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Consumption Pattern and Indigenous Knowledge of Moringa Oleifera among Dwellers of Rural Enclaves around Ibadan Metropolis, Oyo State, Nigeria

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Abstract
Moringa oleifera is a perennial plant which has high economic and medicinal values in many countries of the world. This study was carried out to investigate the indigenous knowledge and consumption pattern of Moringa oleifera among dwellers in rural enclaves around Ibadan metropolis. The study covered 5 rural settlements around Ibadan metropolis which are Gbopa, Olodo, Onipe, Ibuso gboro and Abapanu. 20 households were selected from each settlement to arrive at a total number of 100 questionnaires out of which 90 were retrieved. The data was analyzed using descriptive statistics and multiple regression analysis. It was discovered that Moringa oleifera has 2 local names in the area which are ''gbogbonise'' and ''ewe igbale'' but majority of the respondents knows the plant as Moringa. It was also found out from findings that most of the respondents use the plants because of the medicinal value attached to it. Education and household size positively and significantly influence Moringa consumption at 0.05 level of significance. The study therefore recommends that household members should try and get adequate training necessary for effective consumption of the plant.

INTRODUCTION

Moringa oleifera (horseradish tree – English) is a short, slender, deciduous, perennial tree. Almost every part of the plant (leaves, flowers, roots and bark) is of value to man, it can be used as food or with medicinal and therapeutic purposes (Anwar et al., 2007), especially in developing countries. Moringa news (2008) reported that the leaf is a power house of nutritional value. The seed is said to be eaten like a peanut in Malaya. Thickened root is used as substitute for horseradish. The Foliage is eaten as greens, in salads, in vegetable curries, as pickles and for seasoning. The root is used in Nicaragua for dropsy. Moringa oleifera, in the belief of some folk, does not only have high nutritional and medicinal values (Morton, 1991), but also possesses mystical power. For instance, while the India's ancient tradition of Ayurveda believed that the leaves of Moringa oleifera prevent about 300 diseases; and Hartwell (1971) had reported that the flowers, leaves and roots are used in remedies for tumors and dropsy in Nicaragua. More so, Moringa oleifera is not only planted around homes among the Hausa of Nigeria, to provide fence but also are planted on graves to prevent hyenas from exhuming corps. Moringa oleifera is, thus, perceived in the Hausa culture, as a sacred tree that protects both the living and the dead.

Moringa seed oil (yield 30-40% by weight), also known as Ben oil, is a sweet non-sticking, non-drying oil that resists rancidity. It has been used in salads, for fine machine lubrication, and in the manufacture of perfume and hair care products (Tsaknis J. 1999). Moringa serve as a source of income to the rural inhabitants and therefore it is increasingly becoming an important source of livelihood for a number of people as several people have started nurseries to grow moringa in large quantities for sale within and outside the country (Azeez et al, 2013). Peoples' reasons for planting and perceptions of benefits varied across the country. Four of the most common and most important reasons are the need for: food; an important medicine for home consumption; cash earning enterprise and the diversity of other uses. Cultivation of this multiple–use species is an economic proposition unlike many slower growing and more habitat specific medicinal plant species.

Moringa is already a popular tree for indigenous agro forestry in Nigeria and a multiple use species with similar potential in Africa. All parts of Moringa are useful and help to: (a) Maintain mental alertness and healthy skin; (b) Boosts energy levels; (c) Improves mental clarity/focus; (d) Promotes sound sleep; (e) Provides all vital vitamins; (f) Is an extremely powerful free radical fighter; (g) Moringa has very high levels of fibres'; (h) Cleanses and Detoxifies the body of infectious toxins; (i) Strengthens your immune system; (j) Enhances sexual desire and performance; (k) Fights cancerous cells; (l) Slows down the aging process; (m) Promotes healthier and younger-looking skin; (n) Normalizes and regulates cholesterol levels; (o) Helps maintain healthy heart function; (p) Minimizes inflammation among several others.
Fuglie (2001), also reported the many uses for moringa to include: alley cropping (biomass production), animal forage (leaves and treated seed-cake), biogas (from leaves), domestic cleaning agent (crushed leaves), blue dye (wood), fencing (living trees), fertilizer (seed-cake), foliar nutrient (juice expressed from the leaves), green manure (from leaves), gum (from tree trunks), honey- and sugar cane juice-clarifier (powdered seeds), honey (flower nectar), medicine (all plant parts), ornamental plantings, biopesticide (soil incorporation of leaves to prevent seedling damping off), pulp (wood), rope (bark), tannin for tanning hides (bark and gum), water

purification (powdered seeds). Moringa oil was once used for lubricating watches and other delicate machinery, is clear, sweet and odourless, almost never going rancid. It is edible and it is becoming increasingly popular in the cosmetics industry. Leaves and young branches are used as fodder. Moringa may also be used in fish and poultry feeds. Foidl, et al (2001)

