Effects of Organic, Organominral and NPK Fertilizer Treatments on the Sensory Evaluation Of *Amaranthus Cruentus* Soup In Ikorodu and LASU

E.A OkubenaDipeolu

Department of Botany, Lagos State University, Ojo P.MB 0001 LASU Post Office
leye_sam@yahoo.com

Abstract

Five sets of different regular consumers of *A. cruentus* including students, lecturers, bankers, messengers and farmers took part in sensory evaluation of cooked Amaranth vegetable harvested from the soils fertilized with either Kola pod husk (KPH), Pace setter Organomineral fertilizer (PGB) and NPK 15:15:15 fertilizer (NPK) in Ikorodu and LASU. The colour, taste, texture and flavour of the vegetable soup were assessed to give overall acceptability of the food. The vegetables produced were prepared separately with the same ingredients and labeled. The soup was taken in combination with pounded yam. Questionnaires were administered to the respondents. The assessment was carried out three times after harvesting at first, second and third cropping of *A. cruentus* at the two locations. The result showed that overall acceptability was given to the *A. cruentus* soup produced where KPN and PGB were applied as organic and organomineral fertilizers over NPK.

Key word: Taste, Flavour, colour, texture

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Introduction

Edible species of the genus Amaranthus namely *A. cruentus, A. dubius, A caudatus, A. hypochondriacus* are common in *Nigeria. Amaranthus cruentus* is a Mexican and Guatemalan species which

is useful both as a grain or leaf vegetable type. The grain types have white seeds. The vegetable types have dark seeds. It is probably the most adaptable of all amaranth species, and it flowers under a wider range of day length better than the others. *A. cruentus* was most likely introduced to Africa by Europeans. *Amarathus cruentus and A. hypochordraicus* are characteristically very vigorous with broad leaves and protein rich edible seeds. The *A. cruentus* crop is variously known locally as *'tete'* (Yoruba), 'green', (Igbo) or 'aleho'(Hausa). It is a tender herbaceous plant with edible leaves and tender stem. Its importance lies basically in its ease of cultivation and the quality of the leaves and tender stem. With other ingredients such as pepper and melon; it is used to make soup. *Amaranthus cruentus* leaves contain 3.5 % protein and 1.5 % carbohydrates as well as 0.75 % minerals and 6.7 % vitamins (1). *Amaranthus cruentus* is cultivated and consumed all over the country and it can be rated among the top 5 of the most important national vegetables. The average consumption of *A. cruentus* leaves in the tropics is estimated at about 20 - 25 g per head per day which is below the recommended rate of 100 g per head per day (2). Protein from *A. cruentus* leaves provides as much as 25% of the daily protein intake during the harvest season. It is grown all the year round (3).

Olufolaji (4), recommended 70 kg N, 34 kg P and 26 kg K ha^{-1} to give the highest fresh leaf yield for Amaranth. Olufolaji (2) found that well cured poultry manure at 20 t/ha was adequate for high leaf yield in *A. cruentus* while 75 kg N ha^{-1}, 20 kg P ha^{-1} and 40 kg K ha^{-1} mineral fertilizers were recommended for the same crop. Makinde (5) recommended 67.5 kg N/ha as optimum N requirement for *Amaranthus cruentus* growth. Just like any other crop, the performance and yield of *A. cruentus* depend, largely on the soil nutrient status. *Amaranthus cruentus* responds well to nitrogen application but excess can aggravate lodging (6 and 7). Amount of nutrients application like NPK depends on plant population per space (2). To increase the seed yield therefore, NPK fertilizer was recommended at the ratio of 1:1:2 for optimum production (6). Manga *et al*. (7) and Makinde, (5) also concluded that protein content can be increased with any of the nitrogen fertilizers. When the soil nutrient status is below critical level, poor yield is expected.

Kola pod husk and PGB fertilizers are among wastes generated in the kolanut plantation and processed municipal wastes in the city, respectively. Farmers are aware of the availability of these wastes but no known information that a farmer has put these into use in vegetable production. Most times, these wastes are dumped at dumpsites and incinerated. Open incineration leads to air pollution and waste of many organic resources that could have benefited agricultural soils. This act has been prohibited in some countries (8).

