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MORINGA OLEIFERA LAM: ITS POTENTIALS AS A FOOD SECURITY AND RURAL MEDICINAL ITEM

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ABSTRACT

An attempt has been made here to review the nutritive and medicinal value of miracle tree (*Moringa Oleifera)*. It is established that virtually every part of the tree (leaves, stem, bark, root, pod, flower, seeds, and gum, oil(from seed)) is beneficial in some way hence regarded as the tree with greatest benefits on planet earth. The tree is rich in proteins, vitamins, minerals. All *Moringa Oleifera* food products have a very high nutritional value. They are eaten directly as food, as supplements, and as seasonings as well as fodder for animals. It is also maintained that Moringa preparations (in form of extracts, decoctions, poultices, creams, oils, emollients, salves, powders, porridges) have been found to be effective medicinally for the treatment and prevention of various ailments including dental conditions, detoxification, reproductive, skin, circulatory, nervous, digestive disorders, inflammations, antimicrobial/ biotical, parasitic cases as well as general disorders/conditions. It is also emphasized that *M. oleifera* can also be put into use in water treatment, environmental stabilization and an oil source for biodiesel. The paper concludes that its exploitation will significantly contribute to food security thereby, alleviating poverty and improving rural health care.

Keywords: Moringa Oleifera, food security, rural health care

No. of Tables: 3 **No. of References: 28**

Introduction

Moringa Oleifera commonly called drum-stick, horseradish or miracle tree is n ative to southern foothills of the Himalayas and possibly Africa and Middle East. Today, it is the most widely cultivated species in the genus and in many other places including central and southern America, Mexico and Malaya (Adedokun *et al*., 2010; Odebode *et al*. 2010; Phiri, 2010). It belongs to the family Moringaceae. It is a multi-purpose tree crop with great potentials. Onyekwelu and Olabiwonnu (2010) reported that with the seed oil content of between 35 and 47%, *M.oleifera* is considered as a species with great bioenergy potentials. The plant is grown for food and Ozumba (2011) stated that it is an exceptionally nutritious vegetable tree with varieties of potential value. Drumstick grows well on all type of soils, humus rich forest soil being the most ideal. *M.oleifera* is one of the nature's gifts to humanity because of its numerous wealth in vitamins and minerals as well as natural anti-oxidants. Anwan and Bhanger (2003) reported that *M.oleifera* is considered as one of the world's most useful trees because almost every part of the tree is useful in one way or another. Dahiru *et al.* (2006) noted that in the tropics, *M.oleifera* is used as forage for livestock. As a traditional food plant item in Africa, *M.oleifera* has the potential of improving nutrition, boost food security, and foster rural development by enhancing and sustaining rural households as well as supporting sustainable land use and care (Adedokum *et al.,* 2010; Odedode *et al.,* 2010). The plant has been found to be rich is vitamins, minerals and edible oil called Ben oil (Ofoh *et al.,* 2011). Generally, the tree offers hope, nutrition, and medicinal and economically devastating poor third world countries. *Moringa Oleifera* is a miracle tree that has been cultivated for a long period of years and it is now found throughout the tropics. It is grown commercially around the world as food, drink and medicine (Hadiza, 2011). *M.oleifera* grows fast and reaches up to 12m. The bark is grey and thick and looks cork, peeling in patches. It loses its leaves from December to January and new growth starts in February to March. Moringa produces cream coloured flower when it is 8 months old and the flowering season begins in January and continues through to march. The fruit ripens from April to June and the pods are triangular in cross section, 30 to 50cm long and contain oily, black winged seed. is an evergreen plant. It remains evergreen from January to December. *M.oleifera* is Nigeria's evergreen gold

