EFFECT OF FARMYARD MANURES ON THE GROWTH AND YIELD OF *AMARANTHUS CRUENTUS*

AKPAROBI S.O.

Abstract

The effect of different level of farmyard manures (0t/ha, 15t/ha, 25t/ha and 35t/ha) on the growth and yield of Amaranthus cruentus was studied. Data collected on weekly basis were plant height, number of leaves, leaf area, fresh and dry weights. Results showed that all parameters measured increased with plant age and significant differences (P > 0.05) were observed among the farmyard manure levels. Addition of more manure to the seedlings had positive effect on all the parameters measured. The seedlings treated with manure level of 35 t/ha had the highest mean values of 123.27 cm, 11 585 cm2, 141.56, 1.75 kg and 0.99 kg per plant for plant height, leaf area, number of leaves, fresh and dry weights respectively while those treated with manure at 0 t/ha had the least values for the parameters measured. This study showed that in rainforest agro-ecological zones with heavy rainfall that encourages the decomposition of poultry manures. The application of manure level of 35 t/ha to amaranthus seem to had the highest mean values for all the parameters measured such as plant height, leaf area, number of leaves, leaf area, fresh and dry weights. Thus, it should be recommended for farmers growing amaranthus in rainforest agro-ecological zone.

Key words: *Amaranthus cruentus*, farmyard manure, yield, agro-ecological zone

INTRODUCTION

Amaranths cruentus is an important vegetable in human diet as a source of nutrients such as vitamin, minerals, sugar, water, protein and fibre needed for healthy body growth and sustenance (Bailey, 1992). The young leaves and stems are boiled as greens (NRC, 1984). They are grown as soup vegetables or for boiled salad greens (Adeyemi et al., 1987). The nutrient values of amarantus per 100% edible portion (leaves) as water 85 ml, calorie 48, protein 5 g, fat 0.7 g, carbohydrates 5 g, fibre 1.5 g, calcium 250 mg, iron 4 mg, B-carotene equivalent 1 800 mg, thiamine 0.1 mg, riboflavin 0.3 mg, niacine 1.5 mg and ascorbic acid 100 mg (Tindall, 1975).

Originally, the bulk of vegetables consumed in Nigeria were supplied by subsistence farmers. Vegetable supply to areas of high demand has remained low and seasonal as the subsistence farmers continue to rely on natural rainfall. Today, high demand for vegetables in the cities and towns has stimulated the growth of market gardening along perennial rivers and streams. This is a common sight at Onitsha, Lagos, Port Harcourt, Warri, Sapele, Agbor, Jos, Ibadan, Kaduna, Sokoto and some other towns. Some gardeners rely on irrigation water from streams, wells and boreholes to cultivate vegetables all year round. Vegetable production has becomes a good source of employment for young school leaves (DFRRI, 1990).

Some of the problems encountered by amaranth growers include decreasing soil fertility and quantity of manure required for optimum crop productivity (Lucas and Ojeifo, 1985; Adeyemi et al., 1987). Inadequate supply chemical fertilizer and lack of capital to buy them (Adeyemi et al., 1987; Olufolaji et al., 1990; Olufolaji et al., 1999). To increase the availability of high quality amaranth throughout the year at reduction in its price, there is a need to use organic manure such as farmyard manure which is available in large quantity and there is high rainfall to encourage its decomposition in Delta State. Thus, the objective of this study the effect of farmyard manures on the growth and yield of *Amaranthus cruentus*. To determine the quantity of manure to apply for the attainment of maximum yield of *Amaranthus cruentus*.

MATERIALS AND METHODS

Experimental site: A field experiment was conducted at Delta State University, Asaba Campus – Anwai. Asaba Campus is located at 06º 14‘ N and 06º 49’E of the equator. It lies in the tropical rainforest zone, characterized by seven months of rainy season between April and October, punctuated by a short break in August. An annual rainfall range of 1 500 mm to 1 849.3 mm (Asaba Metrological Bulletin, 2003). Composite soils (0–15 cm depth) samples were taken from the site. It was air dried at room temperature and passed through a 2 mm sieve before it was taken to IITA laboratory, Ibadan, Nigeria for analysis. The chemical and physical characteristic of the soil at the experimental site showed that the soil is sandy loam and it had the pH (6.3), available P (10.4 ppm), Organic carbon (0.71%). Organic matter (1.24%), Total Nitrogen (0.08%), Sand (69.41%), Silt (22.25%) and Clay (8.40%).

