Direct RESEARCH JOURNALS

Direct Research Journal of Agriculture and Food Science
Vol.5 (12), pp. 433-437, December 2017
ISSN 2354-4147
DOI: https://doi.org/10.5281/zenodo.3534189
Article Number: DRJAFS2336225914

https://directresearchpublisher.org/drjafs/

*Full Length Research Paper*

# Evaluation of nutrient and anti-nutritional factors of leaves of moringa (*Moringa oleifera*) in Sokoto, Nigeria

***[1]Y. Na-Allah, [2]A. Bello, and [1]N. Kabir**

[1]Department of Animal Science, Usmanu Danfodiyo University, Sokoto, Sokoto State, Nigeria.
[2]Department of Veterinary Anatomy, Usmanu Danfodiyo University, Sokoto, Sokoto State, Nigeria.
*Corresponding Author E-mail: yakubunallah@gmail.com

Received 23 October 2017; Accepted 25 November, 2017

This study was conducted to evaluate the nutrient and anti-nutritional compound in *moringa oleifera* lam leaves affected by location. The leaves were sourced from upland, lowland, and residential gardens. The DM varies with location ranging from 96.8-91.8%. The CP differs with location ranging from 14.6-8.2%. The treatment sourced from the residential garden has the highest DM (98.6%) and the one at the lowland has the lowest (91.8%). The CP of the treatment sourced from lowland has the highest (14.6%), and that of upland has the lowest CP (8.2%). The CF of the treatment from upland is the highest (7.8%), while that of the residential garden is the lowest (4.6%). The EE has a very low amount of EE which was recorded in all the treatment in residential garden between 0.83 to 0.00%. The treatment in NFE from upland has the highest (65.7%), while that of lowland is (61.3%). The highest content of ash was recorded in the treatment from residential garden (14.2%), while that of upland is the lowest (9.8%). From the antinutritional compound evaluated, Tannin has the highest value which varies between 14.8-13.9g/100g. Saponin varies between 2.48-2.08g/100g. Alkaloid varies between 2.09-30g/100g. Oxalate varies between 1.38-1.16g/100g, Phenol varies between 0.85-0.74g/100g. From this chemical analysis, it was discovered that both samples contain a high content of starch with a good amount of CP and ash content. From the research, it shows that moringa oleifera is a good source of nutrients and therefore, moringa oleifera could be used as feed supplement for poultry lives stock production. And also the anti - nutritional analysis has also revealed that moringa oleifera is very high in Tannin but low in phenol.

**Keywords**: Anti-nutritional compound, Fadama (Lowland) farms Moringa *Oleifera,* nutrient, residential gardens, upland farms

## INTRODUCTION

Moringa Plant *(moringa oleifera* lam), belong to the family moringaceae, and is the most widely cultivated species throughout the world. The tree is native to the Indian subcontinent and has become naturalized in the tropical and sub-tropical areas around the world. Moringa tree derive its name from the tamil word “morungai” and the tree is known by such regional names as Benzolive, drumstick, horseradish, Kelor, Marango, Mlonge, Mulangay, Saijihan and Sajna (Fahay, 2005). Anwar et al., (2007) reported that moringa oleifera is an aboriginal of the Indian sub continent, but has become naturalized both in the tropical and subtropical areas around the world. The plant thrives best under the tropical inland climate, can grow well in the humid tropics or hot dry lands, and can survive in less fertile soils. It is also less affected by drought. Khallafalla *et al*. (2010) reported that almost every part of moringa tree can be used for food, medicines, or industrial purposes. Anwar *et al*. (2007) reported that moringa leaves have immense nutritional values, especially as sources of minerals and amino acids. Moringa leaves have been used to combat malnutrition, especially among infants and nursing mothers. It has been used as short term alternatives to chemoprophylaxis. Moringa leaves also play a major role in animals’ ability to overcome the detrimental effects of parasitism and diseases. Recently, a high degree of

