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Effect of Different Rates of Poultry Manure On Growth and Yield of Amarathus (Amaranthus Cruentus)

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Abstract: *Amarathus is an important leafy vegetable that is nutritionally and medically very relevant in human diet, thus the effect of poultry droppings (otlha, 5tlha, 10t/ha, 15t/ha and 20t/ha) was studied. Data collected on weekly basis were plant height, number of leaves, leaf area, fresh shoot weight, fresh root weight, dry shoot weight and dry root weight. Results obtained from the study showed no significant (P=0.05) difference among the higher rates of poultry manure (10t/ha, 15t/ha, and 20t/ha), but significantly performed competitively better than the lower rates of 5t/ha and 0t/ha, in most of the parameters assessed. The growth and yield parameters measured increased with increasing rate of the poultry manure applied. The plants treated with 20t/ha rate of poultry manure recorded the highest value in all the parameters studied. Thus for maximum increase production of amarathus in the studied area, 20t/ha of poultry manure should be used.*
Keyword: *Amarathus, growth, poultrymanure, yield.*

I. Introduction

Amarathus (Amarathus cruentus) is an important vegetable crop grown in Nigeria, mostly for its leafy material used in preparing dishes such as soup, stew, salad porridge and as garnish. The leafy material contain well balanced protein as it is enriched with the presence of lysine, an essential amino acid lacking in cereal and tubers. Hence Amarathus protein can be comparable to animal protein. According to Kauffmah and Webber, (1990), Amarathus leaves contain 17.5-38.3 percent protein of which 5% is lysine, an essential amino acid. Nutritionally, the leaves are more superior than spinach and lettuce and contain high levels of carotene and micronutrients such as Na, Cu, Ma, and Cl (Shippers, 2000, Mnkeni 2005, Janick 1997, Kauffman and Webber, 1990), Medically, Martiorosyan and Miroshnichen, (2007), observed that people with hypertension and cardiovascular disease can use the leaves as an effective alternative to drug therapy. Amarathus grains are equally edible and nutritious. It has been found useful in bakery and feed production industries.

In developing countries, the problem of protein deficiency is paramount, hence increased production of crops like Amarathus with balance protein, short growing and maturing period, less labor intensive is highly desirable, however the increased production of this crop is confronted with low yield, soil infertility and deficiency in important mineral nutrients. The reason has been the high cost of fertilizers and non-availability that limit the use by the poor resource farmers. Secondly most of the fertilizers are high soluble types that lead to faster leaching of nutrients (Lampkin, 200, Rembialkowska, 2003). Therefore, an animal waste in the likes of poultry droppings is a better alternative. Poultry manure is a good source of organic matter which has been considered as the life wire of soil as well as store house of chemical nutrients. Organic manure generally ameliorates the entire soil physical, chemical and biological properties of the soil as it energies the activities of soil microbes, which help in the liberation of plant nutrients and the healthy growth of the crop plants. Organic manure has also been found to sustain yield under continuous cropping and improve the fertility of a degraded soil (Eghareyba and Ogbe, 2002). According to Colling Wood, et al, (1988), proper poultry manure is required for optimum growth and development of vegetable since excessive nitrogen increases their susceptibility to fungal disease and deterioration of keeping quality. Hence there is need for poultry manure application in cropping system to maximize nutrient recycling and to minimize losses. Thus the objective of this study was to determine the effect of different rates of poultry manure on growth and yield of Amaranthus.

II. Material And Method

The experiment was conducted at the Teaching and Research Farm of the Department of Crop Science and Horticulture, Anambra State University, Igbariam Campus. The experimental site lies on latitude $06^{0}14'$N and longitude $06^{0}45'$E. The rainfall pattern is bimodal between April and October, with a mean annual rainfall of 2500mm. The relative humidity of the study area is moderately high all the year round and the temperature range is between21^{oc}-35^{0c}. The soil is of the sandy clay loam textural class and classified as Ultisol (FDALR, 1985).

Nursery operation/Field preparation/Experimental design and Treatment allocation.

