DETERMINATION OF GROWING CAPABILITY AND NUTRITIONAL CONTENTS OF GRAIN AMARANTH FOR FOOD SECURITY AND HEALTHY LIVING IN NIGERIA

BY

Dr. Abolaji, Grace T.

Director, Center for Undergraduate Research

Kwara State University, Malete, NIGERIA

PAPER PRESENTED AT THE GRAIN AMARANTH INSTITUTE INTERNATIONAL CONFERENCE

AUGUST 3-5, 2016, TENNESSEE STATE UNIVERSITY, NASHVILLE, USA.

INTRODUCTION: GRAIN AMAHANTH

- **Inexpensive to grow by the rural poor**
- **Can be easily established and harvested**
- **Early maturing producing a lot of seeds/grain**
- **Highly tolerant to drought**
- **Highly nutritive with high quality proteins (lysine and methionine); minerals & vitamins; and dietary fibers.**
- **Highly palatable and can be used raw, cooked, popped or milled to flour.**
- **Can be used in different diets as green leave vegetables, oil extract, flour, and animal feed.**

THE PROBLEM

- GA have nutritional and health benefits:

- improvement in well-being to prevention

- improvement of specific ailments - recovery of severely malnourished children and increase in the body mass index of people formerly wasted by HIV/AIDS (Tagwira *et al.*, 2006).

- GA oil in diets = increased concentration of polyunsaturated fatty acids and effective natural antioxidant supplement.

-capable of protecting cellular membranes against oxidative damage (Martirosyan, *et al.*,(2007).

- GA nutritional value + environmental adaptability creates an excellent potential for positive impact on poor farmers who rely on staple crops that are neither resilient nor nutritious (Monica *et al.*, 2011).

- However, GA production/consumption in Nigeria is dismal. There is therefore the need to determine if grain amaranth would grow in Kwara state Nigeria, and its nutritional and medicinal characterization as strategies to improve food security and healthy living.

OBJECTIVE OF THE STUDY

The general objective:

- **Determine the Growing and Nutritional contents of grain amaranth in Kwara State Nigeria for food security and healthy living.**

The specific objectives:

- **To determine if grain amaranth could be grown in Kwara state Nigeria.**
- **To carry out proximate analysis and determine the mineral and vitamins composition of harvested grains.**
- **To relate the nutritional and medicinal properties to food security and healthy living respectively.**

LITERATURE REVIEW

- Amaranth green leaves are commonly eaten boiled by many countries in West Africa (Tung, 2010).
- Amaranth leaves are high in vitamins A, K, B6, C, riboflavin and foliate.
- It is also rich in essential minerals including calcium, iron, magnesium, phosphorus, potassium, zinc, copper, and manganese.
- Due to its high iron content, it is recommended for those at risk for anemia.
- The cooked grain is 90% digestible and because of its ease of digestion it has traditionally been given to those recovering from illness.

LITERATURE REVIEW

- Dhellot et al., 2006 pointed out that the fibre content of *Amaranth* seeds is three times that of wheat and its iron content is five times more than wheat.
- Consumption of grain amaranth is reported to have nutritional and health benefits.
- The crop can positively impact on thousands of poor farmers who rely on staple crops that are often neither resilient nor nutritious (Monica *et al.*, 2011).

MATERIALS AND METHODS

- Seeds of grain amaranth was obtained from REAP Nairobi Kenya Seminar on Medicinal Plants in Agriculture.
- Seeds were propagated, transplanted and nurtured to maturity in a medicinal plant garden in Ilorin Kwara State Nigeria.
- Grains were harvested, processed and samples were prepared for analysis to determine the nutritional and medicinal contents.

MATERIALS AND METHODS Cont'd

- The harvested grains was dried and ground to powdered form by using a grinder.
- The Proximate composition was determined by bringing the samples to uniform size and analyzed for moisture, protein, fat, ash, fiber and carbohydrate by the methods of AOAC (2003).

%Moisture =W1-W2 X 100/Wt. of sample, where

- W1 = Initial weight of crucible + Sample
- W2 = Final weight of crucible + Sample

Note: Moisture free samples were used for further analysis.

