



**EFFECT OF ORGANIC FERTILIZER (COW DUNG, SHEEP/GOAT, AND
POULTRY DROPPING) ON THE PERFORMANCE OF AMARANTHUS
(*Amaranthus creuntus*)**

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ABSTRACT

The experiment was conducted in Bauchi State College of Agriculture (BSCOA) demonstration field during 2021 rainy season to evaluate the effect of organic manure on performance of Amaranth (*Amarthus cruentus*). The experimental was laid out in Randomized Complete Block Design (RCBD) with four treatments (poultry manure, sheep and goat manure, cow dung and control), replicated three times. The result showed significant difference ($P < 0.05$) for all the parameters measured. Plant height at 5 weeks after planting (WAP); poultry dropping had the tallest plant with value of 43.41cm and the shortest 23.81 cm recorded by the control. The control had the lowest value for all the parameters and poultry dropping recorded the highest. The yield value showed that poultry had 47333 kg/ha. Based on the result obtained, poultry dropping can be recommended to farmers in the study area to improve Amaranthus production.

Keywords: Amaranthus, Cow-dung, Poultry-dropping, Performance, Sheep/goat.

INTRODUCTION

Vegetable Amaranth (*Amaranthus cruentus*, L) is an annual crop and it belongs to the family *amaranthaceae*, which also contains very many, important tropical leafy vegetables. Amaranth is usually a short-lived annual crop capable of growing up to 2m in height (Coleman, 2021). The crop is known by many local names in Nigeria and these include: Allayahu in Hausa, Tete in Yoruba, and Inene in Igbo. Other names are African spinach, Indian spinach and amaranths (Omidiji, 1978). Amaranth is usually an erect short lived annual herb growing to a height of about 1-2m depending on the variety and environmental conditions. Amaranth is usually grown in home gardens and the succulent leaves of the leafy vegetable are picked when plants are 5-7 weeks old. The cultivation of amaranth is very profitable since it could be grown many times in a year due to its short growing period usually 45-90 days depending on the specie. Amaranths are grown and consumed as leafy vegetables in Nigeria and various parts of Africa (Opiyo *et al.*, 2015; Smith and Eyzaguirre, 2007). Amaranths are promising leafy vegetable crops considering their increasing availability in retail and supermarkets and have been ranked among the most preferred indigenous vegetables in Africa (Agong and Masinde, 2006). Studies have shown that nutritional value of vegetable amaranth is comparable to some exotic vegetables such as spinach and/or superior to others such as Brassicca species (Odhav *et al.*, 2007). It contains high levels of essential amino acids and minerals elements like calcium, iron, and zinc (Andini *et al.*, 2015). Amaranthus species is a good source of vitamins, for instance IPGRI (2006) reported amaranth to contain about thirteen times higher iron and B-carotene (vitamin A) was fifty times better than cabbage. Furthermore, leafy amaranths contain numerous phytochemical compounds such as phenolic and flavonoids (Onyango *et al.*, 2010) associated with strong antioxidant activity. Vegetable amaranth is one of the most



preferred African leafy vegetables in African communities (Opiyo *et al.*, 2015) and its dietary value together with its environmental tolerance and plasticity, presents it as an appropriate crop for alleviating micronutrient malnutrition, thus improving food security in developing countries. Commercial production of amaranths is a potential source of employment and income generation in rural and Peri urban vicinity, particularly with the increasing awareness of the dietetic value of indigenous vegetables (Onyango *et al.*, 2010).

