

Moringa oleifera: A rare plant, its nutritional and health benefits

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Abstract

The various ways in which human foods are produced have been intensely discussed and questioned in recent time. It is expected that food from plants, farm animals and microorganisms should be inexpensive, healthy and of good quality. Therefore, the goal to produce sufficient food for everybody can only be achieved if the world food production increases by 2% per year. However, poultry possess a limited natural resistance and immunity against colonization or infection by potentially pathogenic microorganisms. Therefore, antimicrobial feed additives have made a tremendous contribution to profitability of intensive husbandry and providing people with healthy and nutritious animal products. Among antimicrobial feed additives, leaf and seed meals have been prominent recently in poultry and livestock production generally. Growing evidence indicates that increased intakes of phytonutrient-rich botanicals improve the nutritional status and health of the consumers. Moringa oleifera plant, a promising biologically active native plant found in Nigeria has nutritional and botanical attributes useful in livestock production. In poultry, Moringa oleifera leaf and seed meal is used as feed additive, especially in the absence of high plant energy-protein ingredients like full-fat soya bean. Various studies had been conducted on moringa plant by different researchers all reporting a positive effect on animal performances. This study therefore, review some reports from different researchers on the nutritional benefits of Moringa oleifera plant in animals and humans.

Keywords: *Moringa oleifera*, nutrition, phytochemicals, livestock and poultry



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Résumé

Les différentes manières dont les aliments humains sont produits ont été intensément discutées et remises en question ces derniers temps. On s'attend à ce que les aliments provenant de plantes, d'animaux de ferme et de micro-organismes soient bon marché, sains et de bonne qualité. Par conséquent, l'objectif de produire suffisamment de nourriture pour tout le monde ne peut être atteint que si la production alimentaire mondiale augmente de 2% par an. Cependant, les volailles possèdent une résistance naturelle et une immunité limitées contre la colonisation ou l'infection par des micro-organismes potentiellement pathogènes. Par conséquent, les additifs alimentaires antimicrobiens ont énormément contribué à la rentabilité de l'élevage intensif et à la fourniture aux populations de produits animaux sains et nutritifs. Parmi les additifs alimentaires antimicrobiens, les tourteaux de feuilles et de graines ont occupé récemment une place importante dans la production de volaille et de bétail en général. De plus en plus de preuves indiquent que des apports accrus de plantes riches en phytonutriments améliorent l'état nutritionnel et la santé des consommateurs. La plante Moringaoleifera, une plante indigène biologiquement active prometteuse trouvée au Nigéria, possède des attributs nutritionnels et botaniques utiles dans la production animale. Chez la volaille, la farine de feuilles et de graines de Moringaoleifera est utilisée comme additif alimentaire, en particulier en l'absence d'ingrédients protéiques à haute teneur

énergétique végétale comme le soja entier. Diverses études ont été menées sur la plante de moringa par différents chercheurs rapportant toutes un effet positif sur les performances des animaux. Cette étude passe donc en revue certains rapports de différents chercheurs sur les bienfaits nutritionnels de la plante Moringa oleifera chez les animaux et les humains.

Mots-clés: Moringa oleifera, nutrition, phytochimiques, bétail et volaille

Introduction

There is a well-established connection between diet and health. Increasing health care costs have catalyzed a change in emphasis towards preventing chronic diseases (e.g., heart diseases, cancer, osteoporosis) instead of treating them once they develop. Growing evidence indicates that increased intakes of vegetable materials and foods rich in phyto-nutrients may help prevent such diseases and improve the health of Nigerians. In Nigeria like in most other parts of the developing world, many of the local vegetable materials are under-exploited because of inadequate scientific knowledge of their nutritional potentials. Though several works reporting compositional evaluation and functional properties of various wild plants in use in the developing countries abound in literature (Oyenuga, 1968; Aduku, 1991; Umar, 2006; Ekop, 2007; Akubugwo *et al.*, 2007), much still need to be done to explore the possibilities of employing their use particularly, in solving the dearth of nutrients required in the diets of Nigerians. As a result of this, development of alternative antimicrobial agents that will improve the production of livestock and will not have residual effect on meat is of great importance (Ogbe and Affiku, 2012). *Moringa oleifera* plant is important in human and animal nutrition, therefore this research seek to explore the nutritional and health benefits of *Moringa oleifera* plant, as alternatives to foods of poor nutritional value and how this influences composition relative to current consumer needs and perceptions.

