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Global Journal of Research in Agriculture & Life Sciences
ISSN: 2583-4576 (Online)
Volume 05 | Issue 03 | May-June | 2025
Journal homepage: https://gjrpublication.com/gjrals/

Research Article

Influence of Organic and Inorganic Nutrient Sources on the Growth and Shoot Yield of Amaranthus Variety (AMARANTHUS CRUENTHUS) in North East Nigeria

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DOI: 10.5281/zenodo.15377640 **Submission Date: 05 April 2025 | Published Date: 10 May 2025**

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Abstract

Field experiments are carried out to determine the effect of organic and inorganic nutrient sources on the growth and shoot yield of two varieties of Amaranthus at the Teaching and Research Farm of the Federal University Wukari, Taraba State Nigeria during the 2020 and 2021 cropping seasons. The two varieties of Amaranthus used as treatments are Amaranthus cruentus and Amaranthus caudatus, the organic fertilizers were, poultry manure, cow dung and compost manure and inorganic fertilizers are, N.P.K (15:15:15), Urea and the control application (0kg/ha) these fertilizer treatments were applied to two varieties of Amaranthus in a randomized complete block design and replicated three times. Data were collected on growth, shoot yield and dry matter production parameters of the plant and were analyzed using analysis of variance (ANOVA) at 5% level of probability ($P \leq 0.05$). The results recorded showed that application of fertilizers either organic or inorganic improved the growth and shoot yield parameters of the plants when compared to unfertilized plants. Poultry manure produced significantly highest fresh shoot weight at 4, 5 and 6 weeks after planting as well as the highest number of leaves, nodes and plant height. It was observed that poultry manure was outstanding in performance in all treatments during the experiment going by its responses and more suitable than NPK fertilizer. Fresh Shoot weight of (7.50g) and (7.89g) are recorded for poultry application at 6 and 7th week against (2.61g) and (6.16g) for NPK, hence poultry manure is therefore recommended for the production of Amaranthus vegetable.

Keywords: *NPK, poultry manure, cow dung, urea, organic manure, vegetable.*

INTRODUCTION

Vegetable crops are the most important food diet to humanity which provides body with minerals and vitamins needed for normal growth and development (Dhandevi and Rajesh, 2015: Asaduzzaman and Toshiki, 2018). Amaranthus as a vegetable is one of the most produced annual leaf vegetables in Africa and is among the highly cultivated vegetable in Nigeria. It provides regular income for the farmers throughout the year for it could be grown within 5 and 6 weeks and severally by the farmers (Adewole and igberaese,2011). The vegetable provides the body with required nutrition such as vitamins fibres and minerals Bailey, 1992. It could also be a good source of fodder for animals especially cattle and goats. Amaranthus also has pharmacological properties (Baral et al, 2011: Alegbejo, 2013). Decrease in soil fertility as results of continuos cultivation has been a major problem facing the production of Amaranthus vegetable. This could be overcome by the use of fertilizer either as organic or inorganic (Adeyemi et al, 1999; Lucas and Ojeifo, 2000). Inorganic fertilizer is not readily available and where they are the price is too high for the farmers. Therefore, organic fertilizer is the only nutrients that are affordable and available for the resource poor farmers who engage in the vegetable production (Olufolaji et al, 1999). Several reports are available on the use of organic fertilizers in the production of vegetables. Daramola, et, al 2009, reported an improvement in the growth and dry matter yield of Amaranthus through the application of different organic nutrients sources, Akanbi et, al, 2006 also reported increase in the shoot yield of Celosia from the applied organic fertilizer application. But more information is needed on the dosage rates for effectiveness of

different fertilizers on the growth and yield of Amaranthus vegetable. Hence the study is design to evaluate the effect of different fertilizer rates on the growth and shoot yield of Amaranthus in the study area.

