MORINGA: A POTENTIAL SUBSTITUTE TO ANTIBIOTICS AND DIETARY SUPPLEMENT IN BROILER PRODUCTION- A REVIEW

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ABSTRACT
Moringa oleifera, a small size tree, which can grow to a height of 5 to 10 m. It survives in different climate of the world. It can grow under harsh climatic conditions without being much affected by drought. It tolerates different ranges of rainfall estimated at minimum 250 mm and maximum at over 3000 mm. It thrives on soil pH of 5.0 to 9.0. The trunk is soft with white corky and its branches has a gummy bark. It possesses tripinnate compound leaf with several small leaf legs. The flowers are white in colour and the three wings seeds are scattered by the winds. It is cultivated for its multiple utilities. Every part of Moringa is used for certain nutritional and/or medicinal propose. It is a good source of protein, vitamins, oils, fatty acids, micro and macro minerals elements as well as various phenolics, it was also reported to have anti-inflammatory, antimicrobial, antioxidant, and antihelmintic usefulness. Research on this precious herb may lead to the development of novel agents for various diseases to substitute the current antibiotics which are fast becoming ineffective. This review provides a brief overview about medicinal and Nutritional potentials of *Moringa oleifera* and its use as a component of modern medicine and broilers feed.
Key word: *Moringa oleifera,* anti-microbial, anti-oxidant, feed additive, broiler

INTRODUCTION
The presence of residues of antibiotics in poultry meat and meat products beyond maximum permissible limits is a matter of serious concern (Muaz *et al.,* 2018). The use of antibiotics for animal products is also a global concern to world health organization (WHO, 2014) because there is increased emergence of antibiotic resistant pathogens due to sub-therapeutic use of antibiotic as growth promoters, which poses a serious hazard to human health (Torun *et al.,* 2018). According to Brock Biology of Micro-organisms (2014), Antibiotic resistance (AR) is defined as the ability of an organism to resist the bacteriostatic or bactericidal effects of an antibiotic to which it was normally susceptible.

Justification
The need for the knowledge of a potential alternative to antibiotics in broiler production is consequential because its meat is usually ready for consumption at an average of 6 weeks. The avoidance of improper use of antibiotics and the prevention of its residual effect in meat is therefore the essence of this review.

Properties of Moringa Plant
Moringa oleifera is a well-known cultivated species in the genus Moringa, (family Moringaceae) under the order Brassicales. It is also known as drumstick tree, horseradish tree, and ben oil tree or benzoil tree or miracle tree (Arora *et al*, 2013). It can grow under harsh climatic conditions without being much affected by drought (Morton, 1991). It tolerates different ranges of rainfall estimated at minimum 250 mm and maximum at over 3000 mm. Palada and Chang (2003) reported that it thrives on soil pH of 5.0 to 9.0. *Moringa oleifera* trunk is soft with white corky and its branches has a gummy bark. It possesses tripinnate compound leaf with several small leaf legs. The flowers are white in colour and the three wings seeds are scattered by the winds (Anwar and Bhanger, 2003; Prabhu et al., 2011). The plant is native to South Asia and Western Africa (Alnidawi *et al*, 2016).

Nutritional properties

Moringa leaves or derivatives are not easily consumed by chickens but about half the protein content can be extracted in the form of a concentrate and added to chicken feed (Price, 2007). According to Fuglie, (2000) phytase can be added to Moringa leaves to break down phytate leading to increased absorption of phosphorusin in chicken diet.

The leaves have been seen to exhibit high contents of vitamin A, C, and E (Hekmat *et al*, 2015), on dry matter basic it contains dry matter (DM) 93.63% to 95.0 %, crude protein (CP) 17.01 % to 22.23 %, carbohydrate 63.11 % to 69.40 %, crude fiber (CF)6.77 % to 21.09 %, crude fat (EE) 2.11 % to 6.41 %, ash (total mineral) 7.96 % to 8.40 %, gross energy 14.790 (MJ/kg), and fatty acid 1.69 % to 2.31 % [58–60].

Medicinal properties of *Moringa oleifera*

Moringa oleifera has enormous medicinal potential, which has long been recognized in the Ayurvedic and Unani system (Mughal *et al*., 1999). Nearly every part including root, bark, gum, leaf, fruit (pods), flowers, seed, and seed oil have been used for various ailments in the indigenous medicine (Odebiyi and Sofowora, 1999). The seed and leaves have been broadly use in human food industry and health related issues (Fahey, 2005). Furthermore, the seed powder of M. oleifera contains polyelectrolytes, which are the most important active ingredients for water purification. Alnidawi *et al*., (2016) conducted an experiment with a view to examining the effects of *Moringa oleifera* leaf on health status in broilers.it was discovered that total cholesterol content was lower with higher level (at 15 % and 20 %) of *Moringa oleifera* inclusion in broiler diets. Similarly, high-density lipoprotein cholesterol (HDL) content in serum was increased and low-density lipoprotein cholesterol (LDL) was decreased with higher level of supplementation of *Moringa oleifera* in broiler.

