



Consumption pattern and acceptability of underutilised green leafy vegetable sprinkles on selected foods in Ado-Odo/Ota Local Government Area, Ogun State, Nigeria

Babayemi B.A.*, Adepoju O.T.

Department of Human Nutrition,
University of Ibadan, Nigeria

***Corresponding author:**

Babayemi B.A.,

Phone: +2348160032661,

E-mail: ba.babayemi@gmail.com

Submitted 10 April, 2020

Accepted 23 June, 2020

Competing Interests: The authors declare no competing financial interests.

ABSTRACT

Background: Green leafy vegetables generally have the potentials to supply the dietary fibre and micronutrient needs in diets. However, less importance is placed on underutilized vegetables compared to other crops because their global production is low and as well seemed to have low market value. Underutilized vegetables can help to solve the problem of dietary fibre and micronutrient deficiency.

Objectives: This study assessed the consumption pattern of underutilized vegetables among households in Ado-Odo/Ota Local Government Area and the acceptability of selected food (jollof rice) sprinkled with *Ebolo* (*Crassocephalum crepidioides*), *Odu* (*Solanum nigrum* L), and *Yanrin* (*Launaea taracifolia* (L).

Methods: The sample size was determined using Fischer's sample size formula. The study design was a descriptive survey. A semi-structured interviewer-administered questionnaire was used to obtain information from 625 respondents which are women in households willing to participate in the research. Fresh samples of *Crassocephalum crepidioides*, *Solanum nigrum* L, and *Latuca teraxacifolia* were purchased from Ota market. The leafy parts of the vegetables were washed, cut, oven-dried at 90°C for 6 h and pulverized. Jollof rice was cooked and dried *ebolo*, *odu* and *yanrin* were sprinkled on each food and stirred thoroughly. Sensory evaluation was carried out. A portion, about two table spoons of the three samples coded E (jollof rice and *ebolo*), O (jollof rice and *odu*) and Y (jollof rice and *yanrin*) were served to each of fifty (50) panelists.

Results: Observations showed that about three-quarter (76%) of the respondents consumed underutilized vegetables. About half (52%) gathered the underutilized vegetables from the wild and 68% purchased them from the market. Also 51% were allergic to the underutilized vegetables. Food improved with *yanrin* was most preferred.

Conclusions: Food improved with *yanrin* was most preferred. Underutilised vegetables are relatively consumed in households and yet to be fully exploited.

Keywords: Underutilised vegetable, consumption pattern, sensory evaluation

INTRODUCTION

While there have been global efforts to ensure food security (Bureau and Swinnen, 2018), studies have shown that low dietary fibre diets are still common among poor rural dwellers. Their micronutrients intake is below recommended daily allowance (Harika *et al.*, 2017). There is, therefore, the need for cheap alternatives to solving the problem of nutritional deficiencies in the diet of the rural poor.

Recent studies have shown that exploiting underutilized vegetables can solve the problem of food security, particularly in the developing countries (Bvenura and Afolayan, 2015). Green leafy vegetables generally have the potentials to supply dietary fibre and micronutrients (Slavin and Lloyd, 2012; Bvenura and Sivakumar, 2017). They are rich in β -carotene, ascorbic acid, iron, zinc, folate and

dietary fiber (Fabbri and Crosby, 2016; Prodanov *et al.*, 2004). However, only a very small percentage of edible green leafy vegetables have been utilised for human consumption. There are many underutilized vegetables which are yet to be explored to meet human nutritional needs. Less importance is placed on underutilized vegetables compared to other crops because their low global production (Stamp *et al.*, 2012; Ebert, 2014) and low market value (Adhikari *et al.*, 2017; Chivenge *et al.*, 2015). Studies have shown that they have potentials as sources of food as well as having medicinal values (Belew *et al.*, 2009; Kadiri and Olawoye, 2015).

Underutilised vegetables refer to vegetables that are underutilised due to low regional or global production and because of some perceived

low market values (Stamp *et al.*, 2012; Ochatt *et al.*, 2007). Underutilised vegetables may also refer to vegetable species that are domestically cultivated for various purposes including use as food, for fibre contents, oil and medicinal values, and use as fodder; but have reduced importance over time. Other terminologies used instead of “underutilized” are orphan, neglected, underused, local, minor, traditional, underdeveloped, etc (Padulosi, 2017). Examples of underutilized vegetables common in Nigeria are Glossy Night Shades (Odu), Snake tomato (Tomato elejo), Garden egg (Igbagba), Amanranth (Tete a tededaya, and fire weed (ebolo) (Kadiri and Oseni, 2015)

