

The utilization of *Moringa oleifera* in Zimbabwe

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Abstract

Information is provided on the uses of *Moringa oleifera* Lam. in Zimbabwe. Semi-structured interviews and open ended questions were conducted in both rural and urban areas. The tree introduced from India is prized for its edible leaves, seeds and the pods which are eaten as vegetables. The roots, leaves and pods are said to have medicinal properties. The vitamin-rich, mineral packed and nutritious vegetable was introduced into Zimbabwe at some early time, it is widely cultivated in many home gardens and is now widely naturalized.

Introduction

Moringa oleifera Lam. (Horse-radish tree or Drumstick) is a medium-sized (about 10 metres high) tree belonging to the Moringaceae family. The moringaceae is a single genus family with 14 known species, of these only *M. oleifera* (synonym *M. pterygosperma* Gaertn.) is the most widely known species and is planted in the whole tropical belt (Jahn 1988). The tree is indigenous to northern India and Pakistan (Verdcourt 1985). Commonly known as the 'horse-radish' tree, arising from the use of the root by Europeans in India as a substitute for horse-radish, *Cochlearia armoracia* (synonym *Armoracia rusticana*). Like *C. armoracia*, the roots of moringa are pungent and were commonly used as a condiment or garnish. Such a practice would not now be recommended as the root has been shown to contain 0.105% alkaloids, especially moringinine and a bacteriocide, spirochine, both of which can prove fatal following ingestion (Oliver-Bever 1986; Watt & Breyer – Brandwijk 1962). The other widely used common name is 'drumstick' tree, arising from the shape of the pods, resembling the slender and curved stick used for beating the drum.

Common name of *M. oleifera* in Malabar is Moringo and this is the origin of the generic name (Palmer & Pitman 1972). Very little is known about its introduction in Zimbabwe prior to its first collection by Holland in 1943 (National Herbarium, Harare records). The early herbarium specimens document it as an ornamental tree, planted in public parks and private gardens. It has also been grown by Indian families as a vegetable. But moringa is now a permanent feature on the menu of the Tonga people of Zimbabwe, with its leaves being used as a spice when preparing food. *M. oleifera* may have been introduced during the European occupation or possibly long before Arab traders (Palgrave 1983).

The highest concentrations of moringa tree is found in Binga District, where it is known as *Zakalanda* by the locals. It is believed that the tree was brought to Binga by the Indian traders using the Zambezi River in their search for gold, ivory and other items. It is now widely cultivated in several parts of the country and is naturalized in many areas including the Zambezi valley.

Although moringa tree is essentially not indigenous to Zimbabwe, it has become part of the traditional diet in Binga District and many other places. Reliable information regarding its utilization is crucial. Unfortunately in Zimbabwe, such data are often lacking, despite the economic importance of *M. oleifera*. Very little research has been done on the species although it is widely used by the rural poor as a food resource. Zimbabwe has a large impoverished rural population which relies to a great extent on wild botanical resources (Campbell 1987). This study was therefore undertaken not only to extract detailed information from respondents on known uses but also to elucidate further unknown uses of moringa and also reinforce the need to preserve this important plant resource.

Materials and Methods

This study was aimed at documenting the uses of moringa tree by both the rural and urban communities in Zimbabwe. Information on the uses of moringa was gleaned from the literature and also interviewing a wide range of people. Known uses of this species were derived from the works of Watt & Breyer-Brandwijk 1962; Palgrave 1983. The study was undertaken during the period 2004 – 2005. Field studies were carried out in some 20% of the districts of Zimbabwe mainly in Manicaland, Mashonaland, Matebeleland and Midlands. The process involved close consultation with the community in information sharing, data gathering and compilation. It involved visiting several villages, communities and discussing with many individuals. This study was consequently undertaken to illustrate the multiple uses of moringa in Zimbabwe.