Justification for the study

There has been a clamour for the cultivation and utilization of lesser known indigenous plant species like Moringa oleifera in farming systems. While a number of studies have been carried out on the origin, morphology and chemistry of Moringa, little or no efforts have been made to unearth the prevailing socio-cultural perceptions, indigenous knowledge and consumption pattern of the plant. The enormousity of the benefits of this specie is a reason to look into the awareness of the specie locally and to find out the knowledge base of local people on it. The consumption pattern will not only give a picture of the level of consumption but will also help in policy recommendation of mass propagation so that the specie can be sustainably used. Moringa on a global scale can be a basis for sustainable and predictable global progress and development and above all, people need to be made aware of the beneficial role played by Moringa in order to enjoy the full benefit attached to its use.

Health benefits of Moringa

It is believed that this miracle tree has more Vitamin A than carrots, more Vitamin C than oranges, more calcium than milk and more iron than spinach (Azeez et al 2013). It is a complete food in itself. Its strong antioxidant properties guard against skin cancer and prostrate growth. Moringa oleifera also prevents the growth of cysts, tumors and glands. It curbs other health complications such as diabetes, anaemia and high blood pressure. Liver, kidney, stomach and thyroid problems can also be prevented by taking this medicine. The anti-inflammatory properties of moringa oleifera reduce different body pains. It is very effective for treating arthritis, rheumatism and joint pain. It can also control other severe diseases such as epilepsy, migraine and other headaches. Its detoxification properties make it suitable to treat scorpion and snake bites. Almost all parts of the tree have been utilised within traditional medicine practices (D'souza,J. and Kulkarni, A.R., 1993).

Nutritional Benefits

Everything about Moringa oleifera is nutritious. The leaves, shoots, pulp and seeds are edible. Some of the plant parts could also be dried and turned into powder and used for several food preparations. Moringa oleifera contains all essential vitamins and minerals. It is also available in capsule form. The Moringa oleifera is an alternative medicine that is fast becoming popular in the West. “Imagine a tree in your backyard that will meet all your nutritional needs, take care of you medicinally, and purify your water for you. According to Alford, 2010, ‘The ancient traditional medicine of India called ayurveda says the leaves of the Moringa tree prevent 300 diseases. Alford (2010), also wrote that modern science is confirming that these leaves could help prevent untold suffering and death caused by malnutrition and related diseases, hence it is tagged ‘Trees for Life’. Nearly all parts of Moringa tree have a high degree of nutritional value. Together, the edible parts of the tree contain high amounts of the 8 “essential amino acids” that your body does not produce but must be replenished daily.

Processing:

Processing should start immediately after harvesting and transporting the leaves to the processing point. This involves the followings:

1. Stripping the leaflets: Strip all the leaflets from the leaf petiole. This can be done directly from the branches if the leaves have not been stripped off the main branch before transportation. At this stage, diseased and damaged leaves are discarded.

2. Washing: Wash leaflets in troughs using clean potable water to remove dirt. Wash leaves again in 1% saline solution for 3-5 minutes to remove microbes. Finally wash again in clean water. Leaves are now ready for drying. Drain each trough after each wash: fresh leaves must always be washed with fresh water.

3. Draining: Strain water from the leaves in buckets that have been perforated, spread leaflets on trays made with food-grade mesh and leave to drain for 15 minutes before taking them to the dryer.

4. Drying: There are three main methods for drying moringa leave. Room drying Spread the leaflets thinly on mesh tied on racks (mosquito net mesh can be used) in a well-ventilated room. This room should be insect, rodent and dust proof. Air circulation can be improved by using ceiling and floor level vents protected with a clean filter to keep the sun and dust out. It is possible to use a fan, but the air must not be directly oriented

towards the leaves, as it can increase contamination with germs in the air. It is advisable to turn the leaves over at least once, with sterile gloves, to improve uniformed drying. Leaves should be completely dry within a maximum of 4 days. The loading density should not exceed 1 kg/m2. However, room-dried leaves cannot be mould-free guaranteed with the maximum recommended moisture content of 10 per cent. Therefore, we do not advise this method. In Solar drying: Spread the leaves thinly on mesh and dry in the dryer for about 4 hours (Temperature range is 35°C–55°C on a very sunny day). The final product should be very brittle. We recommend solar drying for both small and large scale processing, particularly for those in rural communities where there is no electricity. Loading density should not exceed 2 kg/m2. Mechanical drying involves the use electric or gas hot-air dryers. Drying temperatures should range between 50°C and 55°C. If temperature exceeds 55°C, leaves will "burn" and turn brown. Leaves should be dried until their moisture content is below 10%. We recommend this method for large scale leaf processing as this ensures year round production. Loading density should not exceed 2.5 kg/m^2.