Yanrin (*Launaea taracifolia* L.) is an example of underutilised vegetables having other botanical names such as African Lettuce, and wild lettuce which originated from Senegal east to Ethiopia and then to Tanzania. Yanrin was said to be cultivated first from Ethiopia where it spreads to other places as weeds. In Nigeria it is grown locally as leafy vegetable. Yanrin leaves are consumed when fresh as they are used for salads or can be cooked as soups or sauces (Adebisi, 2004). The nutritional contents of yanrin are water, energy, protein, fat, carbohydrate, fibre, calcium, and phosphorus (Leung *et al.*, 1968). Ebolo botanically called *Crassocephalum crepidiodes*, commonly called fire weed is a vegetable commonly grown in most African countries; in the southern part of Nigeria it is called Ebolo. (Adams, 1963).

The shelf-life of fresh vegetables is very short after harvest. They are usually characterised by uncontrolled browning, wilting and loss of nutritional value even at ambient temperature and relative humidity. They are easy to preserve and use when converted into powder form (Jiang *et al.*, 2013).

The study aimed at assessing the consumption pattern and sensory evaluation of *Ebolo* (*Crassocephalum crepidiodes*), *Odu* (*Solanum nigrum* L) and *Yanrin* (*Launaea taracifolia* (L) supplemented foods.

METHODOLOGY

The approach was a descriptive cross-sectional study. It was carried out in Ado-Odo/Ota Local Government area of Ogun State. The sample size was determined using Fischer’s sample size formula as shown below:

$$\text{Minimum sample size (n)} = \frac{w^2}{d^2} \times p \times q$$

where $w = 1.96$ (constant); $d = 0.05$ (error); $p = 50\%$ (assumed prevalence); $q = 100-p$ (= 50%)

$$n = \frac{1.96^2}{0.05^2} \times 0.5 \times 0.5 = 384.16$$

However, to cater for attrition, 10% of the calculated sample size was used, which added up to 422. To improve the quality of the study, the sample size of 625 was used.

Sampling

Ado-Odo/Ota Local Government Area (LGA) was selected because it is an agrarian community where vegetables are grown. There are 16 wards in the LGA. List of all communities in the selected wards was obtained from the internet search; five communities were used in administering the questionnaire namely: Ijoko, Ilogbo, Ewupe, Iyana-iyesi, and Adefarasin; these communities were chosen to obtain a comprehensive study on their consumption pattern. Although Ado-Odo/ Ota is made up of the Awori indigenes, there are many others residing there due to migration and its closeness to Lagos State, sharing a common boundary. Simple random sampling was used to select the respondents. Inclusion criteria were women in households while the exclusion criteria were non-household members, men and women who did not show interest to participate in the research.

Data Collection

A semi-structured interviewer-administered questionnaire was used to obtain information from the respondents. The questionnaire was made up of the following sections: socio-demographic characteristics of the respondents; assessment of consumption pattern of the named underutilized vegetables; underutilized-indigenous frequency questionnaire and a questionnaire containing the 9 hedonic scales for the sensory evaluation of jollof rice sprinkled with dried *Ebolo*, *Odu* and *Yanrin* leaves.

Collection and preparation of the underutilized vegetables

Fresh samples of *Ebolo* (*Crassocephalum crepidioides*), *Odu* (*Solanum nigrum* L), and *Yanrin* (*Latua teraxacifolia*) were purchased from Ota Market, one of the local markets in Ado-Odo/ Ota Local Government area, Ogun State. The leafy parts of these vegetables were

washed, cut and oven-dried at 90 °C for 6 hours. The dried leaves were pulverized, packaged in airtight sterile bottles, labeled and stored in a refrigerator until used. The sample codes are presented in Table 1.

Preparation of jollof rice

Jollof rice was prepared by adding 0.3 kg of a mixture of ground pepper, tomatoes and onion into a pot containing 30 mL of groundnut oil. The whole content was stewed for about ten minutes; then 0.3 kg of parboiled rice was poured into the stew after some quantity of water was added. Salt was added to taste; then the whole content was covered and allowed to cook for about 20 minutes.

Sensory evaluation

The prepared jollof rice was divided into three equal portions; and about four handfuls each of dried *ebolo*, *yanrin* and *odu* were sprinkled on each portion of the jollof rice and mixed thoroughly. A portion, about two table spoons of the three samples coded E (jollof rice and *ebolo*), O (jollof rice and *odu*) and Y (jollof rice and *yanrin*) were served to each of fifty (50) panelists. A questionnaire that reflects the 9 (nine) Hedonic scale as mentioned below for taste, colour, appearance, aroma and general acceptability and a section for the panelist's preference for the three underutilized vegetables in the jollof rice was shared to 50 panelists: 9 – Like extremely; 8 – Like very much; 7 – Like moderately; 6 – Like slightly; 5 – Neither like or dislike; 4 – Dislike slightly; 3 – Dislike moderately; 2 – Dislike very much; 1– Dislike extremely.

