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# KNOWLEDGE ON UTILIZATION OF MORINGA AS A NUTRIENT SUPPLEMENT AMONG PEOPLE OF GADAM COMMUNITY, KWAMI LOCAL GOVERNMENT AREA OF GOMBE STATE, NIGERIA

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**ABSTRACT-**

**Background:** Utilization of natural product of plant origin having fewer side effects has gain popularity over the years. There is immense scope from natural product that can intimate health nutritious benefit rather than traditional benefit. However, the emphasis of this call appears more on the utilization of locally available and indigenous natural product to combat health. The study seeks to assess the knowledge and utilization of moringa as nutrient supplement among people of Gadam community.
**Method:** A descriptive survey research designed was adopted for the study, the study targeted all resident of Gadam community who are 30 years and above using a sample size of 110; data was collected via structured interview questionnaires, which was analyzed using SPSS V24 and results presented in frequency and percentage tables.
**Results:** Majority 41.3% of the respondents fall into the age group of 30 – 35 years, while few of the respondents fall into the age group of 45-49years accounting for 10.1% of the surveyed. 99.1% of the respondent knows that moringa is a tree plant, 0.9% doesn't know moringa as a tree plant, 98.2% of the respondent have knowledge on nutritional value of moringa, 1.8% of the respondent are not knowledgeable on its nutritional value, 99.1% of the respondent are also aware that moringa has a medicinal benefits 0.9% are not aware of its medicinal benefits. 54.13% of the respondents strongly agreed that dried moringa leaves can be used as spices, 43.12% agreed while 0.92% strongly disagree also, 1.84% disagree, factors influencing utilization of moringa include taste of

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moringa as 53.21% of the respondent strongly agreed, 23.85% of the respondents agreed, 47.71% of the respondent strongly agreed that low sensitization on moringa affect its utilization as a tree plant, 32.86% agreed also.
**Conclusion:** The results concluded that the respondents had a good knowledge on moringa, the extent to which moringa is utilized as a food supplement in Gadam community is good, low sensitization and taste of moringa are key factors identified to affect moringa utilization. The researcher therefore recommends that the health care providers should deliver quality health talk and emphases on the nutritional content of moringa.

**Keywords** – knowledge, utilization, moringa, supplement, food supplement, people

## 1. Introduction

### Background to the study

Micro nutrient deficiency (MND), a form of malnutrition that continues to cause serious global concern and a topic of interest for researchers, micro nutrient deficiency results from insufficient intake of essential vitamins and minerals which negatively affect immunity, growth development and general wellbeing. Micro nutrient deficiency is often associated with clinical symptom of disease that can be prevented or alleviated through nutritional therapy. Despite the global agenda and program established toward combating malnutrition, micro nutrient deficiency challenges are still present in countries of Sub-Saharan Africa (Olusanya 2018). Moringa oleifera is one such tree having tremendous nutritional benefit; it is rich in macro and micro nutrients which are important for normal functioning of the body. Almost all parts of this tree are edible (Odeyinka, Torimiro, Oyedele & Asaolu; 2020; Olusanya 2018) Moringa leaves are excellent source of many vitamins and minerals, one cup of fresh chopped leaves (21 grams) contains: Protein 2g, Vitamin B619% of the RDA, Vitamin12% of the RDA, Iron11% of the RDA, Riboflavin (B2)11% of the RDA,Vitamin A (from beta carotene)9% of the RDA,Magnesium8% of the RDA (Arnason, 2018). Hence, it is considered as a very good supplement because of it high protein value, with that, it is known as the “miracle tree” because of its diversified nutritional beneficial features e.g. 10 times more vitamins than carrot, 7 time more vitamin c than orange, 17 time more calcium than milk and 15 times more potassium than banana (Zahidul, Rashatu, Faruk, Mahtab-ul-islam et al; 2021).