MATERIALS AND METHODS

Experimental Site

The studies are carried out at the Teaching and Research Farm of Federal University Wukari, Taraba state, Nigeria during the raining seasons of 2020 and 2021 to study the effect of organic and inorganic fertilizer application on the growth and shoot yield of Amaranth vegetable. Taraba state lies between latitude $6^0$30, 8^0 30N of the equator and longitude 9^0 and 12^0E of the Greenwich meridian with a land mass of 54.426km^2. The state has a tropical wet – dry climate, well drained alluvial soils and has both savannah and Rain Forest vegetation. The rainfall ranges from 100 mm to 250 mm per annum in the north with the driest and wettest season lasting from December to February and July to September, respectively. Soil sample of the site was collected at 15cm depth using an auger and poultry manure collected was taken for analysis while the land was ploughed and harrowed. The soil was analyzed for P^H, nitrogen, carbon, organic matter and the concentration of phosphorus, calcium and magnesium. The soil P^H was determined using the distilled water in KCL with a soil water ratio of 1:2.5. The suspension was thoroughly stirred and allowed to stand for 30minites after which the P^H was determined using an electronic P^H meter. Total nitrogen was determined by micro Kjeldahl digestion method described by A.O.A.C (1980). The cations (Ca, Mg) were determined by the atomic absorption method as outlined in the Analysis of the official Analytical Chemists (A.O.A.C, 1980).

Treatments and Experimental Design

The experiment was laid out in a complete randomized block design and replicated three times. The treatments consisted of two varieties of Amaranthus which are Amaranthus cruentus and Amaranthus cadulatus and five fertilizers comprising organic sources as poultry manure at 10t/ha, cow dung at 10t/ha, compost manure at 10t/ha and inorganic sources as NPK15:15:15 at 150kg/ha and Urea at 100kg/ha with a control (0kg/ha). These were arranged in a randomized complete block design with three replications.

Cultural Practices

The seeds were purchased from the certified seed seller at Osogbo Osun State, Nigeria. The plot size for the experiments was 2m x 1m and the total number of plots used is 36. The organic manure was applied onto the plot two weeks before planting while the inorganic fertilizers (urea and NPK) are applied one week after germination. Seeds were drilled in three rows of 60cm on each plot and covered with a light soil while pre soil of the site as well as organic fertilizers are chemically analyzed and the results are presented in table 1 and 2. Destructive sampling are carried out at 4,6,8,10 weeks after planting and the growth and shoot yield parameters of the plant were taken which includes plant height ,number of leaves ,nodes branches and fresh shoot weight as well as dry matter yield of stem ,leaves and root were all taken by oven dry the plant samples at a temperature of 72 ^{oc} for 48hrs in the laboratory after which the weight of different parts were taken and recorded.

Data Analysis

The data collected were subjected to analysis of variance (ANOVA) where the least significant difference (LSD) and Duncan Multiple Range Test (DMRT) are used to separate the mean at 5% level of probability.

RESULTS

The results of the pre soil and organic fertilizers used were shown in Table 1 and 2. The soil of the experiment was found to be sandy loam and has low nitrogen as well as organic matter contents which indicated low soil fertility. Therefore, soil amendment in form of fertilizer is needed to improve the soil fertility. The variety effect was significant on the growth and shoot yield parameters taken in the study (Table 3). The variety two (Amaranthus caudatus) produced significantly higher plant height at all the growth stages as well as number of leaves, nodes, root weight, fresh weight and dry matter yield but there was no significant difference in the number of branches produced by the plant. The effect of applied fertilizer treatments on the plant height was significant statistically and poultry manure application produced the tallest plants followed by cow dung but the control produced the shorter plants as shown in (Table 4). The number of nodes was also positively influenced by the fertilizer treatments in the studies and the poultry manure gave the outstanding number of nodes at every stage of the growth measured followed by cow dung and organic manure application (Table 5). The number of leaves produced was also significantly affected by the applied treatments in all stages of growth measured. The poultry manure treatment gave the highest leave number at 4 to 8weeks after planting while at 9 and 10 weeks the best results for leave number came from organic compost treatment and the control treatment had the least leave number (Table 6). There was no significant difference in the number of branches produced as well as seed weight irrespective of the fertilizer treatments applied on the plant (Table 7). Furthermore, the fertilizer treatments also affected fresh shoot weight positively at 4 to 7 weeks after planting and poultry manure treatment gave the significantly highest fresh shoot weight follow by NPK and urea while there was no significant relationship at 8 to 10