because if compared with other tree species, there is a clear difference that *M.oleifera* is more financially rewarding (Ozumba, 2011). *Moringa oleifera* helps the environment by releasing a lot of oxygen into the atmosphere. Unlike crude oil, *M.oleifera* has no environmental hazards. If you are looking for money, *M.oleifera* presents ample opportunity and if you are looking for knowledge, *M.oleifera* is both a science and an art (Ozumba, 2011).*M.oleifera* has so many potentials; the first step towards realizing these potentials is to put a *Moringa* seed into the soil. Juice from *Moringa* leaves can be used to produce an effective plant growth hormone, increasing yields by 25-30% for nearly any crops onion ball, pepper, Soya, maize, sorghum, coffee, tea, chili, melon. Moringa provides wind protection and shade. Burying Moringa leaves into the soil before planting serve as a natural pesticide. Crush leaves of *Moringa oleifera* can be used to clean cooking utensils. The bark of *M.oleifera* can be beaten into a fiber that can be used to make rope, mats; the wood produces a blue dye (Adeyemi *et al.,* 2012). The tree also produces viscose resin that is used in the textile industry. *M.oleifera*, due to its canopy orientation and type of leaf formation(compound leaf), is regarded a carbon sink ultimately useful in carbon sequestration.

The potentials of *Moringa oleifera*

a. As a food security item

All *Moringa oleifera* food products have a very` high nutritional value. Every part of the tree can be eaten especially the leaves, young shoots, young pods, flowers, roots and the bark (Adeyemi *et al.*, 2012).*Moringa* has long been considered a panacea for improving the nutrition of poor communities in the tropics and sub tropics(Agbogidi and Ilondu, 2012). Protein content of leaves is high (20-35% on a dry weight basis) most important is that the protein is of high quality having significant quantities of all the essential amino acids. This amino acid balance is very unusual in plant foods. *Moringa* leaves also contain high quantities of nutrients (per 100g fresh weight) vitamin A (75641U), vitamin C (51.7mg), calcium (185mg) and potassium (337mg) (Radovich, 2010).

The leaves of *M.oleifera* both fresh and dried are eaten in African countries such as Ghana, Nigeria, Ethiopia, East Africa and Malawi. They may be eaten as spinach in soup, in curies and in salad. *M.oleifera* leaves are the only source of extra protein, vitamins and minerals. The leaves are mixed with various dishes because they are very

nutritious. *M.oleifera is a* complete plant that has more ABCD iron and protein more than anything else in planet earth. *M.oleifera* is used to make Filipino chicken soup. Dehydrated *M. oleifera* leaves contains Seven (7) times the vitamin C found in orange, four (4) times of the calcium found in milk, three (4) times of the potassium found in banana, two (2) times of the protein found in yogurt, nine (9) times the iron in spinach, two (2) times the vitamin A found in carrot and four (4) times fiber in oats as well as other minerals for healthy living. Moringa trees have been used to combat malnutrition, especially among infants and nursing mothers. Three non-governmental organizations in particular—Trees for Life, Church World Service and Educational Concerns for Hunger Organization—have advocated Moringa as "natural nutrition for the tropics." Leaves can be eaten fresh, cooked, or stored as dried powder for many months without refrigeration, and reportedly without loss of nutritional value. Moringa is especially promising as a food source in the tropics because the tree is in full leaf at the end of the dry season when other foods are typically scarce (Dahot and Memon, 1985; Fahey, 2005). *Moringa oleifera* also serves as animal forage (leaves and treated seed-cake). The flowers can be cooked and mixed with other food. The flower provides good source of protein and potassium. They also serve as a good source of nectar for honey producing trees (Adeyemi *et al.*, 2012). The pods are cooked like green beans and have a similar flavor to asparagus. *Table 1* below shows the nutritional value of *Moringa oleifera* leaves and pods per 100gm. The seeds are eaten like peas (boiled or fried) when still green (Fuglie, 2000). *Moringa* oil is of excellent quality (73% oleic acid, similar to olive oil) for cooking (Dhar and Gupta, 1982; Price, 2007). *M.oleifera* is a very popular species in Visayas region of Philippine; the immature pods are prepared as green peas while the matured ones are fried. The gum that is produced from the bark can be used to season food. Studies including those of Olabiwonnu and Onyekwelu (2010) and Agbogidi and Ilondu (2012) have shown that *M.oleifera* seeds gave high yield of oil, which has good antioxidant capacity with great potential for industrial, nutritional and health applications. Large scale cultivation of this economic plant could be used as poverty alleviation strategy in Nigeria. Moringa seed kernels contain oil that is valued for culinary and cosmetic use (Duke 1987; Adedokum *et al.*, 2010). The oil contains 60-75% oleic acid and is comparable to olive oil in taste

and value in cooking characteristics. The oil has an antioxidant content, which makes it slow to go rancid. Low-tech extraction methods (e.g. grinding and boiling toasted seed) may be used but are relatively slow and inefficient. One low-tech method involves dehulling and grinding the kernels, then boiling them for 5 minutes in water. After boiling the mixture is strained and allows sitting overnight during which time the oil separates from the water.