Due to its high protein content, its richness in vitamins and minerals, the low demanding cultivation condition, moringa oleifera is often promoted as a promising plant to combat malnutrition (Milla, Penalver & Nietox, 2021). The diet of people in developing nations sometimes lacks vitamin, minerals and protein. In these countries moringa oleifera can be an important source of many essential nutrients (Arnason, 2018). Interventions such as fortification of commercial food consumed by a large population and the use of synthetic food supplement have been carried out to address the malnutrition problem. However, it has been reported that fortification is more a “post-processing” intervention that does not necessarily integrate agricultural practices with nutritional outcomes. It’s reported that most of these interventions are affected by socio-economic factor such as education, women empowerment, cultural belief, infant feeding practice, intra household food distribution and social norms (Olusanya 2018; Daba, 2022). Moringa leaves are used as a spice in common dishes, fresh leaves added in salad or cooked as vegetable soup, dry leave powder added

to meals for children, moringa tea is prepared by adding 1 spoon of leaf powder to boiled water (Mashamaite et al, 2019). Moringa leaves contain other major nutrients which are similar to vegetables; however, moringa leaf is processed into powdered form without losing any of its nutritive properties unlike other vegetables (Olusanya 2018).

However, in western countries, the dried leaves are sold as dietary supplement either in powder or capsule form (Arnason, 2018). Moringa leaves powder has been used to prevent and alleviate malnutrition in pregnant women, lactating mothers and their children, same study maintains that 600 malnourished infants are treated every year and the result shows that the children maintain or increase their body weight which improves their overall health, furthermore the studies shows that pregnant women recover from anemia, have babies with higher birth rate and lactating women increase their production of milk (Olusanya 2018). The most amazing fact about moringa is that it is a storehouse of nutrients and a medicinal chemical as it was reported by different scholars; moringa tree is rich in nutrient (minerals, fiber and protein) that can play essential role in human nutritional consumption. Numerous of the research reports have shown that moringa oleifera leaves has high protein compare to, with others leaves eaten as food (Daba, 2022). The most amazing fact about moringa is that, it is a store house of nutrients and medicinal chemicals, research studies have reported that moringa tree is rich in nutrient such as minerals, fiber and proteins that can play essential role in human nutritional consumption (Isa, 2019). Moringa has been included in some diets to combat malnutrition especially among infants and breast feeding mothers in developing country (Mashaimate, Pieterse, Mothapo & Phiri; 2021). All parts of Moringa tree which include flowers, seeds, stem and leaves are highly beneficial due to its unique and significant role and importance; this makes Moringa to be an exceptional tree. Moringa oleifera consist of immense therapeutic properties e.g. anti-oxidant. Although the value of moringa is gaining more recognition, little has been done to introduce these benefits as food to most part of the world; moringa is still under utilized as a food but is well acceptable as medicine (Olusanya, 2018). Moringa leaves also have a low calorific value and can be used in the diet of the obese however, moringa leaves contain other nutritive phyto chemicals such as tannins, sterols, terpenoids, flavonoid, saponins, anthraquinones, alkaloids and reducing sugar present (Isa, 2019).

Moringa oleifera serves many benefits in developing countries such as having an ability to be used for some crafts (due to being a tree and cleaning water) it also plays an important role in soil and climatic mitigation change (Daba, 2022). The moringa plant has been used for centuries throughout the tropic for medicinal purposes and to improve nutrition especially in children. This study emphasizes on the important of moringa oleifera in food and how it can assist in improving the health and wellbeing of humans. It focuses on the current status of moringa oleifera as human food supplement. Moringa oleifera can be part on solving a variety of health problems, disease, vitamin deficiency, malnutrition and at same time being useful natural resource to the population and industry (Meireless, Gomes, Lopes & Hinzman et al; 2020). Moringa oleifera is an inexpensive, eco-friendly and socially beneficial alternative, especially for socially neglected population suffering from poverty and malnutrition and for those who have limited access to technological resources, however, it is essential that the nutrient of this wonder tree are exploited for variety of purpose. Moringa oleifera hold great potential of improvement and valorization especially for food and nutritional security.

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**Aims of the study**

- To assess the level of knowledge on moringa oleifera in Gadam community
- To ascertain the level of moringa utilization in Gadam community
- To identify the factors influencing utilization of moringa oleifera in Gadam community

## Methods

### Study design and sample

A descriptive survey research design was adopted for the research study which aims at describing the utilization of moringa as a nutrient supplement. The target population for this study includes inhabitants of Gadam community within the age range of 30 years and above. Using Taro Yamame formular, a sample size of 110 was calculated, the Sampling method employed at the course of this study was multi-stage sampling method were samples was selected using simple random sampling and conveiniet sampling technique.

