EFFECT OF DIFFERENT LEVELS OF POULTRY MANURE ON GROWTH AND YIELD OF A MARANTHUS PLANT (*Amaranthus hybridus*) IN OBIO AKPA, AKWA 'BOM STATE, NIGERIA.

ABSTRACT

The field experiment was carried out at the Teaching and Research farm of Akwa Ibom State University Obio Akpa campus, in 201 B to determine the Optimum Poultry manure rate for Amaranthus„ The experiment was laid out in a randomized complete block design replicated three times. The treatment were four rates of poultry manure and 6 t/ha) .Growth and yield parameter were assessed, Data collected were subjected to analysis of variance (ANOVA). Significance difference at 5% probability. Result showed that poultry manure rate had significant (pe 0.05) effects on all the growth and yield parameters assessed except stem girth. The treatment that received 6 t/ ha performed best in all the parameters, while the least was recorded from the control treatment. The application of 6 t/ ha poultry manure, produced 12:19 t/ha fresh foliage yield, followed by plot that received 4 t/ha poultry (1 1.33 t/ha), The treatment of 2 t/ha produced 7.70 t/ha foliage yield. The least foliage yield of 3.18 t/ha was harvested from the control plot the application of poultry manure also enhanced dry matter accumulation. The plot of 6 t/ha poultry manure produced 30.71g matter, while the control treatment had 33.14g. Therefore, the study recommended the application of 4 t/ha poultry manure for optimum fresh foliage yield and dry matter accumulation.

Keywords: Poultry manure, different rate, growth yield parameter, dry matter, harvesting interval, Amaranthus plant.

INTRODUCTION

Amaranthus is a perennial vegetable. Amaranthus is a cosmopolitan genus of herbs. The genus Amaranthus, in the family Amaranthaceae has more than 800 species. These include *Amaranthus hybridus*, *Amaranthus cruetus* and others are consumed as leaf vegetables (Findal, 1975). Amaranthus originated in America and one of the oldest food crops in the world, with evidence of its cultivation reaching back as far as 6700 BC. At present, Amaranthus is extensively grown as a green, leafy vegetable in many temperate and tropical regions. The largest area ever grown was during the height Of the Aztec civilization in Mexico during the 1400s. After the arrival of the Spanish conquistadors in Mexico in the early 1 500s, Amaranthus almost disappeared on the America as crop until research began on it in the US in the 1970s. Amaranthus has spread around the world (Including Mexico, Central America, India and Nepal).

According to Akubugwo (2007), approximate composition Of Amaranthus hybrids L. Leaves are moisture content 83.48%, Ash, Content 1 3.80%, crude protein 17.92%, crude oil 4. 65%, crude fibre 8.61%, available carbohydrate 52.18 and calorific value (Kcal/ 1 00g) 26 8.92. Nigeria has also been claimed as the centre of diversity, corroborated by the prevalent use of local names and the enormous genetic diversity available there. Amaranthus play important roles in nutrition, it provides calcium, iron, Vitamin A (carotene) and Vitamin c (ascorbic acid) and vitamin c (ascorbic acid) (Palada and Chang, 2003). It is used as a refrigerant, diuretic and purgative, as an enemafer stomach troubles, piles, against cholera and also as a sudorific. People with hypertension and cardiovascular diseases can use the leaves as an effective alternative to drug therapy (Akubugwo, 2007). Their nutrition quality receives world attention especially as a rich source of mineral and protein (Olufolaji and Tayo, 1980; Ikeh et al., 2023).

Some Amaranthus species are also cultivated for their seeds, which are known to contain about 16% protein and consequently utilized in confectionaries. Approximately 60 species are presently recognized with inflorescence and foliage ranging from purple and red to gold. The leaf vegetable has a rich profile of essential body metabolites such a s vitamin A, 8 and C mineral elements such as irons, calcium and phosphorus and some

measure of protein (Omueti, l930; Esang et al 2021). It is principally grown for its large fleshly leaves and herbaceous stem Which are succulent palatable and nutritious. It can be boiled and added to soups or stews and also useful for livestock feed and human consumption. Invariably, the leaves of grain amaranthus could be used for feeding rabbit and other micro livestock at the early stages of growth (Palada and Chang, 2003; Akpaninyang and Opara, 2017).