Although vegetable amaranth has relatively low cultivation scale as compared to the cultivation of other vegetables such as tomatoes, human population increase has put in pressure on available vitamins, calcium and protein source from other vegetable crops which cannot meet the increasing demand. Pest infestation, disease attack and the easy perishability of these vegetables and poor knowledge on its cultivation practices has contributed to the unavailability of these crop to man. Therefore, it is very important to look at other vegetable crop that effectively replace or supplement the demand for other vegetables. The potential of vegetable amaranth to supplement any of these existing largely cultivated vegetables cannot be over emphasized because it is a low land crop and can be grown both in wet and dry seasons, it is not easily perishable as tomato, and roselle and more over it has an appreciable optimum level of production. Also, in many parts of Nigeria and Africa at large, indigenous vegetables have been cultivated on the traditional methods with little or no fertilizer application but with recent awareness of the need to increase food supply not only by increasing crop yield per unit area. More emphasis has been placed on the use of fertilizer to improve yield but there is need to find the effective economically right quantity to apply and at what stage of growth (time) to apply it so as to avoid wastage and unnecessary cost of production. It has become imperative to conduct studies into various requirements that will increase the yield potential of amaranth.

Vegetable Amaranth is an important crop for the people of Nigeria and the developing world in general. In order to diversify the food base, there is need to look at lesser-known indigenous crops such as Amaranth. Like Amaranth, crops like soybeans, sunflower and peanut centuries ago were considered unworthy of research but today they are among the world's most important crops, which requires greater attention because of their high nutritive value (National Research Council [NRC], 1984). The ability of vegetable amaranth to serve as supplementary or comparative crop with other vegetable sources provide an alternative source for food supplement, since the high and increasing demand for vegetable is competitive. The plant undoubted characteristics of being resistant to certain pests and diseases, not easily perishable, high vitamin content, potassium and calcium content justify the need to undertake the study, so as to know the best organic fertilizer for growing *Amaranthus* in the study area at a low cost to the majority peasant farmers with the following objectives; To investigate the effect of organic fertilizers on the growth and yield of amaranth.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at Bauchi state college of agriculture School farm, located at 10°25'N and 9°51'E. Bauchi state is located in the Northern Guinea savannah agro-ecological zone of Nigeria. The research was carried out during 2021 rainy season. The experimental treatments consisted of three different organic fertilizer viz; cow dung, sheep/goat, poultry dropping and control. These treatments were laid out in a Randomized Complete Blocks Design (RCBD) with three replications. The following growth and yield parameters were access during the study: Plant height (cm), Number of Leaves, Stem girth (cm) Leaf area (cm²), Shoot fresh weight (kg). All the data collected were subjected to analysis of variance (ANOVA) to test the level of significance of all the treatment. Duncan's Multiple



Range Test (DMRT) was however adopted during the analysis to separate significantly different treatment means.

Table 1 showed that the soil is Clay loam in texture, with a pH value of 5.2 was slightly acidic. The total Nitrogen and organic carbon are 0.13g/kg and 12.86g/kg, respectively. The pre-study soil test indicates that the soil is low/deficient in some essential nutrients and requires fertilizer modification. This is an indication that the soil is good for fertility test and is suitable for the present study.

Table 1: Physical and chemical properties of the experimental soil

Soil parameter	Soil test value
pH	5.2
Total N (g/kg)	0.13
Organic carbon (g/kg)	12.86
Available phosphorus (mg/kg)	7.45
Particle size distribution (g/kg)	
Sand	46.4
Clay	35.2
Silt	35.4
Textural class	Clay loam

RESULTS AND DISCUSSION

Effect of Organic manure on Plant height (cm) of *Amaranthus*

Different organic manure had a significant effect ($P \leq 0.05$) on the plant height (Table 2). The effect of organic manure on plant height (cm) as observed at 3,4, and 5 weeks after planting, with significant differences. However, no significant difference at 6 weeks after planting. At 3,4,5 weeks after planting poultry dropping recorded the tallest plant height of (15.59cm, 26.45cm and 43.41cm), respectively, followed by sheep and goat manure, cow dung. The shortest plant height was recorded by the control treatment.

Table 2: Effect of organic manure on plant height of *Amaranthus cruentus* at 3,4,5 and 6 weeks after planting in Bauchi during 2021 rainy season.