Low-tech oil expellers have been successfully used for extracting Moringa oil. One such press (the Komet press is reported to produce 6.5litres (7.2qt) in 8 hours with a 12% yield of oil. The report maintained that 10kg (22.1b) of seed yielded 1.2kg (2.641b) or 1.3l (1.4qt) of oil. Ram and screw presses have also been for Moringa oil extraction with yields of 5.6%. Dehulling can improve oil yielded, but the increase is small and may not justify the extra effort (Rajangam, 2001; Radovich, 2010). Yields using a screw press can be improved to 20% if the seed is first crushed; 10% by volume of water added, followed by gentle heating over low heat for 10-15 minutes, taking care not to burn the seed. Producing Moringa oil on a small scale might be economically feasible if it were marketed to restaurants, hotels and others high-end venues as a locally produced alternative to imported olive oil. If oil is extracted through pressing, costs may be further reduced if press cake is used to replace purchased fertilizer (Emonger, 2009).Folkard and Sutherland (1996) reported that 25 grams daily intake of Moringa leaf powder will give a child 42% protein, 125% calcium, 61% potassium, 41% magnesium, 71% iron, 272% vitamin A and 22% vitamin C.

b. *Moringa oleifera* as a rural medicinal item

In many parts of the world, every part of the *Moringa oleifera* tree has been used effectively against various ailments (Onwuliri and Dawang, 2006; Ozumba. 2008). In many other countries, Moringa micro-nutrient liquid, a natural anti-hermitic and adjuvant is used as a metabolic conditioner to act against endemic diseases in developing countries. *M. oleifera* has a lot of medicinal uses. It is a healing plant used for the treatment of many ailments and troubles (Dahiru*et al.*, 2006; Ozumba, 2008; Damilola, 2011). *Moringa oleifera* leaves contain specific antioxidants and health promoting ingredients that offers veritable answer to malnutrition and diseases. *Moringa oleifera* leave is a strong antioxidant, effective against prostrate and skin cancers, an anti-tumor and an anti-

aging substance. *M.oleifera* leaves help men to produce more sperm (Damilola, 2011). *M.oleifera* leaves provide immunity against HIV and AIDS and manage fibroid, while preventing other diseases. In many warm-climate countries today, health workers are now treating malnutrition in small children, pregnant and nursing women with *M.oleifera* leaf powder (Adekitan *et al.*, 2012). *Table 2* below presents the recommended daily allowance (RDA) of various nutrients supplied to nursing mothers and children. The nutrients help to build up the immune system of both nursing mothers and children.

Table 1.*Nutritional value of Moringa oleifera leaves and pods per 100gms*

Component analyzed	Pods	Leaves	Leaf Powder
Moisture (%)	86.9	75	7.9
Calories	26	92	205
Protein (g)	2.5	6.7	27.1
Fat (g)	0.1	1.7	2.3
Carbohydrate (g)	3.7	13.4	38.2
Fiber (g)	4.8	0.9	19.2
Minerals (g)	2	2.3	-
Ca (mg)	30	440	2,003
Mg (mg)	24	24	368
P (mg)	110	70	204
K (mg)	259	259	1,324
Cu (mg)	3.1	1.1	0.57
Fe (mg)	5.3	7	28.2
S (mg)	137	137	870
Oxalic acid (mg)	10	101	1,600
Vitamin A - β carotene (mg)	0.11	6.8	16.3
Vitamin B -chlorine (mg)	423	423	-
Vitamin B1 -thiamin (mg)	0.05	0.21	2.64
Vitamin B2 -riboflavin (mg)	0.07	0.05	20.5
Vitamin B3 -nicotinic acid (mg)	0.2	0.8	8.2
Vitamin C -ascorbic acid (mg)	120	220	11.3
Arginine (mg)	3.6	6	1.33%
Histidine (mg)	1.1	2.1	0.61%
Lysine (mg)	1.5	4.3	1.32%
Tryptophan (mg)	0.8	1.9	0.43%
Phenylalanine (mg)	4.3	6.4	-
Methionine (mg)	1.4	2	0.35%