Amresh et al (2009) reported hepatoprotective and antioxidant activity of 50% ethanol extract of whole plant of Amaranthus spinosis against carbon tetracharide (CC4) induced. The crop is adapted to a wide range of soil conditions. Sandy soil with slightly acidity is best surfed. A temperature range of 20-300c. is required, the land should be ploughed or dug followed by leveling then shallow trenches of width 30-35cm, well rotten farmyard manure is mixed with soil in the trenches (Costea and Demason, 2007). Amaranthus is grown during both wet and dry seasons though irrigation is normally required for dry season crop, since the rate of transpiration by the leaves is fairly high. It prefers soil with pH above 6. Amaranths is planted either by direct seeding or transplanting. Since amaranths seeds are very small, it is mix with sand at a ratio of lg seed and obtain a uniform Stand, then cover seed highly with a layer of compost or rice hulls immediately after broadcast (AVROC, 2003; Udounang et al 2022).

In crop production, organic and inorganic materials such as poultry manure are used to supplement chemical fertilizers (Akpan et al. 2024 and Akata et al., 2024). Poultry manure like other manure is known to improve the soil by enhancing both physical and chemical properties. According to Okoli et al (2015) and Ekwere et al (2022) the use of poultry manure in amaranthus production is desirable as it had variable impacts on most parameters assessed, the result of the study showed that the poultry manure rates are capable of improving of yield of amaranthus. Nweke and Obasi (2013) observed that higher organic manure rate 15 t/ha and 20 t/ha, and pig manure rates 12 t/ ha and 24 t/ha, respectively gave higher yield result than where manure was not applied.

According to Grubben (1976), Amaranthus species are endowed with rapid growth rate which could encourage shoot re-growth following cutting. Furthermore, Ben et al (2024) and Essien et al (2023) viewed that increasing nutrient content is by boosting with organic material; poultry manure. Hence, there is need to carry out a research on the effect of different levels of poultry manure on the growth and yield of amaranthus plant.

MATERIALS AND METHODS

Experimental Site

This research was carried out between July to October, 201 8 at the Teaching and Research Farm, Obio Akpa Campus, Akwa Ibom State University, Nigeria. The research site is situated between latitude40 31 1 and 5030n and longitude 80 30' and 80 DOE, with annual rainfall of 2500mm. Total area of land for the experiment was 1 5m x 17m (255m2). Twelve beds were made With the dimension Of 4m X 3m each With pathways of 1m within land area and 0.05m between Other land areas.

EXPERIMENTAL TREATMENTS

Four treatment were replicated three times which includes three different levels of Poultry manure and one in which no poultry manure was added used as control, that is C tons ha-I, 2 tons ha", 4 tons ha-I and 6 tons ha•l. The poultry manures were obtained from the University poultry farm.

NURSERY MANAGEMENT

Amaranthus black seeds were sown in prepared nursery seedbeds on the experiment sit e. Little quantity of manure were applied in the seedbeds to aid it germination, seed were sown by broadcasting seeds over the bed. Transplanting was done in the evening so as to reduce temperature stress,

EXPERIMENT DESIGN

The experiment was laid out in a randomized Complete Block Design (RCBD) With three replications

CULTURAL PRACTICES

Land preparation: The land was cleared and debris were packed

Transplanting: After 30 days in the nursery, the seedlings were transplanted. The transplanting was done at a spacing of 50cm x 50cm.

Weeding: This was done twice at 2weeks after transplanting (WAT) and at 6 weeks after transplanting (WAT)

Fertilizer Application: Poultry manure was applied at 2weeks and 6weeks after transplanting using ring method.

Data Collection: Data were collected on the field from four (4) randomly selected plants and were tagged from each plot.

The growth parameters measured were;

Plant Height (cm): The plant height was measured with the aid of a meter rule from the soil level to the plant apex.

Stem Girth (cm): This was measured by typing a thread around the base area and reading the marks off a ruler.

Leaf Area (cm2): This was determined by measuring the length and width of leaf of tagged plants. It was later corrected factor

Thus LA = 08 x LW (Kuet and svobada, 1971)

Where

L=Length Of the leaf

W=Width of leaf

Number Of leaves: This was determined by manual counting of the marketable leaves on the plant.

Number of Branches: Number of branches were carefully counted on each tagged plant. The yield components

were:

Dry Matter Accumulation (g): This was determined by removing the moisture content of fresh foliage either through Sun drying or oven drying.

Foliage Weight (t/ha): This can be determined by cutting the leaves of the amaranthus plant and weighed

Germination Percentage (%): The germination percentage was determined by dividing the unsuccessful transplants from the successful transplants and multiplying the total by the percentage mark (1 00). The number of unsuccessful plants were out of 576 plant s, given a germination percentage of 83.33% was recorded.

1 STATISTICAL ANALYSIS

Data collected were subjected to analysis of variance (ANOVA) to determine the level of significance of treatment and means were significantly separated by the use of Least Significant Difference (LSD) at 5% probability level.