Agboola *et al.,* (9) and Titiloye *et al.,* (10) reported 45 different waste materials rich in the following nutrient elements: N, P, Ca, Mg, Zn, Cu, Fe and Mn. Farm wastes represent a potential source of nutrients that could be harnessed to boost agricultural production (10). Organic materials such as FYM, poultry manure, green manure, crop residues, water weeds, city waste etc. have been reported as suitable substitute for

inorganic fertilizers to maintain sustainable crop production and environmental quality (11). Reports on the positive responses of crops to the various organic fertilizers cut across all the classes of agricultural crops including leaf vegetables (12, 13, 14 , 16 17*)* . Researches have shown that researchers focus attention on the optimum production of vegetables not minding the their implications on consumers acceptability, taste and textures. This study was therefore, set up to investigate the effects of two organic materials: kola pod husk and Pacessette Grade B organic fertilizer used alone or in combination with NPK 15:15:15 compared with NPK (15:15:15) alone and control (no fertilizer application) on the growth, yield and quality of *A. cruentus* on two ecological areas of Lagos State. The organic materials were chosen because they are locally available.

Materials and Methods

The study Area

There were two study sites, namely Ikorodu farm settlement and Lagos State University (LASU) Ojo Campus. The two locations belong to two soil types Ikorodu (Orthic Luvisol) and LASU (Dystric Fluvisol) (FAO, 1992) (i) Ikorodu is located in the rain forest area of south- west, Nigeria (6° 37'N; 3° 53'E) and the altitude is about 15.50 meters above sea level (ii) LASU is located at Ojo in Badagry Division of Lagos State of Nigeria. It is located at the swamp forest area of south western Nigeria, ($6^0$27'N; $3^0$130'E and the altitude is about 6.1 meters above sea level. The dominant vegetation of Lagos State is the swamp forest consisting of the fresh water and mangroves, swamp forest both of which are influenced by the double rainfall pattern of the state which makes the environment a wet land region. Amaranthus vegetables are widely consumed by the residents of the two communities.

Field experiment

Experments were carried out to determine the effect of kola pod husk, organomineral fertilizer and NPK 15:15:15 fertilizer on the growth and nutrient quality of amaranthus.

Sampling procedure

Five sets of different regular consumers of *A. cruentus* including students, lecturers, bankers, messengers from the Ministry of Agriculture and local farmers. These five sets of people took part in sensory evaluation of cooked Amaranth vegetable. The colour, taste, texture and flavour of the vegetable soup were assessed to give overall acceptability of the soup. A total of one hundred respondents was randomly selected and interviewed from the group. Twenty respondents were selected from each group. Ballot paper was used to select the group among the numerous industries in Nigeria. The respondents were allowed to fill the questionnaires after the conduct of the experiment. The vegetables produced were prepared separately with the

same ingredients and labelled. The soup was taken in combination with pounded yam. The assessment was carried out three times after harvesting at first, second and third cropping of *A. cruentus* at the two locations.

Result and Discussion

Effects of different fertilizers on sensory evaluation of *A. cruentus* vegetable soup at first field cropping at Ikorodu and LASU

At Ikorodu, soil treated with KPH organic and Organomineral Fertilizer (OMF) gave overall acceptability of *A. cruentus'* soup 'liked very much' while those treated with PGB as organic and OMF got liked moderately at first cropping. Soil treated with 100 % NPK and control was given 'liked slightly' and 'disliked slightly' respectively. At LASU, soil treated with PGB as organic and OMF got overall acceptability of 'liked very much' while those treated with KPH as organic and OMF got 'liked moderately'. Soil treated with 100 % NPK and control received 'disliked moderately' and 'disliked extremely' (Table 4.39).

Residual effects of different fertilizers on the sensory evaluation of *A. cruentus* vegetable soup at second field cropping at Ikorodu and LASU

Amaranthus cruentus soup produced from the soils that were previously applied with KPH and PGB as organic and organomineral fertilizers (OMF) received overall acceptability of ‘liked extremely’ and liked moderately, respectively at Ikorodu. The 100 % NPK and control got ‘neither liked nor disliked’ and ‘disliked’ respectively. At LASU, where PGB and KPH as organic and organomineral fertilizers was previously applied to the soil produced vegetable soup with liked ‘very much’ and ‘liked moderately’, while 100 % NPK and control received disliked very much and disliked, respectively (Table 4.40).