The nursery was carried out in the field and the nursery bed was prepared by repeated tilling to maintain a good seed bed for seed germination. Poultry manure was incorporated, watered and allowed to age for two days before the seeds were sown by broadcasting. The nursery bed was not shaded, for the sake of sunlight that was observed to be necessary for amarathus. At 21days old the seedlings were transplanted, at the height of 10cm corresponding to 7 leaves. Prior to uprooting the seedlings, they were watered 30 minutes before the time. The seedlings were later removed with ball of soil so as not to disturb their roots and as 'shock absorber' to transplanting exercise. The experimental sites were the seedlings were to be transplanted was cleared using cutlass and cultivated manually using hoe. The plots were laid out as randomized complete block design (RCBD) with three replicates. The land was measured 7.4m x 11m given an experimental area of 81.4m^2 and three blocks each measuring 1.8m x 11m was marked out. Each block was further divided into 5 plots, each squared plot measuring 1.8m x 1.8m with 0.5m paths between plots and 1m spaces between blocks. In all there were a total of 15 experimental plots. The different rates of poultry manure (0t/ha, 5t/ha, 10t/ha, 15t/ha and 20t/ha) were applied by broadcasting in the respective plots and incorporated into the soil. The plots were watered for 7 days to encourage rapid mineralization of poultry manure before transplanting. The transplanted seedlings were then carefully inserted into the hole made for them. The seedlings were spaced at 30cm between plots in a row and 30cm between rows. The experimental field was kept relatively weed free till harvest. The parameters measured were, number of leaves, leaf area, plant height, fresh shoot weight , dry shoot weight and dry root weight at 5 weeks after planting (WAP), 6 WAP and 7 WAP.

Data Analysis:

Data generated from the study were subjected to analysis of variance (ANOVA), according to steel and Torrie (1980) and separation of treatment means for significant effects was done using the least significant difference (LSD) at 5% alpha level.

III. Results

The result of plant height measured at 5, 6, 7 WAP in Table 1 showed that the height of plant at 20t/ha, 15t/ha, 10t/ha and 5t/ha did not differ significantly, but significantly (P=0.05) better than the height of the plant treated with 0t/ha. The highest plant at 5WAP was observed in plots treated with 15t/ha but as the weeks increased to 6 and 7 weeks, the plots treated with 20t/ha gave the highest plant height. The result of 6WAP, indicated that 20t/ha performed significantly better than the 5t/ha and 0t/ha, though at par with 10t/ha and 15t/ha. The number of leaves result in Table 1 showed an order of 20t/ha>15t/ha>10t/ha>5t/ha>0t/ha in 5WAP, 6WAP and 7WAP and they were statistically non-significant, but significantly higher than the control.

Table 1 Effect of different rates of poultry manure on plant height (cm) Number of leaves, Leaf area (cm^2) of amarathus

Treatment	Plant height cm			Number of Leaves			Leaf area (cm^2)		
	5WAP	6WAP	7WAP	5WAP	6WAP	7WAP	5WAP	6WAP	7WAP
0t/ha	20.0	25.6	48.5	17.6	48.7	66.7	39.9	50.7	75.1
5t/ha	27.5	38.8	61.7	38.1	81.1	101.5	69.2	101.7	116.2
10t/ha	30.2	43.9	80.7	41.6	105.3	125.8	80.6	135.6	149.8
15t/ha	31.4	49.1	84.7	43.9	107.0	128.9	84.5	145.2	170.5
20t/ha	30.0	52.3	88.8	50.3	112.7	139.9	93.8	147.0	181.6
LSD 0.05	6.7	10.6	10.1	20.7	42.6	42.1	NS	NS	43.0

LSD = Least significant difference, WAP = weeks after planting.

The leaf area result showed that the values obtained increased as the rates of poultry manure increased in 5WAP, 6WAP and 7WAP, though the increases were not significant, except for 7WAP were the treatment rates were significantly better than the control rates. The result of fresh shoot weight in Table 2, showed non-significant differences among the rates of poultry manure applied at 5WAP. At 6WAP the values obtained from plots treated with 10t/ha, 15t/ha and 20t/ha were statistically similar, but significantly (P=0.05) higher than treatment of 0t/ha and 5t/ha. There was no significant difference observed in the fresh root weight (Table2) of all the treatments applied at 5WAP, at 6WAP and 7WAP, the higher rates of poultry droppings,10t/ha, 15t/ha and 20t/ha, though at par, were significantly better than the control rate. At 7WAP 5t/ha were not statistically better over the control, 0t/ha. Among all the treatment rates, 20t/ha recorded the highest fresh root weight at 5WAP, 6WAP and 7WAP.