RESULTS

The Demographic characteristics considered were age, sex, marital status, educational attainment, occupation, source of household food, ethnic group. From the results, the mean age of the respondents was approximately 29, About 88.8% of the respondents were married. About 83.3%, 77.5%, 18.8% of the respondents were Yoruba, Christians and Muslims respectively.. Almost half (47.8%) of the respondents had tertiary education while 30% had secondary school education.

Table 2 shows that approximately 96% of the women consumed vegetables generally, 76% (The study aimed at assessing the consumption pattern and sensory evaluation of *Ebolo* (*Crassocephalum crepidiodes*), *Odu* (*Solanum nigrum* L) and *Yanrin* (*Launaea taracifolia* (L) supplemented foods.)

consumed underutilized vegetables, while 51% were allergic to the listed underutilized vegetables. According to Table 3, 14% rarely purchased underutilized vegetables; 21% never purchased; 12% frequently purchased; while about 53% sometimes purchased.

Table 1: Sample codes

Sample codes	Description
JE	Jollof rice and <i>Ebolo</i>
JY	Jollof rice and <i>Yanrin</i>
JO	Jollof rice and <i>Odu</i>

Table 2: Acquisition and consumption of vegetables (%)

Variable	Frequency (%)	
	Yes	No
Do you often consume vegetable?	96.3	3.8
Do you consume underutilized vegetables?	76.3	23.8
Do you gather them from the wild?	52.5	47.5
Do you purchase underutilised indigenous vegetables UUIVs from the market?	68.0	32.0
Are you allergic to any of the listed UUIVs?	50.8	49.3

Table 3: Purchase and consumption of underutilised vegetables

Variable	Frequency (%)
Frequency of purchase of underutilized vegetables	
Rarely	14
Sometimes	53
Never	21
Frequently	12
Frequency of consumption of underutilized vegetables	
Once a day	12
Twice a week	58
Once a week	17
Twice a month	4
Rarely	9
Reasons for underutilized vegetables no longer consumed	
Unavailability	54.8
Cost	6.5
Preparation stress	26
Loss of traditional recipe	12.8

Table 4: Evaluation of colour, taste, aroma, general acceptability and preference

Variable	Frequency (%)		
	Odu	Ebolo	Yanrin
Colour			
Like extremely	10	16	30
Like very much	16	14	22
Like moderately	26	22	28
Like slightly	28	24	10
Neither like nor dislike	2	4	4
Dislike slightly	12	12	4
Dislike moderately	2	6	2
Dislike very much	2	2	0
Taste			
Like extremely	14	20	28
Like very much	20	18	32
Like moderately	24	24	12
Like slightly	24	16	18
Neither like nor dislike	6	6	4
Dislike slightly	4	8	4
Dislike moderately	4	4	0
Dislike very much	2	4	2
Aroma			
Like extremely	18	16	24
Like very much	16	22	28
Like moderately	18	22	26
Like slightly	26	24	14
Neither like nor dislike	12	4	0
Dislike slightly	8	8	6
Dislike very much	0	4	2
General Acceptability			
Like extremely	16	18	22
Like very much	16	18	36
Like moderately	24	30	24
Like slightly	28	18	10
Neither like nor dislike	6	12	4
Dislike slightly	4	2	0
Dislike moderately	2	2	2
Preference			
	22	26	50

The majority (58%) of the respondents consumed underutilized vegetables twice a week while 12% consumed once daily. Unavailability was the major reason respondents no longer consumed underutilized vegetables; this was followed by preparation stress, loss of traditional recipe, then cost.

Among the underutilized vegetables, *yanrin* sprinkled on jollof rice was most preferred by the respondents (Table 4). From the evaluation of colour, taste and aroma, *yanrin* sprinkled on jollof rice ranked the highest, followed by *ebolo*, then *odu*.

DISCUSSION

From the demographic characteristics of the respondents, few were singles compared to the married that were more in number. This showed that the food consumption pattern may be influenced by the marriage factor, as also reported in previous studies (Li *et al.*, 2017). The married can be assisted by their spouses in terms of finances as the results showed that majority of the household heads were self-employed and had monthly average income greater than

N20,000. The low turn-out of the singles respondent in this study was similar to that reported by Osewa *et al.* (2013). It is implied in the demography results that the young unmarried folks were not interested in the utilization of underutilized vegetables which may be due to the fact that knowledge about the nutritional importance of these underutilized vegetables was far from them, or that marriage was an important factor.