### Setting

The research work was conducted in Gadam community which is a ward in Kwami local government area of Gombe state, Nigeria. The community is situated at the western part of the local government which is approximately twenty-three kilometers (23km) away from Gombe metropolis. Gadam community shares common boundaries with Kwami community to the South, Bojude community to the North. Gadam community has approximately 31,334 populations according to National Bureau of statistics (NBS 2018). The community population are dorminantly Bolawa speaking ethnic, others include Fulani, Kanuri, e. t. c. Farming and rearing of animals are the major occupation of the inhabitants, others include civil service, trading, business as well as other small scale business.

### Data analysis

Data collected for the study via structure questionnaires was analyzed using SPSS v24 and results were presented using descriptive statistic method of frequency distribution and percentage tables.

## Results

**Table 1.1 socio-demographic data**

| Variable | Frequency | Percentage |
|---|---|---|
| Sex | | |
| Female | 73 | 67% |
| Male | 36 | 33% |
| Total | 109 | 100% |
| Age distribution | | |

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| | | |
|---|---|---|
| 30 – 34 years | 45 | 41.3 % |
| 35 – 39 y3ears | 13 | 11.9% |
| 40 – 44 years | 23 | 21.1% |
| 45 – 49 years | 11 | 10.1% |
| 50 years and above | 17 | 15.6% |
| Total | 109 | 100 |
| Tribe | | |
| Bolawa | 62 | 56.88 % |
| Fulani | 16 | 14.68% |
| Hausa | 16 | 14.68% |
| Others | 15 | 13.76% |
| Total | 109 | 100 |
| Marital status | | |
| Married | 77 | 70.6% |
| Unmarried | 22 | 20.2% |
| Divorce | 3 | 2.8% |
| Widow | 7 | 6.4% |
| Total | 109 | 100 |
| Educational status | | |
| Primary | 50 | 45.9% |
| Secondary | 27 | 24.8% |
| Tertiary | 24 | 22.0% |
| Others | 8 | 7.3% |
| Total | 109 | 100 |
| Occupation | | |
| Farmer | 45 | 41.3% |
| Trader | 40 | 36.7% |
| Civil servant | 18 | 16.5% |

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| | | |
|---|---|---|
| Others | 6 | 5.5% |
| Total | 109 | 100 |
| Religion | | |
| Islam | 90 | 82.6% |
| Christians | 18 | 16.5% |
| Others | 1 | 0.9% |
| Total | 109 | 100 |

**Table 1.2 Level of knowledge on moringa**

| SN | Statement | Yes (f) | Yes (%) | No (f) | No (%) |
|---|---|---|---|---|---|
| 1. | Moringa is a tree plant | 108 | 99.1% | 1 | 0.9% |
| 2. | Moringa has a nutritional value | 107 | 98.2% | 2 | 1.8 |
| 3. | Moringa has a medicinal benefit | 108 | 99.1% | 1 | 0.9% |
| 4. | Every part of moringa is valuable either as food or medicine | 108 | 99.1% | 1 | 0.9% |
| 5. | Moringa are combined into traditional food for human consumption | 107 | 98.2% | 1 | 1.8% |
| 6. | Moringa have impact to animals when it is been included in their feed | 108 | 99.1% | 1 | 0.9% |
| 7. | Moringa has high protein content compared to other leaves eaten as food | 108 | 99.1% | 1 | 0.9% |
| 8. | Moringa is a useful natural resources for industries | 95 | 87.2% | 14 | 12.8% |

**Table 1.3 Response on utilization of Moringa oleifera**

| SN | Statement | SA | A | SD | D | Total |
|---|---|---|---|---|---|---|
| 1. | Moringa leaves can be used as a substitute for nutrion (protein, vitamins) in weaning a baby | 82 (75.23%) | 20 (18.35%) | 2 (1.83%) | 5 (4.59%) | 109 100% |
| 2. | Moringa oleifera can be used to supplement a diet with calcium, | 68 (62.39%) | 36 (33.03%) | 2 (1.84%) | 3 (2.75%) | 109 100% |

