

UTILIZATION POTENTIALS OF MORINGA OLEIFERA IN NIGERIA: A PRELIMINARY ASSESSMENT

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ABSTRACT. A survey on the utilization potentials of *Moringa oleifera* in Nigeria was conducted in 2011. The survey involved 14 states (including the Federal Capital Territory) across the five agroecological zones. The 14 States were Borno, Kano, Adamawa, Kebbi, Kaduna, Niger, Nassarawa, Abuja (F.C.T), Kogi, Benue, Kwara, Oyo, Enugu and Anambra. A semi-structured questionnaire and field visits were adopted in this study while a multistage random sampling technique was used in selecting the respondents. The survey found more than 25 local names of *Moringa oleifera* in Nigeria. Widespread utilization of *Moringa* as food was observed with its use as vegetable in soup, as salad or herbal tea having particularly high scores. There was low awareness of *Moringa oleifera* as a domestic cleansing agent although about 30% of respondents used it in domestic water clarification. The species has high ethno-medicinal value, addressing close to 20 conditions including typhoid and malaria fever (78.7%), ear infection (71.8%), eye infection (66.9%), lowering of blood sugar (diabetes mellitus) (65.2%) and blood pressure (64.7%). It is evident that this important species is still underutilized in Nigeria and more efforts are required for a fuller exploitation of its rich potentials.

1. INTRODUCTION

The drumstick tree, *Moringa oleifera*, is a multipurpose tree species. It is used in agricultural production as manure, pesticide, foliar fertilizer (Fuglie, 1999) and plant growth hormone (Foidl et al., 2001). Its use in domestic water purification (Anwar et al., 2007) and as a source of food and medicine is also well acclaimed (Fuglie, 1999). Its potential to address global undernourishment problems has been highlighted (Thurber and Fahey, 2009).

Apart from their use as food, Africans are well accustomed to the utilization of plants for medicinal purposes. In South Africa, a significant proportion of the population has recourse to traditional medicine which essentially relies on indigenous plant species. In Durban for instance, 40% of the black population patronize indigenous medicinal services (Mander, 1998). In West Africa, traditional medicine is a key component of the healthcare delivery system. Over 40% of the inhabitants of countries like Burkina Faso, Niger and Ghana use medicinal plants. In Nigeria, over 90% of the rural population and over 40% of urban settlers depend on traditional medicine (FAO, 2011).

Users of medicinal plants do not consider them inferior to Western medicine. Besides, there is even international trade in medicinal plants primarily between neighbouring countries, although South Africa is known to export some medicinal plant species such as *Parax ginseng* to Germany (FAO, 2011). Thus apart from medicinal benefits obtained, there is enhancement of family incomes and even national economies. As such, exploitation of these species is expected to continue. Already, some of these species are becoming increasingly depleted in population or getting extinct in non-protected areas leading to scarcity in the market, with attendant high prices of what is available or use of substitutes. This has necessitated efforts towards domestication (Sunderland et al., 1999).

Moringa oleifera, though exotic to Africa, seem to be “indigenized” in so many regions going by the number of vernacular names it commands. Originating in India, Pakistan and the surrounding regions, it is now being cultivated in many parts of Africa, Asia and other tropical areas (Fahey, 2005). Although the tolerance of the plant to a wide range of ecological conditions (Nouman et al., 2013) is likely behind its fast and wide spread, the usefulness of the plant could also partially account for this.

Evidence on the utilization of *Moringa oleifera* in Nigeria exists in the literature. However, there seem to be no formal documentation of the utilization of this species in Nigeria. Current advocacy on the use of *Moringa* appears to be gaining momentum. There is the need to properly document the current status of utilization of the species in Nigeria, hence this work. This will assist in identifying intervention pathways in the promotion of this important resource in the country.