weeks after planting as shown in (Table 8). The fresh root weight results obtained indicated that poultry manure application produced the best root weight at 4 to 9 weeks after planting but although at 7, 8 and 10 week after planting there was no significant relationship among the treatments (Table 9). The dry matter weight of leaves was significantly affected by the fertilizer treatment only at 4 and 6 WAP as observed in (table 10) where cow dung had the highest at 4 weeks and poultry manure at 6weeks respectively. Table 11 showed the stem dry weight taken during the experiment and the result recorded indicated a significant relationship among the fertilizer treatments at 4 to 8 weeks after planting (WAP). Cow dung produced the best stem dry weight at 4 WAP while poultry manure application gave the highest stem dry weight at 5, 6 and 8 WAP. Root dry weight was only significantly affected by the treatments at 4, 5, 8 and 10 WAP, and the poultry manure application was best when compared to other fertilizer treatments used except at 4WAP where cow dung significantly produced higher root dry weight of (0.55g) (Table 12).

Variety and fertilizer treatments effect on the growth and shoot yield of Amaranthus are presented in (Table 13) where the variety and poultry manure produced the highest plant height at all the stages of growth measured followed by variety A, cruentus and poultry manure application and the least height from the control treatment. The influence of variety and fertilizer treatments on the number of leaves indicated that variety A, caudatus and poultry manure produced the best results at 4 and 5 weeks after planting while at 6 WAP variety A, cruentus and poultry manure application gave the best leaves number. Furthermore at 7, 9 and 10 WAP variety A, caudatus and organic manure treatment gave the best number of leaves when compared to other treatments combination. The observation for the number of nodes was seen in table 13, and variety A, caudatus with poultry manure gave the highest nodes number at 4, 5, 6, 8, and 9 WAP while at 12 WAP variety A, caudatus with cow dung had the best nodes number. Fresh shoot weight also had significant relationship among the treatments combinations in this case the results obtained indicated that variety A, caudatus and poultry manure produced the highest and significant fresh shoot weight at all sampling periods except at 9WAP where variety A, caudatus and organic manure application gave the best result. The fresh root weight also had the same trend as the fresh shoot weight in the study. There was a significant relationship among the treatment combinations on the leaves dry weight at all growing periods except at 5WAP. variety A, caudatus and cow dung produced the best leaves dry weight at 4WAP and at 6 and 7 WAP variety A, caudatus and poultry manure had the best leaves dry weight when compared to other treatments combination. Furthermore, at 8WAP it was variety A, caudatus and cow dung while at 9 and 10 WAP variety A, caudatus and urea and variety A, caudatus and NPK respectively gave the best leaves dry weights. The stem dry weight also had significantly relationship among the treatment combinations in the study except at 7 WAP where there was no significant difference between the treatments combination means. The variety A, caudatus and cow dung and variety A, caudatus and poultry all gave the best stem dry weight when compared to other treatments combinations. The results obtained on seed weight parameter in the study indicated that seed weight was only significant at 10 WAP where variety A, caudatus and poultry manure produced the highest seed weight of (3.78g).

Table 1: The soil chemical and physical analysis of the Teaching and d Research Farm, Federal University, Wukari

Properties	values
$P^{H(H2o)}$	5.75
Organic carbon (%)	1.36
Organic Matter (%)	2.35
Total N (%)	0.98
Available P (MgL^{-1}	0.52
Exchangeable K (mol/kg)	1.6
Exchangeable Na (mol/kg)	2.1
Exchangeable Ca (mol/kg)	3.8
Exchangeable Mg (mol/kg)	1.8
Exchangeable Acidity (mol/kg)	1.10
TEB	9.3
CEC	10.4
Base Saturation (%)	89.4
Sand (g/kg)	76.80
Clay (g/kg)	15.20
Silt(g/kg)	8.0
Textural Class	Sandy loam soil

Table 2: The Nutrient compositions of the organic fertilizers used in the study.