Table 2 Effect of fresh shoot weight (g) and fresh root weight (g) of amarathus

Treatment	Fresh shoot weight (g)			Fresh root weight (g)		
	5WAP	6WAP	7WAP	5WAP	6WAP	7WAP
0t ha	7.7	17.0	52.6	1.6	4.0	11.7
5t ha	19.0	55.4	97.7	3.3	13.2	21.8
10t ha	20.4	90.9	197.5	3.9	21.1	40.2
15t ha	22.4	95.5	232.0	4.3	20.5	45.0
20t ha	30.2	98.9	266.0	5.4	22.7	53.2
LSD 0.05	NS	57.5	104.4	NS	11.7	14.5

LSD = Least significant difference, WAP = weeks after planting

The result of the effect of different rates of poultry droppings on dry shoot weight are given in Table 3, the result at 5WAP showed that the rates of poultry droppings did not significantly influence the dry shoot weight of amarathus. As the weeks after planting increased from 6WAP-7WAP, 15t/ha and 20t/ha showed significant (P=0.05) increase over the 5t/ha and 0t/ha. At all the stages of measurement, 5t/ha did not perform better than the 0t/ha. The 20t/ha rate recorded the highest dry shoot weight and trend of increase in 5WAP, 6WAP and

7WAP was 20t/ha>15t/ha>10t/ha>5t/ha>0t/ha. The result of the dry root weight showed that the effect of the poultry rates were at par with each other at 5WAP, but at 6WAP and 7WAP the higher rates of 20t/ha, 15t/ha and 10t/ha though statistically similar performed significantly better than the lower rates of 5t/ha and 0t/ha, the trend of the result showed that as the rates of poultry manure application from zero level increased, there was consistence increase in the results of the parameters assessed in 5WAP, 6WAP and 7WAP.

Table 3 Effect of different rates of poultry manure on dry shoot weight (g) and dry root weight (g) of amarathus

Treatment	Dry shoot weight (g)			Dry root weight (g)		
	5WAP	6WAP	7WAP	5WAP	6WAP	7WAP
0t/ha	1.1	2.5	9.3	0.2	0.5	2.3
5t/ha	1.9	6.1	13.0	0.3	1.4	3.6
10t/ha	2.0	8.5	31.3	0.4	1.7	6.5
15t/ha	2.1	9.8	38.7	0.5	2.0	6.9
20t/ha	2.3	10.2	43.4	0.6	2.1	9.3
LSD 0.05	NS	3.7	20.9	NS	0.7	3.0

LSD = Least significant difference, WAP = weeks after planting.

IV. Discussion

The result of the study showed that the poultry manure rates are capable of improving the yield of amarathus. Though there was no statistical significance difference observed in most of the parameters assessed which may be attributed to the short cropping period given less time for the mineralization of the nutrients that are there in the manure applied, but the result of the parameters assessed increases with an increasing rate of poultry manure. The observed differences in values obtained in all the parameters assessed could be attributed to the differences in nutrient contained in the rate of poultry manure applied. Asiegbu and Carol (2000), Nweke and Obasi (2013) observed that higher organic manure rates 15t/ha and 20t/ha, and pig manure rates 12t/ha and 24t/ha respectively gave higher yield result than where manure was not applied. The observed improvement in all the parameters assessed could be attributed to the ability of poultry manure to increase soil organic matter content the store house of plant nutrients, energies the activities of soil organism, which help to liberate the chemical nutrients needed by the crop plant; these invariably might have contributed to the improvement of the parameters studied. More so, Tisdall (1975) reported that amarathus requires soil with high organic content and such soils favored the production of leaf number, this was vindicated from the result obtained, because the number of leaves per plant increased with the dosage application of poultry manure from zero level. The enhancement of the parameters studied by the application of poultry manure may as well be due to its rich in nitrogen and other plant nutrients. Abou-Elmagd et al, (2006) reported that poultry manure is rich in nitrogen and other plant nutrients and as a result it favors the growth and development of root system which reflects better growth, photosynthetic activity and dry matters accumulation.

V. Conclusion

From the result obtained in this study, it can be concluded that the use of poultry manure in amarathus production is desirable as it had variable impacts on the parameters assessed in this trial. The poultry manure applied at the rates of 10t/ha, 15t/ha and 20t/ha was found consistently to have affected the plant height, number of leaves leaf area, fresh and dry weight of shoot and roots of amarathus.

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