Threonine (mg)	3.9	4.9	1.19%
Leucine (mg)	6.5	9.3	1.95%
Isoleucine (mg)	4.4	6.3	0.83%

Table 2. *Percentage of the recommended daily allowance (RDA) of various nutrients supplied to nursing mothers and a 1-3 years old child by Moringa oleifera leaf powder (6 tablespoons per day for a nursing mother, 1 tablespoon three times per day for a 1-3 years old child).*

Nutritional component supplied	RDA	
	Parent	Child
Protein	21	42
Calcium	84	125
Magnesium	54	61
Potassium	22	41
Iron	94	71
Vitamin A	143	272
Vitamin C	9	22

The flower juice improves the quality and flow of mother's milk when breast feeding. The flower encourages urination. The flower also prevents cough, asthma, muscle diseases and enlargement of spleen. It is eaten raw; pods act as a dewormer and treat liver and spleen problems as well as pains of the joint. Due to high protein and fiber content, the pod can play a useful part in treating malnutrition and diarrhea. The seeds are used for their antibiotic and anti-inflammatory properties to treat arthritis, rheumatism, gouts, cramps, sexually transmitted disease, boils and epilepsy (Fahey, 2005; Ajala*et al.*, 2012).The roots is use to prevent tuberculous glands in the neck, to destroy tumors, ulcer, earaches, shuttering of ear and as a fermentation to relieve spas (Adeyemi *et al.*, 2012). The stem and bark removes all kinds of pain. It is authelmintic and useful to cure eye disease. *Moringa oleifera* has also been used in treatment and prevention of detoxification and cancer as well as other ailments *(Table 3).*

CONCLUSION

The role of *Moringa oleifera* as a food security and rural medical item has been reviewed. The need for its large scale production in rural areas in the tropics and Nigeria especially cannot be over emphasi-zed in order to reap its benefits as food and food ingredients, potential production of anti-oxidants and pharmaceutical products

for local and international markets, water treatment and livestock and fish feed.

Table3. *Reported nutritional, therapeutic and prophylactic uses of Moringa oleifera*

Traditional Use Condition/Effect	**Plant Part**
Antimicrobial / Biocidal	LFSPRBGO
Bacterial	LFS
Dental Caries/Toothache	RBG
Infection	LF
Syphilis	G
Typhoid	G
Urinary Tract Infection	L
Fungal/ Mycoses	O
Thrush	O
Viral	
Common cold	FRB
Epstein-Barr Virus (EBV)	L
Herpes Simplex Virus (HSV-1)	L
HIV-AIDS	L
Warts	S
Parasites, Dranunculiasis (guinea-worm)	F
Helminthes	LFP
Schistosomes	S
Trypanosomes	LR
Other / Not Attributed to a Specific Pathogen	
Bronchitis	L
Earache	G
External sores/ulcers	LFRB
Fever	LRGS
Hepatic	L
Skin (Dermal)	O S
Throat infection	F
Water treatment (general)	S
Asthma	RG
Cancer Therapy/Protection	LFPBS
Anti-tumor	LFSB
Prostate	L
Radio protective	L
Skin	P
Circulatory/endocrine Disorders	LFSPR
Anti-anemic	L
Anti-hypertensive	LP

Cardio tonic	R
Diabetes/hypoglycemia	LP
Diuretic	LFRG
Hypocholestemia	L
Thyroid	L
Tonic	F
Hepatorenal	LR
Detoxification, Antipyretic	BO
Purgative	O
Snakebite	B
Scorpion-bite	B
Digestive Disorders	LSRBG
Colitis	LB
Diarrhea	LR
Digestive	B
Dysentery	LG
Flatulence	R
Ulcer / Gastritis	LS
Inflammation	LFSPRG
Rheumatism	LFSPRG
Joint pain	P
Edema	R
Arthritis	S
Immunity	SO
Immune-stimulant	S
Lupus	O
Nervous Disorders	LFRBGO
Anti-spasmodic	SR
Epilepsy	RB
Hysteria	FRBO
Headache	LRBG
Nutritional	LSBO
Antinutritional factors	B
Antioxidant	LO
Carotenoids	L
Energy	LSO
Goitrogen	S
Iron deficiency	LS
Oil quality	O
Protein	LS
Vitamin/mineral deficiency	LS