Treatments	P^H	%C	%N	P	K	Ca	Mg	Na
Poultry Manure	7.50	8.50	5.74	1.79	0.38	2.62	1.76	0.02
Cow Dung	7.90	8.90	5.60	0.56	3.57	3.10	1.34	0.02
Organic Manure	7.80	7.48	4.76	0.84	0.96	0.26	0.28	0.01

Table 3. The effect of varieties on the growth parameters of Amaranthus species at different sampling periods

Variety	Week after planting	Plant height (cm)	Number of leaves	Num ber of nodes	Number of branches	Fresh plant weight (g)	Root fresh weight (g)	Stem dry weight (g)	Leaves dry weight (g)	Root dry weight (g)
V1	**4WAP**	9.64b	5.80b	4.56b		1.54b	0.27b	0.31b	0.53b	0.12b
V2		15.80a	9.44a	7.58a		4.62a	1.22a	0.95a	1.22a	0.27a
Mean								0.16	0.23	0.76
V1	**5WAP**	15.74b	9.20a	7.16a		1.98a	0.33a	0.65a	0.90a	0.24a
V2		18.04a	9.33a	7.16a		2.33a	0.42a	0.89a	1.16a	0.34a
Mean		0.86	0.50	0.39		0.28	0.08	0.31	0.27	0.09
V1	**6WAP**	15.84b	10.93a	10.56b		2.53b	0.36b	1.02b	0.94b	0.30b
V2		25.71a	11.13a	12.56a		6.36a	1.22a	2.55a	2.28a	0.67a
Mean		1.81	0.71	0.19		0.82	0.19	0.55	0.51	0.17
V1	**7WAP**	17.46b	11.53b	12.07 b		3.35b	1.21b	1.08b	0.65a	0.30b
V2		27.28a	14.11a	15.04a		10.14a	3.75a	2.69a	0.50b	0.76a.
Mean		1.62	0.52	0.50		1.39	0.76	0.66	0.41	0.15
V1	**8WAP**	16.35b	11.82b	11.98b	0.22a	2.82b	0.67a	1.08b	1.20b	0.59b
V2		29.55a	13.58a	15.11a	0.00a	5.56a	1.30a	33.47a	2.28a	1.20a
Mean		1.45	0.83	0.46	0.02	0.57	0.23	0.72	0.36	0.22
V1	**9WAP**	21.99b	11.89b	14.67b	0.04a	6.87b	1.96b	1.76b	1.07b	0.68b
V2		37.56a	14.56a	20.29a	0.00a	31.60a	6.98a	6.06a	3.06a	1.90a
Mean		2.76	0.77	0.93	0.04	6.75	1.30	1.56	0.55	0.41
V1	**10WAP**	18.35b	10.60b	13.80b	0.00	2.14b	0.45b	1.24b	0.71b	0.46b
V2		38.57a	13.07a	18.33a	0.00	6.13a	0.96a	4.60a	2.08a	0.99a
Mean		2.38	0.58	0.59	0.00	1.02	1.02	0.88	0.37	0.19

Values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting, V1= Amaranthus cruentus, V2 = Amaranthus caudatus.

Table 4. Effect of Fertilizer treatments on Plant Height of Amaranthus spp, at different sampling periods

Fertilizer treatments	4 WAP	5 WAP	6 WAP	7WAP	8 WAP	9 WAP	10 WAP
NPK	8.58 b	12.08 c	14.63 b	16.42 c	17.38 c	20.07 c	23.61b
UREA	8.52 b	14.80 b	16.47 b	20.55 bc	20.03 bc	25.22 bc	27.15b
POULTRY	24.87 a	28.19 a	34.19 a	35.04 a	32.71 a	42.29 a	39.29a
Cow Dung	11.36 b	15.66 b	19.77 b	21.66 b	23.57 b	28.96 b	29.26b
COMPOST	10.26 b	13.72 bc	18.82 b	18.19 bc	21.06 bc	25.96 bc	29.56b
CONTROL	8.01 bc	12.28 c	13.04 c	15.98 c	17.49 c	19.64 c	22.56b
Mean	2.85	2.72	5.68	5.11	4.56	7.49	8.68

Values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting, V1= Amaranthus cruentus, V2 = Amaranthus caudatus

Table 5. Effect of Fertilizer treatments on Number of Nodes of Amaranthus spp, at different sampling periods

Fertilizer treatments	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP	9 WAP	10 WAP
NPK	5.89 b	6.72 b	10.67 b	13.39 ab	11.11 c	16.17 b	14.78 b
UREA	5.44 b	7.50 b	11.00 b	13.17 b	13.44 b	16.50 b	14.61 b
POULTRY	8.56 a	9. 22 a	14.11 a	14.56 a	15.78 a	21.94 a	18.94 a
Cow Dung	6.00 b	7.00 b	10.06 b	13.44 b	14.06 b	16.89 b	17.33 a
COMPOST	5.44 b	6.83 b	11.94 b	13.22 b	13.33 b	18.39 b	14.67 b
CONTROL	5.04 b	5.98 b	10.01 b	12.46	10.88 c	16.01 b	14.04 b
Mean	1.14	1.21	1.92		1.45	2.93	1.87

Values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting, V1= Amaranthus cruentus, V2 = Amaranthus caudatus.

