

Moringa as a Livestock Feed: A Sustainable Approach to Animal Nutrition

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Maheswari Behera¹, Varanasi Adarsh², R. S. Ghasura³, Lakshmi Singh^{1*}

¹Department of Botany, College of Basic Science and Humanities, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha

²School of Agriculture, GIET University, Gunupur, Odisha

³Department of Veterinary and Animal Husbandry Extension Education, Kamdhenu University, Anand, Gujarat

Moringa oleifera, known as the "Drumstick tree," is a rapidly growing, drought-resistant species indigenous to

the Indian subcontinent and extensively planted in tropical and subtropical areas. Moringa has garnered much attention for its substantial nutritional value and therapeutic potential over the years. In addition to its

advantages for human consumption, Moringa is progressively being investigated as a sustainable and nutritious feed additive for cattle. The incorporation of Moringa into livestock diets has demonstrated improvements in growth performance, milk production, and overall health, attributable to its abundant content of proteins, vitamins, minerals, and bioactive substances (Rizwan et al., 2024).

Nutritional Composition of Moringa

Moringa is renowned for its remarkable nutritional properties, positioning it as a valuable feed supplement for animals. Diverse plant components, such as leaves,



seeds, pods, and stems, are abundant in vital nutrients that enhance animal health and productivity. A comprehensive analysis of the essential nutritional constituents of Moringa has been

described below:

(i) Proteins and Amino Acids

Moringa leaves are a superior source of high-quality protein, comprising roughly 25–30% crude protein on a dry weight basis. The protein content is analogous to conventional protein-rich feeds like soybean meal, rendering it a significant alternative for livestock nutrition. Additionally, it is rich in essential amino acids such as lysine, methionine, and tryptophan,

which are crucial for growth, muscle development, and overall metabolic functions in animals (Amad and Zentek, 2023).

(ii) Vitamins and Minerals

Moringa leaves are rich in vital vitamins and minerals that enhance numerous physiological activities in animals. It is rich in vitamin A, C, E, and several B-complex vitamins. It contains high levels of calcium, phosphorus, magnesium, potassium, and iron, which are vital for bone development, enzyme activation, and red blood cell formation (Stadtlander and Becker, 2017).

(iii) Fiber

The fiber content of Moringa leaves varies between 7-15%, facilitating optimal digestion and gastrointestinal health in both ruminants and monogastric animals. Moderate fiber levels facilitate effective digestion, however high fiber intake may impair nutrient absorption, necessitating a balance of Moringa with other feed components (Amad and Zentek, 2023).

(iv) Bioactive Compounds and Antioxidants

Moringa comprises several bioactive components, such as flavonoids, polyphenols, and glucosinolates, which demonstrate antioxidant, antibacterial, and anti-inflammatory characteristics. These chemicals mitigate oxidative stress, augment immunological function, and boost disease resistance in livestock, resulting in improved overall health and productivity (Mulyaningsih and Yusuf, 2018).

Benefits of Inclusion of Moringa as a Livestock Feed

The following are the primary advantages of Moringa as animal feed:

(i) High-Quality Protein Source for Growth and Development

Moringa leaves possess 25–30% crude protein, rendering them a superior alternative to traditional protein-rich feed components such as soybean meal and alfalfa. Essential amino acids, such as lysine, methionine, and tryptophan, facilitate muscle development, tissue regeneration, and general growth in animals. Research indicates that Moringa-based meals for poultry, cattle, goats, and sheep improve weight gain and body condition scores (Amad and Zentek, 2023).

(ii) Enhanced Immune Function and Disease Resistance

Moringa is abundant in bioactive components, including flavonoids, polyphenols, and glucosinolates, which exhibit antioxidant, anti-inflammatory, and antibacterial effects. These chemicals mitigate oxidative stress, enhance immunological responses, and safeguard animals against prevalent bacterial and viral diseases. The elevated levels of vitamins C and E enhance immunity, diminishing the necessity for synthetic feed additives and antibiotics (Kekana et al., 2022).

(iii) Improved Milk Yield and Quality in Dairy Animals

Supplementation of Moringa in the diets of dairy cattle, goats, and buffaloes has been documented to augment milk output and improve milk quality. The elevated levels of calcium, phosphorus, and vitamin A in Moringa leaves enhance lactation performance. Furthermore, the inclusion of omega-3 fatty acids enhances the nutritional composition of milk,

rendering it more beneficial for human consumption (Sherasiya et al., 2022).