renewed interest was placed on the nutritional properties of moringa as livestock feed, due do its potential to increase animal productivity (Reyes *et al., 2006;* Oduro *et al.,* 2008). In Nigeria, moringa trees are found in the north, but migrating to the south because of it efficiency. In Nigeria it is found in such places like Sokoto, Kebbi, keno, Kaduna and Zamfara. However, there are considerable variations in the nutrient contents of moringa, which depends on such factors like genetic backgrounds, environment and cultivation methods (Brisibe *et al.,* 2009). Anjorin *et al*. (2010) also reported that the nutritional content in the leaves of moringa varies with locations. This has necessitated the need to evaluate the nutrient composition of moringa found in different location. This will go a long way in providing the necessary information that would enable effective utilization in livestock feed and for other purposes. Anjorin *et al.* (2010) evaluated nutritional composition of moringa of the South Africa ecotype. This was the first report that includes the profiling of chemical composition, fatty acids, amino acids, as well as vitamins which are essential in animal feed. These nutrients evaluated are used for osmotic adjustment; activate enzymes, hormones and maintenance of life processes. The nutritional composition also plays a significance role in medicinal, nutritional and therapeutic values *(*Al-Kharusi *et al.,* 2009). In addition the chemical composition of the fibre fraction of the moringa affects the digestibility of the feed, which directly and indirectly affect the feed utilization by animals. The aim of this study is to evaluate moringa leaves for nutrient composition and anti-nutritional compounds in Sokoto. The objectives were to evaluate the nutrient composition of Moringa leaves from lowland, upland and residential gardens in the study area and to evaluate the anti-nutritional compounds in moringa leaves from lowland, upland and residential gardens in the study area.

## MATERIALS AND METHODS

### Study area

The study was conducted in the biochemistry laboratory of Usmanu Danfodiyo University Sokoto (U.D.U.S). Sokoto state is located within latitude of 120°N and 13.55°N and longitudes 48°E and 654°E (Mamman *et al.,* 2000). It has alternating rainy season and dry season as well, Rainfall starts late from May to early of October with mean annual rainfall ranging between 500 mm to 800 mm. The vegetation in Sokoto state is typified by grasses, shrubs as well as short scattered trees. The landscape is undulating and rocky. The soil type is predominantly sandy to sandy loam with low fertility. The major arable crops cultivated include; Millet, Sorghum, Cowpea, Groundnut, Cassava, Potato and other vegetables are cultivated in the Fadama land located at the confluence of the rivers Sokoto and Rima.

### Sample collection and preparation

This experiment was conducted using leaves samples of Moringa tree (*Moringa oleifera*) sourced from three different locations as follows;

(i) Residential gardens
(ii) Upland farms
(iii) Fadama (Lowland) farms

The leaves were collected from young and old branches of moringa trees from each location. Leaf samples of same age and location was kept separately to obtain a representative sample of each location and age of plant. The various representative samples were weighed and air dried. A sub sample was taken from each of the representative sample and oven dried to obtain the dry matter content. Then the remaining portion of the representative sample was milled using laboratory mortar and pestle. The milled sample was sieved using 0.2mm laboratory sieve to obtain the fined particles portion of each sample. The prepared sample was used for chemical analysis.

### Treatment and experimental design

The treatments for this experiment comprised of the three location where moringa *oleifera* leaves were sourced namely, residential gardens (T1), upland farms (T2) and lowland farms (T3). Leaves from both mature and young branches were collected and mixed together for each treatment. Each of the treatment was replicated three (3) times giving a total treatment combination. Randomized Completely Blocked Design (RCBD) was used for the experimental layout and data analysis.

### Chemical analysis

### Proximate analysis

The prepared samples for each treatment was analyzed for proximate compositions such as Dry matter (DM),Ash, Crude protein (CP), Crude fibre (CF),Ether extract(EE),And Nitrogen free extract(NFE), as described by Association of Official Analytical Chemist (AOAC, 2002).

### Anti-nutritional factors evaluation

The prepared samples for each treatment was used for the evaluation of some anti nutritional compounds, such

as Phytate, Tannins, Oxalate, Alkaloids, Phenol and Saponin.
(a) Tannin was evaluated (using the method described by Dawra *et al*.1998)
(b) Phytate was evaluated (using the method described by Maga et al. (1989)
( c ) Phenol was evaluated (using the method described by Khanahmadi *et al.* (2010)
(d) Alkaloids was evaluated (using the method described by Sousek *et al.* (1999)
(e) Oxalate was evaluated (using the method described by Day and underwood (1986)
(f) Saponin was evaluated (using the method described by AOAC, (2002)

**Data collection**

Data collected from each treatment sample include the proximate composition dry matter (DM), ash; Crude protein (CP), Crude fibre (CF), Nitrogen free extract (NFE) and Ether extract (EE). and some anti-nutritional compounds, such as Phenol, Tannins, Phytate, Alkaloids, Oxalate and Saponins.