The consumption of vegetables among the respondents was substantial; and can be increased and varied by the use of underutilized vegetables when dried and used as sprinkles on foods. Dried underutilized vegetables can be sprinkled on food at all meal time (Jiang *et al.*, 2013) thereby increasing dietary and micronutrient intake that help to reduce illness of public health importance such as colon cancer, e.t.c.

The underutilized vegetables were sometimes purchased, though some of the respondents testified that they no longer consumed the indicated underutilized vegetables for many reasons such as unavailability, loss of traditional recipe and other reasons especially for those living in the areas where home gardens could not be done; for examples, those living in flats or those not living around farms where the underutilized vegetables can be fetched. More than half of the respondents gathered underutilized vegetables from the wild.

Furthermore, unavailability was the major reason for not consuming underutilized vegetables as many respondents testified that they were consuming many of the underutilized vegetables elsewhere before migrating to Ado-Odo/Ota local government. Another major reason was the preparation stress: the traditional method of preparing these vegetables may be strenuous. The preparation processes are such as boiling, blanching, thorough washing, squeezing, e.t.c. Other reasons included loss of traditional recipes and the cost. The preparation of these nutrient-dense odu, ebolo and yanrin in dried form reduces the everyday stress involved in preparation and cooking as they can be preserved longer since the moisture content that can cause growth of microorganisms has been removed, yet supplying the needed micronutrients and dietary fibre to the consumers.

The sensory evaluation carried out for fifty panelists using the 9 points hedonic scale for colour, taste aroma, etc, revealed that *yanrin* sprinkled on jollof rice ranked the highest, followed by *ebolo*, then *odu*. The panelists preferred *yanrin* sprinkled on jollof rice more than the other underutilized vegetables.

CONCLUSION

Indigenous vegetables are yet to be exploited though they are nutrient-dense, and they add more sensory values to jollof rice, yam porridge and white rice as *ebolo*, *yanrin* and *odu* were sprinkled on them. When these vegetables were each sprinkled on jollof rice for sensory evaluation, the one containing *yanrin* was most preferred by the panelists. This showed the acceptability of the underutilised vegetables and demonstrated that they can be consumed if traditional knowledge of production through improved practices can be conveyed to Ado-Odo/Ota Local Government Area. Also, the importance of consumption and knowledge of improved preparation and cooking methods that enhance nutrient bioavailability should be advocated.

REFERENCES

- Adebisi, A. A., (2004) *Launaea taraxacifolia* (wild) Ain ex.C. Jeffrey.(internet) Records from Prot4U. Grubben, G.J. H & Denton, O.A. (Editors). PROTa (Plant Resources of Tropical Africa/ Resources vegetales de l'Afrique tropicale), Wageningen, Netherlands.
- Adhikari, L., Hussain, A. and Rasul, G. (2017). Tapping the Potential of Neglected and Underutilized Food Crops for Sustainable Nutrition Security in the Mountains of Pakistan and Nepal. *Sustainability* 9: 291; doi:10.3390/su9020291
- Belewu, M. A., Olatunde, O. A. and Giwa, T. A. (2009). Underutilized medicinal plants and spices: Chemical composition and phytochemical properties. *Journal of Medicinal Plants Research* 3 (12): 1099-1103
- Boakye, A.A., Wireko-Manu, F.D., Agbenorhevi, J.K. and Oduro, I. (2014). Dietary fibre, ascorbic acid and proximate composition of tropical underutilised fruits. *African Journal of Food Science* 8(6): 305-310
- Bureau, J. and Swinnen, J. (2018). EU policies and global food security. *Global Food Security* 16: 106-115
- Bvenura, C. and Afolayan, A.J. (2015). The role of wild vegetables in household food security in South Africa: A review. *Food Research International* 76 (4): 1001-1011
- Bvenura, C. and Sivakumar, D. (2017). The role of wild fruits and vegetables in delivering a balanced and healthy diet. *Food Research International* 99 (1): 15-30.