Residual effects of different fertilizers on the sensory evaluation of *A. cruentus* vegetable soup at third field cropping at Ikorodu and LASU

At the third cropping, the overall acceptability for the soup prepared from the *A. cruentus* produced from the soil previously treated with KPH and PGB as organic and organomineral fertilizers received ‘liked slightly’ at both locations. Overall acceptability of ‘disliked very much’ and ‘disliked extremely’ were received from the soup prepared from *A. cruentus* cropped to soil that previously treated with 100 % NPK at Ikorodu and LASU, respectively (Table 4.41).

Table 1: Effects of different fertilizers on the sensory evaluation of *A. cruentus*' soup at 6WAS at first field cropping at Ikorodu and LASU

Treatments	Ikorodu					LASU				
	Colour	Taste	Texture	Flavour	Overall Acceptability	Colour	Taste	Texture	Flavour	Overall acceptability
Control	4	3	5	3	4	1	1	1	1	1
PGB (100%)	7	5	7	5	6	8	8	8	8	8
PGB + NPK (75:25)	8	6	8	6	7	8	8	8	8	8
PGB + NPK (50:50)	7	7	8	6	7	8	8	8	8	8
KPH (100%)	8	9	8	7	8	8	6	6	6	7
KPH + NPK (75:25)	8	8	8	8	8	8	6	6	6	7
KPH+ NPK (50:50)	9	8	8	7	8	8	6	6	6	7
KPH (100%)	5	7	7	5	6	2	4	3	3	3

Table 2: Residual effects of different fertilizers on sensory evaluation of *A. cruentus'* soup at 6WAS at second cropping at Ikorodu and LASU

Treatments	Ikorodu					LASU				
	Colour	Taste	Texture	Flavour	Overall Acceptability	Colour	Taste	Texture	Flavour	Overall acceptability
Control	3	5	4	4	4	1	1	1	1	1
PGB (100%)	6	8	6	8	7	8	9	7	8	8
PGB + NPK (75:25)	8	6	7	7	7	8	7	9	8	8
PGB + NPK (50:50)	6	8	7	7	7	8	9	7	8	8
KPH (100%)	9	8	8	8	9	6	8	6	8	7
KPH + NPK (75:25)	8	9	8	8	9	6	8	6	8	7
KPH+ NPK (50:50)	9	7	9	7	8	7	7	7	7	7
KPH (100%)	6	4	6	4	5	2	1	3	2	2

Table 3: Residual effects of different fertilizers on sensory evaluation of *A. cruentus'* soup at 6WAS at third cropping at Ikorodu and LASU

Treatments	Ikorodu					LASU				
	Colour	Taste	Texture	Flavour	Overall Acceptability	Colour	Taste	Texture	Flavour	Overall acceptability
Control	1	2	2	3	2	1	1	1	1	1
PGB (100%)	5	5	6	4	7	6	5	7	6	8
PGB + NPK (75:25)	5	5	5	5	5	7	6	5	6	6
PGB + NPK (50:50)	6	6	6	6	5	6	5	7	6	6
KPH (100%)	6	6	6	6	6	7	6	5	6	6
KPH + NPK (75:25)	6	7	5	8	6	7	6	5	6	6
KPH+ NPK (50:50)	7	6	8	5	7	5	7	6	6	6
KPH (100%)	2	1	3	2	2	1	1	1	1	1

Rating

Liked extremely: 9, Liked very much: 8, Liked moderately: 7, Liked slightly: 6, Neither liked nor disliked: 5, Disliked slightly: 4, Disliked very moderately: 3, Disliked very much: 2, Disliked extremely: 1.

However, for sustainable *A. cruentus* production, the superiority of organomineral and organic fertilizers proved the report on the questionnaire generated at the two study sites and substantiates the claims of vegetables farmers in LASU that minerals fertilizers give sub optimal yield and quality in this soil (16). These research findings also give credence to an organic farming philosophy in this difficult (LASU) soil.

The colour, taste, texture, flavour that gave overall acceptability to the vegetable where KPH and PGB were applied as organic and organomineral fertilizer over NPK was in agreement with the report of Fasina *et al.* (14); Schippers (12) that soil treated with organic materials has sustainable vegetable yield over period of time.

The chlorophyll, K and N of *A. cruentus* enhanced by the application of KPH and PGB as organic and organomineral fertilizers over NPK at second and third cropping was a direct linkage with the positive result obtained on sensory evaluation conducted at the two study sites (18*).*

However, the quantity and quality of yield of *A. cruentus* was sustained throughout the growth period at the three cropping periods with KPH and PGB as organominerals fertilize.

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