5. Milling: Mill dry leaves using a stainless steel hammer mill. For personal or household use, leaves can be pounded in a mortar, or milled with a kitchen blender. Small-scale processors can use a burr mill or rent a commercial hammer mill for routine milling of their products.

6. Sieving: Sieve the leaf powder if need be. When you mill with a hammer mill, the fineness of the product will depend on the size of the screen used in milling. If too coarse, sift using a sifter with the desired screen size. Moringa leaf powder can easily be contaminated by moulds as it strongly attracts moisture.

OBJECTIVES OF THE STUDY

The broad objective of the study is to determine the indigenous knowledge and consumption pattern of Moringa oleifera among rural inhabitants in some selected settlements around Ibadan metropolis. The specific objectives are

- To analyse the socio-economic characteristic of the consumers of Moringa.
- To investigate the indigenous knowledge of Moringa in the study area.
- To determine consumers' perception and level of awareness of Moringa
- To determine the factors responsible for the consumption and various uses of the plant.

MATERIALS AND METHODS

The study was carried out in Ibadan. Ibadan is the capital of Oyo State and the third largest metropolitan area by population in Nigeria, after Lagos and Kano. Ibadan is situated in the south western part of Nigeria. It is 200m above the sea level, latitudes 7^0 26' with annual rainfall of about 128cm. According to the 2006 census, the human population in Ibadan was estimated to be 1,338,659. The people in Ibadan are noted for the following activities; farming, trading, manufacturing and civil servants. The study covered 5 rural settlements in Ibadan peri-urban areas which are Gbopa, Olodo, Onipe, Ibuso gboro and Abapanu. Data was collected through the use of well structured questionnaires. 20 households were randomly selected from the 5 settlements. Descriptive statistics such as percentages, frequency distribution was used to analyze the socioeconomic characteristics, awareness level of moringa and the indigenous knowledge of the plant. Multiple regression analysis was used to determine the factors affecting the consumption of the plant.

The equation used is in the form:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + ei$$

Where:

Y = Consumption of Moringa (kg)
a = Constant
X_1 = Sex of respondents (1 = male, 2 = female)
X_2 = Age of respondents (years)
X_3 = Educational qualification (1 = tertiary, 0 = others)
X_4 = Marital status (1 = single, 2 = married)
X_5 = Profession (1 = civil servant, 2 = others)
X_6 = Household size
X_7 = Reason for moringa consumption (1 = medicinal, 0 = others)
X_8 = Willingness to pay (1 = yes, 0 = No)
X_9 = frequency of use (1 = daily, 2 = others)
Ei = Error term

RESULTS AND DISCUSSION

The socio-economic characteristics like age, sex, marital status, religion, education and household size were examined. The age distribution shows that majority of the respondents are between 31-40.This implies that majority of the consumers are in their active age and can continue to enjoy numerous benefits of Moringa. The gender distribution shows that 46.7% of the respondents are males while 53.3% are females. This implies that females are more involved in the use of Moringa when compared to males in the study area. The marital status distribution of the respondents shows that greater percentages of the respondents were married and they depend on numerous benefits of Moringa by which they sustain their family.

The religion distribution of the respondents shows that 70% of the respondents are Christian while 28.9% are Muslims and 1.1% practiced traditional religion. The implication of these findings is that Moringa production and consumption has no religion barrier. The educational level distribution shows that majority (36.7%) of the respondents have secondary education and 31.1% have tertiary education. This implies that most of the consumers have basic education and will be able to learn more about the various uses of Moringa not known to them. The income distribution shows that majority (26.7%) of the respondents earns income less than N10000.This implies that rural enclaves where the consumers settle are low income earners. The household size distribution shows that majority of the respondents have household size less than 4. This implies that the consumers have low household size.

Table 2 shows that 34.4% of the respondents in the rural enclaves knows the plant as ''gbogbonise'' meaning that is relevant for all uses while 24.4% of them knows it as ''ewe igbale'' and 41% disclose they don't know local name, despite the fact that they use it This implies that the name Moringa is common in the area and majority of the respondents knows the plant as Moringa. Table 4 indicates that 73.3% of the respondents use Moringa for medicinal purposes while 15.6% use it for food and cultural practices. This implies that majority of the respondents are aware of the medicinal value of Moringa.

Table 4 indicates that 58.9% of the respondents use the plant for cooking while 3.3% use it as chewing stick. The implication of this finding is that majority of the respondents in the area are not aware of some other uses of Moringa like animal fodder, water purifying ability and oil content of moringa seed. Table 5 shows that 25% of the respondents use Moringa to cure malaria while 3.3% use it for hypertension. This implies that majority of the respondents are aware of the healing power of Moringa and its ability to treat many ailments.