RESULT AND DISCUSSION

Result of soil physico-chemical properties at the Experimental Site before planting (Table 1), The result showed that the soil was sandy soil. Organic carbon and total N content were low (Essien et at, 2023), The soil was acidic (Essien e! al. 2024) Therefore, the soil growth yield required application of manure for proper yield

Table 1. Soil Physico- Chemical Properties of the Experimental Site before planting

Soil Properties	
Sand	88.70
Silt	6.30
Clay	5.00
PH (H20)	5.10
Electrical conductivity (ds/m)	0.08
Toatal Nitrogen (%)	0.11
Available phosphorus	87.55
Organic Carbon (%)	1 .42
Exchangeable Ca	3.01
Exchangeable Mg	1.59g
Exchangeable K	0.11
Exchangeable Na	0.07
Exchangeable Acidity	1 .95
ECEC	6.73
Base Saturation (%)	71.03

ECEC- Effective cation exchangeable capacity

Number Of amaranthus leaves Per Plant as Influenced by Poultry Manure Rates.

Number of leaves per plant of Amaranthus was significantly influenced by poultry manu re application at 4, 6, B, 10 and 12 weeks after transplanting (WAT), shown in Table 2. Th e amaranthus that received higher dose of poultry manure (4 and 6 t/ha) was significant ly taller than those that received 2tfha manure, which were also taller than the control. T he treatment of 6 t/ha had 38.40, 70.33, 97.52, 103.42 and 1 19.55 leaves per plant at 4, 6,8,10 and 12 WAT, respectively. The control treatment had 14.60, 27.40, 33.70, 38.30 an d 46 40 leaves per plant, respectively

Table 2, Number Of Leaves Per Plant as influenced by poultry manure

Rates of Poultry Manure (t/ha)	Weeks After Transplanting (WAT) 2	4	6	8	10	12
Control	780	14.6	27-40	33.72	38.30	46.40
2	8.33	22 46	51.70	71.50	80.44	88.21
4	9.40	34.60	68.09	91.30	101 .01	12.40
6	9.42	38.40	70.33	97.52	103 42	119.55
LSD (PSO.05)	NS	3.71	5.00	5.39	6.50	6.80

* NS Not Significant

Amaranthus Height (cm) as Influenced by Poultry Manure Rates

Plant height as influence by poultry manure rates indicated significant difference in all t he weeks under investigation except at 2 WAT- The increase in poultry manure rate from 2 to 4 t/ha indicated significant increase in plant height (Table 3), whereas statistically t here was no significant difference observed between the plant height in 4 t/ha and 6 t,th a rates, at 12 WAT- The plant that received 6 t/ha was significantly different from the hei ght in 2t/ ha.

Table 3: Amaranthus Height as Influenced by poultry manure Rate

Poultry manure Rate (t/ ha)	Weeks After Transplanting (WAT 2	4	6	8	10	12
Control	16.75	24.46	26.31	29-40	31.01	35.73
2	15.88	46.67	49.25	53.11	53.14	61.06
4	16.42	57.75	52.36	56.91	61.33	63.9B
6	16 45	58.33	52S4	5720	64.02	64.51

CSO (pso.05)	NS	2.62	2.70	3.01	3.18	3.25

NS = Not Significant

Leaf Area of Amaranthus as Influenced by Poultry manure Rates

Leaf area as affected by Poultry manure raters varied significantly at 4, 6, 8, 10 and 12 WAT (Table4). The largest leaf area, 91.33, 100.09, 11 3.70, 95.01 and 9483 cmz at4, 6, B, 10 and 12 WAT respectively. The leaf area recorded in the treatment of 6 t,tha poultry manure rate was not statistically significant, when compare to 91.30, 98.30, 110.66, 9, 3.75 and g3.70, respectively, recorded from the treatment of 4 t/ha with the leaf area of 3
5.02, 291 5, 2560, 2048 and 20.11 cmz, respectively.

Table 4: Leaf Area (cm3) Of Amaranthus as influenced by poultry manure rates

Poultry manure	Weeks After Transplanting (WAT)					
	2	4	6	8	10	12 Rate (t/ha)
Control	13.93	35.02	29.15	25.60	20.48	20.1 1
2	1 3.99	50.85	53.01	39.65	39.64	3925
4	14.01	91 .30	98.32	110.66	93.75	9370
6	13.97	91 .33	100.09	11 3.70	95.01	94.33
LSD (P<0.05)	NS	2.17	3.70	3.92	3.42	3.20

NS: Not Significant

Stem Girth Of Amaranthus as Influenced by Poultry Manure Rates

Stern girth as affected by poultry manure were not significantly different (Py 0.05) in all t he sample weeks (Table 5). However, in the stern girth, the highest dose of poultry manur e treatment recorded the biggest stem girth and was statistically significant when comp ared to the mean values recorded in control treatment

Table 5: Stem girth Of Amaranthus as influenced by poultry manure rates.