Table 6. Effect of Fertilizer treatments on Amaranthus spp Number of Leaves at different sampling periods

Fertilizer treatments	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP	9 WAP	10 WAP
NPK	7.00 bc	9.11 ab	10.28 b	11.61 b	11.50 a	11.61 b	10.28 b
UREA	6.67 bc	9.17 ab	11. 28 ab	13.33 a	12.50 a	12.17 ab	11.83 ab
POULTRY	10.28 a	10.39 a	12.61 a	12.94 ab	14.11 a	14.29 a	11.94 ab
Cow Dung	7.78 b	8.89 ab	9.28 b	12.89 ab	13.11 a	13.56 ab	12.44 a
COMPOST	6.39 c	8.78 b	10.72 ab	13.33 a	12.28 a	14.50 a	12.67 a
CONTROL	5.89 c	8.01 b	9.13 b	10. 57 bc	11.04 b	11.04 b	9.49 bc
Mean	1.35	1.56	2.23	1.62	2.42	2.42	1.83

Values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting, V1= Amaranthus cruentus, V2 = Amaranthus caudatus.

Table 7. Effect of Fertilizer treatments on Number of Branches for Amaranthus spp, at different sampling periods

Fertilizer treatments	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP	9 WAP	10 WAP
NPK	0.00 a	0.00 a	0.00 a	0.11 a	0.00 a	0.00 a	1.83 a
UREA	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a	2.22 a
POULTRY	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a	6.33 a
Cow Dung	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a	0.88 a
COMPOST	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a	0.53 a
CONTROL	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a	0.00 a	0.48 a
Mean	0.14	0.14	0.14	0.14	0.70	0.14	4.46

values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting.

Table 8. Effect of Fertilizer treatments on Fresh Shoot Weight of Amaranthus spp, at different sampling periods

Fertilizer treatments	4 WAP	5 WAP	6 WAP	7 WAP	8WAP	9 WAP	10 WAP
NPK	4.46 a	1.50 b	2.61 b	6.16 b	0.51 a	16.67 a	3.18 a
UREA	2.14 b	2.06 b	4.17 b	7.86 a	0.98 a	16.34 a	3.66 a
POULTRY	4.67 a	3.83 a	7.50 a	7.89 a	1.32 a	23.18 a	5.74 a
Cow Dung	2.61 ab	1.56 b	3.61 b	6.19 b	0.99 a	16.61 a	4.15 a
COMPOST	1.53 b	1.83 b	4.33 b	5.62 b	1.14 a	23.18 a	3.96 a
CONTROL	1.23 bc	1.48 b	2.48 b	5.03 c	0.49 a	15.88 a	3.08 a
Mean	2.19	0.89	2.57		1.01	22.43	3.21

Values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting.

Tale 9. Effect of Fertilizer treatments on Fresh Root Weight of Amaranthus spp, at different sampling periods

Fertilizer treatments	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP	9 WAP	10 WAP
NPK	0.70 b	0.22 b	0.50 b	2.34 a	0.51 a	2.57 b	0.69 a
UREA	0.25 c	0.29 b	0.76 ab	2.75 a	0.98 a	4.28 ab	0.50 a
POULTRY	2.00 a	0.68 a	1.16 a	2.63 a	1.32 a	7.57 a	0.92 a
Cow Dung	0.33 c	0.28 b	0.64 ab	2.37 a	0.99 a	3.35 b	0.88 a
COMPOST	0.45 bc	0.40 b	0.89 ab	2.32 a	1.13 a	4.55 ab	0.53 a
CONTROL	0.02 c	0.18 bc	0.48 b	2.01 a	0.53 a	3.84 b	0.58 a
Mean	0.34	0.25	0.61	2.53	1.01	4.09	0.60

Values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting.