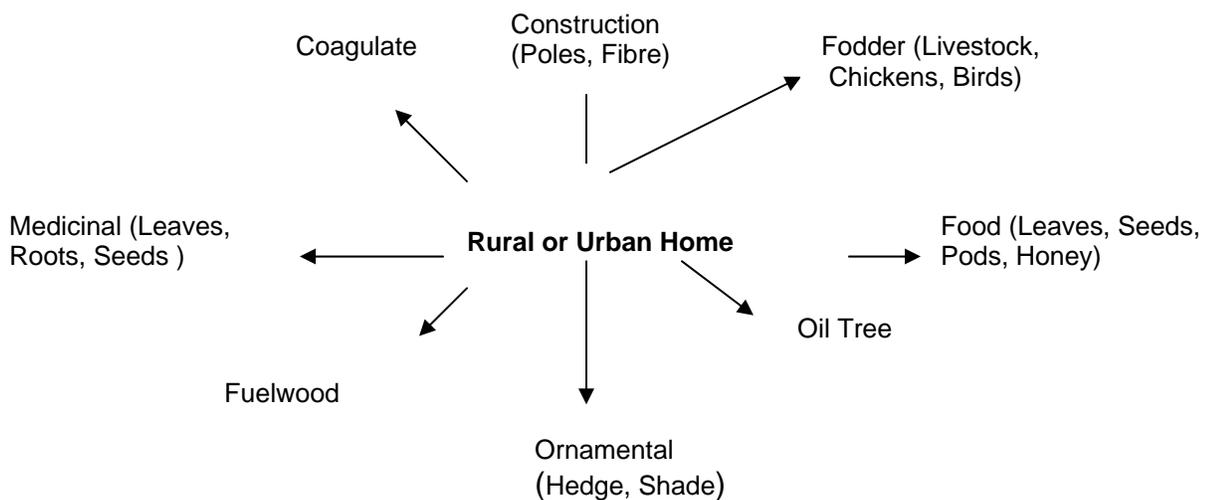
Purposive sampling was used in the selection of participants in order to allow me to have an in-depth focus on the issues important to the study (Cohen & Manion 1989). The research process seeks to understand the uses of moringa from the perspective of a range of stakeholders and to involve them directly in planning follow-up action. This study also included decision makers from all levels of government, civil society and the local elite, thereby uncovering different interests. Participants comprised both elderly members of the community as well as the youth. Participant observation and interviews (unstructured individual and focus group) were the main methods used in data collection. This participatory approach though difficult to quantify, provide a valuable insight into the multiple meanings, dimensions and experiences with this particular plant species. It captures information that standard plant uses methods are likely to miss. 'Open-ended methods' such as unstructured interviews and discussion groups allows the emergence of issues and dimensions that are important to the community but not necessarily known to the researcher.

Recurrent themes were uncovered in this report by a process of systematic content analysis. In its broadest sense, different researchers have emphasized various aspects of content analysis, from its capacity to generate quantitative descriptions by analyzing word counts (Silverman 1993) to its ability to help researchers draw inferences from a text by breaking that text into discrete units of manageable data that can then be meaningfully reorganized (Weber 1990). In this study, interview data was coded and sorted into themes. Inconsistencies and unique statements were noted and given particular attention.

Results and Discussion

In all the districts, moringa was found to be used for the following purposes: vegetable, medicine, ornamental and as a source of oil (Figure 1). Other non-common uses included firewood, coagulate, fencing, in construction of traditional huts, making rope and as fodder for livestock.

Figure 1: Multiple uses of *M. oleifera* in rural and / or urban areas in Zimbabwe



Vegetable

The leaves of moringa are widely eaten like rape or spinach in many rural and urban communities in Zimbabwe. The leaves, the growing tips of the plant with or without flowers are first pounded then cooked with tomatoes and in some cases peanut butter is added. The leaves can be harvested during the dry season when no other vegetables are available. The leaves are known to have a high content of protein, minerals and vitamins (Table 1). The leaves of moringa are an excellent source of the sulphur containing amino acids methionine and cystine, which are often in short supply (Council of

Scientific and Industrial Research 1962). The high concentrations of essential amino acids, mineral ions and vitamins makes moringa an ideal nutritional supplement. Its leaves can be dried and made into a powder by rubbing them over a sieve and stored for use as a nutritional additive to soups, sauces or meal dishes. Although some of the nutritional content is lost during the process, the powder remains an excellent source of vitamin A. As a nutritional additive, 2 or 3 spoonfuls of powder are usually added to rice, soups and sauces just before serving. Small amounts of leaf powder will not have a marked effect on the taste of the soup.

Regular intake of moringa in the form of relish made out of fresh leaves and dried leaf powder which can be added to porridge or other relishes prevent anaemia and most forms of malnutrition. It is therefore an ideal vegetable for young children and pregnant women. In Binga District, the Ministry of Health and Child Welfare is encouraging the use of moringa tree as a vegetable especially to children under the age of five years as this can halt malnutrition. In many parts of Matebeleland, the leaves are widely eaten by women during pregnancy and after childbirth. This is done probably to provide the proteins, vitamins and minerals to both the mother and the child during the most critical phase of their lives. Pregnant women believe that drinking of the broth from cooking moringa leaves as soon a uterine contraction pain are felt speeds up and facilitates delivery.