Experimental design: The experimental design was a completely randomised block design with 3 replications. The experimental site was cleared, packed, and tilled before preparing vegetable beds. The vegetable beds

were marked and beds measuring 1 × 10 m, with 0.3 m between adjacent beds were randomly laid out. Manure was applied at the appropriate doses, thoroughly worked in and covered with dry palm fronds. Nursery beds were prepared before this time using three parts top soil, two parts well rotted poultry manure and one part river sand, mixed thoroughly. The mixture was heated for 40 minutes using garri frying pot to sterilize it and sieved to remove soil aggregates. The sterilized nursery soil mixture was put in a box measuring 1 m × 25 m with adequate holes in the bottom to allow surplus water to drain through the soil. The well preserved and treated seed of *Amaranthus cruentus* procured from Delta State Agricultural Procurement Agency, Ibusa were used. The seeds were mixed with dry sand (0.5 milk cup seed: 2.0 milk cup sand) to ensure uniform distribution and sown broadcast on the nursery bed. Adequate watering was done, and seedlings started to emerge 8 days after sowing.

Planting holes were dibbled with sharp pointed stick and the seedlings were firmly transplanted four (4) weeks after sowing in the nursery. At that time the seedlings were 3–5 cm in height. Watering was done during and after transplanting to facilitate the lifting of seedlings as well as reduce shock on the plant. To reduce weed competition for growth factors, and create pest and disease free environment, hand pulling of weeds was done regularly on the beds while hoe was used to weed between the beds and edges of experimental area.

Farmyard manures application: The well-rotted manure (poultry dropping) was carefully weighed and thoroughly worked into the experimental plot at 0 t/ha, 15 t/ha 25 t/ha and 35 t/ha. The beds were watered and left for one week before the transplanting of seedlings on them took place, to enable carbon dioxide escape thus preventing burning and scorching on the tender seedlings.

Data collection and analysis: Data collected on weekly basis were plant height, number of leaves, leaf area, fresh and dry weights. Data collected were subjected to statistical analysis system using SAS (1999). The treatment means were separated using least significant differences at 5% level of probability.

RESULTS AND DISCUSSION

The result showed that plant height was observed to increase with plant age (Table 1). At 2 weeks after planting (WAP), there were no significant differences in plant height of amaranthus treated with the various manure levels (0 t/ha, 15 t/ha, 25 t/ha and 35 t/ha). However, between 4 and 10 WAP, significant differences in plant height were observed among different manure levels. The highest plant height was recorded for manure treatment unit of 35 t/ha (Table 1). The result revealed that amaranthus treated with the highest manure level of 35 t/ha attained the highest plant height of 123.27 cm and those that received no manure treatment reached a maximum height of 80.20 cm. This finding agreed with earlier report of Adeyemi et al. (1987) who observed that adequacy of manure decreased the number of days from planting to first harvesting, and it increased the plant height of amaranthus. Also, Tindall (1975) reported that amaranthus require soils with high organic content, and adequate mineral nutrients favoured the production of higher plant height amaranthus.

Amaranthus treated with the various manure levels of 0 t/ha, 15 t/ha, 25 t/ha and 35 t/ha did not show any significant difference in number of leaves at 4 WAP

Tab. 1: Plant height (cm) of *Amaranthus cruentus* treated with various manure levels

Manure level (t/ha)	Number of weeks after planting				
	2	4	6	8	10
0	5.18	12.30	27.20	32.82	80.20
15	5.30	11.98	23.90	35.91	69.90
25	5.01	12.40	36.20	59.83	81.91
35	5.40	17.80	38.20	76.10	123.27
Mean	5.22	13.62	31.38	48.69	88.82
LSD (0.05)	0.34	1.04	4.36	6.85	7.24

Tab. 2: Number of leaves of *Amaranthus cruentus* treated with various manure levels