2. METHODOLOGY

A field survey on the utilization of *Moringa oleifera* in Nigeria was conducted between August and September 2011. A semi-structured questionnaire and field visits were used in this study. A multistage random sampling technique was used in selecting the respondents. In the first stage, 14 states namely: Borno, Kano, Adamawa, Kebbi, Kaduna, Niger, Nassarawa, Abuja F.C.T., Kogi, Benue, Kwara, Oyo, Enugu and Anambra were randomly selected from the five agro-ecological zones in Nigeria. From each of the selected states, four towns/village communities were selected because of the presence of *Moringa* in the town or village communities. From each of the town/village communities, five persons were randomly selected, making a total of 20 persons per state. Two hundred and eighty respondents constituted the sample size. The instrument (questionnaire) was validated before being administered to the respondents. Results of the survey were elucidated using frequency and percentage.

3. RESULTS

Table 1 contains the various local names by which *Moringa oleifera* is known across the country. Such names include Zogale (Hausa), Son-bishi, Zogale (Fulani); Ewe-Igbale, Ewe-Iba, Igi-Igbale (Yoruba); Agbaje, Npataka, Zele, Okwe-Olu, Okwe-Oyibo, Odudu-Oyibo (Ibo); Jeelegede (Tiv); Geregeji (Igala); Zogala (Kamberi). It is obvious that within some linguistic groups, the plant has more than one name.

The use of *Moringa oleifera* as food recorded high percentage scores with each use item having a score of more than 50% (Table 2). Of the food uses, use as vegetable in soup, as salad or tea topped the list with 95.7, 79.9 and 71.1% respectively. Its use as spice or chewing of raw leaves as snack was less popular; having ratings of 61.0 and 57.9% respectively. Generally, the root was the least used of all parts as food. The use of *Moringa oleifera* as a domestic cleansing agent was little appreciated by respondents (Table 3). Thus its use ranged from 18.4% (washing of cooking utensils) to 32.1% (purification of drinking water). In this use category, the most favoured part was the leaf, followed by the stem and then the root.

The survey result revealed a lot of medicinal uses to which the species is subjected (Table 4). Medicinal applications with more than 50% rating included treatment of fever (78.7%), ear infection (71.8%), eye infection (66.9%), lowering of blood sugar (diabetes mellitus) (65.2%) and lowering of blood pressure (64.7%), treatment of common cold (55.1%), male impotency (53.7%) and skin diseases (53.2%). A lot of other medicinal uses had ratings of above 40%. More than 40% of respondents were aware of the usefulness of the species to persons living with HIV/AIDS. There was evidence that the stem and roots of *Moringa* are also used in ethno-medicine although the plant part mainly used for medicine was the leaf.

4. DISCUSSION

The survey reported here identified more than 25 local names of *Moringa oleifera* in Nigeria. There is the high likelihood that the number of these names would increase if more linguistic groups are included. Although the foreign origin of the species is not in doubt and has even been recognized through some of the names like *Okwe-oyibo*, *Odudu-oyibo* or *Okwe-bekee* (foreign tree) in Igbo language, it obviously has been indigenized in many parts of Nigeria. Two factors may have worked in favour of this indigenization, namely; the usefulness of this species as highlighted in this study as well as its ability to thrive under a wide range of conditions (Nouman et al., 2013).

The use of *Moringa oleifera* as human food appears widespread. In Nigeria, popular uses are consumption of the leaves as vegetable in soup or as salad with groundnut paste or as herbal tea. In an earlier study Nnam (2009) reported that *Moringa* leaves were eaten as vegetable in soup, porridge and in complementary baby food. The leaves of *Moringa* are eaten like rape or spinach in many rural and urban communities in Zimbabwe. The leaves are high in protein, iron, calcium, vitamins A, E, C and K, phosphorus and magnesium (Chawla *et al.*, 1988; Makker and Becker, 1997). The protein content of *Moringa* is higher than that of beef (Nnam, 2009). It is also a cheaper and better source of essential amino acids compared to the protein rich foods from animal sources (Hendrix, 2008). The plant has been advocated as a viable option in the tackling of undernourishment problems particularly in developing countries (Tesfay et al. 2011). In fact, for more than 40 years, the World Health Organization has been using *Moringa* to fight malnutrition in many countries especially among infants and nursing mothers (Harvey 2005).

