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Growth and Yield Response of *Amaranthus* (*Amaranthus caudatus*) to Organic Manure (Cow Dung) in Anyigba, Dekina LGA of Kogi State, Nigeria

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ABSTRACT

The study was conducted at Prince Abubakar Audu University Research and Demonstration Farm, Anyigba, during the 2022 rainy season. The objective of the study was to evaluate the effects of rate of cow dung manure application on the growth and yield of *Amaranthus*. (*Amaranthus caudatus*). Randomized complete block design (RCBD) was used in the experiment and was replicated 3 times. The treatment consisted of 6 varying levels of organic manure, i.e., 6 treatments and 3 replications which resulted to a total of 18 plots. The parameters measured includes: Plant height (cm), number of leaves per plant, leaf area per plant (cm), shoot weight (g) and root weight (g). From the result obtained, it was obvious that *Amaranthus* was influenced by application of cow dung manure at of (648 g plot^{-1}) gave the highest yield for almost all the growth and yield characters such as plant height, number of leaves, leaf area and root weight of plant. While (324 g) also have the highest for shoot weight alone. Since 648 and 324 g of cow dung had the highest growth and yield results, *Amaranthus* farmers in Anyigba environment should lay their hands on cow dung as their nutrient source for application to *Amaranthus* crop to influences the growth and yield.

INTRODUCTION

Amaranth is the common name for cultivated species of the genus *Amaranthus* (family Amaranthaceae). It is one of the oldest food crops in the world. *Amaranthus* is one of the most promising plant genera and consists of approximately 70 species, 40 of which come from America, 17 are mainly herbaceous species, 3 are cereals and the rest are weeds[1]. Amaranth leaves and seeds can be cultivated as versatile plants that are tasty and nutritious, as well as ornamental plants[2]. some species are important food sources such as plants or grains[3]. Amaranth is cultivated mainly for its edible leaves, which are regularly added to many local people's meals, however, some species have edible seeds. It is one of the few plants whose leaves are eaten as a vegetable, while the seeds are used as grain. There is no difference between crop and grain species, as the leaves of young plants grown for grain are edible[4]. Some organic materials have been reported as soil amendments to increase crop production. The potential of cow dung, bird droppings, compost and garden manure as soil amendments in tropical regions has been reported[5]. The application of organic matter as fertilizer provides substances that regulate growth and improve the physical, chemical and microbial properties of the soil[6]. It has been reported that organic fertilizers alone are not sufficient to support crop production, as large amounts are required to meet plant nutrient needs due to their low availability[7]. Lack of access to nutritious food and the consequent impact on health is the main problem. Food and nutrition security is a major challenge for human well-being and meeting the nutritional needs of people is an equally important aspect of their health and safety. Action must be taken to resolve this issue. I believe this problem can be solved by growing *Amaranthus*, which has high nutritional value and *Amaranthus* is one of those crops. This study was conducted to find out the effect of different levels of cattle manure on the vegetative growth of *Amaranthus*.

MATERIALS AND METHODS

The test was conducted at Prince Abubakar Audu Anyigba University. (Latitude 70°29^1 N and Longitude 70°11^1 E) Kogi Province. A waterfall in the savannah zone of southern Guinea, Nigeria. A flat bed of 1.0×1.5 m was prepared to grow *Amaranthus* (native plant) seedlings from Agricultural Development Program (ADP) Anyigba, Kogi and poultry cage from Prince Abubakar Audu University Animal Science Farm. The seeds are transplanted into the experimental plot as soon as they reach a height of 8-10 cm with 3-4 leaves. Weeding was done manually at regular intervals during the experiment.

Treatments and experimental design: The trial was conducted in a randomized complete block design (RCBD) with 3 repetitions and 6 treatments, making a total of 18 plots. consisting of organic fertilizers: T0: 0 t ha^{-1}, T1: 171 g plot^{-1}, T2: 324 g plot^{-1}, T3: (513 g plot^{-1}), T4: 684 g plot^{-1} and T5: 855 g plot^{-1}).

