Nutrient Source Affects the Vegetative Yield; Nutrient Quality and Shelf Life of Marketable Fresh Leaves of *Amaranthus hybridus* L.

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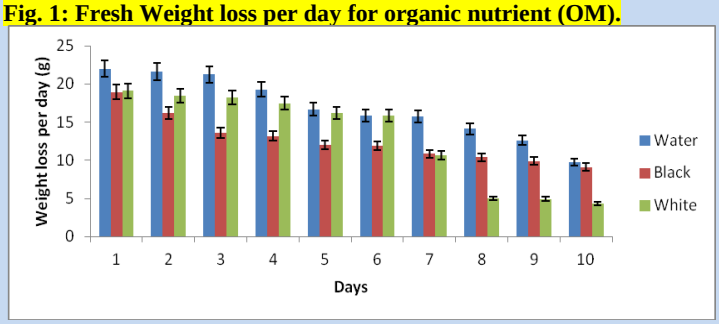
INTRODUCTION

In Nigeria, as in most other tropical countries of Africa where the daily diet is dominated by starchy foods, vegetables are the cheapest and most readily available sources of important proteins, vitamins, minerals and essential amino acids (Okafor, 1983). Unfortunately vegetables are faced with the great challenge of short shelf life and many are under-exploited because of inadequate scientific knowledge of their nutritional constituents. *Amaranthus hybridus* leaves contain 17.5-38.3% protein of which 5% is lysine; an essential amino acid that is lacking in most cereal based diets and tubers (Kauffman and Weber, 1990).Local farmers allege that nutrient source affects both the productivity and quality of farm products. This study was carried out to compare the effects of organic and inorganic nutrient sources on the productivity, nutritive quality and shelf life of fresh marketable *A. hybridus* leaves.

Fig. 1: Fresh Weight loss per day for organic nutrient (OM).



OBJECTIVE

The objectives of this study was to compare the effect of Organic manure(OM) and Urea inorganic fertilizer (UF), with Top soil (TS) as the control on the productivity, nutritive quality and shelf life of *A. hybridus* leaves.

Table 1: Main effects of nutrients on number of branches, stem girth, leaves and height of *Amaranthus hybridus*.

Nutrients	No. of Branches	Stem girth(cm)	No. of Leaves	Height (cm)
Control	$8.83\pm0.51_a$	$3.57\pm0.89_a$	$49.14\pm1.74_a$	$44.91\pm2.77_b$
Organic	$19.61\pm0.84_c$	$5.56\pm0.14_b$	$105.04\pm4.93_c$	$79.69\pm3.15_c$
Urea	$12.88\pm0.93_b$	$3.44\pm0.10_a$	$75.43\pm5.43_b$	$38.53\pm2.33_a$
F-LSD	1.12	0.173	6.98	3.9
$P_{0.05}$	0.001***	0.001***	0.001***	0.001***

Values with the same alphabet do not differ significantly using $LSD_{0.05}$

MATERIALS AND METHODS

Experimental site: The study was conducted in a screen house in the Botanic Garden, Department of Plant science and Biotechnology, University of Nigeria, Nsukka, Nigeria in 2012.

Table 2: Proximate analysis of *Amaranthus hybridus leaves*

Treatment	Pruning	Moisture (%)	Ash (%)	Protein (%)	Fats (%)	Fibre (%)
Control	Pruned	82.15	3.92	6.12	1.01	0.71
	Unpruned	82.13	4.25	7.26	1.01	0.73
Organic	Pruned	82.91	3.55	17.16	1.01	0.71
	Unpruned	81.91	2.91	17.51	1.02	0.71
Urea	Pruned	81.45	3.33	12.25	1.01	0.71
	Unpruned	80.31	2.15	14.62	1.01	0.71

Treatment and Experimental Design: Treatments included 50:50 Poultry droppings: Compost manure (OM), at the ratio of 7: 2 kg of (OM) to Top Soil, Urea inorganic fertilizer (UF), at the ratio of 7: .05 kg of Top soil Urea and Garden Top Soil (TS) Control. The experiment was laid out in a Completely Randomized Design (CRD) with 36 experimental units per treatment. After two week of transplanting, nine (18) plants from each treatment were randomly pruned 10cm below the shoot apex and the fresh leaves were used to carry out the marketable fresh leaf- shelf life studies(SLS).Three storage conditions were used-Water in Beaker(WB), wrapping in White Polythene bags(WP) and Black Polythene bags(BP).

Measurements, Data Collection and Analyses: Data were collected weekly on the following parameters: Plant height, number of leaves, stem girth and number of branches. On termination of the study, fresh weights of leaves, stems and roots were determined. Data collected were subjected to Analysis of Variance (ANOVA) using GENSTAT software. $LSD_{.05}$ (Least Significant Difference) was used to compare means. For Proximate Analysis- Protein, Fibre and Ash contents were determined following the standard method of Official Analytical Chemists (AOAC, 2005). Fat content was determined according to the method of Odo and Ishinwu (1999).