**Data analysis**

The data collected was subjected to analysis of variance (ANOVA), as described by Gomez and Gomez, (1984) and treatment means that show significance differences were separated using least significant difference (LSD) test.

**RESULTS AND DISCUSSION**

This study evaluated some nutrients and anti-nutritional compounds composition of Moringa oleifera leaves from residential gardens (T1), upland farms (T2) and lowland farms (T3) in Sokoto. Proximate composition (DM, CP, CF, EE, NFE and Ash) and anti-nutritional compounds (tannin, saponin, phytate, phenol, oxalate and alkaloid) were evaluated from the leaf samples as shown in (Table1). Results obtained showed that M. oleifera leaves contained 91.8 to 96.8% DM, 14.0 to 14.6%, CP, 5.1 to 7.8% CF. 0.8 to 0.20% EE, 62.3 to 65.7% NFE and 10.5 to 14.2% Ash.

Analysis for anti-nutritional compounds (phytochemical) showed that the leave contained 14.0 to 18.8mg/100g tannin, 1.1 to 1.4mg/100g saponin, 2.2 to 2.5 mg/100g phytate, 1.7 to 2.1mg/100g alkaloid, 1.2 to 1.4mg/100g oxalate and 0.8 to 0.9mg/100g phenol. All the values did not differ significantly (P, 0.01) between the treatments. Result on the proximate composition of MO leaves collected from Residential Gardens, Upland and Lowland Farms. In Sokoto is presented in (Table 1).

**Dry matter (DM)**

The result on dry matter (DM) indicated that DM contents varied as 91.8 to 96.8% and did not differ significantly (P<0.01) between the treatments. The values obtained from this study were however higher than the range of 88.8 to 94.6% reported by AFRIS, (2004).

**Crude protein (CP)**

The results on crude protein (CP) content MO leaves showed that the CP content varied as 8.2 to 14.6%and did not differ significantly (P<0.01). The values obtained from this study were higher than the 7.73% CP reported by Ogbe and John, (2011), but lower than 24.0 CP reported by Bengaly *et al. (*2011*)*. But did not differ significantly (P<0.01) between the treatment.

**Crude fibre (CF)**

The results on crude fibre (CF) content of *M.oleifera* leaves showed that the CF content varied as 4.6 to 7.8% did not differ significantly (P<0.01) between the treatment. The CF values from this study were similar to 7.5% reported by Ogbe and John, (2011).

**Ether extracts (EE)**

The result on ether extract(EE) content of *M.oleifera* leaves showed that the EE content varied as 0.3 to 0.8% and did not differ significantly (P<0.01) between the treatment. The values obtained from this study were lower than the 6.0% EE reported by Yameogo *et al.* (2011).

**Nitrogen free extract**

The result on nitrogen free extract (NFE) of *M.oleifera* leaves showed that the NFE varied as 65.7-62.3% and did not differ significantly (P<0.01) between the treatment. The NFE values obtained from this study were higher than 60.2% NFE reported by (Yameogo et al., 2011).

**Ash**

The result on Ash content of M. oleifera leaves showed that the Ash content varied as10.5 to 14.2% and did not differ significantly(P<0.01) between the treatment. The values obtained from this study were higher than6.14% Ash reported by (Yemeoga et al., 2011).

**Table 1**.Proximate composition of Moringa oleifera leaves in Sokoto, Nigeria.

| | Composition (%) | | | | | |
|---|---|---|---|---|---|---|
| **Treatment** | **DM** | **CP** | **CF** | **EE** | **NFE** | **Ash** |
| Residential | 96.8 | 14.0 | 4.6 | 0.0 | 62.3 | 14.2 |
| Upland | 92.3 | 8.2 | 7.8 | 0.8 | 65.7 | 9.9 |
| Lowland | 91.8 | 14.6 | 5.1 | 0.3 | 61.3 | 10.5 |
| SEM | 0.33 | 0.10 | 0.05 | 0.20 | 0.83 | 0.29 |