Data were obtained from 3 plants per plot to assess the growth and the yield of the *Amaranthus:*

- **Plant height (cm):** This was determined by measuring the height attained at 2 weeks' interval from transplanting till harvest this was measured using the meter rule
- **Number of leaves per plant:** The total number of leaves produced by the plants in each plot were counted manually at 2 weeks interval from transplanting till harvest
- **Leaf Area (cm^2):** The leaf area was determined by the use of a measuring tape to measure the length and breadth area as L×B×0.6
- **Fresh weight of plant (g):** The shoot weight of the plant was determined at the end of the experiment using the electronic weighing scale
- **fresh root weight:** The root weight of the plant was determined at the end of the experiment using the electronic weighing scale

Data analysis: The Analysis of Variance (ANOVA) was carried out to determine the differences in parameters. Significantly different mean values were compared using Duncan's Multiple Range Tests (DMRT) at 5% significance level.

RESULTS AND DISCUSSION

Plant height: From the result in Table 1 of Plant height all treatments varied statically at 2 and 4 weeks after transplanting, however there was significant difference ($p \leq 0.05$) at 6 weeks after transplanting, at 2 weeks after transplanting treatment 513 g had the highest mean value of 13.71 cm, while control had the least mean value of 7.67 cm, at 4 weeks after transplanting treatment 684 g had the highest mean value of 15.50 cm while control had the least 10.63 cm. at 6 weeks after transplanting, 648 g had the highest plant height but not significant difference with 513 g (i.e., statically there is a little difference between 513 and 648 g, pot with no treatment application control had a least plant height.

Number of leaves: From the result in Table 1 of Number of leaves all treatments varied statically at 2 and 4 weeks after transplanting, however, there was significant difference ($p \leq 0.05$) on plant height at 6 weeks after transplanting, at 2 weeks after transplanting treatment 684 g had the highest mean value of 5.67, while control had the least mean value

Table 1: Effect of cow dung organic manure on plant height (cm), number of leaves (cm) and leaf area (cm^2) of *Amaranthus*

Treatments	Plant height (cm)			Number of leaves (cm)			Leaf area (cm^2)		
Cow dung (g pot^{-1})	2 WAT	4 WAT	6 WAT	2 WAT	4 WAT	6 WAT	2 WAT	4 WAT	6 WAT
0	7.67	10.63	13.08^{c}	5	7.33	31.50^{b}	2.60	3.38	4.49^{c}
171 g	10.73	14.97	16.37^{b}	5.67	12	14.27^{b}	5.81	7.78	5.77^{d}
324 g	10.30	15.00	17.23^{b}	6	11	15.50^{b}	5.47	7.19	6.57^{b}
513 g	13.71	15.33	24.77^{a}	6	11.33	19.90^{a}	8.85	7.96	10.37^{b}
684 g	10.83	15.50	29.73^{a}	5.67	11.33	20.90^{a}	5.66	8.30	16.14^{a}
855 g	9.50	12.17	21.25^{a}	6	11	17.17^{a}	5.08	5.76	8.13^{b}
C.V (%)	27.87	25.47	17.31	8.91	20.25	15.30	10.31	8.10	8.80
$L.S.D_{(0.05)}$	Ns	ns	64.20	Ns	Ns	4.69	ns	ns	1.68

WAP: Weeks after Transplanting, LSD: Least significant difference, Means with different letters in same sampling period are significantly different at 5% level of probability, otherwise they are not significant, CV: Coefficient of variations and NS: Not significant

Table 2: Effect of cow dung organic manure on shoot weight and root weight of *Amaranthus*

Treatments cow dung (g pot^{-1})	Shoot weight $plant^{-1}$ (g)	Root weight $pant^{-1}$ (g)
0	5.68	2.62^{c}
171 g	8.57	5.40^{b}
324 g	11.5	7.93^{b}
513 g	5.41	18.40^{a}
684 g	5.98	28.87^{a}
855 g	5.94	13.37^{b}
C.V (%)	7.75	23.30
$L.S.D_{(0.05)}$	Ns	133.37

LSD: Least significant difference, Means with different letters in same column are significantly different at 5% level of probability, otherwise they are not significant, CV: Coefficient of variations and NS: Not significant

(5 cm), at 4 weeks after transplanting treatment 171 g had the highest mean value of 12, while control had the least (7.33). At 6 weeks after transplanting, 648 g had the highest plant height of 20.9 but not significant difference with 513 and 855 g (i.e., statically there is a little difference between 513, 648 and 855 g plot with no treatment application control had a least number of leaves.