Poultry manure	Weeks After Transplanting (WAT)					
Rate (t/ha)	2	4	6	8	10	12
Control	1 .71	2.84	3.73	3.78	3.79	3.81
2	1 .75	3.71	4.81	4.88	4.89	5.03
4	1 .76	3.75	4.98	5.06	5.08	5.10

6	1.73	3.76	5.10	5.1 1	5.15	5.17
LSD (P<0.05)	NS	NS	NS	NS	NS	NS

NS Not significant

Number Of branches per plant as influenced by poultry manure rates

Number of branches per plant differed significantly (P 0:05) at 1,6,8,10and 12 WAT (T

able 6). The result showed that the Amaranthus plants that received higher dose of poult ry manure (4 and 6t/ha) branched profuse compared to the number of branches in 2t/ha plots and control treatment.

The result further indicated significant increase in number of branches per plant when 2t 'ha rate was compared to the control plot. At 12 WAT, the plot that received 6 t,fha poultr y manure had 31.75 braches, while 28.60 and 21.77 were recorded in 4 t/ ha and 2t/ha p oultry manure rates, respectively. The least number of branches per plant (14.06) was 0b served from the control treatment.

Table 6: Number of Branches Per Plant as influenced by Poultry Manure Rates

Poultry manure Rate (t/ha)	Weeks	After	Transplanting	(WAT)		
	2	4	6	8	10	12
Control	0.33	2.89	5.75	972	1241	14.06
2	0.33	4.55	8.06	14.98	19.34	21.77
4	0.32	6.33	10.31	19.11	24.67	28.60 31
6	0.36	6.81	12.41	22.40	26 40	75
LSD (P<0.05)	NS	1.60	1.71	2.18	2.36	3.23

NS = Not significant

Total Fresh Foliage Yield and Dry Matter Accumulation

Total foliage yield as influenced by poultry manure rate varied significantly (P<O.O 5) when compared to 7 70 t/ ha and 3.1 8t/ha from 2t/ha poultry manure and control plot s respectively. The total fresh foliage yield obtained from the treatment that received 6t/ ha poultry manure (12.19) t/ha) was not significant different (+0.05) When compared t 0 1 1 .33 t/ha total fresh foliage yield harvested from the treatment Of 4 t,fha poultry man ure.

Table 7: Foliage Yield and dry Matter Accumulation (g) of Amaranthus as Influenced b y Poultry Manure Rates.

Poultry manure rate (t/ha)	Total fresh foliage (t/ha)	Dry matter accumulation 1
Control	3.1 B	23.14
2	770	29.25
4	11 .33	30.71
6	12.19	30.71
LSD €0.05)	1 88	1 .51

DISCUSSION

The significant number of leaves per plant, leave area, plant height, total fresh foliage yield and dry matter accumulation in the plots with poultry manure rates could be attributed to the improvement of soil fertility which in turn increased the vigour in term of the plants. The findings of this investigation is in consonant with the report of Ogedegbe (2013); Akata (2015) that increase in dose of poultry manure significantly increase the growth and fresh foliage yield of Amaranthus curentus.

Apparently, the poultry droppings obtained was from battery cage house, which contain higher nitrogen than those from deep litter house, where sawdust and wood shaving constitute a significant part of total manure, thereby having a high CN ratio and lower rate of mineralization (Akata, 2006).

Ogedebge (2013) and Akata (2015) reported higher Amaranthus yield in plots treated with manure obtained from battery cage. The increase in growth and yield of Amaranthus could be due to higher nutrient content in the manure (Akpaninyang et al., 2015; Ekwere et al., 2019).

The increase in vegetative growth with increase in manure rate could be that the nitrogen content of the poultry manure promotes vegetative growth of the plants, this observation is in conformity with Akata et al., (2016); Ikeh et al., (2013) that N enhanced the photosynthesis process in turn resulted in high vegetative yield.

CONCLUSION

The application of poultry manure enhanced the growth and yield of Amaranthus. The fresh foliage yield and dry matter accumulation obtained from the treatment of 6t/ha was significantly different when compared to 2t/ha and control treatments. Furthermore, the fresh foliage yield and dry matter accumulation recorded from the treatment that received 6t/ha and 4 t/ha poultry manure were not significantly different. It is recommended that application of 4t/ha poultry manure should be appropriate for optimum production of Amaranthus in Obio Akpa soils of Akwa Ibom State.

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