to the manure applied two weeks before planting. The decomposition of the manure released plant nutrients which the pepper utilized for yield. This assertion was in line with Ipinmoroti *et al* (2008) who stated that organic matter treatment resulted in higher soil fertility enhancement in Nitrogen, Phosphorus, potassium, Calcium, Magnesium and Organic carbon build up.

It also concurs with Adeyemi *et al* (1987) who reported increased plant height of *Amaranthus* as a result of poultry manure application. The result agreed with Amarullah *et al* (2007) who reported rapid mineralization of nutrient in poultry manure which made a significant quantity of the nutrient available for the plant absorption.

Effect of Palm bunch ash and Poultry manure on fresh fruit length (cm)

Palm bunch ash (t/ha)	Poultry manure(pm) (t/ha)			Mean
	0	5	10	
0	0.00	5.47	5.87	3.78
5	5.67	5.92	5.93	5.84
10	6.43	6.38	7.02	6.61
Mean	4.03	5.92	6.27	

LSD_(0.05) for poultry manure(PM)=0.365

LSD_(0.05) for palm bunch ash (PBA)=0.365

LSD_(0.05) for PMXPBA=0.632

Effect of palm bunch ash and poultry manure on number of fruit harvested

Results showed that number of fresh fruits harvested was significantly affected ($p < 0.05$) by the application of manure. The highest number of fresh fruits harvested was recorded in soil amended with admixture of PM and PBA at 10t/ha each which recorded 53 fresh fruits of pepper. Results showed that number of fresh fruits harvested was significantly affected ($p < 0.05$) by the application of manure. The highest number of fresh fruits harvested was recorded in soil amended with admixture of PM and PBA at 10t/ha each which recorded 53 fresh fruits of pepper. Increase in the number of pepper fruits with manure application could be attributed to the nutrients contained in the manures. Considering the nutrients supplied by poultry manure, it was observed that, the major nutrients that contributed to the high yield of pepper included nitrogen, phosphorus, potassium, and magnesium and each element had its unique contribution to the yield of the crop. For instance, the addition of nitrogen promoted vegetative growth as well as the setting of flower and fruits and so applying these manures is expected to increase the number of fruits. Increase in the number of pepper fruits with manure application

could be attributed to the nutrients contained in the manures. Considering the nutrients supplied by poultry manure, it was observed that, the major nutrients that contributed to the high yield of pepper included nitrogen, phosphorus, potassium, and magnesium and each element had its unique contribution to the yield of the crop.

This findings are in concord with the previous works of Adeniyi and Ojeniyi, (2005) recorded increase in the Maize cob with manure application and stated that agricultural wastes increases the nutrient contents of the soil and its uptake by maize and also stated that organic manure increases the availability of phosphorus in the soil through the organic anion thereby preventing phosphorus bound to the soil.

Conclusion;

Poultry manure and palm bunch ash are agricultural wastes that contain essential plant nutrients and their application in an acid soil improved soil fertility status and reduced the strength of the acidity. As the rate of poultry manure and palm bunch ash increases, there was a corresponding increase in the growth and yield of pepper. Application of 10 t/ha PM + 10 t/ha PBA

recorded the heights growth and yield parameters of pepper when compared to other treatments studied. Combined application of poultry manure and palm bunch ash increased the growth and yield of pepper than when applied separately.

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