Origin and cultivation moringa plant

Moringa belongs to the single genus monogeneric family, moringaceae and is

well distributed in India, Indonesia, Africa and Asia. There are 13 types of moringa plant species and are *M. oleifera*, *M. arborea*, *M. borziana*, *M. concanensis*, *M. drouhardii*, *M. hildebrandtii*, *M. longituba*, *M. ovalifolia*, *M. peregrina*, *M. pygmaea*, *M. rivaie*, *M. ruspoliana* and *M. stenopetala*. *Moringa oleifera* and *Moringa stenopetala* are commonly found in Africa. The moringa plants grow as a field crop and can be harvested frequently. This technique produces a large amount of usable green matter from a relatively small amount of space. *Moringa* grows faster with many branches that can yield about 800 to 1500 pods per year Fuglie (2004). Some people may wonder how a tree can supply nutrition for a large number of people. Foidl and Reyes (2001) have experimented with growing moringa intensively, as a field crop. They reported that moringa trees can be planted very close together as a field crop, at a spacing as close as ten to fifteen centimeters and they irrigated moringa plantation and used larger amounts of fertilizer they reported harvesting every 35 days—nine crops per year—with a total yield of 650 to 700 tons of green matter per hectare. The yield has been consistent from the same plants for seven years. Dr. Reyes has grown moringa intensively with no irrigation and small amounts of fertilizer, he was able to harvest the leaves every 75 days—four crops in a year. He got a total of 100 tons of green matter per hectare the first year, and 57 tons per hectare the second year. People in these societies discovered a vast array of uses for moringa. This knowledge existed in many different parts of the world—Africa, Latin America, South America, India, Indonesia, and many island nations.

Table 1: Proximate composition of *Moringa oleifera* leaf meal

Parameter (%)	<i>Moringa oleifera</i> leaf meal
Crude protein	26.9
Crude fibre	9.0
Ether extract	6.2
Ash	12.0
Dry matter	95.3

Source: Akangbe *et al.* (2011)**Table 2: Proximate composition of *Moringa oleifera* seed**

Parameter (%)	<i>Moringa oleifera</i> seed
Crude protein	36.9
Crude fibre	9.0
Ether extract	16.2
Ash	12.0
Dry matter	95.3

Source: Akangbe (2015)

Table 3: Phytochemical composition of raw and water-soaked *Moringa oleifera* seed

Parameters (%)	Raw	Water soaked
Alkaloids	0.37	0.07
Saponins	1.17	0.42
Tannins	0.06	0.05
Phytates	4.43	3.70
Cyanogens	1.37	0.93
Glucosinolates	0.66	0.50

Source: Akangbe (2015)

Benefits of Moringa oleifera in human health

We are all well familiar with the problems of malnutrition in our world, and how much suffering and death result. Here are the countries with the highest rates of malnutrition. The amazing thing about *Moringa* is that it grows in almost exactly the same places. These are the countries where *Moringa* grows exactly where it is needed the most. *Moringa oleifera*, otherwise regarded as a “miracle tree”, is reputed to have many medicinal properties, although many have not been scientifically substantiated. *Moringa oleifera* is esteemed as a versatile plant due to its multiple uses. The leaves, fruits, flowers and immature pods of this tree are edible and they form a part of traditional diets in many countries of the tropics and sub-tropics (Siddhyraju and Becker, 2003; Anhwange *et al.*, 2004). In addition to its

substantial uses and nutritional benefits, *M.oleifera* also has a great potential as a medicinal plant. The flowers, leaves and roots are used for the treatment of ascites, rheumatism and venomous bites and as cardiac and circulatory stimulants in folk remedies. The roots of the young tree and also root bark are rubefacient and vesicant (Hartwell, 1995; Anwar and Bhanger, 2003; Anwar *et al.*, 2007). The oil extracted from *M. oleifera* seed is considered to be similar to that for olive oil (Caceres, 1999). It has been used in the treatment of numerous disease conditions (Pal *et al.*, 1995; Makomen *et al.*, 2005; Matthew *et al.*, 2005 and Akangbe 2014) including heart diseases and obesity due to its hypocholesterolemic property (Ghasi *et al.*, 2000). **Children** maintained or increased weight and improved health, Pregnant women recovered from anemia and had babies with higher birth weights and Breast-feeding

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women increased milk production. *Moringa oleifera* leaves have the calcium equivalent of 4 glasses of milk, the vitamin Content of seven oranges, potassium of three bananas, three times the iron of spinach, four times the amount of vitamin A

in carrot, and two times protein in milk (Loren, 2007) and it also helps to purify water, a cheaper alternative to mechanical filtration. Olugbemi *et al.* (2010) reported that *Moringa oleifera* possesses hypocholesterolemic properties and could facilitate cholesterol reductions.