The low level of awareness of *Moringa* as a domestic cleansing agent (18.4 – 32.1%) is rather disturbing in light of the acclaimed capacity of this plant to act as water purifier (Palada and Chang, 2003). *Moringa* seed cake is considered a better water clarifier than the conventional chemical coagulant, Aluminium sulphate (Allum) which is more expensive, toxic and only sediments dirt but does not remove bacteria from water. In contrast, the seed cake is cheap, non-toxic and removes up to 90-98% of bacteria in dirty water (Anonymous, 2002). *Moringa* contains an anti-biotic and a fungicide known as pterigospermin (Price, 2000). With the current trend in climate change, shrinking water bodies pose a serious problem especially in Northern Nigeria during the dry season leaving algae infested stagnant water in the river bed. In a developing country like Nigeria, lacking portable drinking water especially in rural areas, such unwholesome water sources become the only alternatives for drinking and domestic use thereby exacerbating rural health problems. The use of *Moringa* seed cake can go a long way in providing safe drinking water in rural areas and thereby curtailing water related diseases.

The ethno-medicinal uses of *Moringa oleifera* indicated in this study showed that *Moringa* is used for the treatment of typhoid fever and malaria, ear infection, eye infection, common cold (cough and catarrh), high blood pressure, lowering of blood sugar (diabetes mellitus), cure of male impotency and treatment of skin diseases or infections. This substantiates the report of Price (2000) and Fahey (2005), that *Moringa* is efficacious in the treatment of diabetes, high blood pressure, fevers, sores and skin infections. A study conducted by Kasolo *et al.* (2010) on phytochemicals and uses of *M. oleifera* leaves in Ugandan rural communities established that the leaves are used for treatment of twenty-four medical conditions such as diabetes mellitus, malaria or fever, hypertension, Syphilis and skin disease. The review of Farooq *et al.* (2012) confirms that *Moringa* is used in ethno-medicine for the healing of various ailments in Nigeria.

Scientific evidence seems to strongly support the ethno-medicinal role of *Moringa oleifera*. *Moringa* contains nutrients that strengthen the human immune system and prevent many diseases. It is high in iron and therefore can prevent anaemia, insomnia and also build up the body immunity against other diseases. Its high vitamin A content prevents night blindness especially in children and acts as a shield against high blood pressure and stroke. Lack of vitamin A causes over 70% night blindness in children (Fritz, 2000). Three tablespoonfuls of *moringa* leaf powder supplies 125% calcium of the recommended daily allowance (RDA) for building strong bones and teeth to prevent rickets and tooth decay (Price, 2007). *M. oleifera* extract has been reported to be anti-ulcerogenic (Pal *et al.*, 1995a).

It has been reported to contain natural antioxidants such as flavonoids, vitamin C and vitamin E (Dillard and German, 2000). Flavonoids act as antioxidants that prevent oxidative damage by free radicals as they trap unstable, free scavenging radicals and reactive oxygen species (ROS) in the body forming less reactive and stable complexes. These radicals are implicated in most diseases especially coronary or circulatory heart diseases. Flavonoids especially pro-anthocyanidins (condensed tannins) are stronger anti-oxidants than Vitamins C and E (Marion, 2004).