Leaf area (cm^2): From the result in Table 1 of leaf Area all treatments varied statically at 2 and 4 weeks after transplanting, however was significant difference ($p \leq 0.05$) at 6 Weeks After Transplanting, at 2 weeks after transplanting treatment 513 g had the highest mean value of 8.85 cm^2, while control had the least (2.6 cm^2), at 4 weeks after transplanting treatment 648 g had the highest mean value of 8.30 cm^2 while control had the least (3.38 cm^2) at 6 weeks after transplanting, 648 g had the highest plant height of 16.14 cm^2 the control pot had the least leave area of 4.49 cm^2.

Shoot weight (g): From the result in Table 2 of Shoot weights all treatments varied statically, however was not significant difference ($p \leq 0.05$), the pot treated with 513 g had the least mean value of 5.41 g, while the pot treated with 324 g had the highest mean value of 11.5 g. although there was little difference between all the treatments.

Root weight (g): From the result in Table 2 of root weights all treatments were significantly different ($p \leq 0.05$), with treatment 684 g having the highest mean value of 28.87 g, while the plot control pot had the least mean value of 2.62 g.

Effect of cow dung on the growth parameters: From the result, *Amaranthus* was affected by cow dung. Application of cow dung (648 g) gives maximum plant, number of leaves and leaf area. This clearly shows that all measured growth parameters are enhanced by organic fertilizers (cow dung). Increasing the content of N, P, K, Ca and Mg increases the height of *Amaranthus* plants, as well as Uwah[8] in accordance with Agele who reported that organic fertilizers contain both macro and micro. Nutrients such as N, P, K, S, Ca, Mg, Cu, Mn, Zn, Bn, which increase plant yield. Maerere[9] reported that the application of organic matter promotes the growth and activation of microalgae and other beneficial soil organisms, helps reduce the accumulation or deficiency of secondary and micronutrients and is able to maintain high levels. Crop productivity and soil health.

Effect of cow dung on the shoot weight and root weight of *Amaranthus*: From the results obtained, shoot weight for *Amaranthus* was influenced by cattle and sheep. The use of cow dung (324 g) gives the highest weight gain. This shows that the shoot weight is increased by organic manure (sheep and cattle). This suggests that Ayoola[10] reported that the application of organic fertilizers can significantly improve the fertility of these soils and others with similar characteristics. Due to its good response, organic manure can be an attractive fertilizer alternative, especially for perennial plants with a short growth cycle, such as amaranth. For *Amaranthus*, root weight is influenced by cattle-sheep. The application of cow dung fertilizer (648 g gas^{-1}) gave the highest root weight. This clearly shows that the root weight increased with organic manure (cow manure)[11], which observed the length of the upper

and deep roots of barley plants in the treatment of animal manure Ayola and Makinde[11] to a place where no fertilizer is applied.

CONCLUSION

The results of this experiment show that *Amaranthus* responds best to high organic fertilizer applications. This result is important because the excessive application of organic fertilizers increases vegetative growth. Organic fertilizers have different effects on plants according to macro and micronutrients, *Amaranthus* responds better to treatment (648 g) in terms of plant and yield parameters such as plant height, number of leaves and petals, shoot and root weight. The weight is greatly influenced by the lamb 648 and 324 g. The results obtained from this field experiment have shown clearly that application of organic fertilizer was observed to significantly ($p \leq 0.05$) influence the *Amaranthus*. About 648 and 324 g level of organic manure (cow dung) recorded the best growth and yield results. Since 648 g and 324 g level of organic manure (cow dung) had the highest growth and yield results, *Amaranthus* farmers in Anyigba environment should lay their hands on organic manure (cow dung) at a range of 648 and 324 g level of organic manure (cow dung) to use as their nutrient source as high organic manure (cow dung) application to *Amaranthus* crop influences the growth and yield of *Amaranthus* plant positively.

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