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| | | | | | | |
|---|---|---|---|---|---|---|
| | iron, potassium, amino acid, and vitamins | | | | | |
| **3.** | Moringa can be use to correct malnutrition | 65 (59.63%) | 42 (38.53%) | 2 (1.83%) | 0 (0%) | 109 100% |
| 4. | Moringa seed can be used to treat illness such as headache | 51 (46.79%) | 55 (50.46%) | 3 (2.75%) | 0 (0%) | 109 100% |
| **5.** | Moringa flowers can also be a source of nectar which can be used to produce honey | 38 (34.86%) | 45 (41.28%) | 17 (16.00%) | 9 (8.26%) | 109 100% |
| 6. | Moringa seed can be use as a source of oil which is highly edible | 41 (37.62%) | 62 (56.88%) | 4 (3.67%) | 2 (1.84%) | 109 100% |
| **7.** | Dried moringa leaves can be used as spices in food | 47 (43.12%) | 59 (54.13%) | 1 (0.92%) | 2 (1.84%) | 109 100% |
| 8. | Moringa seed powder is used in purifying or treating dirty water | 36 (33.03%) | 40 (36.70%) | 14 (12.84%) | 19 (17.43%) | 109 100% |

**Table 1.4 Factors limiting the utilization of moringa**

| SN | Statement | SA | A | SD | D | Total |
|---|---|---|---|---|---|---|
| 1. | Taste of moringa affect its utilization most especially when supplementing children's diet | 58 (53.21%) | 26 (23.85%) | 21 (20.18%) | 3 (2.75%) | 109 100% |
| 2. | Low sensitization about the importance of moringa as a dietary supplement leads to poor utilization | 46 (42.20%) | 45 (41.28%) | 17 (15.60%) | 1 (0.92%) | 109 100% |
| 3. | In availability of moringa often results to low utilization of moringa oleifera | 52 (47.71%) | 38 (34.86%) | 19 (17.43%) | 0% | 109 100% |
| 4. | Inadequate knowledge about moringa tree products oftens leads to underutilization | 49 (44.95%) | 41 (37.62%) | 18 (16.51%) | 1 (0.92%) | 109 100% |
| 5. | Cultivation of moringa plant in the locality is a factor that affects utilization of moringa | 36 (33.03%) | 19 (17.43%) | 52 (47.71%) | 2 (1.84%) | 109 100% |
| 6. | Moringa should only be consumed situationally (pregnancy) | 9 (8.26%) | 18 (16.51%) | 81 (74.31%) | 1 (0.92%) | 109 100% |
| 7. | Moringa should not be consumed by children | 5 (4.59%) | 13 (11.93%) | 84 (77.06%) | 7 (6.42%) | 109 100% |
| 8. | Moringa consumption are contraindicated by certain underlying disease such as hypotension | 6 (5.51%) | 14 (12.84%) | 82 (75.23%) | 7 (6.42%) | 109 100% |

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## Discussion of findings

Moringa tree is one of the commonest trees in Gadam community, which is known for its remarkable nutritional value and medicinal benefits. It is rich in macro and micro nutrients which are important for normal functioning of the body. All parts of Moringa tree which include flowers, seeds, stem and leaves are highly beneficial due to its unique and significant role and importance; this makes Moringa to be an exceptional tree in the community. The moringa plant has been used for centuries throughout the tropic for medicinal purposes and to improve nutrition especially in children (Payne, 2020). Also, Moringa oleifera lam is perceived as a multipurpose and exceptionally nutritious vegetable plant with variety of potential uses in food (Olusanya 2018). Moringa oleifera are combined into traditional food for human consumption such as moringa soup, local salad, moringa juice etc which is often prepared by the indigenes of Gadam community. Moringa leaves are often used by the community to tackle and prevent malnutrition not only in humans but as well to their animals. The result from table 1.2 shows that the respondents have a good knowledge on moringa oleifera. This also indicated the level of knowledge on moringa among the respondents is high. However, this is in contrast to the research conducted by (Odeyinka, Torimiro, Oyedele & Asaolu; 2020) on farmer's awareness and knowledge of moringa oleifera which shows 51.08% of the farmers were not aware of moringa oleifera, while 48.92% indicated their awareness, 61.81 claim ignorant of the tree plant while 38.19% had knowledge of the plant through extension programs, their friends and parents.