- Chivenge, P., Mabhaudhi, T., Modi, A.T. and Mafongoya, P. (2015). The Potential Role of Neglected and Underutilised Crop Species as Future Crops under Water Scarce Conditions in Sub-Saharan Africa. *Int. J. Environ Res Public Health* 12 (6): 5685–5711.
- Dansi, A., Vodouhè, R., Azokpota, P., Yedomonhan, H., Assogba, P., Adjatin, A., Loko, Y.L., Dossou-Aminon, I. and Akpagana, K. (2012). Diversity of the Neglected and Underutilized Crop Species of Importance in Benin. *Scientific World Journal* 932947: 1-19; doi: 10.1100/2012/932947
- Ebert, A.W. (2014). Potential of Underutilized Traditional Vegetables and Legume Crops to Contribute to Food and Nutritional Security, Income and More Sustainable Production Systems. *Sustainability* 6: 319-335
- Fabbri, A.D.T. and Crosby, G.A. (2016). A review of the impact of preparation and cooking on the nutritional quality of vegetables and legumes. *International Journal of Gastronomy and Food Science* 3: 2-11.
- Harika, R., Faber, M., Samuel, F., Kimiywe, J., Mulugeta, A. and Eilander, A. (2017). Micronutrient Status and Dietary Intake of Iron, Vitamin A, Iodine, Folate and Zinc in Women of Reproductive Age and Pregnant Women in Ethiopia, Kenya, Nigeria and South Africa: A Systematic Review of Data from 2005 to 2015. *Nutrients* 9 (10): 1096. 1096; doi:10.3390/nu9101096
- Jiang, H., Zhang, M. and Adhikari, B. (2013). Fruit and vegetable powders. Handbook of Food Powders – Processes and Properties. A volume in Woodhead Publishing Series in Food Science, Technology and Nutrition, 2013, Pages 532–552. <https://doi.org/10.1533/9780857098672.3.532>
- Kadiri, O. and Olawoye, B. (2015). Underutilized indigenous vegetable (UIV) in Nigeria: a rich source of nutrient and antioxidants – a review. *Annals Food Science and Technology* 16 (2): 236-247
- Kadri O and Olawoye B (2015) Underutilised Indigenous Vegetable (UIV) in Nigeria; A Rich Source of Nutrient And Anti Oxidants- A Review. *Annals Food Science and Technology*. Vol 16, Issue 2, pp 236-247.
- Leung, W-T.W., Busson, F & Jardin, C., 1968. Food composition table for use in Africa. FAO, Rome, Italy. 306pp.
- Li, Y.C., Jiang, B., Zhang, M., Huang, Z.J., Deng, Q., Zhou, M.G., Zhao, Z.P., Wang, Y.F. and Wang, L.M. (2017). Vegetable and Fruit Consumption among Chinese Adults and Associated Factors: A Nationally Representative Study of 170,847 Adults. *Biomedical and Environmental Sciences* 30 (12): 863-874
- Nnamani, C. V., Oselebe, H. O. and Agbatutu, A. (2009). Assessment of nutritional values of three underutilized indigenous leafy vegetables of Ebonyi State, Nigeria. *African Journal of Biotechnology* 8 (9): 2321-2324
- Ochatt, S.; Jain S.M (2017) Breeding of Neglected and Under-Utilised Crops, Species and Herbs Science Publishers Inc,; Enfield, NH, USA.
- Oloyede, F.M., Oloyede, F.A., Obuotor, E.M. and Ibronke, S.I. (2011). Antioxidant Activities and Food Value of Five Underutilized Green Leafy Vegetables in South Western Nigeria. *Nigerian Journal of Nutritional Sciences* 32 (1): 13-18
- Osewa, S.O., Alamu, O., Adetiloye, S., Olubiya, M.R. and Abidogun, E.A. (2013). Use of some Neglected and Underutilized Plant Species among Rural Dwellers in Akinyele Local Government Area of Oyo State. *Greener Journal of Agricultural Sciences* 3 (12): 817-822
- Padulosi, S. (2017) "Bring us back on the Table" GREAT Insight Magazine Vol. 6 no. 4. pp 21-22
- Prodanov, M., Sierra, I. and Vidal-Valverde, C. (2004). Influence of soaking and cooking on the thiamin, riboflavin and niacin contents of legumes. *Food Chemistry* 84 (2): 271-277
- Slavin, J.L. and Beate Lloyd, B. (2012). Health Benefits of Fruits and Vegetables. *Advances in Nutrition* 3 (4): 506–516.
- Stamp, P., Messmer, R. and Walter, A. (2012) Competitive underutilized crops will depend on the state funding of breeding programmes: An opinion on the example of Europe. *Plant Breed* 131: 461–464.
- Tchientche, K.R., Kouamé, C., Atangana, A.R., Chagomoka, T. and Ndango, R. 2013. Nutritional Evaluation Of Five African Indigenous Vegetables. *Journal of Horticultural Research* 21(1): 99-106 DOI: 10.2478/johr-2013-0014.