Plant parts are designated by their first letters (in bold): ***L****eaves, Flowers, Seeds, Pods (drumsticks),* ***Roots, Bark, Gum, and Oil*** *(from seeds).*

REFERENCES

Adekitan, A.A., Martins, O., Awomeso, J.A. and Idowu, O.U. (2012). Effectiveness of *Moringa Oleifera*seedpowder in grey water treatment.*In:* Onyekwelu, J.C., Agbeja, B.O., Adekunle, V.A.J., Lameed, G.A., Adesoye, R.O. and Omole, A. O. (eds.). *Proceedings of the 3rd Biennial National Conference of the Forests and Forest Products Society held at University of Ibadan, April 3-6.*Pp 558-560.

Adedokun, M.O., Oladoye, A.O., Olawumi, A.T. and Laminou, K.I. (2010). Economic contribution of *Moringa oleifera* (Lam) plantation of rural livelihoods in Monoidi Local Government Area of Niger Republic. *Obeche Journal* 28(**2**):142-146.

Adeyemi, T.O.A., Ogunrinde, C.A., Adeleke, A.S. and Omagu, J. O. (2012).Harnessing the potentials of *Moringa oleifera* for health improvement and poverty reduction-areview.*In:*Onyekwelu, J.C., Agbeja, B.O., Adekunle, V.A.J., Lameed, G.A., Adesoye, R.O. and Omole, A. O. (eds.). *Proceedings of the 3rd Biennial National Conference of the Forests and Forest Products Society held at University of Ibadan, April 3-6.*Pp 515-519.

Agbogidi, O.M. and Ilondu, E.M. (2012). Effects of spent engine oil on the germination and seedling growths of *Moringa oleifera* (Lam).*In:* Onyekwelu, J.C., Agbeja, B.O., Adekunle, V.A.J., Lameed, G.A., Adesoye, R.O. and Omole, A. O. (eds.). *Proceedings of the 3rd Biennial National Conference of the Forests and Forest Products Society held at University of Ibadan, April 3-6.*Pp 336-341.

Akaka, O.O., Adebawo, F.G. and Olayiwola, Y.B. (2012).Potential of *Moringa oleifera* Lam seed oil as a biopreservative agent against attack on *Aningeria Robusta* Wood (A.Chev).*In:* Onyekwelu, J.C., Agbeja, B.O., Adekunle, V.A.J., Lameed, G.A., Adesoye, R.O. and Omole, A. O. (eds.).*Proceedings of the 3rd Biennial National Conference of the Forests and Forest Products Society held at University of Ibadan, April3-6.*Pp 186-190.

Anwan, F. and Rashid, U. (2007).Physico-chemical characteristics of *Moringa Oleifera*seeds and seed oil from a wild provenance of Pakistan. *Pakistan Journal of Botany*. 39(**5**): 1443-1453.

Becker, K. (2003). Moringa oleifera: an underutilized tree with amazing versatility Department of Agriculture systems and animal nutrition, Institute for animal production in the tropics and subtropics, University of Hoherheim, Stuttgart, Germany.

Dahiru, D., Onubiyi, J.A. and Umaru, H.A. (2006). Phytochemical screening and antiulcerogenic effect of *Moringa oleifera* aqueous leaf extract. *African Journal of Traditional, Complementary and Alternative Medicines*. 3(**3**): 70-75.

Dahot, M.U.andMemon, A.R. (1985). Nutritive significance of oil extracted from *Moringa oleifera* seeds. *Journal of Pharmacy of the University of Karachi* 3(**2**): 75-80.

Damilola, I.(2011).*Moringa oleifera* :magic plant. *Success Digest Extra.* 6(**28**): 1-7.

Dhar, B. and Gupta, O.P. (1982).Nutritional value of Shigru (*Moringa oleifera* Lam.). B.M.E.B.R. 3(2-4): 280-288.

Duke, J.A. (1987). Moringaceae: horseradish-tree, benzolive-tree, drumstick-tree, sohnja, moringa, murunga-kai, malunggay.*In*: M. Benge (ed.).Moringa: a multipurpose vegetable and tree that purifies water. Sci. & Technol. / For., Environ.and Natural Resources Agro-Forestation Tech. Ser. 27. US AID, Washington, D.C. Pp 19-28.