Utilization of natural product of plant origin having fewer side effects has gain popularity over the years. There is immense scope from natural product that can intimate health nutritious benefit rather than traditional benefit. Although the value of moringa is gaining more recognition, little has been done to introduce these benefits a food to most part of the world, moringa is still under utilized as a food but is well acceptable as medicine (Olusanya 2018), Medicinal benefits of moringa oleifera leaves cannot be overemphasized, however, moringa leaves is believed to cure more than 300 diseases among which includes serving as a purgative which is used to treat pile, fever, it also serves as antiulcer, anti-inflammatory, antitumor, anti-diabetic, anti-oxidant, and anti-dyslipidemia (Oluwaseun, 2017). Leaf extracts exhibit a wide range of biological activities including tissue protective (liver, kidney, heart, testes, and lungs) activities, analgesic, anti-hypertensive, radio protective as well as immune-modulator actions (Oluwaseun, 2017). yet Moringa utilization in the community cannot be over emphasizing as it ranges from food supplementation, Moringa leaves are used as a spice in common dishes, fresh leaves added in salad or cooked as vegetable soup, dry leave powder added to meals for children, moringa tea is prepared to as well as curing illness within the community. The people often used moringa seed in water purification as an alternative to aluminion sulfate, even though, the water used for human consumption is subjected to physical and chemical procedures to make it drinkable, the study on moringa oleifera as a natural gift, point that, a billion people across the world e.g. Africa and Asia are assessed to depend on untreated water sources for their daily needs most especially in rural regions of African countries (Isa, 2019). The results from table 1.3 shows that the extent to which moringa is utilized as a food supplement in Gadam community is good, thus moringa is well utilized in the community. This finding is in line with a research conducted by (Ganji, Idahou, Chadara & Salako et al; 2018) on status and utilization of moringa, the results revealed that

moringa species is one of the most studied and used species with various uses stretching from food and medicinal uses to water purification, bio-pesticide, and production of biodiesel.

However, the major factors influencing utilization of moringa in Gadam community as seen from table 1.4 which includes; taste of moringa most especially when supplementing children's diets, low sensitization on the importance of moringa often leads to under utilization of the tree plant, in availability of moringa in the community, and inadequate knowledge about moringa tree products resulting in low or underutilization. This finding is in line with a research carried out by (Abadi, Deesta & Hegos; 2020) on assessing factors affecting moringa production which shows the main constraint to use moringa is lack of awareness, its health and nutritional benefits, cultural draw back and absence of tree with percentages 74.07%, 16.6% and 9.29% respectively.

In regards to the importance of nutrition to the vital function of the body, moringa has contributed immensely in providing nutrient such as vitamin A, B, C, calcium, iron e t c and it also serve as antimicrobial agent, which protects the body from disease. Inadequate nutrition to infant and adult will predisposed them to condition such as under-nutrition, over-nutrition, hypocalcaemia e t c and complications during growth and developmental stage. The knowledge on moringa has played a significant role in the lives of many people. Moringa is only attributed to its medicinal source often neglecting the nutritional content; however this can be attributed to low or lack of adequate knowledge on the plant. People are now becoming acquainted with the plant and considering it as food which can be utilized in various methods and ways to extract the nutrient content often supplementing diet. Therefore, utilization of moringa serves as a cornerstone for optimum health and the cutting edge for disease prevention. Base on Abraham Maslow's theory, physiological needs are the basic needs for humans, therefore is very essential for every human to have adequate diet which aids in growth and development and also improves the health of an individual. Moringa is a very good source of nutrient containing both the micro and micro nutrient needed by humans for better growth, development and improve their health.

A crucial aspect of our health is influence by the diet we consumed hence, this urges the healthcare providers especially nurses to use this findings as a tool for diet therapy. Moringa oleifera can be part on solving a variety of health problems, disease, vitamin deficiency, malnutrition and at same time being useful natural resource to the population and industry (Meireless, Gomes, Lopes & Hinzman et al; 2020). Moringa oleifera is an inexpensive, eco-friendly and socially beneficial alternative, especially for socially neglected population suffering from poverty and malnutrition and for those who have limited access to technological resources, however, it is essential that the nutrient of this wonder tree are exploited for variety of purpose. Moringa oleifera hold great potential of improvement and valorization especially for food and nutritional security. This findings also challenge public healthcare providers in advocating the use of underutilized natural plant most especially moringa oleifera for optimum health achievement.