Table 6 indicates 91.1% of the respondents are aware of the health and nutritional benefits of Moringa while 8.9% are not aware and undecided. This implies majority of the respondents are aware of healing power of the plant and its ability to prevent high number of diseases in the body. This informs why 73.3% of the respondents perceived Moringa as an economic plant of great medicinal value.

Table 7 summarizes the result of the multiple linear regression in examining the factors responsible for the consumption of Moringa. Linear regression with 9 explanatory variables was specified. The factors that influence household consumption are education and household size. Education, significantly and positively influence household consumption of Moringa at 5 percent level of significance. This explains that if they are well educated, the respondents will be more aware of the benefits attached to the use and this will enhance effective usage.

Household size significantly and positively influences household consumption. This explains that if the household size is high, there is every tendency for the respondents to consume more of the plants.

CONCLUSION AND RECOMMENDATION

During the course of field survey of this findings, it was observed that some of the dwellers of the rural enclaves are not aware of Moringa, therefore there is the need for extension workers to expose such rural dwellers to the numerous benefits attached to the use of the plant and also encourage the production and consumption to sustain their livelihood.

From the findings, majority of the respondents use the plant for cooking. They should therefore try to learn more about other uses of the plant aside cooking such as animal fodder, water purifying potentials and oil content derived from the seed.

The result shows that education is a significant variable responsible for household consumption, so the household members should get adequate training necessary for effective usage of the plant.

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APPENDIX

Table 1: Distribution of respondents by socioeconomic characteristics.

Characteristics	Frequency	Percentage (%)
Age		
<30	10	11.1
31-40	34	37.8
41-50	32	35.5
51-60	7	7.8
Above 60	7	7.8
Total	**90**	**100**
Gender		
Male	42	46.7
Female	48	53.3
Total	**90**	**100**
Marital status		
Single	9	10.0
Married	75	83.3
Divorced	2	2.2
Widow	4	4.4
Total	**90**	**100**
Religion		
Christianity	63	70.0
Islam	26	28.9
Traditional	1	1.1
Total	**90**	**100**
Education		
Tertiary	28	31.1
Secondary	33	36.7
Primary	17	18.8
Vocational/technical	7	7.8
No formal education	5	5.6
Total	**90**	**100**
Income		
<10000	24	26.7
11000-20000	13	14.4
21000-30000	15	16.7
31000-40000	14	15.6
41000-50000	12	13.3
Above 50000	12	13.3
Total	**90**	**100**
Household size		
<4	44	48.8
5-7	41	45.6
8-10	5	5.6
Total	**90**	**100**

Table 2: Local name of Moringa in the study area

Local Name	Frequency	Percentage (%)
Gbogbonise	31	34.4
Ewe igbale	22	24.4
Don't know	37	41.1
Total	90	

Table 3: Traditional Uses of Moringa

Uses	Frequency	Percentage (%)
Medicinal	66	73.3
Cultural practices	7	7.8
Food	7	7.8
Medicinal & food	10	11.1
Total	90	100

Table 4: Consumption Pattern of Moringa

Uses	Frequency	Percentage (%)
Cooking	53	58.9
Tea	19	21.1
Cooking & tea	7	7.8
Chewing stick	3	3.3
Herbal drink	5	5.6
Chewing of leaves	3	3.3
Total	90	100

Table 5: Ailments that Respondents use Moringa for

Ailments	Frequency	Percentage (%)
No ailments	8	7.1
Stomach pain	14	12.5
Body pain	24	21.4
Malaria	28	25.0
Diabetes	13	11.6
Pile	4	3.6
Hypertension	6	5.4
General wellbeing	5	4.5
Cough	7	6.3
Arthritis	3	2.7
Total	112	100

Table 6: Awareness of the health benefits of Moringa

Aware	Frequency	Percentage
Yes	82	91.1%
No	3	3.3%
Undecided	5	5.6%

Table 7: Regression results showing the factors responsible for the consumption of Moringa.

Variable	Coefficients	Std Error	t-value
Constant	0.975	0.570	1.709
Sex	0.036	0.175	0.207
Age	-0.006	0.010	-0.531
Education	0.189*	0.079	2.392
Marital Status	0.058	0.173	0.339
Profession	0.068	0.056	1.204
Household size	0.480*	0.059	8.126
Reason for consumption	-0.141	0.212	-0.662
Willingness to pay	-0.314	0.256	-1.224
Frequency of use	0.023	0.060	0.384

*Shows level of significance at 0.05 $R^2 = 0.570$

PLATE 1: MORINGA LEAVE HARVESTING BY A RESPONDENT

PLATE 2: MORINGA LEAVES DRYING