Key: Dry matter (DM); Crude protein(CP); Crude fibre (CF); Ether extract(EE); Nitrogen free extract (NFE); Ash

**Table 2**. Anti-nutritional compounds of Moringa oleifera leaves in Sokoto, Nigeria.

| | Composition (mg/100g) | | | | | |
|---|---|---|---|---|---|---|
| **Treatment** | **Tannin** | **Saponin** | **Phytate** | **Alkaloid** | **Oxalate** | **Phenol** |
| Residential | 14.0 | 1.4 | 2.2 | 1.3 | 1.2 | 0.9 |
| Upland | 18.8 | 1.1 | 2.5 | 2.1 | 1.2 | 0.8 |
| Lowland | 14.0 | 1.1 | 2.1 | 1.7 | 1.4 | 0.7 |
| SEM | 0.03 | 0.05 | 0.06 | 0.26 | 0.08 | 0.08 |

**Anti-nutritional compounds of moringa oleifera**

Result on the Anti-nutritional compound of M. oleifera leaves samples collected from Residential gardens, Upland and Lowland farms. In Sokoto is presented in (Table 2).

**Tannin**

The results on tannin content of M. oleifera indicated that Tannin contents varied as 14.0 to 14.8mg/100g and did not differ significantly (P<0.01) between the treatment. The values obtained from this study were higher than 10.6mg/100g tannin reported by Awomukwu et al. (2015).

**Saponin**

The results on Saponin content of M. oleifera leaves showed that saponin content varied as1.1 to 1.4mg/100g But did not differ significantly (P<0.01) between the treatment. The values obtained from this study were lower than 3.4mg/100g saponin reported by Awomukwu et al. (2015).

**Phytate**

The results on Phytate content of M. oleifera leaves varied as 2.1 to 2.5 mg/100g and did not differ significantly between the treatments. The values for phytate obtained from this study were lower than 950 mg/100g as reported by Ogbe and Affic, (2011).

**Alkaloid**

The result on Alkaloid content of M. oleifera leaves varied as 1.3-2.1mg/100g and did not differ significantly (P<0.01) between the treatment. The values obtained from this study were lower than 3.2mg/100g reported by Awomukwu et al. (2015).

**Oxalate**

The result on Oxalate of M. oleifera leaves varied as 1.2-1.4 mg/100g and did not differ significantly (P<0.01) between the treatment. The values obtained from this study were lower than 6mg/100g as reported by (Makkar and Becker, 1996)

**Phenol**

The result on Phenol content of M. oleifera leaves varied aso.7 to 0.9mg/100g and did not differ significantly (P<0.01) between the treatment. The values obtained from this study were higher than 0.46mg/100g value reported by Awomukwu et al. (2015).

**Conclusion**

Result obtained from this study revealed that leaves of Moringa oleifera are good source of nutrient, as the leaves had high content of NFE, CP and Ash content with the appreciable amount of CF but low content of EE. From this chemical analysis, it was observed that both sample contain high content of starch with good amount of CP and ash content. This shows that moringa oleifera is a good source of nutrient and therefore, moringa oleifera could be used as feed supplement for poultry livestock production. And also the anti nutritional analysis has also reveal that moringa oleifera is very high in Tannin

but low in phenol.

## Recommendation

Based on the results obtained, Moringa oleifera could be selected from any of the three locations. The Moringa oleifera leaves with moderate protein (8.2 to 14.6%) and high NFE values may substitute other costly feed ingredients.

## Authors' declaration

We declared that this study is an original research by our research team and we agree to publish it in the journal.

### REFERENCES


AL-Kharusi LM, Elmardi MO, Ali A, AL-Said FJ, Abdelbasit KM, Rawahy SA (2009).Effect of minerals and organic fertilizers on the chemical characteristics and quantity of date fruits. International Journal for Agric. Biology.,11:290-296.

Anjorin TS, Ikokoh P, Okolo S (2010). Mineral composition of moringa oleifera leaves, pods and seeds from two regions in Abuja, Nigeria.Int.J.Agric Biol., 12: 431-434.

Anwar F, Sajid L,Muhammad A, Anwarul HG (2007). Moringa oleifera leaves: A Food plant with multiple medicinal uses Phytother. Res., 21: 17-25.