Table 10. Effect of Fertilizer treatments on Leaf Dry Weight of Amaranthus spp, at different sampling periods

Fertilizer treatments	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP	9 WAP	10 WAP
NPK	0.79 b	0.66 a	0.86 b	1.16 a	1.16 a	1.70 a	1.58 a
UREA	0.39 b	1.01 a	1.50 ab	2.35 a	1.87 a	2.32 a	1.43 a
POULTRY	0.60 b	1.52 a	2.77 a	1.49 a	2.08 a	2.22 a	1.55 a
Cow Dung	2.11 a	0.89 a	1.22 ab	1.12 a	1.90 a	1.93 a	1.23 a
COMPOST	0.52 b	1.07 a	1.70 ab	1.38 a	1.59 a	2.17 a	1.19 a
CONTROL	0.38 b	0.48 a	0.64 b	1.18 a	1.09 a	1.8.4 a	1.05 a
Mean	0.77	0.89	1.69	1.38	1.18	1.84	1.22

Values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting.

Table 11. Effect of Fertilizer treatments on Stem Dry Weight of Amaranthus spp, at different sampling periods

Fertilizer treatments	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP	9 WAP	10 WAP
NPK	0.29 b	0.35 b	0.81 b	1.68 a	1.19 b	2.70 a	2.04 a
UREA	0.17 b	0.46 b	1.31 ab	2.02 a	1.55 ab	4.23 a	2.74 a
POULTRY	0.40 b	1.84 a	2.84 a	3.01 a	3.88 a	5.87 a	4.49 a
Cow Dung	2.00 a	0.59 b	2.46 ab	1.41 a	2.31 ab	2.85 a	3.12 a
COMPOST	0.29 b	0.61 b	1.52 ab	1.29 a	1.95 ab	3.90 a	2.21 a
CONTROL	0.18 b	0.38 b	0.95 b	1.58 a	1.60 b	2.98 a	2.45 a
Mean	0.53	1.02	1.83	2.21	2.40	5.18	2.91

Values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting.

Table 12. Effect of Fertilizer treatments on Root Dry Weight of Amaranthus spp at different sampling periods

Fertilizer treatments	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP	9 WAP	10 WAP
NPK	0.15 b	0.12 b	0.29 a	0.44 a	0.42 b	0.83 a	0.38 b
UREA	0.06 b	0.18 b	0.41 a	0.58 a	0.76 ab	1.33 a	0.67 b
POULTRY	0.12 b	0.65 a	0.73 a	0.71 a	1.44 a	1.94 a	1.14 a
Cow Dung	0.55 a	0. 24 b	0.46 a	0.46 a	0.90 ab	1.05 a	0.83 ab
COMPOST	0.09 b	0.26 b	0.53 a	0.45 a	0.96 ab	1.31 a	0.59 ab
CONTROL	0.06 b	0.21 b	0.34 a	0.49 a	0.48 b	0.98 a	0.34 b
Mean	0.16	0.29	0.57	0.49	0.73	1.36	0.62

Values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting

Table 13 Interactive effect of fertilizer application and varieties on the growth parameters of the Amaranthus at harvest

Fertilizer treatments	Variety	Plant height	Number of leaves	Number of nodes	Fresh shoot weight	Fresh root Weight	Leaves dry weight	Seed dry weight
NPK	V1	12.80e	9.67c	12.56ef	1.24c	0.20b	0.41b	0.00b
	V2	27.33cd	10.89 bc	17.00c	5.11abc	1.78a	2.74a	1.25b
UREA	VI	15.08e	10.22c	12.56ef	1.80bc	0.20b	0.75b	0.00b
	V2	35.37bc	13.44ab	16.67cd	5.52ab	0.80b	2.11ab	1.87ab
POULTRY	V1	32.86bc	11.00bc	17.89abc	4.44abc	0.98ab	1.16ab	1.50b
	V2	51.73a	12.89ab	20.00ab	7.03a	0.85ab	1.94ab	3.78a
COW Dung	V1	17.02de	10.89 bc	14.33de	2.17bc	0.62ab	0.75ab	0.22b
	V2	40.89b	14.00a	20.33a	6.12ab	1.14a	1.71ab	2.13ab
COMPOST	V1	14.00e	11.22bc	11.67f	1.04c	0.22b	0.49ab	0.07b
	V2	37.52bc	14.11a	17.67b	6.88a	0.84ab	1.89ab	1.68ab
CONTROL	V1	12.40e	9.88c	11.84f	1.88bc	0.26b	0.49b	0.08b
	V2	12.88e	10.52bc	12.89ef	1.98bc	0.60ab	0.75b	0.09b
Means		10.59	2.58	2.65	4.54	0.85	1.72	2.16