(iv) Better Digestibility and Feed Conversion Efficiency

Moringa leaves provide moderate fiber content (7–15%), which enhances gastrointestinal health and facilitates effective digestion. The superior digestibility of Moringa renders it an optimal feed component, especially for ruminants, as it promotes microbial fermentation in the rumen. Research demonstrates that livestock consuming Moringa-based diets show enhanced feed conversion ratios (FCR), resulting in superior nutrient absorption and increased productivity (Kekana et al., 2022).

(v) Increased Egg Production and Quality in Poultry

The incorporation of Moringa in poultry diets is associated with increased egg production, improved eggshell strength, and enhanced yolk color, attributable to its elevated carotenoid and mineral content. Moreover, the antioxidant capabilities of Moringa mitigate oxidative stress in laying hens, resulting in enhanced reproductive performance and egg hatchability (Sherasiya et al., 2022).

(vi) Sustainable and Cost-Effective Feed Alternative

Moringa is a drought-resistant plant that thrives in diverse agro-climatic conditions, making it a reliable and sustainable feed resource, especially in regions with scarce fodder availability. Its low input requirements, rapid growth, and year-round biomass production make it a cost-effective alternative to commercial feed ingredients, helping farmers reduce

feed costs while ensuring consistent livestock nutrition (Su and Chen, 2020).

(vii) Reduced Dependence on Synthetic Feed Additives

The inherent phytochemicals and antioxidants in Moringa obviate the necessity for synthetic growth enhancers, antibiotics, and vitamin supplements in animal feed. This not only diminishes production expenses but also mitigates the possibility of antibiotic resistance and residues in animal products, thereby fostering safer and more sustainable animal husbandry practices (Sahoo et al., 2020).

(viii) Eco-Friendly and Climate-Resilient Feed Source

Moringa cultivation contributes to carbon sequestration, improves soil fertility, and requires minimal water inputs compared to conventional fodder crops. Integrating Moringa into livestock feeding systems can support climate-resilient agriculture, making it a valuable strategy for reducing the environmental impact of animal farming (Sahoo et al., 2020).

Figure 1 illustrates the various bioactive compounds present in Moringa and its incorporation in different livestock feed.

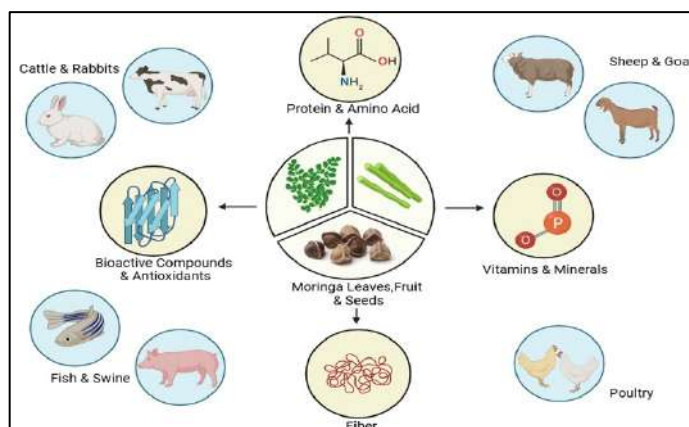


Figure 1: Various bioactive compounds present in Moringa and its utilization in different livestock feed

Processing and Preparation of Moringa for Livestock

To maximize its nutritional benefits and minimize anti-nutritional factors, Moringa must be properly processed before inclusion in animal diets (Su and Chen, 2020).

- **Drying:** Air-drying or shade-drying retains most nutrients while reducing moisture for longer shelf life.
- **Fermentation:** Enhances digestibility, reduces tannins, and improves probiotic activity.
- **Pelletizing:** Improves feed intake and reduces selective feeding behavior.
- **Ensiling:** Preserves Moringa leaves for use during dry seasons while maintaining its nutritional value.

Challenges and Limitations

Despite its numerous benefits, the use of Moringa as a livestock feed also comes with certain challenges (Su and Chen, 2020):

- **Anti-nutritional Factors:** Moringa contains phytates and tannins, which may interfere with nutrient absorption if consumed in excess.
- **Processing Requirements:** To maximize its benefits, Moringa leaves need to be properly dried and processed to maintain nutrient quality and reduce potential toxins.
- **Limited Large-Scale Cultivation:** Although Moringa is widely available, large-scale production for livestock feeding requires proper management and infrastructure.

Conclusion

Moringa oleifera presents a promising and sustainable solution to livestock nutrition. Its rich nutritional profile, coupled with its growth-enhancing, health-boosting, and cost-effective properties, makes it an excellent alternative to conventional feed ingredients. However, further research and proper management strategies are required to optimize its utilization in animal diets. With increased awareness and proper implementation, Moringa has the potential to revolutionize the livestock industry, promoting sustainable and efficient animal farming.

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