Table 4: The mineral composition of raw and water – soaked *Moringa oleifera* seed

Parameters (mg/100)	Raw	Water soaked
Calcium	0.43	0.43
Phosphorus	0.40	0.34
Potassium	0.95	0.93
Magnesium	0.54	0.42
Iron (ppm)	188.30	179.35

Source: Akangbe (2015)

As far back as 150 AD, the ancient kings, queen and warrior of India, Greek, Roman and Egypt have used moringa leaf extract for various treatments and drinks of which they believed that the drink added energy and relieve stress and pain incurred by warriors during the war. Here in Nigeria, moringa leaf powder are sold in different form for the treatment of different kind of diseases, some even consume it raw or cooked, most especially in the northern part of the country without putting into consideration the potential possible negative effect on the blood and internal organs after consumption over a long period of time (Ezekwe *et al.*, 2013).

Benefits of Moringa oleifera in animal nutrition

In Pakistan, only two species of *Moringa*: *M. concanensis* and *M. oleifera* are reported. The former species is rare and confined to only a remote locality of Therparkar, Sindh province of Pakistan The latter species is mostly cultivated in the Sindh province and fed to animals (Oaiser, 1973; Manzoor *et al.*, 2007). *Moringa oleifera* are in high demand for their medicinal value. Apart from the medicinal uses *Moringa oleifera* was reported to be a good source of vitamins and amino acids in poultry nutrition (Olugbemi *et al.*, 2010)

and it was claimed to boost the immune systems (Jayavardhanan *et al.*, 1994). Makkar and Becker (2009), Ogbe *et al.* (2012) and Akangbe (2015), reported that *M. oleifera* seeds soaked in water above 30 minutes increase the crude protein as well as reduce the phytochemical contents. *M. oleifera* is used in livestock feeds and the twigs are reported to be very palatable in ruminants nutrition (Sarwatt *et al.*, 2002.; Kakengi *et al.*, 2007). The edible leaves are very nutritious and its inclusion into layers diets induced double yolks and enhanced yolk color Akangbe (2011), Aremu *et al.*, (2012). Sola-Ojo *et al.* (2013), Akangbe and Abu (2016) and Mosuro (2017) recommended that *Moringa oleifera* leaf and seed can replace vitamin/mineral premix in broiler's diet. It was claimed that *M. oleifera* extracts have shown to regulate thyroid status on male mice (Tahillani *et al.*, 2010). Akangbe and Abu (2018) reported that water-soaked *Moringa oleifera* seed fed to albino rats maintain normal cells within their livers and kidneys. *Moringa oleifera* seed meal can replace *Centrosema pubescentis* seed in rabbit's diets, (Akintunde *et al.*, 2013) and increase sexual libido in male rabbits (Adeyemi and Ewuola 2014). A study carried out by Akangbe (2013) on blood and yolk

cholesterol profile in laying hens revealed that hens on control diet had the highest values while hens on moringa diet obtained the lowest values, this implies that *Moringa oleifera* leaf meal can reduce cholesterol in the blood and egg yolk, which is beneficiary to consumers who avoid consuming yolks in the egg. Akangbe and Abu (2014) went further to investigate a study on hormonal profile of laying hens fed *M. oleifera* and they reported that there were significant differences ($p < 0.05$) on hormonal profile as hens on control diet had the highest estrogen, FSH and LH values which was different from the hens on moringa treatments, this could be due to the connection between *Moringa oleifera* leaf meal and full fat soyabean, *M. oleifera* leaf can influence the reproductive hormones in laying hens. A study conducted by Akangbe (2017) showed *Moringa oleifera* seed can effectively solve the problem of protein utilisation in poultry nutrition by replacing soyabean with moringa seed. Oyedele *et al.* (2013) also replace fish meal with moringa seed and they reported increased in weight and better feed conversion ratio of local chickens Oyedele *et al.* (2013). Akangbe and Abu (2018) reported that organoleptic test approves *Moringa oleifera* seed acceptable for human consumption due to the reduction in the fat content of broiler meat.

Conclusion and recommendations

Moringa oleifera plant should not be used raw in formulating livestock feeds and human consumption because of the inherent anti-nutritional factors. With the possibility of some anti-nutritional factors that may be present in the plant, processing methods can be used to reduce the anti-nutritional factors, thereby enhance livestock and poultry production and human nutrition. To drive the Nigeria livestock industry the use of processed moringa plant may play a significant role in the diets of livestock species. This drive has often been curtailed

by scarcity and or exorbitant prices of certain feed ingredients, particularly the animal protein concentrates. With the findings from this research, it ought to be possible for livestock and poultry farmers to choose and utilise *Moringa oleifera* as non conventional protein feed ingredients in the absence of the conventional ones.

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