Emonger,V.E.(2009).Growth of *Moringa oleifera* Lam seedling provenances under Botswana condition. Botswana Journal of Agriculture and Applied Services 5 (**2**) 56-64.

Folkard, A. and Sutherland, H.O. (1996).The *Moringa oleifera* plant supplement of the Board Trade *Journal Bulletin of the Imperial Institute* Pp. 45-107.

Fuglie, L. F. (2000). The miracle tree *(Moringa oleifera)* natural nutrition for the tropics. Church World Services, Dakar, 68p.

Hadiza, A. (2011). Many Benefit of *Moringa oleifera* (the miracle plant). *Nigerian Observer Online Edition.*January 26. Pp. 1-5.

Odebode, A.V., Woes, T.O., Oyedeji, O.F., Amadi, J.O and Sowumi, I.L. (2010).*Moringa* o*leifera*: a multipurpose tree for restragetising agriculture for sustainable livelihood *In*: Akinlade, J.A., Ogunwale, A.B., Absalom, V.O, Aderinola, O.A, Ojeiyi, O.O., Rafin, T.A., Ojayeni, T.B. and Hélène, D.O. (eds.).Proceedings of the 44th Annual Conference of the Agricultural Society of Nigeria (ASN).Pp 444-445.

Ofoh, M.C.,Obiefuna, J.C., Onwuliri, C.O., Ibewuchi, H, Onwermudu, E.U, Ihejirike, G.O., Jake, F.O., Dialoke, S.A. Adikuru, N.C., Nwocha V.I. and Chukweke, T.C. (2011). Nursery and field establishment of *Moringa oleifera*: The Federal University of Technology, Owerri, Nigeria experience. *International Journal of Agriculture and Rural Developm-ent.*14 (**2**): 589-594.

Ogbunugafor, H.A., Eneh, F.U., Ozumba, A.N., Igwo-Ezikpe, M.N., Okpuzor, J., Igwilo, I.O., Adenekan, S.O. and Onyekwelu, J.C.(2011). Physico-chemical and anti-oxidant properties of *Moringa oleifera* seed oil. *Pakistan Journal of Nutrition* 10(**5**)*:* 409-414.

Onwuliri, F.C and Dawang, N.D. (2006). Anti-bacteria activity of aqueous and ethanol leaf extract of drumstick plant (*Moringa oleifera* Lam.) on some bacteria species associated with gastrointestinal

diseases. *Nigerian Journal of Botany* 19(**2**)*:*272-279.

Onyekwelu, J.C. and Olabiwonnu, A.A. (2010).Seed germination and early growth of *Moringa oleifera* seedlings.*In:* Onyekwelu, J. C., Adekunle, V. A. J. and Oke, D. O. (eds.). Proceedings of the 2nd Biennial National Conference of the Forests and Forest Products Society held at the Federal University of Technology, Akure, Nigeria between 26th and 29th April, 2010. Pp 117-122.

Ozumba, N. A. (2011). *Moringa oleifera*: Nigeria's evergreen gold. *Pax Herbal Magazine 6:* 7-9.

Ozumba, N.A. (2008). *Moringa oleifera*: a review of its medicinal and other uses Institute for Development Studies Monograph series' 3-10.

Palada, M.C. and Chang, L.C. (2003).Suggested cultural practices for Moringa.International Cooperation guide. Asian Centre (AVRDC), Pub 03-545:1-4.

Phiri, C. (2010). Influence of *Moringa oleifera* leaf extracts on germination and early seedling development of major cereals. *Agriculture and Biology Journal of North America* 1 (**5**): 774-777.

Price, M.L. (2007).The *Moringa* tree. *Echo Technical Note.* Florida, USA. Pp. 1-12.

Radovich, T. (2010). Farm and forestry production and marketing profile for *Moringa* (*Moringa oleifera*).*In*: Elevitch, C.R. (ed.). Specialty crops for Pacific Island Agro forestry. Permanent Agricultural Recourses Holualoa, Hawaii.Pp 1-11.

Rajangam, J. (2001).Development potential for *Moringa* products October 29th\– November 2nd 2001 Dar-salaam, Tanzania.