Antimicrobial Effects

In a recent study, aqueous extracts of *Moringa oleifera* was found to be inhibitory against many pathogenic bacteria, including *Staphylococcus aureus, Bacillus subtilis, Escherichia coli,* and *Pseudomonas aeruginosa* in dose dependent manner (Saadabi and Abu Zaid, 2011). It was also found to be inhibitory against *Mycobacterium phlei* and *B. subtilis.* Its Leaf extract was found to be effective in checking growth of fungi *Basidiobolus haptosporus* and *Basidiobolus ranarums* (Nwosu and Okafor, 1995).

Anti-inflammatory properties

According to Amit Mittal (2017), investigation shows that aqueous extract of Moringa oleifera leaves (200 mg/kg) exhibited anti-inflammatory activity in all models for inflammation. It was therefore construed that the anti-inflammatory effect might be due to active constituents (flavonoids, tannins, rhamnose, xylose, galactose, arabinose, galacturonic acid) that are present in the aqueous extract of Moringa oleifera leaves.

Anti-oxidant properties

Using different methods of extraction, it was discovered that ethanol and methanol extracts of *Moringa oleifera* exhibited the highest level of anti-oxidant property with 66.8 %, and 65.1 % respectively (Lalas and Tsaknis, 2002; Siddhuraju and Becker, 2003). Bajpai *et al*., (2005) and Siddhuraju and Becker, (2003) discovered that the bioactive compounds of phenolics (such as quercetin and kaempferol) are responsible for antioxidant activity.

Table 1: Some pharmaceutical compounds found in *Moringa oleifera*

S/N	Compounds	Method of Extraction	Application	Reference
1	Pterygospermin	Solvent extraction followed by MIC Analysis	antibacterial and fungicidal effects	Rao *et al*. 2008
2	4-(4'-O-acetyl-a-L rhamnopyranosyloxy) benzyl isothiocyanate, 4-(a Lrhamnopyranosyloxy) benzyl isothiocyanate, niazimicin, benzyl isothiocyanate, and 4-(a Lrhamnopyranosyloxy) benzyl glucosinolate, Anthonine and Spirochin	Solvent extraction followed by MIC Analysis	Antibacterial	Fahey (2005), Busani *et al*., (2012), Nwosu and Okafor (1995)

Source: Farooq *et al*, 2012

Table 2: Role of *Moringa oleifera* on performance in broilers.

S/N	Type	Study design	Main findings	References
1	*Moringa oleifera* leaf powder	broilers from 0–42 days, dose: 0, 5%, 10% 15%, 20%, (inclusion type)	• Higher pH of breast muscle • Higher weight and diameter of breast muscle fibers • Higher water holding capacity of breast muscle • Higher ash percentage of tibia bone • Higher body weight • Higher hemoglobin percent, and RBC number • Higher body weight at starter and finisher period	dose: 0, 3%, 5%, and 7% (inclusion type) broilers from 1–42 days, dose: 0, 0.05%, 0.10% (supplementation type)
2	*Moringa oleifera* leaf extract	broilers (Cobb-500) from 1–35 days, dose: starter (1, 3 and 5 g/kg); grower (3, 9, and 15 g/kg); and finisher (5, 15, and 25 g/kg) (inclusion type)		
3	*Moringa oleifera* leaf meal			
4	*Moringa oleifera* leaf meal			
5	*Moringa oleifera* leaf powder	broilers (Hubbard) from 1–35 days, dose: 6,9,12, and 15 g/kg (supplementation type)		
		broilers (Ross) from 1– 49 days,		

• Lower FCR • 4No effects on feed intake • Higher dressing percentage, thigh muscle weight and bursa weight • No effects on CP, CF, DM, EE, ash, NDF, ADF digestibility • Higher feed intake • Higher dressing percentage • Higher meat	tenderness and juiciness score • Higher final body weight • Higher dressing percentage Rehman *et al*., (2018) Alnidawi *et al*, (2016)	Nkukwana *et al*, (2014) Safa and Tazi (2014)	David *et al.,* (2012)

Source: Shad Mahfuz and Xiang Shu Piao, (2019)

CONCLUSION

Herbal plants have considerable promise in health promoting effects in poultry because they contain substances which are considered potential alternatives to antibiotics. Medicinal potential of *Moringa oleifera* is difficult to cover in a single article. This review has provided a glimpse of *Moringa oleifera* applications for performing appraisal of this promising medicinal plant. Although, many bioactive compounds have been discovered from *Moringa oleifera*, these discoveries is in infancy. Future rigorous studies can lead to the detection, and commercialization of *Moringa oleifera* bioactive compounds as a remedies for several poultry broilers ailments. This review shows that *Moringa oleifera* could be successfully used as an environmentally friendly feed additive in broiler chicken to promote growth as well as boost their immune system because of its richness in essential vitamins and minerals. *Moringa* leaf meal can be used safely at levels of 5% to 20% in broiler diets without deleterious effects on their performance. The future study should focus on the uses of *Moringa oleifera* in relation to a pathogen challenge as well as dosages. Further review on *Moringa oleifera* as an alternative for antibiotics should be considered for laying hen for the production of organic meat and egg.

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