RESULTS

The results (Table 1) showed that (OM) treatment produced plants with significantly; higher number of branches, larger stem girth, greater number of marketable fresh leaves and greater plant height than UF and TS treatments. The proximate analyses (Table 2) showed that (OM) Treated plants produced more protein than the other two treatments. The shelf life and quality studies (Fig. 1) showed that the shoot cuttings from the OM treatment, preserved in WB significantly recorded less weight loss than the ones kept in (WP), followed by the ones kept in (BP) up till the 7th day. The same trend was observed for UF and TS treatments. For colour retention (Table 3), the ones grown in OM and preserved in WB retained their natural green colour better than those kept under WP and BP storage conditions as well as those grown TS and UF treatments. Plants grown with TS performed better than the ones grown with UF. The same trend was observed for Leaf Fall Index (FLI) Table 4, where the ones grown in OM and stored in WB had the least leaf fall over a one week period.

Table 3. Effect of Nutrient Source and Storage Condition on Leaf Colour Quality

Treatment	Nutrient Source																							
	CPD							UFA							GTS									
	Changes in Leaf Colour							Changes in Leaf Colour							Changes in Leaf Colour									
	D 1	D 2	D 3	D 4	D 5	D 6	D 7	D 1	D 2	D 3	D 4	D 5	D 6	D 7	D 1	D 2	D 3	D 4	D 5	D 6	D 7			
Shoot in WB	10	10	9	9	8	7	6	8	7	6	5	4	3	2	9	9	8	7	6	5	5			
Shoot in BP	10	9	8	7	6	5	4	8	7	5	4	3	2	1	9	8	7	7	6	5	4			
Shoot in WP	10	9	8	7	6	5	4	8	7	5	4	4	2	1	9	8	7	6	5	5	3			

LEGEND: 10 -Very deep green, 9 -Deep green, 8 -Light Deep Green,7- Faint Deep Green, 6 -Green, 5- Faint green,4- Very faint green, 3 -Greenish yellow, 2 -Light green yellow, 1 -Faint greenish yellow

Table 4. Effect of Nutrient Source and Storage Condition on Leaf Loss Index (Quality)

Treatment	Nutrient Source																							
	CPD							UFA							GTS									
	Leaf Loss Index (Quality)							Leaf Loss Index (Quality)							Leaf Loss Index (Quality)									
	D 1	D 2	D 3	D 4	D 5	D 6	D 7	D 1	D 2	D 3	D 4	D 5	D 6	D 7	D 1	D 2	D 3	D 4	D 5	D 6	D 7			
Shoot in WB	0	0	0	0	0	1	2	0	0	2	2	3	3	4	0	0	2	2	3	3	3			
Shoot in BP	0	0	0	1	2	3	3	0	0	2	3	3	4	5	0	0	2	2	3	3	4			
Shoot in WP	0	0	0	1	2	3	4	0	0	2	3	4	4	4	0	0	1	2	3	3	4			

Legend: 0=0% Leaf Loss (LS), 1=10% (LS), 2=20% (LS), 3=30% (LS), 4=40% (LS), 5=50% (LS).

DISCUSSION AND CONCLUSION

The better performance of the plants grown in OM in all the parameters studied may not be unconnected with higher nutrient content of this nutrient source as revealed by chemical analysis (not presented)which was higher than that of TS and then UF. The longer shelf life and better quality of leaves from this nutrient source indicate that its content may consists of better balanced essential nutrients. It is concluded that OM could be a better nutrient source for the production of high quality *A. viridis* leaves in Sub Saharan Africa. When freshly harvested twigs are stuck inside water in beakers or other containers on top of kitchen tables, their natural colours and freshness could be retained for up till 7 days after which they start deteriorating. With these cheap and easy to apply protocols, huge losses in fresh *A. viridis* production could be reduced which may have some positive effects on food security in the region.

REFERENCES

Association of Official Analytical Chemists (2005). Official Methods of Analysis of AOAC International (18th Ed.). Gaithersburg, Maryland, USA. 983pp.

Odo, F.O. and Ishinwu, C.N. (1999). Experimental Procedures for Food and Water Analysis. Computer Edge Publishers, Enugu, Nigeria. 27pp.

Okafor, J.O. (1983). Horticultural Promosing Indiginous Wild Plant species of the Nigerian Forest Zone. *HortScience* 123: 165-176.

Kauffman, C.S. and Weber, L.E.(1990). Grain Amaranth. In: Janick, J and Simon, J.E. (Ed). Advances in New Crops. Timber Press, Portland. 127-139.

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