%Ash = Difference in wt. of Ash x 100

- W1= Initial weight of crucible
- W2= Weight of crucible + Sample
- W3= Weight of crucible + Ash
- Difference in wt. of ash = W3 -W1

MATERIALS AND METHODS Cont'd

% Crude Protein = 6.25* x %N (*. Correction factor)

%N =(S-B) x N x 0.014 x D x 100/wt. of sample x V. Where

- S = Sample titration reading
- B = Blank titration reading
- N = Normality of HCl
- D = Dilution of sample after digestion
- V = Volume taken for distillation
- 0.014 = Milli equivalent weight of Nitrogen

- % Crude Fat = wt. of ether extract x 100/wt. of sample

- Nitrogen Free Extract (NFE) = (100 - % moisture + % crude protein + % crude fat + % crude fiber + % ash)

RESULTS

- GA obtained from REAP Nairobi Kenya was successfully propagated, transplanted, nurtured to maturity & harvested after 65 days of propagation

RESULTS:

N.B. All the results show the average value of triplicate analysis for each sample.

Table 1: Proximate Composition of Grain Amaranth

Nutrient	% composition
Moisture	6.49
Ash	2.25
Protein	19.85
Fat	1.79
Dietary Fiber	1.81
Carbohydrates	77.82
Energy	322kcal/100g

RESULTS:

Table 2: Mineral composition of Grain Amaranth

Minerals	mg/100g
Iron	66.0
Zinc	11.3
Calcium	178.7
Magnesium	284.5
Manganese	5.71
Potassium	400.5

RESULTS:

Table 3: Vitamins in Grain Amaranth

Vitamin	mg/100g
Thiamin	0.276
Riboflavin	0.734
Niacin	1.042

DISCUSSION:

The grain amaranth in this study is rich in:

- proteins (19.85%);
- carbohydrate (77.82%);

Other components include:

- ash (2.25%); dietary fiber (1.81%); fat (1.79%); and energy (322 kcal/100g).
- Stephen, et.al. (2013) in a similar study; proteins 15.8%, lipids 7.5%, carbohydrate 66.0%, ash 3.3% and fiber 6.9%.
- The findings obtained in this study had similar or better values

DISCUSSION:

- The results in this study showed that amaranth grain is a better source of iron (66.0 mg/100g) compared with the 16.8-21.0 mg/100g obtained by Stephen. et. al., (2013) and (13.0 mg/100g) Mburu, et. al. (2012).
- Other minerals of importance in the grain amaranth identified in this study included potassium (400 mg/100g); calcium (178.7 mg/100g); and magnesium (284.5 mg/100g).
- Niacin concentration was similar to 0.9 mg/100g of sample, as reported by other researchers (FAO/WHO, 2002 and Martirosyan, et. al 2007).

DISCUSSION:

- Niacin is important for proper blood circulation and the healthy functioning of the nervous system.
- Thiamin (vitamin B1), a water-soluble vitamin, is needed by infants to help the body release energy from carbohydrates during metabolism.

CONCLUSIONS:

- Growing of grain amaranth in Kwara state was successful with high yield of grains.
- The grain amaranth in this study demonstrated the concentration of high valued and essential minerals especially zinc and iron that could stabilize immune function that might reduce complications from HIV/AIDS and anemia diseases respectively.
- The contents of magnesium and manganese in the grain amaranth studied are crucial to infants' growth and development.
- The grain amaranth in this study was loaded with balanced nutrients. When included in diets at both household and village levels, it could provide high protein-energy weaning foods; and enhance the nutritional status of the populace toward food security and healthy living in Nigeria.

RECOMMENDATIONS:

- Growing of grain amaranth should be encouraged at both household and community levels to enhance the nutritional status of the populace toward food security in Nigeria.
- Inclusion of grain amaranth in diets should be adopted to produce high protein-energy weaning food for infants and balanced diets for adults for healthy living.
- Amaranth Value Chain System that would include youths should be encouraged by Kwara State Government, Tertiary institutions, or Entrepreneurs in the growing, processing, value addition and marketing of grain amaranth. This would reduce youth unemployment and other associated socioeconomic problems in Nigeria.
- Further research studies need to be done in order to determine the status of growing and consumption of grain amaranth; and to promotion such in a value chain system.

REFERENCES

- Agong SG (2006). *Amaranthus caudatus* L. In: Brink, M. and Belay, G.(editors). Prota 1: Cereals and pulses. Prota, Wageningen, The Netherlands.

- AOAC, 2003. Official Methods of Analysis of the Association of Official Analytical Chemists, 17th edition. Association of Official Analytical Chemists, Arlington, Virginia.

- Bink M, Belay G (2006). Cereals and pulses. WUR, The Netherlands. Birch GG, Spencer M, Cameron AG (1980). Food science, (2nd ed., pp.29-37).Oxford, UK: Pergamon Press.