Values with different letters along the columns are significantly different using DMRT at 5% probability level. WAP = Weeks after planting.

DISCUSSION

The soil of the field used in this research work showed low in Nitrogen nutrition and organic matter contents which indicated that the soil is low in fertility. This made the application of fertilizer to be more appropriate in this study. This in line with the finding of Law-Ogbomo et al 2009, that organic fertilizer application increases vegetable growth and yield in poor tropical soils. Also, the use of organic materials such as manure, compost, etc to amend poor and degraded soils has produced positive results through physical and biological rejuvenation Havlin et at, 2005. Variety two (Amaranthus caudatus) used in the study produced Highest plant height, Number of leaves, nodes number and dry matter yield, this implies that the variety (2) (Amaranthus caudatus) showed the genetic superiority which may be due to the inherent genetic ability in variety A. caudatus as documented by Amarullah (2020) and Adetunji et al, 2011 on Cassava crops. This is supported by the work of Alka shuk et al 2018 where he observed genetic diversity in accessions of Amaranthus species. Fertilizer treatments improved the growth and shoot yield of Amaranthus vegetable in the study which may be attributed to the adequate supply of various mineral nutrients required by the vegetable plant for normal growth and developments (Egbe, et al 2013). Poultry manure application produced the highest plant growth parameters such as the plant height, number of nodes, and leaves, fresh shoot weight and also dry matter yield. This observation is in agreement with that of Akanbi et al, 2010, and Babalola et al 2001) in their study on tomato, okro and roselle (Hibiscus Sabdariffa). Shoot yield of the Amaranthus vegetable was better improved by the poultry manure treatment which may be due to the supply of organic Nitrogen by the manure. Nitrogen is an important constituent of chlorophyll, protein, amino acid, nucleic acid nucleotides, enzymes alkaloids and vitamins, which played a key role in Carbohydrate and protein metabolism. This made it to be an essential in plant growth and development. (Myer, 1998) The nitrogen supply promoted cell division and enlargement that ultimately enhanced vegetative growth of the plant and lead to increase leaf number and sizes which help the plant to intercept adequate Sunlight for the production of more carbohydrate and assimilate during photosynthesis; that improved growth and development. Malok et al, 2003, Daramola et al, 2009. The combination effect of variety and fertilizer in the study showed that, variety 2, (Amaranthus claudatus) when combined with poultry manure produced significantly highest shoot yield, dry matter yield and seed weight. This may be due to the property of poultry manure, which supply not only primary, but secondary and trace elements and release to the plant in synchrony with crop needs throughout the growth season. (Janik, 1986 Plaster, 1992, Daramola et al 2009.)

CONCLUSION

The improvement recorded in the study with the reference to Amaranthus vegetables in terms of their growth parameters, dry matter yield production and seed weight to applied fertilizer than no fertilizer treatment showed the important of nutrients for optimum production of Amaranthus vegetable. Poultry manure ranks the first followed by cow dung, and compost manure respectively in the study. Therefore, productivity of amaranths vegetables can be improved through adequate fertilization especially the use of poultry manure at the rate of 10t/ha.

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CITATION

Adeyeye, A.S, Etukudo, O.O, Ahmadu, R, Balogun, K, Olalekan, K.K, Gadu, H.O, & Ishaku, M.A. (2025). Influence of Organic and Inorganic Nutrient Sources on the Growth and Shoot Yield of Amaranthus Variety (AMARANTHUS CRUENTHUS) in North East Nigeria. In Global Journal of Research in Agriculture & Life Sciences (Vol. 5, Number 3, pp. 24–31). https://doi.org/10.5281/zenodo.15377640