Treatment/Organic manure	Plant height (cm)/Weeks after planting			
	3	4	5	6
Poultry dropping	15.59a	26.45ab	43.41a	55.31
Sheep and goat dung	13.07ab	22.64ab	36.85ab	55.24
Cow dung	11.22bc	16.79bc	26.72bc	46.55
Control	8.37c	14.05c	23.81c	34.54
Level of significance	*	*	*	NS

Means with the same letter(s) under the same column are not significantly ($P > 0.05$) different using Duncan Multiple Range Test (DMRT).

The differences observed (Table 2) could be attributed to amount of nutrient in each of the source of manure. Tiamiyi *et al.* (2012) reported that plant high of *Amaranthus* was greater in poultry dropping treated soil. They attributed it to readily available nutrient. Similarly, Ewulo (2005) which stated that varied chemical concentration were observed in soil amendment when poultry manure from different source were used, the report confirmed an increased in soil fertility, increased the yield of the vegetable, had a high nutritional and also increase soil physical and chemical properties.



Effect of Organic manure on Number of Leaves of Amaranthus

Table 3 presents the effect of organic manure on Number of leaves as observed at 3,4,5 and 6 weeks after planting. There is significant difference at 3,4,5 and 6 weeks after planting. The highest number of leaves (8.40) (10.73) (12.27) (16.47) at 3,4,5 and 6 weeks after planting was recorded by application of poultry manure and the lowest number of leaves (6.00), (7.00), (8.67) and (12.87) was recorded by control plots, respectively. The significant difference observed on number of leaves can be attributed to the nutrient composition of poultry dropping as compared to other treatment and the control has least number because there is no nutrient addition to the soil. The result here lends support from the work of Kunene *et al.* (2021) who stated that; the addition of fertilizer, either organic or inorganic, positively affected the number of leaves per plant at the early stages of plant growth to a certain age.

Table 3: Effect of organic manure on number of leaves *Amaranthus cruentus* at 3,4,5 and 6 weeks after planting, during 2021 rainy season in Bauchi.

Treatment/Organic manure	Number of Leaves/Weeks after planting			
	3	4	5	6
Poultry manure	8.40a	10.73a	12.27b	16.47a
Sheep and goat dung	7.40a	8.87b	10.47b	14.47ab
Cow dung	5.93b	7.27c	8.73a	13.06b
Control	6.00b	7.00c	8.67a	12.87b
Level of Significance	*	*	*	*

Means with the same letter(s) under the same column are not significantly ($P > 0.05$) different using Duncan Multiple Range Test (DMRT).

Effect of Organic manure on Leaf Area (cm²) of Amaranthus

The effect of organic manure on leaf area of *Amaranthus* at the various growth stages (Table 4) showed that there was no significant difference at 3WAP however, at the other stages poultry dropping repetitively recorded the largest leaf area and the control the smallest leaf area. The result obtained here is in contrary to that obtained by Kunene *et al.* (2021).

Table 4: Effect of organic manure on Leaf area of *Amaranthus cruentus* at 3,4,5 and 6 weeks after planting, during 2021 rainy season in Bauchi.

Treatment/Organic manure	Leaf area (cm ²)/Weeks after planting			
	3	4	5	6
Poultry dropping	9.38	11.84a	13.55a	18.21ab
Sheep and goat dung	8.69	9.33b	12.44ab	16.24b
Cow dung	7.84	9.29b	10.77a	13.65b
Control	7.70	8.91b	10.28b	13.35b
Level of Significance	NS	*	*	*

Means with the same letter(s) under the same column are not significantly ($P > 0.05$) different using Duncan Multiple Range Test (DMRT).

Effect of Organic manure on Stem Girth (cm) of Amaranthus

Table 5 results obtained on stem girth shows that there was significant difference ($P > 0.05$) at 4,5 and 6 weeks after planting. While there was no significant different at 3 weeks after planting. Poultry dropping also had the widest stem girth as compared to other treatments. The result obtained in this study concur to the one obtained by Adesida *et al.* (2019) who reported that application of high amount of poultry manure increased the stem girth.