Moringa leaves have been used as a nutraceutical even by World Health Organization (Harvey, 2005). Nutraceuticals are food or components of food that provide medicinal or health benefits (Tapas *et al.*, 2008). Dietary intake of flavonoids is used for the treatment of Parkinson disease (Mazzio *et al.*, 2011). Clinical trials have linked increasing intake of flavonoids with a reduced occurrence of breast cancer in humans (Bosetti *et al.*, 2005). Flavonoids also reduce several risk factors for cardiovascular diseases in human (Arai *et al.*, 2000), lowers total and low density lipoproteins (LDL) cholesterol in plasma and liver (Jung *et al.*, 2003). They improve vasodilation and vaso-relaxation preventing the formation of potentially damaging clots and subsequent stroke. According to Paliwal *et al.* (2001), *Moringa* possesses anti-tumor, anti-pyretic (fever), anti-epileptic, anti-inflammatory, anti-ulcerogenic, anti-spasmodic, diuretic, anti-hypertensive, anti-cholesterolaemic, anti-oxidant, anti-diabetic and hepatoprotective activities.

The high alkaloid content may make *Moringa* a candidate plant for production of medicines by the pharmaceutical industry. Examples of commonly used drugs of alkaloid sources are Chloroquine, an anti-malarial drug derived from the stem bark of *Cinchona officinalis*; Codeine, an analgesic and pain reliever also used in cough medicine; an eye-drop phytostegma obtained from *Phytostigma vernonosum* (Calabar beans), Procain and Novocain. Reserpine alkaloid from the root of *Rauwolfia serpentine* has been used in India for centuries for the relief of Epilepsy and Hypertension (Plummer *et al.*, 2006).

Concern over the safety of moringa seems to be emerging based especially on the known toxicity of alkaloids. The maximum concentration of alkaloids in *Moringa* is observed in the root and root bark. The concentration of Pterigospermin and Spirochin alkaloids (0.105%) are high in the root therefore eating large amounts at once or too often could cause abortions in women, rise in blood pressure, paralyses or death (Mehta *et al.*, 2003). The roots and root bark of *Moringa* are anti-fertile and abortifacients, preventing the implantation of fetus (Ankush *et al.*, 2011). *Moringa* root bark contains a nerve paralyser (Fritz, 2000). Fortunately, our survey shows that the roots are hardly consumed. The amount of alkaloids in the seeds is less than that in the root and root bark of *Moringa*, but the leaves are safe to consume, having no known negative side effect or toxicity (Mehta *et al.* 2003; Roloff 2009). There is scarcity of literature on the toxic build-up of alkaloids in *Moringa* leaves and seeds over a period of time. This should therefore be investigated. This study has established some level of utilization of *Moringa oleifera* in Nigeria. However, more decisive interventions will have to be made to ensure a higher, more diversified and sustained exploitation.

5. CONCLUSION

A survey on the utilization potentials of *Moringa oleifera* in Nigeria was conducted in 2011. The survey involved 14 states (including the Federal Capital Territory) across the five agroecological zones. The 14 States were Borno, Kano, Adamawa, Kebbi, Kaduna, Niger, Nassarawa, Abuja (F.C.T), Kogi, Benue, Kwara, Oyo, Enugu and Anambra. A semi-structured questionnaire and field visits were adopted in this study while a multistage random sampling technique was used in selecting the respondents. The survey found more than 25 local names of *Moringa oleifera* in Nigeria. Widespread utilization of *Moringa* as food was observed with its use as vegetable in soup, as salad or herbal tea having particularly high scores. There was low awareness of *Moringa oleifera* as a domestic cleansing agent although about 30% of respondents used it in domestic water clarification.