Manure level (t/ha)	Number of weeks after planting				
	2	4	6	8	10
0	5.33	18.11	32.22	58.56	91.00
15	5.33	21.33	54.67	83.00	110.11
25	5.44	33.80	70.78	117.89	138.33
35	5.67	26.44	97.89	120.11	141.56
Mean	5.44	24.94	63.89	94.66	120.20
LSD (0.05)	0.40	2.62	6.47	9.96	4.09

Tab. 3: Leaf area (cm^2) per plant of *Amaranthus cruentus* treated with various manure levels

Manure level (t/ha)	Number of weeks after planting				
	2	4	6	8	10
0	31.18	922.16	1 017.50	2 402.13	4 005.80
15	34.69	1 490.32	1 934.22	4 484.50	6 650.60
25	34.38	2 592.50	2 725.00	6 019.50	10 169.25
35	41.44	3 055.67	6 124.98	11 298.71	11 558.00
Mean	35.42	2 015.16	2 950.42	7 368.20	8 095.41
LSD (0.05)	0.40	2.62	6.47	9.96	4.90

Tab. 4: Fresh weight (kg) per plant of *Amaranthus cruentus* treated with various manure levels

Manure level (t/ha)	Number of weeks after planting				
	2	4	6	8	10
0	0.07	0.12	0.33	0.62	0.88
15	0.12	0.20	0.41	0.76	1.08
25	0.21	0.55	0.72	0.91	1.31
35	0.50	0.82	0.98	1.25	1.75
LSD (0.05)	0.25	0.22	0.34	0.25	0.46

Tab. 5: Dry weight per plant of *Amaranthus cruentus* (kg) treated with various manure levels

Manure level (t/ha)	Number of weeks after planting				
	2	4	6	8	10
0	0.11	0.21	0.29	0.41	0.52
15	0.20	0.28	0.35	0.50	0.64
25	0.25	0.35	0.50	0.67	0.78
35	0.32	0.47	0.61	0.78	0.99
LSD (0.05)	0.09	0.20	0.19	0.12	0.14

while at 6, 8 and 10 WAP, significant differences were observed in the number of leaves (Table 2). The plant that received manure treatments of 35 t/ha produced the highest average number of leaves of 98, 120 and 141 per plant at 6, 8 and 10 WAP (Table 2). The least average number of leaves of 32, 59, and 91 per plant were produced by amaranthus that received 0 t/ha manure during the period under study. The result showed that the higher the quantity of manure applied, the higher the number of leaves produced per plant. Also, the plants treated with manure at 35 t/ha had greater leaf area per plant (Table 3). Tindall (1975) reported that amaranthus require soils with high organic content and such soils favoured the production of leaf number and leaf area. Olufolaji et al. (1985) stated that the lowest fertilizer of 60 t/ha gave the least leaf number and leaf area per plant when compared to other higher level of fertilizer application in amaranthus.

The result showed that fresh weight and dry weight per plant increased with increase in quantity of manure applied (Tables 4 and 5). Plants treated with 35 t/ha manure had higher fresh weight and dry weight than those treated with 25 t/ha, 15 t/ha, and 0 t/ha manure respectively. This study showed that to obtain maximum yield per plant, amaranth grower is expected to apply manure at 35 t/ha. Adeyemi et al. (1987) found out that adequacy of manure decreased the number of days from planting to first harvesting, increased the number of harvests before senescence and therefore recommended that poultry manure improves the rate of regrowth of amaranthus. Tindall (1975) reported that amaranthus require soils with high organic content which favoured the production of fresh weight.

This study showed that in rainforest agro-ecological zones with heavy rainfall that encourages the decomposition of poultry manures. The application of manure level of 35 t/ha to amaranthus seem to had the highest mean values for all the parameters measured such as plant height, leaf area, number of leaves, leaf area, fresh and dry weights. Thus, it should be recommended for farmers growing amaranthus in this zone.

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Corresponding author:

Akparobi S.O.
Department of Agronomy, Delta State University,
Asaba Campus, Asaba, Delta State, Nigeria.
e-mail: soakparobi@yahoo.com