AOAC, (2002). Official Methods of Analysis of the association of Official Analytical Chemist (A.O.A.C.) Washington, D.c

Awomukwu DA, Nyananyo BL, Paula S, Bulelani LS (2015). Identification, Validation and Classification of the Genus Phyllanthus in Nigeria Using ITS Genetic Marker and the Taxonomic Implication. International Journal of Genetics and Genomics. Vol. 3(1): pp. 1-7. doi: 10.11648/j.ijgg.20150301.11.

Brisibe EA, Umoren UE, Brisibe F Magalhaes PM, Ferreira JFS, Luthria D, Wu X, Prior RL (2009).Nutritional characteristics and antioxidant capacity of different tissues of Artemisia annua L. *Food chemistry*. 115: 1240-1246.

Daniel Azubuike Awomukwu, Bio Louis Nyananyo, Paula Spies, Bulelani Londoloza Sizani. Identification, Validation and Classification of

Daniel Azubuike Awomukwu, Bio Louis Nyananyo, Paula Spies, Bulelani Londoloza Sizani. Identification, Validation and Classification of

Dawra RK, Makkar SP, Singh B (1988). Protein binding capacity of micro quantities. *Tannins Analytical Biochemistry* 170: 50-53.

Day RA, Underwood AL (1986). *Qualitative analysis*.5th Ed.New Delhi, india prentice Hall publication, Pp.701.

Fahay JW (2005). Moringa oleifera: A Review of the medicinal evidence for its nutritional, therapeutic and prophylactic properties. Part 1.http:// www.TFL Journal.org/ article.php /2005/201124931586.Acessses 15/03/2011.

Genomics. Vol. 3, No. 1, 2015, pp. 1-7. doi: 10.11648/j.ijgg.20150301.11

Genomics. Vol. 3, No. 1, 2015, pp. 1-7. doi: 10.11648/j.ijgg.20150301.11

Gomez KA, Gomez AA (1984).Statistical procedures for agricultural research.John and willey sons. New York. Pp. 7 -29.

Khallafalla MM, Abdellatif E Dafalla HM, Nassrallah AA, Aboul-Enein KM, lightfoot DA, EL-Deeb FE, EL- Shemy HA (2010). Active principle from Moringa oleifera Lam leaves effective against two leukemias and a hepatocarcinoma. *African Journal of Biotechnology*., 9(49): 8469-8471.

Khanahmadi M, Rezazadeh SH, Taran M, (2010). In-vitro antimicrobial and antioxidant properties of smymiumcordifoliumboiss (umberniferae) *extract.Asian J. Plant sci.*, 9:99-103.

Maga B, Nair, RKR, Kurira PW (1989). Comparative growth performance of some multipurpose trees and shrubs grown at machakos, *Kenya. Agroforestry systems*.9(1):17-27.

Makkar HPS, Becker K(1996). Nutritive value and antinutritional components of whole and ethanol extracted *Moringa oleifera* leaves. Animal Feed Science and Technology. 63(1):21–228.

Mamman AB, Oyebanji JO, Peter SW (2000). Nigeria a people united a future assured (survey of states) vol.2 Gabumo Publishing company Ltd. Calabar-Nigeria.

Ogbe AO, John PA (2011). Proximate study, mineral and anti-nutrient composition of Moringa oleifera leaves harvested from Lafia Nigeria: Potential benefits in Poultry nutrition and health. Journal of microbiology, Biotechnology and Food Sciences: 1(3) 296-308.

Reyes SN, SPorndly E, Ledin I (2006). Effects of feeding different levels of foliage from Moringa oleifera to creole dairy cows on intake, digestibility, milk production and composition livestock sci., 101 (- 3): 24-31.

Sousek J, Guedon D, Adam T, Bochovakova H, Taborska E, Valka I and simanek V (1999). Alkaloids and organic acids content of eight fumaria species phytochem analysis 10: 6-11.

the Genus Phyllanthus in Nigeria Using ITS Genetic Marker and the Taxonomic Implication. International Journal of Genetics and

the Genus Phyllanthus in Nigeria Using ITS Genetic Marker and the Taxonomic Implication. International Journal of Genetics and

Yameogo CW, Bengaly MD, Savadogo A (2011). Determination of chemical composition and nutritional values of *Moringa oleifera* leaves. Pakistan Journal of Nutrition. 10(3):264–268.