Table 1. Names of *Moringa oleifera* in Nigeria

State/Location	Ethnic Group/Tribe	Names	Percent.
Borno	Glavda	Shashabana	92.3
	Marghi	Kabbi	50.0
	Mafa	Dalam	50.0
Kano	Hausa	Zogale	100.0
	Hausa-Fulani	Zogale	100.0
Adamawa	Yandang	Son-nyakuri	100.0
	Fulani	Son- bishi	100.0
	Higgi	Glagandi	100.0
Kebbi	Gungawa	Uzagala	100.0
	Kamberi	Zogala	94.4
Niger	Dukkawa	Cesobo	65.0
	Kamberi	Zogala	100.0
Kaduna	Atuku	Susu'o	100.0
	Kataf	Telliye	50.0
	Kataf	Zogale	50.0
	Jaba	Zogale	50.0
Nassarawa	Gbagyi	Saggiya	50.0
	Bassa (Bwavi clan)	Chabita	95.4
Abuja F.C.T	Gbariyamma	Ganji	100.0
	Bassa-komo (Gbajingala clan)	Zangalakadi	83.3
	Gbagyi-nge	Ozogale	100.0
Benue	Tiv	Jeelegede	86.4
Kogi	Igala	Geregeji	100.0
	Bassa-komu	Chiebo	100.0
Kwara	Batonu	Yoruhara	100.0
Enugu	Ibo	Agbaje	60.0
	Ibo	Npataka	20.0
	Ibo	Zeke	20.0
Anambra	Ibo	Okwe-olu	70.0
	Ibo	Okwe-oyibo	25.0
	Ibo	Odudu-oyibo	5.0
Oyo	Yoruba	Ewe-Igbale	75.0
	Yoruba	Igi-igbale	20.0
	Yoruba	Ewe-iba	5.0

Percent. = Percentage respondents in the tribe

Table 2. Percentage distribution of respondents according to the uses of *Moringa oleifera* as food in Nigeria

Uses as food	Response		Part of <i>Moringa oleifera</i> used		
	Yes (%)	No (%)	Leaves (%)	Stem (%)	Root (%)
Taken as tea	71.1	28.9	97.0	2.5	0.5
Taken as vegetable in soup	95.7	4.3	98.1	1.9	0.0
Fresh raw leaves chewed as snack	57.9	42.1	95.1	1.9	0.0
Leaves used with groundnut paste to prepare salad	79.9	20.1	99.0	1.0	0.0
Used as a spice	61.0	39.0	91.3	3.3	5.4

Table 3. Percentage distribution of respondents according to the uses of *Moringa oleifera* as domestic cleansing agent in Nigeria

Uses as Domestic Cleansing Agent	Response	
	Yes (%)	No (%)
Washing of cooking utensils	18.4	81.6
Purification of dirty water for drinking	32.1	67.9
Purification of fish ponds	24.6	75.4
Flocculating contaminants	23.5	76.5

Table 4. Percentage distribution of respondents according to the medicinal uses of *Moringa oleifera* in Nigeria

Uses/ Conditions Treated	Response		Part of <i>Moringa oleifera</i> used		
	Yes (%)	No (%)	Leaves (%)	Stem (%)	Root (%)
Ear infection	71.8	28.2	75.4	18.9	5.7
Eye infection	66.9	33.1	62.6	29.4	8.0
Toothache	48.0	52.0	47.9	28.2	23.9
As purgative	43.8	56.2	80.2	10.4	9.4
Common cold, cough and catarrh	55.1	44.9	85.6	12.1	2.3
Reduction of viral load of HIV victims	46.6	53.4	83.9	13.6	2.5
Worm expeller	39.6	60.4	76.7	10.0	12.2
Male impotency	53.7	46.3	68.5	12.0	19.4
Lowering blood sugar (Diabetes miletus)	65.2	34.8	82.3	14.6	3.1
Lowering high blood pressure	64.7	35.3	80.0	17.5	1.9
Increased lactation	40.7	59.3	88.7	7.2	4.1
Treatment of indigestion	40.8	59.2	87.9	8.1	4.0
Poison from snake bite	42.1	57.9	41.8	20.4	36.7
Skin diseases/infections	53.2	46.8	43.9	36.6	18.7
Typhoid and Malaria fever	78.7	21.3	83.0	12.0	5.0
Immune booster	44.2	55.8	89.0	5.0	6.0
Anaemia in children and adults	39.9	60.1	86.4	10.2	3.4
Diarrhea	39.8	60.2	74.7	20.2	5.1
Sore throat	29.9	73.1	83.0	12.0	5.0

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