**Limitation of the study**

This research work is limited to the people of Gadam community, various challenges encountered at the course of this research work limiting wider coverage includes; financial constrain, translation of questionnaires to local languages which tedious, time, distance, resilience on self-report data which is often subjected to biases, inherent questions being asked such as recalled bias and above all, most of the respondents needed to be assisted to fill in the questionnaires.

## Conclusion

The surveyed respondents displayed a high level of knowledge on moringa tree plant, this indicates that the people of Gadam community are farmiliar and conversant with moringa as a tree plant. Most of the respondents agreed on various uses of moringa tree plant either as food or medicine, thus moringa can said to be well utilized in the community although some factors identified to affects the usage of moringa. From the factors identified in the study, it can be concluded that the people of Gadam community has little or no cultural limitations relating to moringa utilization.

## Recommendations

Considering the findings and results shown from the analyzed data, the researcher therefore recommends that the health care providers should deliver quality health talk and emphases on the nutritional content of moringa, both the government and non-governmental organizations should equipped and encouraged sensitization programs on the importance of nutritional and health benefit of moringa. Support programs should be created such as moringa seeds donation should be given to farmers, the community should address and tackle food securities to boast its social-economical status which can only be achieved via utilization of agricultural and natural product most especially moringa tree plant cultivation.

## REFERENCES

1. Abadi T, Desta Z, Hagos H (2020), Assessing factors affecting moringa production at North-western zone of Tigray, Ethiopia, vol. 2, No 1, ideas spread limited. https://doi.org/10.30560/as.v2n1p17
2. Arnason A (2018) 6 science-based health benefits of moringa oleifera, vol1, health line media a red ventures. https://www.healthline.com/nutrition/6-benefits-of-moringa-oleifera#TOC_TITLE_HDR_2
3. Daba M (2022), Miracle tree: A review of multi-purposes of moringa oleiferaand its implication for climatic change mitigation, J Earth science climate change. https://doi:10.4172/2157.7617.1000366
4. Ganji K, Idohou R, Chadare F J, Salako V K, Assogbadjo, Kakai G (2018) satus and utilization of moringa oleifera, vol26. African Crop Science Journal. DOI:10.4314/acsj.v26i.10
5. Isah N (2019), utilization of moringa as a weaning supplement in breastfeeding mothers, unpublished.
6. Mashaimaite C V, Pieterse P J, Mothapo P N, Phiri E E (2021), Moringa oleiferain South Africa: a review on its production, growing conditions and consumption as food source, s journal science arts. https://doi.org/10.17159/sajs.2021/18689
7. Meireles D, Gomes J, Lopes L, Hinzman M, Machado J, (2020), A review of properties, nutritional and pharmaceutical, applications of moringa oleifera: integrative approach on conventional and traditional Asian medicine, Springer. https://doi.org/10.1007/s13596-020-00468-0

8. Milla P G, Penalver R, Nieto G (2021), Health benefits of uses and application of moringa oleiferain bakery product, vol. 10, MDPI. https://doi.org/10.3390/plant10020318

9. Odeyinka S M, Torimiro D O, Oyedele J O, Asaolu O (2020) farmer's awareness and knowledge of moringa oleiferain South-western Nigeria: a perceptional analysis, vol.2, Asian journal of plant sciences. https://doi.org/10.3923/ajps.320.325

10. Olusanya R N (2018), The nutritional composition and acceptability of moringa oleiferaleaf powder (MOLP) supplemented Mahewu: a maize meal based beverage for improved food and nutrition security (PDF), Inyuvesi yakwazulu-Natali press.

11. Oluwaseun O A (2017), How fumctional is moringa oleifera? A review of its nutritive, medicinal, and socioeconomic potential, Sage publication. https://doi.org/10.1177/0379572117749814

12. Payne J W (2020) Scientist studies the moringa plants' medicinal, nutritional benefits vol. 19 fogarty international center.

13. Zahidul I, Rashadu S M, Faruk H, Mahtab-ul-islam K, Pakibul H M, Karim R (2021), Moringa oleiferais a prominent source of nutrient with potential health benefits Volume 2021, Hindawi https://doi.org/10.1155/2021/66227265