Table 1. Composition of leaves and pods (per 100g of edible portion) (Council of Scientific and Industrial Research 1962)

	Leaves	Pods
Moisture (%)	75	86.9
Protein (g)	6.7	2.5
Fat (g)	1.7	0.1
Carbohydrate (g)	13.4	3.7
Mineral matter (%)	2.3	2
Fibre (g)	0.9	4.8
Calcium (mg)	440	30
Oxalic acid (%)	101	0.01
Phosphorus (mg)	70	110
Copper (µg/g)	1.1	3.1
Iodine (µg/kg)	51	18
Iron (mg)	7	5.3
Vitamin A (I.U)	11 300	184
Nicotinic acid (mg)	0.8	0.2
Vitamin C (mg)	220	120
Vitamin B (µg)	210	

Besides the leaves, the young pods can also be eaten as a vegetable. The immature green pods are probably the most valued and widely used of all the tree parts in countries like India (Council of Scientific and Industrial Research 1962). The pods are generally prepared in a similar fashion to green beans. The pods are highly nutritious containing all the essential amino acids (Table 1). Although primarily utilized world-wide by the Asian population as a vegetable, the usage by other people is increasing. An international market already exists for both fresh and tinned pods. The seeds are utilized in some regions of India either in their green immature state or are fried in their mature state (Council of Scientific and Industrial Research 1962). The Indian horticulturists have already attempted to grow moringa with long pods and very sweet taste (Council of Scientific and Industrial Research 1962; Jahn 1988). There is no doubt that such selective breeding with respect to pod size and taste is crucial if moringa is to be used as a nutrition supplement.

Medicinal uses

The flowers, leaves and roots are widely used as remedies for several ailments. The bark of the moringa root should be scraped off because of its toxicity and the flesh of the root should be eaten sparingly (Oliver-Bever 1986). Moringa seeds are effective against skin-infecting bacteria *Staphylococcus aureus* and *Pseudomonas aeruginosa* (Council of Scientific and Industrial Research 1962; Oliver-Bever 1986). They contain the potent antibiotic and fungicide terygospemin. Moringa seem to have most of the food nutrients (Table 1) required by the body to replenish its defensive mechanisms. The Tonga people of Binga District use the root powder as an aphrodisiac and when it is mixed with milk, it is considered useful against asthma, gout, rheumatism and enlarged spleen or liver. It also helps in the removal of wind from the stomach and as a snuff can be used to alleviate ear and toothache.

The leaf juice has a stabilizing effect on blood pressure. The leaf juice controls glucose levels in diabetic patients. Fresh leaves and leaf powder are recommended for tuberculosis patients because of the availability of vitamin A that boosts the immune system. If leaf juice is used as diuretic, it increases urine flow and cures gonorrhoea. Leaf juice mixed with honey treats diarrhoea, dysentery and colitis (colon inflammation). Fresh leaves are good for pregnant and lactating mothers, they improve milk production and are prescribed for anaemia. Paste made from bark treats boils. Paste from ground bark can be applied to relieve pain caused by snake, scorpion and insect bites. Oil is sometimes applied externally for skin diseases.

Source of oil

Some families use oil from moringa seeds for cooking and lighting. The oil from the seeds of *M. oleifera* and *M. peregrina* Fiori (synonym *M. aptera* Gaerlin) are known in the trade as 'ben oil' or 'behn oil' and are edible and also used for illumination and in cosmetics (Council of Scientific and Industrial

Research 1962). Ben oil was erroneously reported to be resistant to rancidity and considered particularly suitable for enflourage and as a lubricant for fine machinery. However, the oil turns rancid like any other vegetable oil. The oil is highly valued by watch makers as a lubricant. It is highly esteemed by perfumers, for its great power of absorbing and retaining even the most fugitive odours. The oil is useful in the manufacture of soap, producing a stable lather with high washing efficiency.

Extracting the oil is not easy as for example extracting oil from sunflower seeds and may need a machine operated press. The oil has a potentially high market value and could be a source of income. After expressing the oil from the seeds a seed-cake remains which is a very good fertilizer. Its use as a potential animal feed has in the past, not been recommended as it contains alkaloids and saponin (Council of Scientific and Industrial Research 1962).