Table 5: Effect of organic manure on Stem girth of *Amaranthus (Amaranthus cruentus)* at 3,4,5 and 6 weeks after planting.

Treatment/Organic manure	Stem girth (cm)/Weeks after planting			
	3	4	5	6
Poultry dropping	1.05	1.68a	2.31a	3.45a
Sheep and goat dung	0.94	1.40ab	1.89ab	2.72b
Cow dung	0.95	1.39ab	1.82ab	2.59b
Control	0.87	1.10b	1.68b	2.34b
Level of Significance	NS	*	*	*

Means with the same letter(s) under the same column are not significantly ($P > 0.05$) different using Duncan Multiple Range Test (DMRT).

Effect of Organic manure on Fresh shoot weight (kg) of *Amaranthus*

The significant differences were observed on the fresh shoot weight of *Amaranthus* at harvest as shown in Figure 1. The highest yield was recorded by poultry dropping (47333 kg/ha) followed by treatment; sheep and goat manure (24958 kg/ha) and Cow dung (11417 kg/ha), the lowest yield was recorded by control with a value of 6750 kg/ha. The result obtained could be attributed to the easy availability and release of nutrients by poultry manure as compared to other treatments. The result concurs with the findings of Adedeji *et al.* (2019) who stated that the highest fresh and dry shoot weight was obtained in Poultry Manure while the lowest weight was recorded in control treatment. This agreed with the report of Ewulo (2005) which stated that varied chemical concentration were observed in soil amendment when manure from different source were used, 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 of plant nutrients, stimulate the activities of soil organism, which aid the release of nutrient needed by the crop plant; these might have contributed to the improvement of the parameters considered (Okoli and Nweke, 2015).

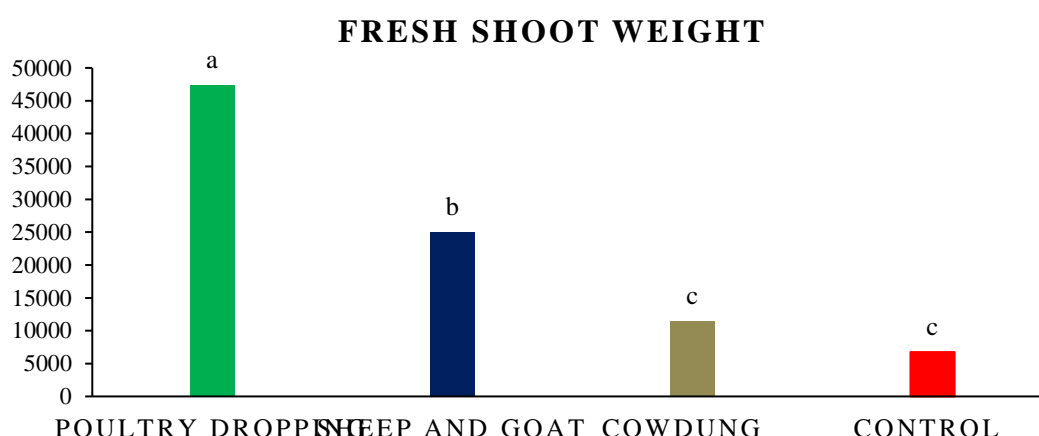


Figure 1: Effect of organic manure on *Amaranthus (Amaranthus cruentus)* on yield parameters

CONCLUSION AND RECOMMENDATIONS

The control had the lowest value for all the parameters and poultry dropping recorded the highest. The yield value showed that poultry recorded fresh weight of 47,333kg/ha. Based on the result obtained poultry dropping can be recommend to farmers in the study area to improve *Amaranthus* production and their livelihood, and further studies should be carried out on different level of poultry manure so as to know the appropriate level for the study area.



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