- Centeotl (2002). Amaranth: Ancient food of the gods for the people of today. Nutritional value. [Online]. Available at: http://prodigyweb.net.mx/centeotlac/eng/pages/valor.htm (Accessed on 5/ 4/2006).

- Dhellot JR, Matouba MG, Maloumbi JM, Nzikou DG, Linder M, Desobry S, Parmentier M (2006). Extraction, chemical composition and nutritional characterization of vegetable oils: Case of *Amaranthus hybridus* (var 1 and 2) of Congo Brazzaville. Afr. J. Biotechnol. (5):1095-1101.

- FAO/WHO (2002). Thiamin, riboflavin, niacin, vitamin B6, pantothenic acid and biotin. In: *Human Vitamin and Mineral Requirements*, Report of a Joint FAO/WHO Expert Consultation, FAO, Rome,; **3**: 27-30.

- Gardner Amanda (2014). 18 Health Benefits Of Whole Grains www. huffingtonpost.com Posted: 08/10/2014 12:22 pm EDT Updated: 08/13/2014 11:59 am EDT

REFERENCES

- Home Remedies (2008). Herbal medicines and amaranth. Retrieved on March 28, 2012, from:http://www.best-home-remedies.com/herbalmedicine/vegetables /amaranth.htm.

- Martirosyan DM, Miroshnichenko LA, Kulakova SN, Pogojeva AV and VI Zoloedov (2007). Amaranth oil application for coronary heart disease and hypertension, Lipids In *Health and Disease,*; **6**:10-11.

- Mburu MW, Gikonyo NK, Kenji GM and AM Mwasaru (2012). Nutritional and Functional properties of a Complementary Food Based on Kenyan Amaranth Grain (Amaranthus cruentus). African Journal of Food Agriculture, Nutrition and Development. ISSN 1684 5374. Volume 12 No. 2 April.

- Mnkeni AP, Masika P, Maphaha M (2007). Nutritional quality of vegetable and seed from different accessions of Amaranthus in South Africa. Paper presented at the International Symposium on the Nutritional Value and Water Use of Indigenous Crops for Improved Livelihoods held on 19th and 20th September 2006 at the University of Pretoria in Pretoria, South Africa.

- Stephen Kariuki, Daniel Sila, Glaston Kenji (2013). Nutritional Profile of Amaranth Grain Varieties Grown in Kenya. Food Science and Quality Management www.iiste.org. ISSN 2224-6088 (Paper) ISSN 2225-0557 (Online) Vol.17

- Tung A (2010). Amaranth: Food Production without Attention. Nourishing the Planet Project.

$11,203.00 GRANT/SPONSOR/SCHOLARSHIP NEEDS FOR PROPOSED GRAIN AMARANTH RESEARCH PROJECT

TITLE: USING ON-FARM ADAPTIVE RESEARCH TO PROMOTE PRODUCTION AND UTILIZATION OF GRAIN AMARANTH AMONG WOMEN FARMERS IN KWARA STATE, NIGERIA

ABSTRACT

- The concern for loss of crop varieties resulting from the profound climate change has placed the future supply of food and rural incomes at risk.
- These have stimulated organizations and scientists worldwide into retrieving, researching and disseminating the knowledge in production and utilization of neglected, disregarded, underexploited alternative crops.
- The pseudo cereal grain amaranth (*Amaranthus cruentus*) is one of such alternative crops.

ABSTRACT CONTINUED

- Grain amaranth is a fast growing, high yielding, stress resistant, nutritious crop with potential to contribute to the alleviation of poverty and malnutrition.
- The project is aimed at contributing to the improvement of livelihoods in the areas of food supply, income and nutrition of resource poor women farmers; using On-farm Adaptive Research.
- Field trials would be carried out on farmers plots in order to carry the farmers along in the research and for ease of adoption.

ABSTRACT CONTINUED

- The population for this research includes women farmers in Nigeria. Purposive sampling technique would be used to select Kwara State, and women vegetable farmers in Ilorin Metropolis.
- Survey data would be collected through the use of questionnaire to obtain information on existing knowledge and practice about production and use of grain amaranth including quantity and price of inputs, and price and quantity of output.
- Using the findings of collected data and field trials, workshops will be organized to train women farmers from other states of Nigeria on the production and utilization of grain amaranth.
- The project is expected to promote more production and utilization of grain amaranth that would result to increased food supply, improved diet, better health, and increased income for the women farmers and their households.

SEEKING COLLABORATION/SPONSORS/GRANTS/ CHOLARSHIPS FOR THE PROPOSED RESEARCH PROJECT

THANKS FOR YOUR ATTENTION!!!