Animal forage

Leaves are readily eaten by cattle, sheep, goats, pigs and rabbits. Branches are occasionally lopped for feeding cattle. Moringa tree is now a relief to the residents of Umguza District in Matebeleland as they face shortages of grass for cattle feeding. The residents cut back the main stem to encourage side shoots which they use for livestock feeding. Leaves can also be used for fish, chickens and several bird species. Chickens and birds feed on moringa seeds.

Coagulant

Crushed moringa seed kernel and seed-cake are very effective in water purification (Jahn 1988). When seeds from the tree are crushed and poured into an open well, all the suspended dirt particles like silt, solids, bacteria and other microorganisms stick together (coagulates) and sink to the bottom and the rest of the water will be left as clean as tapped water. The process can also be applied at home for the treatment of unclean river water. Twenty litres of water can be purified with 2 grams (2 level teaspoons) of crushed seed or seedcake. This makes it possible to separate the dirt from the top purified water. This is cheaper and environmentally friendly alternative to water purification.

Ornamental

Moringa is widely grown in urban areas as a garden plant, shade tree and as a hedge plant (Maroyi 2006). Moringa can be used as a cut flower or flowers can be collected for decoration purposes. The trees can be planted close to each other if it is to be used as a live fence tree.

Its use as firewood and in construction

Umguza residents in Matebeleland and other dry regions face shortages of firewood and timber because such areas are bare as a result of high deforestation. Moringa is a relief in such areas because the tree which is perennial and available throughout the year can be used as fuelwood source.

Although the soft and light wood is acceptable firewood for cooking, it makes poor charcoal. The wood is very soft and light, most villagers tend to use it for light construction work. The timber is not durable in the ground and is not resistant to moisture and termites. The corky, grey bark of the tree yields a coarse fibre which is utilized in the production of ropes or mats.

Source of income

Moringa is increasingly becoming an important source of livelihood for a number of people as several villagers in parts of Matebeleland have started nurseries to grow moringa in large quantities for sale to other villagers and other provinces. In most cases group members share the seedlings, planting most on their farms, selling some to other farmers. Of late, the small town of Binga has become a hive of activity hosting people from all over the country who buy the moringa products in bulk. The products range from fresh leaves and pods to powdered leaves. Most farmers also give seedlings to relatives and neighbours. The prize of a single seedling ranges from Z\$50 000.00 – Z\$100 000.00 (US\$0.5 – US\$1). The high prices for seedlings are indicative of their high demand. Demand generally outstrips supply. Moringa is the most important plant species in nurseries at the moment. Farmers' 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; a 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 agroforestry in Zimbabwe and a multiple-use species with similar potential in Africa.

Other Uses

The wood provides a pulp that is considered suitable for newsprint, wrapping, printing and writing papers (Council of Scientific and Industrial Research 1962). The bark and gum can be used in tanning hides. The wood yields a blue dye. Powdered seeds can be used to clarify honey without boiling. Seed powder can also be used to clarify sugarcane juice. Flowers are a good source of nectar for honey producing bees.

The presence of long taproot make it resistant to periods of drought. Moringa can be a benefit in the fight against desertification. As it is fast growing, grows best in arid conditions, this makes it ideal for mass planting. It is also suited to areas where strong winds and long, dry spells occur simultaneously, causing serious soil erosion. The green leaves of moringa make a useful mulch. The press cake left after oil extraction from the seeds can be used as a soil conditioner or as a fertilizer.

Conclusion

The results of this study are merely to illustrate some of the characteristics of the introduced plants which are useful in our day to day lives. It is hoped that further research might be undertaken to explore some of the aspects discussed in this report. This research should be aimed at providing a more comprehensive and detailed information on plants which are important to human welfare. The lack of such preliminary data on economically important plant species limits our ability to devise conservation action plans and ascertain sustainable harvesting rates of such species. This also makes it difficult to promote the involvement of local people in resource management.

Most of Zimbabwe experiences a significant dry season and is subject to drought years. During years of drought, subsistence on the basis of crops obviously becomes difficult if not impossible. Therefore the cultivation of moringa under such circumstances is recommended. More and more urban people are turning to the use of moringa because of the high nutritional value. It contributes to a more balanced diet for many people and a significant improvement in food security for the community at large. Moringa play an important role in income generation and subsistence. It offers a significant opportunity for the poorest people to earn a living as producers and traders without requiring large capital investments. Commercial growers can make a lot of money from the fast growing moringa. Women are the key players in the production, processing and marketing of moringa. For these women and their families, the income earned are of utmost importance.

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